Customer Experience Pathways to Sustainable Banking: A Mixed-Methods Case Study of Indonesian State-Owned Banks (Himbara)

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Abstract

This study investigates the role of customer experience as a mediating mechanism linking digital banking, technological readiness, green finance, and volatile, uncertain, complex, and ambiguous conditions to sustainable banking performance in Indonesia's state-owned banks. The research adopts a sequential explanatory mixed-method approach that combines a survey of 260 purposively selected mobile banking users with a follow-up focus group discussion. Partial least squares structural equation modeling is employed for hypothesis testing, while qualitative thematic analysis provides contextual reinforcement. The findings demonstrate that digital banking, technological readiness, green finance, and environmental turbulence significantly enhance customer experience, which in turn strengthens sustainable banking outcomes. Direct and indirect effects confirm the strategic importance of customer experience in translating technological and environmental factors into sustainability performance. The results indicate that sustainable banking development requires an integrated strategy that aligns digital capability, technological preparedness, and green financial initiatives with coherent customer experience management.

Keywords: Customer experience; digital banking; technological readiness; green finance; sustainable banking; state-owned banks; environmental turbulence; strategic integration; mixed-method research; Indonesia

INTRODUCTION

The global financial system faces increasing pressure to adopt Sustainable Banking due to rising climate risks, widening social inequality, and persistent economic volatility. The World Economic Forum reports that extreme weather events and food insecurity have begun to affect global economic performance and the portfolios of major financial institutions (World Economic Forum, 2023). The banking sector therefore assumes a strategic function in supporting low-carbon transition pathways, promoting financial inclusion, and strengthening long-term economic resilience. International commitments continue to reinforce this shift toward sustainability within the banking industry. More than 350 global banks have endorsed the Principles for Responsible Banking to align their operations with the Sustainable Development Goals and the Paris Agreement (UNEP FI, 2023). The International Monetary Fund emphasizes that banks play a pivotal role in closing the financing gap for climate mitigation and adaptation by integrating climate-related risks into risk management frameworks and enabling market-based incentives such as carbon pricing (International Monetary Fund, 2023). Regulatory developments, including the TCFD framework, IFRS S2, and the European Union's CSRD, further strengthen expectations for

banks to embed environmental, social, and governance principles into corporate governance (European Commission, 2023).

Indonesia's financial authorities have responded to the global momentum by implementing a comprehensive regulatory foundation for sustainable finance. The Financial Services Authority (OJK) introduced the Sustainable Finance Roadmap and subsequently issued key regulations such as POJK No.17/2023 on ESG risk management and POJK No.14/2023 on carbon market operations. The enactment of the Financial Sector Omnibus Law (P2SK Law No.4/2023) established a national green taxonomy to guide environmentally aligned economic activities. The publication of the Climate Risk Management and Scenario Analysis (CRMS) guideline in 2024 provides banks with a structured approach for assessing climate-related impacts across their portfolios (OJK, 2024). Several major banks have also committed to Indonesia's 2060 Net Zero Emissions target. Bank Indonesia complements this agenda through macroprudential instruments that incentivize sustainable lending. The implementation of the Macroprudential Liquidity Policy provides reserve requirement reductions for banks financing green mortgages and electric vehicles (Bank Indonesia, 2023). The introduction of the Macroprudential Inclusive Financing Ratio strengthens the social dimension of sustainability by encouraging lending to MSMEs and low-income households. The government further expands sustainable financing channels through Green Sukuk and SDG-linked bonds.

Recent studies indicate that the digitalization of banking enhances Customer Experience by improving accessibility, personalizing services, and increasing process efficiency (Chauhan et al., 2022). Evidence from systematic reviews shows that elements such as system quality, information quality, and service quality shape customers' perceptions of their digital banking experience and influence their willingness to continue using digital channels. Findings from empirical research demonstrate that stable systems and intuitive features reinforce customer loyalty, while service interruptions and the persistence of legacy systems weaken trust and overall satisfaction (Kim, 2025). Cybersecurity threats present a significant challenge because security incidents diminish user confidence and compel banks to invest heavily in digital resilience (Katuri, 2025). Gaps in digital literacy and uneven technological infrastructure restrict the benefits of digital transformation, which means that the adoption of new technologies does not consistently translate into positive customer experiences without structured user support and education programs (Az-Zahra et al., 2023). Insights from policy literature emphasize that banks need to align improvements in digital service quality with stronger operational reliability, robust risk governance, and well-designed literacy initiatives to ensure that digital transformation genuinely strengthens the customer experience (International Monetary Fund, 2024; World Economic Forum, 2023).

The need to understand the relationship between banking digitalization, environmental sustainability, and Customer Experience has become increasingly important because existing literature does not yet explain the mechanisms that connect these three dimensions. Prior studies have shown that digital service quality enhances Customer Experience, yet most of this work concentrates on technological attributes such as system quality and service quality without examining whether customer experience operates as a pathway linking digital technology to environmental sustainability practices. Evidence from sustainability-oriented banking research indicates that technology can encourage environmentally responsible behavior, although these studies have not evaluated the role of Customer Experience as either a mediating or moderating mechanism. International reviews also emphasize the importance of integrating digital innovation with sustainability strategies, even though empirical examinations that test the connecting

processes between digital innovation, environmental orientation, and sustainability outcomes remain limited. This gap highlights the need for further research that clarifies how Customer Experience shapes customer acceptance, behavior, and engagement toward technology-enabled sustainability initiatives.

The presence of a volatile, uncertain, complex, and ambiguous (VUCA) business environment reshapes customer expectations and increases the need for organizational adaptability. Foundational work on this concept positions VUCA as a lens for understanding contemporary strategic challenges that demand a shift from traditional managerial approaches (Bennett and Lemoine, 2014). Later contributions explain that leaders must develop anticipatory and scenario-based capabilities to respond proactively to shifting customer preferences (Johansen, 2012). The effects of VUCA extend to operational and customer-facing activities because fluctuations in demand, technological disruptions, and supply-chain complexity elevate customer needs for speed, transparency, and personalization in banking services.

Agility Strategy emerges as an important contextual variable because organizational agility determines the extent to which firms can redirect strategic focus, reconfigure resources, and pursue opportunities amid uncertainty. The concept of strategic agility highlights the importance of sensing, seizing, and transforming capabilities that enable firms to maintain strategic relevance in rapidly changing environments (Doz and Kosonen, 2008). The broader framework of dynamic capabilities reinforces this view by emphasizing the need to modify internal competencies and structures to address emerging threats and opportunities (Teece et al., 1997). Research in information systems adds that digital architectures and digital options support agility by enabling rapid service adjustment without undermining reliability (Sambamurthy et al., 2003). Customer-behavior literature further suggests that consistent and trustworthy customer experiences are essential for sustainable behavior adoption, which implies that poorly governed agility may erode trust and loyalty (Lemon and Verhoef, 2016). The limited empirical evidence on how Agility Strategy moderates the link between Customer Experience and sustainability outcomes in the banking sector underscores the relevance of investigating this moderating mechanism.

The main objective of this study is to examine how key drivers of digital transformation and sustainability shape *customer experience* and ultimately strengthen *sustainable banking* within Himbara banks. The analysis focuses on the influence of digital banking, technological readiness, green finance, and the VUCA environment on customer experience and sustainable banking, supported by an assessment of the mediating role of customer experience and the moderating role of agility strategy. The study also aims to formulate strategic recommendations that enable Himbara banks to enhance their sustainable banking performance in a more competitive and dynamic financial landscape.

CONCEPTUAL FRAMEWORK

Customer Experience

Digital banking enhances customer experience through accessible services, fast transaction processing, and improved convenience (Joshi and Aggarwal, 2025; Chauhan et al., 2022; Sathwika et al., 2024; Bhatnagr and Rajesh, 2024). Functional quality, trust, perceived security, usability, and effective communication strengthen users' positive experience. Digital transformation shapes more proactive financial behaviour and creates space for the adoption of innovative financial products (Challa, 2024; Harahap et al., 2024). Personalisation features and gamification elements,

including rewards, leaderboards, and challenges, increase customer engagement and loyalty (Hentati and Jallouli, 2025; Meylina et al., 2024; Shabani et al., 2022; Nasirzadeh and Fathian, 2020; Prasetyaningrum et al., 2024). Customer responses vary across age groups because younger users value speed and personalised interactions, while older users prioritise trust and direct support (Fathimath Thasleena and Santhi, 2025). AI-driven gamification based on behavioural segmentation delivers higher levels of retention and engagement (Pradhan et al., 2025). Strong security safeguards, data privacy, and protection systems build trust and support continued usage (Ahmed et al., 2024; Gui et al., 2024; Sebihi et al., 2024; Azhari et al., 2025; Levy, 2022). Emotional attachment to digital platforms strengthens the link between experience and loyalty. Security-related concerns remain a barrier for older or risk-averse customers (Ravichandran et al., 2025). Technical problems, including connectivity issues, legacy systems, and usability limitations, reduce user experience quality (Arora and Banerji, 2024; Wang et al., 2024; Grljević et al., 2025; Albashrawi and Motiwalla, 2015). Improvements in cybersecurity, user-centred design, AI-based personalisation, and effective complaint management serve as essential requirements for optimising customer experience (Balage and Sedera, 2024; Arsu and Aytaç, 2023).

Technological readiness shapes customer experience through optimism and innovativeness that encourage the adoption of digital services (Moray and Jain, 2024; Ho et al., 2025; Chen and Chen, 2009). The positive effect decreases when customers perceive discomfort and insecurity, which illustrates how readiness influences responses to self-service technologies. The moderating effect of technological readiness becomes visible in its interaction with self-service quality in determining customer satisfaction, particularly in developing countries (Pooya et al., 2020; Nguyen et al., 2023). Perceived value generated by ATMs, kiosks, and mobile applications increases satisfaction, and technological readiness operates as a mediator in this process (Boon-Itt, 2015; Pham et al., 2020). Perceived value acts as the primary driver of loyalty in self-service banking (Mainardes and Freitas, 2023). The influence of readiness varies according to demographic characteristics, including age, gender, income, and education, because men tend to respond to social status cues while women are more affected by perceived usefulness (Chawla and Joshi, 2017; Chawla and Joshi, 2018; Goh and Sun, 2014; Saxena et al., 2023). Socioeconomic conditions and digital literacy shape customers' readiness in developing economies (Fall and Birba, 2019; Maharani and Utomo, 2023). Market contexts display different levels of readiness, with agility and sensemaking capability becoming essential in SMEs (Pingali et al., 2023). Security, reliability, and ease of use determine satisfaction in such environments (Mahaboob Basha et al., 2020).

Green finance enhances customer experience through perceived benefits and environmental concern that encourage the adoption of green financial services (Jain et al., 2025; Devesh et al., 2024). Green banking initiatives, including green loans and digital services, increase customer satisfaction and retention (Pawar and Munuswamy, 2022; Mir et al., 2025). Ethical perceptions of environmental practices mediate the relationship between environmentally friendly services, trust, and loyalty, especially in Southeast Asia (Gour and Agarwal, 2025; Khan et al., 2015; Nasuka et al., 2021; Zhang et al., 2023). The alignment of environmental values with religious principles in Islamic banking strengthens loyalty and the adoption of green services (Purnama et al., 2025; Muflih et al., 2024; Rosula et al., 2024; Sudarsono et al., 2021; Bilal and Sulaiman, 2021). Authentic green marketing communication increases awareness, builds brand equity, and reduces the risk of greenwashing (Choubey and Sharma, 2024; Nguyen et al., 2025; Ibe-enwo et al., 2019; Malik et al., 2025; Tu et al., 2024). Targeted education and communication

are necessary to expand public acceptance of green finance (Kuosuwan et al., 2024; Putri et al., 2017; Chauhan et al., 2025). Cultural and religious factors play a central role in shaping customer responses to green services, particularly in predominantly Muslim contexts. Public awareness of green finance remains moderate, which supports the need for further education and communication efforts (Jain et al., 2025).

VUCA shapes customer experience through rising uncertainty and complexity that require strategic adaptation in the banking sector (Khare et al., 2022; Sharma and Nama, 2024; Pirker, 2024; Weiß, 2025). The dynamic nature of VUCA encourages banks to innovate, clarify communication, and deliver personalised support for customers. Older customers experience stronger effects from unstable conditions because they tend to have higher levels of technology-related anxiety (Spevak et al., 2025; Han and Ko, 2025; Rajaobelina et al., 2021; Chotitumtara and Namahoot, 2025). Perceived risk, low digital literacy, and security concerns act as major obstacles for this group. Organisational strategies to address VUCA include the use of AI, IoT, and agile workforce management to strengthen personalisation, security, and operational resilience (Madhumita et al., 2024; Al Doghan and Mirzaliev, 2024; Gabriele, 2024; Muduli and Choudhury, 2024; Kuchciak and Warwas, 2021). Customer-centric practices, enhanced cybersecurity, and digital literacy programmes become essential to maintain customer experience quality (Ahmed et al., 2024; Bhatnagr et al., 2024). Inclusive design, digital literacy training, and immersive learning such as VR reduce technology-related anxiety among older customers (Steelman and Wallace, 2017; Jung et al., 2025; Guo et al., 2025; Zhang et al., 2025). Social support and clear communication reinforce trust and ease of use for this group (Yadav et al., 2025).

H1–H4: digital banking, technological readiness, green finance, and VUCA influence customer experience.

Sustainable Banking

Customer experience forms the psychological and behavioral basis that motivates customers to support sustainable banking practices (Sardianou and Stauropoulou, 2025). Positive interactions create trust and loyalty, which encourage customers to adopt environmentally friendly products and use digital features designed to reduce carbon footprints (Kuosuwan et al., 2024). High levels of satisfaction with fintech services strengthen customers' intentions to continue using these services, resulting in improved sustainability performance through operational effectiveness and resource efficiency. Perceptions of economic and environmental benefits also increase the acceptance of green services, although some customers still consider social implications such as job security and accessibility (Filgueiras et al., 2024). Consistent commitment from top management reinforces the relationship between customer experience and the successful adoption of sustainability practices (Newton et al., 2024).

Digital banking provides an operational infrastructure that enables the banking sector to deliver sustainability initiatives more effectively (Kuosuwan et al., 2024). The use of AI, blockchain, and Industry 4.0/5.0 frameworks enhances transparency and service efficiency (Azouaoui et al., 2023). Well-managed digital transformation accelerates the achievement of the SDGs when supported by adequate employee training (Bahl et al., 2023). Digital capability strengthens green finance initiatives because digital awareness mediates the success of sustainability programs (Serdarušić et al., 2024). The combination of green banking practices and digital capability improves sustainability performance by reducing paper usage, optimizing energy consumption, and streamlining service processes (Valerie et al., 2025).

Green finance contributes directly to sustainable banking by improving environmental performance and financial stability (Gulzar et al., 2024). The integration of ESG criteria into financial products enhances institutional resilience and ensures long-term sustainability (Rasheed et al., 2023). Green banking policies encourage customer engagement with environmentally friendly financial products (Anjalidevi et al., 2024). Green bonds reduce credit risk due to increased investor confidence (Sheng and Montgomery, 2025). The implementation of ESG policies improves profitability, while green lending decreases non-performing loan ratios and supports revenue growth (Lian et al., 2022). Strong regulatory frameworks are required to expand green finance adoption, especially in developing countries (Luo and Sroka, 2025).

VUCA conditions drive banks to build adaptive and resilient organizational structures as a means to maintain operational sustainability (Khalatur et al., 2021). Adaptive leadership becomes essential for responding to uncertainty by incorporating systems thinking and change management approaches (Khare et al., 2022). Scenario planning and modeling approaches help banks project risk impacts and prepare strategic responses (Nishimoto, 2021). Employee competencies, including emotional stability and adaptability, strengthen organizational resilience (Shetty and Suprabha, 2025). Risk management frameworks such as CAMELS enhance preparedness for VUCA conditions, particularly when digitalization increases risk complexity (Risal and Panta, 2019). Organizational knowledge and digital systems support strategic resilience and help sustain performance amid uncertainty (Weiß, 2025). Technological readiness strengthens banks' ability to integrate sustainable banking principles through improved efficiency, fintech adoption, and the use of green technologies (Bhuiyan et al., 2024). Technological capability functions as a mediator between external pressures and sustainability outcomes (Sharma et al., 2023). Employee training in fintech enhances operational efficiency and supports the adoption of environmentally friendly technologies that contribute to environmental performance. Effective IT governance accelerates green institutional activities and promotes long-term sustainability (Bonsu et al., 2025). Barriers such as limited IT infrastructure, restricted funding, and inadequate digital skills influence technological readiness, particularly in the MSME sector (Susanty et al., 2025). Best practices show that strong digital–sustainability readiness correlates positively with economic performance and positions technology as a foundational element of sustainable banking (Trequattrini et al., 2025).

H5–H9: customer experience, digital banking, green finance, VUCA, and technological readiness influence sustainable banking.

Agility strategy functions as a strategic mechanism that strengthens the influence of customer experience on sustainable banking because this strategy enhances the bank's ability to recognize and respond to customer needs rapidly and accurately (Junfeng and Butkouskaya, 2024). Banks with a high level of customer agility can align their understanding of customer expectations with sustainability objectives, enabling more optimal economic, social, and environmental performance (Probojakti et al., 2024). The precision of responses to customer needs also supports the effective integration of sustainability values within banking services across multiple interaction points. Agility strategy reinforces the relationship between customer experience and sustainable banking because it creates an organizational structure that is flexible and adaptive to changes in the business environment (Al-Nattar and Alazzawi, 2020). Adaptive capabilities allow banks to utilize customer feedback promptly, which ensures that sustainability-oriented services can be implemented consistently (Mutambik, 2023). The improvement in responsiveness to customer

needs strengthens long-term loyalty, which serves as a fundamental basis for the success of sustainability initiatives (Sardianou and Stauropoulou, 2025). Banks that apply agility strategy effectively can link positive customer experience to sustainability commitment through stronger innovation capabilities, faster decision-making, and more efficient operations (Frempong et al., 2022). The integration of this strategy creates added value that enhances customer trust in green initiatives, increasing the likelihood that customers will support environmentally responsible products and policies (Han et al., 2025). Organizational readiness to pursue sustainable innovation becomes stronger when agility strategy is combined with digital transformation and a customer experience orientation (Mihardjo et al., 2019). Agility strategy therefore moderates the relationship between customer experience and sustainable banking because this strategy improves the bank's ability to respond to customer needs, strengthens customer loyalty, and ensures the adaptive integration of sustainability values across business processes.

H10: agility strategy moderates relationship between customer experience and sustainable banking.

The mediating role of customer experience provides the conceptual foundation for explaining how digital banking, technological readiness, green finance, and VUCA conditions influence sustainable banking. Customer experience emerges as an essential behavioural mechanism because it shapes the way customers perceive value, trust, and long-term engagement with sustainable banking practices (Kuosuwan et al., 2024). Customer experience mediates the relationship between digital banking and sustainable banking by strengthening the positive effects of digital services on satisfaction and retention. Digital platforms that offer accessibility, efficiency, and reliability create stronger customer attachment to environmentally responsible banking models (Sathwika et al., 2024). The improvement of customer experience in the digital environment enhances the likelihood that customers will support sustainable initiatives embedded in digital banking services.

Customer experience also mediates the influence of technological readiness on sustainable banking. Banks that demonstrate readiness to adopt advanced technologies tend to deliver higher service quality, which increases customer satisfaction and encourages sustained engagement (Çakaloğlu, 2022). The readiness to implement innovative systems generates smooth, responsive, and secure service interactions that strengthen customer confidence in sustainable banking performance (Siswanti et al., 2024). Customer experience further mediates the relationship between green finance and sustainable banking. The availability of green financial products creates value only when customers perceive the services as beneficial, transparent, and aligned with sustainability goals. Positive experiences with green loans, green services, or eco-friendly transaction features strengthen satisfaction and loyalty, which reinforces the long-term success of sustainable banking strategies (Aldaarmi, 2024; Serdarušić et al., 2024). Higher awareness and positive perceptions of green financial initiatives amplify customer participation in environmentally responsible banking practices (Hussain et al., 2025; Mir et al., 2025).

Customer experience also mediates the effect of VUCA conditions on sustainable banking. Banks operating in environments characterized by volatility, uncertainty, complexity, and ambiguity require strong strategic agility to maintain service stability. Effective management of digital applications and information technologies enhances customer experience, which supports the resilience and sustainability of banking operations under VUCA pressures (Tanchangya et al., 2025). High-quality customer interactions contribute to institutional adaptability and strengthen

sustainable outcomes. Customer experience functions as a mediator that integrates technological, environmental, and contextual factors into a coherent pathway toward sustainable banking. The strengthened satisfaction, trust, and behavioural commitment that arise from positive experiences enable customers to support and adopt sustainable banking initiatives more consistently. The mediating mechanism therefore reinforces the overall influence of digital banking, technological readiness, green finance, and VUCA dynamics on sustainable banking performance.

H11–H14: customer experience mediates the influence of digital banking, technological readiness, green finance, and vuca on sustainable banking

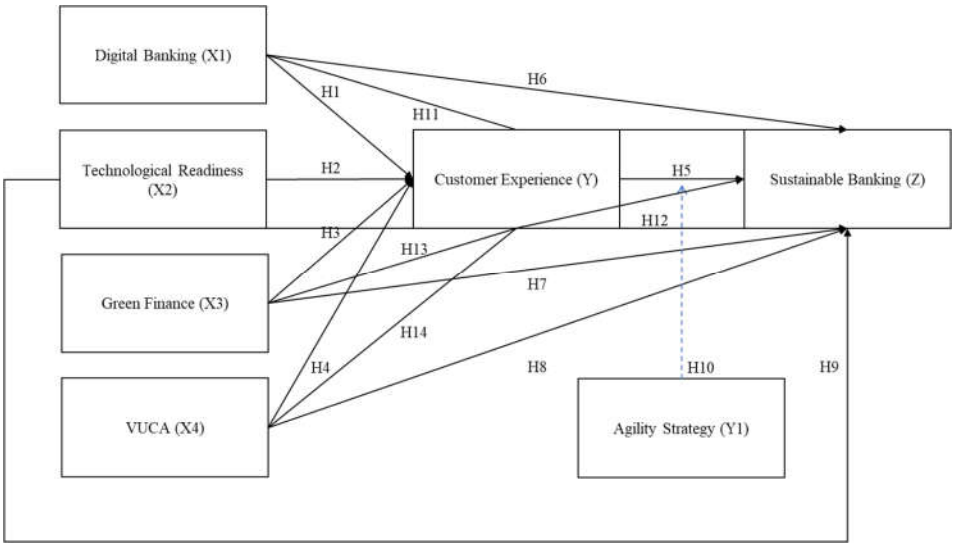

Figure 1. Conceptual Framework

METHODOLOGY

This study employs a mixed method sequential explanatory design to obtain a comprehensive understanding of the factors influencing Sustainable Banking. The design initiates with quantitative data collection and analysis, followed by qualitative data to reinforce and deepen the findings. The entire research process is carried out throughout 2025 until early 2026. Primary data are obtained through questionnaires and focus group discussions (FGD), while secondary data are collected from relevant academic literature. The questionnaire is distributed to customers of Himbara (Indonesia's State-Owned Banks) banks in the Greater Jakarta area who actively use mobile banking and show interest in Green Finance products. The FGD engages eight participants selected based on their relevance to the research topics. The literature review complements the primary data by examining theories and recent developments related to Digital Banking, Technological Readiness, Green Finance, VUCA, Customer Experience, Agility Strategy, and Sustainable Banking.

The study applies structural equation modeling (SEM) to analyze the quantitative data and utilizes NVivo to manage the qualitative data. The population for the quantitative phase consists of customers of Himbara banks (Bank Mandiri, BNI, BTN, and BRI) who use mobile banking services and reside in the Greater Jakarta region (Jakarta, Bogor, Depok, Tangerang, Bekasi). The

region is selected due to its position as the area with the highest digital penetration in Indonesia and its role as an economic hub that drives the adoption of technology-based banking services. Purposive sampling is used because the analysis requires respondents with characteristics that align with the research context, particularly individuals familiar with digital services and exposed to sustainability initiatives in banking. Sample criteria ensure this relevance, including active mobile banking usage within the past month (having conducted transactions within the last three months) and experience with features or information related to Green Finance.

Customers of Himbara banks are selected because these institutions have the largest user base, extensive digital penetration, and a growing sustainability portfolio, providing an appropriate empirical setting to assess Sustainable Banking. The minimum sample size follows Hair et al. (2019), which recommends five times the number of indicators. The 52 indicators in this study require at least 260 respondents. The sample allocation is performed proportionally using population data of the Greater Jakarta region, as the exact customer population is unknown. Population size is used as a proxy to represent potential users of Digital Banking.

Table 1. Proportional Sample Size

Region	Population 2025 (Persons)	Proportion (%)	Sample Size
Jakarta	10,678,000	58%	150
Depok	2,167,960	12%	30
Tangerang	1,971,650	11%	28
Bogor	1,083,780	6%	15
Bekasi	2,648,960	14%	37
Total	18,550,350	100%	260

Source: Statistics Indonesia (BPS, 2025)

The FGD in the qualitative phase involves employees and customers of Himbara banks to explore actual experiences related to mobile banking services, the use of Green Finance products, and the dynamics of Customer Experience.

Table 2. FGD Participant Profile

No	Participant	Total	Relevance
1	Himbara bank customers	4	Provide perspectives on experiences using digital services and sustainable products.
2	Himbara bank employees	4	Offer operational insights related to customer services and sustainability implementation.

Source: Processed by the researcher (2025)

The research variables consist of independent variables, an intervening variable, a moderating variable, and a dependent variable, each operationalized through dimensions relevant to digital banking and sustainability. The independent variables include Digital Banking with the dimensions of trust, ease of use, and information quality; Technological Readiness with the dimensions of optimism, innovativeness, discomfort, and insecurity; Green Finance with the dimensions of accessibility, transparency, environmental impact, and customer education; and VUCA with the dimensions of volatility, uncertainty, complexity, and ambiguity. The intervening variable is Customer Experience with the dimensions of sense, feel, think, act, and relate, which capture the indirect mechanisms linking the independent variables to the dependent variable. The

moderating variable is Agility Strategy, comprising strategic sensitivity, resource fluidity, and leadership unity, which strengthen or weaken relationships among variables. The dependent variable is Sustainable Banking, consisting of the dimensions of environmental, social, and governance performance, reflecting holistic sustainability practices in banking operations. All variables are measured using a five-point Likert scale because the scale effectively captures perceptions, experiences, and behavioral tendencies of banking customers regarding digital services and sustainability strategies.

RESULTS AND DISCUSSION

Measurement Model Evaluation Outer Model Assessment

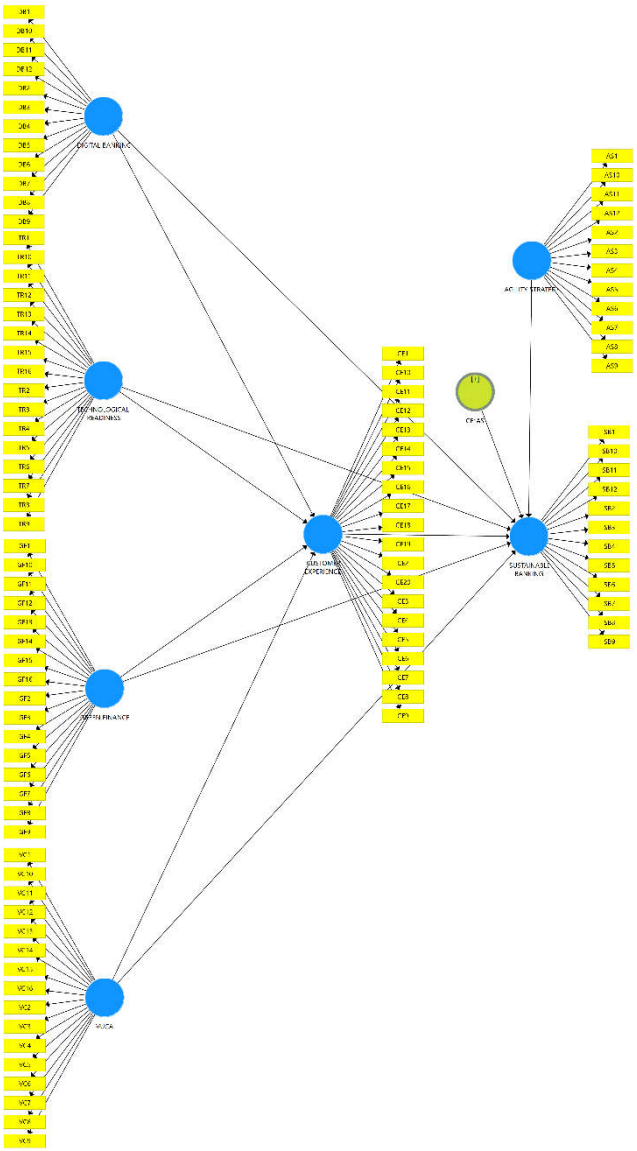

Figure 2. Outer Model Diagram (Measurement Model)

Validity Test

Convergent Validity

The discussion on loading factors rests on the understanding that high values reflect the ability of each indicator to represent the latent construct it is intended to measure. The methodological guideline proposed by Hair et al. (2021) establishes a loading factor of ≥ 0.70 as the preferred threshold because such values indicate a substantive contribution of the indicator to its corresponding latent variable. The difference between the highest and lowest loading values within a construct provides an indication of the consistency of indicator strength, and a narrow gap signals stable measurement performance and a relatively uniform pattern across indicators. The application of this principle in the present analysis shows that the indicators for each variable perform adequately, with their loading values remaining within the acceptable methodological limits defined by Confirmatory Factor Analysis. The distribution of values within the recommended range demonstrates the absence of measurement distortion that could compromise construct validity, and the modest level of disparity among indicators confirms that none of them exhibit a significantly weak or atypical contribution. The overall pattern supports the conclusion that all variables possess reliable measurement properties for subsequent analyses, with indicator structures that display stability and coherence in line with established quantitative measurement criteria, ensuring that each variable is suitable for structural model testing or other relevant analytical procedures.

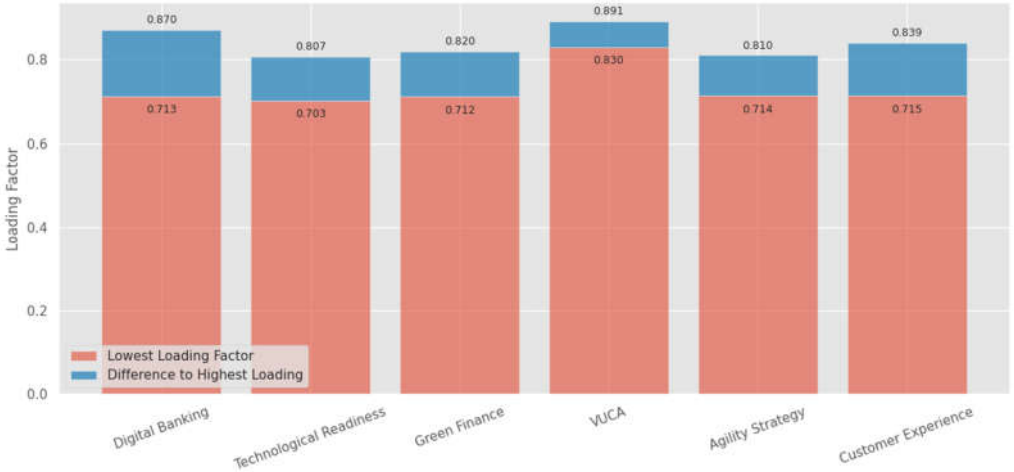

Figure 3. Highest vs Lowest Loading Factors for Each Variable

The Average Variance Extracted (AVE) value reflects the extent to which the indicators adequately explain the variance of their respective constructs, with interpretation consistently aligned to the ≥ 0.50 threshold as recommended by Hair et al. The AVE values across all variables indicate that each construct demonstrates strong indicator representation, which confirms that the level of convergent validity is acceptable for subsequent analyses. The Customer Experience variable exhibits the highest capacity for variance extraction, while the remaining variables remain within ranges that indicate stable construct consistency. This pattern places all variables in a methodologically robust position, ensuring that the model rests on a sound measurement foundation for the forthcoming structural examination.

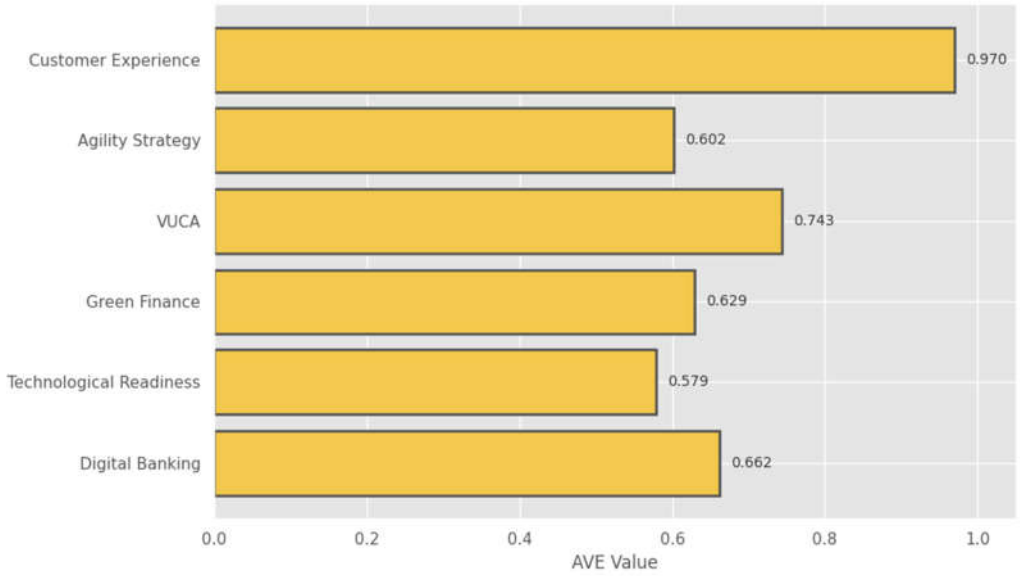

Figure 4. Average Variance Extracted (AVE) for All Variables

Discriminat Validity

The assessment of discriminant validity in this study relies on two established approaches, namely the Heterotrait–Monotrait Ratio (HTMT) and the Fornell–Larcker Criterion. The use of these two methods provides a comprehensive view of the extent to which each construct is empirically distinct from the others. The HTMT results indicate the adequacy of discriminant validity across all constructs. Each construct demonstrates an HTMT value below the recommended threshold of 0.90, which reflects a clear distinction among the latent variables.

Table 3. HTMT

	Agility Strategy	**CE*AS**	**Customer Experience**	**Digital Banking**	**Green Finance**	**Sustainable Banking**	**Technological Readiness**	**VUCA**
Agility Strategy								
CE*AS	0.209							
Customer Experience	0.130	0.082						
Digital Banking	0.074	0.209	0.470					
Green Finance	0.068	0.265	0.466	0.330				
Sustainable Banking	0.157	0.285	0.577	0.594	0.681			
Technological Readiness	0.122	0.246	0.503	0.466	0.660	0.632		
VUCA	0.070	0.252	0.288	0.080	0.336	0.370	0.248	

Source: Processed by the researcher (2025)

The comparison of correlations within the HTMT matrix confirms that no construct exceeds the cut-off value, which reinforces the validity of the measurement model from the perspective of discriminant separation. The evaluation using the Fornell–Larcker Criterion provides further confirmation of discriminant validity. Each construct displays a square root of the Average Variance Extracted (AVE) that is greater than its correlations with other constructs. The magnitude of these diagonal values reflects the strength of each construct in explaining its own indicators relative to its relationship with other latent variables.

Table 4. Fornell–Larcker Criterion

	Agility Strategy	CE*AS	Customer Experience	Digital Banking	Green Finance	Sustainable Banking	Technological Readiness	VUCA
Agility Strategy	0.776							
CE*AS	0.204	1.000						
Customer Experience	-0.093	-0.070	0.787					
Digital Banking	-0.021	-0.197	0.482	0.814				
Green Finance	0.038	-0.259	0.468	0.322	0.793			
Sustainable Banking	0.132	-0.274	0.593	0.565	0.651	0.783		
Technological Readiness	-0.034	-0.237	0.505	0.453	0.633	0.604	0.761	
VUCA	-0.043	-0.253	0.284	0.046	0.328	0.366	0.241	0.862

Source: Processed by the researcher (2025)

The comparison of diagonal and off-diagonal values in the Fornell–Larcker matrix demonstrates that each construct maintains a satisfactory degree of discriminant validity. The magnitude of each square-root AVE consistently surpasses the inter-construct correlations, which verifies that the constructs represent conceptually distinct dimensions within the proposed model.

Reliability Test

The assessment of reliability presents an overview of the consistency of each construct in measuring the intended conceptual domain. The principle outlined by Hair et al. (2019) places a Cronbach's alpha value of ≥ 0.70 as the threshold that indicates an adequate level of reliability. This criterion ensures that each indicator performs in a stable manner when representing the latent variables examined in the study. The results show that all variables demonstrate Cronbach's alpha values well above the recommended cutoff. This pattern reflects strong internal consistency within each construct, which confirms that all variables can be considered reliable for subsequent analytical procedures.

Table 5. Reliability Test

Variable	Cronbach's Alpha	Rho_A	Composite Reliability (Rho_C)	Description
Digital Banking (DB)	0.953	0.958	0.959	Reliable
Technological Readiness (TR)	0.951	0.952	0.956	Reliable
Green Finance (GF)	0.961	0.961	0.961	Reliable
VUCA (VC)	0.977	0.982	0.979	Reliable
Agility Strategy (AS)	0.940	0.947	0.948	Reliable
Customer Experience (CE)	0.953	0.974	0.970	Reliable
Sustainable Banking (SB)	0.942	0.943	0.950	Reliable

Source: Processed by the researcher (2025)

Inner Model Assessment

Coefficient of Determination (R^2)

The coefficient of determination describes the extent to which the independent variables account for the variance of the dependent variables within the model. The R^2 value indicates the explanatory strength of the model based on the classification proposed by Hair et al. (2017). An R^2 above 0.67 reflects a strong category, a value between 0.33 and 0.67 reflects a moderate category, and a value above 0.19 but below 0.33 reflects a weak category.

Table 6. R-Square Results

Variable	R Square	R Square Adjusted
Customer Experience	0.390	0.380
Sustainable Banking	0.664	0.655

Source: Processed by the researcher (2025)

The model indicates that Customer Experience has an R2 value of 0.390, which means that 39% of the variance in this construct is explained by the independent variables included in the model. The remaining 61% of the variance is influenced by external factors not incorporated into the analysis. Sustainable Banking has an R2 value of 0.664, which means that 66.4% of the variance in this construct is explained by the independent variables identified in the model. The remaining 33.6% reflects the influence of other variables outside the scope of the analysis. Based on the classification by Hair et al. (2017), both endogenous constructs demonstrate R2 values within the moderate range, indicating that the model possesses a reasonably adequate explanatory power.

Effect Size (f^2)

The measurement of effect size (f2) aims to assess the contribution of each independent variable in explaining the dependent variable within a research model. The results of the effect size analysis presented in Figure 5 show that most relationships among the constructs fall into the small category.

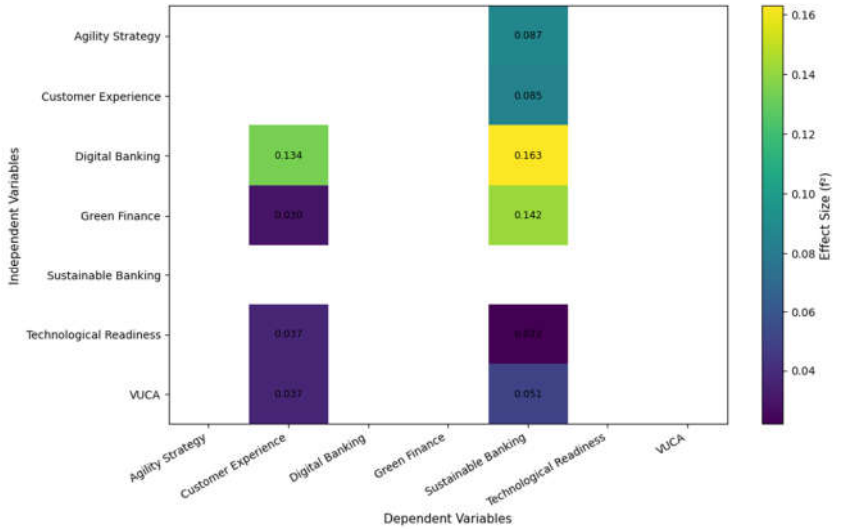

Figure 5. Effect Size Matrix

The results of the effect size analysis presented in Figure 5 show that most relationships among the constructs fall into the small category. A higher f2 value indicates that the independent variable exerts a stronger effect on the dependent variable. Hair Jr et al. (2022) categorize the interpretation of f2 into three levels, namely small (≥ 0.02), medium (≥ 0.15), and large (≥ 0.35). The findings indicate that although the relationships between variables are statistically significant within the structural model, their contributions to enhancing the explained variance remain relatively limited. The medium category is observed only in a limited number of relationships, most notably in the effect of Digital Banking on Sustainable Banking. This evidence suggests that this relationship offers a more substantial explanatory contribution relative to the others, while still remaining below the threshold for a large effect.

Q-Square (Q^2)

The Q^2 assessment is conducted to evaluate the predictive relevance of the model in explaining the variance of endogenous constructs. A Q^2 value greater than zero indicates that the model possesses adequate predictive capability for the constructs being tested. A Q^2 value less than zero indicates that the model lacks sufficient predictive relevance for the corresponding dependent variable. The results presented in Figure 6 show that two endogenous constructs exhibit positive Q^2 values, consisting of Customer Experience with a value of 0.226 and Sustainable Banking with a value of 0.396. The interpretation of these values demonstrates that the model has a moderate predictive ability for Customer Experience and a strong predictive ability for Sustainable Banking.

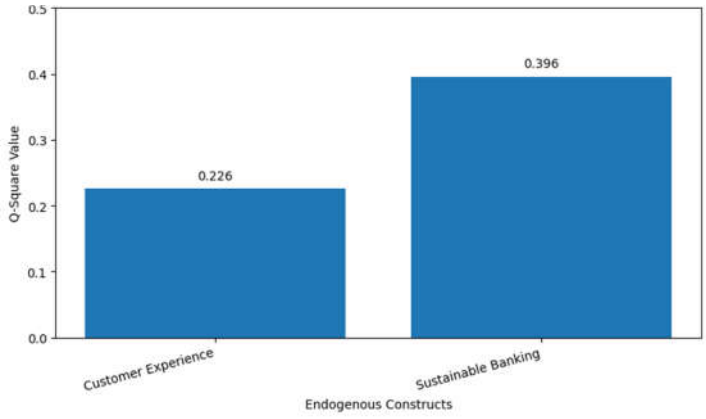

Figure 6. Q-Square Predictive Assessment

Goodness of Fit (GoF) Model Evaluation

The Goodness of Fit (GoF) assessment examines how well the PLS-SEM model represents the observed data, using the Standardized Root Mean Square Residual (SRMR) as the primary indicator of model fit.

Table 7. Fit Summary

Indicator	Estimated Model
SRMR	0.079
Chi-Square	15781.698
NFI	0.569

Source: Processed by the researcher, 2025

The SRMR value of 0.079 falls below the recommended cutoff of 0.10, indicating that the discrepancy between the empirical correlation matrix and the model-implied correlations remains within an acceptable range. The result confirms that the structural model demonstrates an adequate level of goodness of fit.

Results of Hypothesis Testing

The hypothesis testing in this study aims to evaluate the direct, moderating, and mediating effects between variables by examining the values of the path coefficient and p-value obtained through the bootstrapping procedure in SmartPLS. The evaluation was conducted after all measurement and structural model assessments met the required criteria. The acceptance of each hypothesis refers to the significance level of $p < 0.05$, indicating that the proposed relationship is statistically supported.

Table 8. Results of Bootstrapping Analysis

Hypothesis	Relationship	Original Sample	T Statistics	P Value	Conclusion
H1	Digital Banking → Customer Experience	0.323	5.238	0.000	Supported
H2	Technological Readiness → Customer Experience	0.206	2.476	0.007	Supported
H3	Green Finance → Customer Experience	0.181	2.053	0.020	Supported
H4	VUCA → Customer Experience	0.160	2.584	0.005	Supported
H5	Customer Experience → Sustainable Banking	0.222	4.503	0.000	Supported
H6	Digital Banking → Sustainable Banking	0.285	6.861	0.000	Supported
H7	Green Finance → Sustainable Banking	0.300	4.160	0.000	Supported
H8	VUCA → Sustainable Banking	0.146	3.271	0.001	Supported
H9	Technological Readiness → Sustainable Banking	0.121	2.034	0.021	Supported
H10	Agility Strategy moderating Customer Experience → Sustainable Banking	-0.093	2.037	0.021	Supported
H11	Digital Banking → Customer Experience → Sustainable Banking	0.072	3.233	0.001	Supported
H12	Technological Readiness → Customer Experience → Sustainable Banking	0.046	2.394	0.009	Supported

H13	Green Finance → Customer Experience → Sustainable Banking	0.040	2.034	0.021	Supported
H14	VUCA → Customer Experience → Sustainable Banking	0.036	2.033	0.021	Supported

Source: Processed by the researcher (2025)

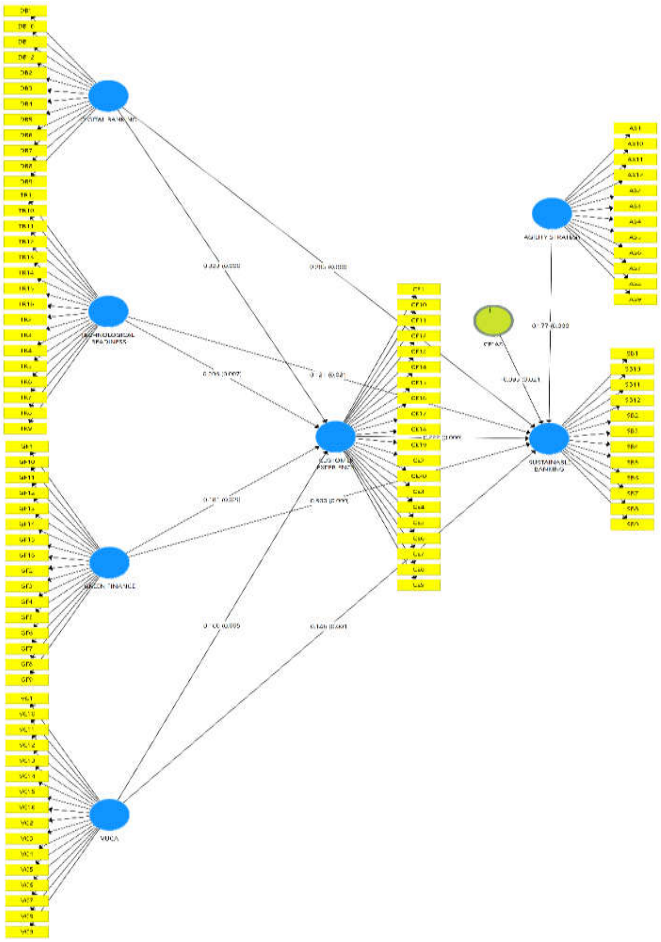

Figure 7. Structural Model Diagram (Inner Model)

Focus Group Discussion (FGD)

The findings of the Focus Group Discussion provide a deeper understanding of and bank employees perceive the transformation of the banking industry toward Sustainable Banking. The discussion involved eight participants who met the required criteria and held relevant experiences related to digital services and sustainability. The insights complement the quantitative analysis by explaining the underlying mechanisms that shape the relationships among variables in the research model.

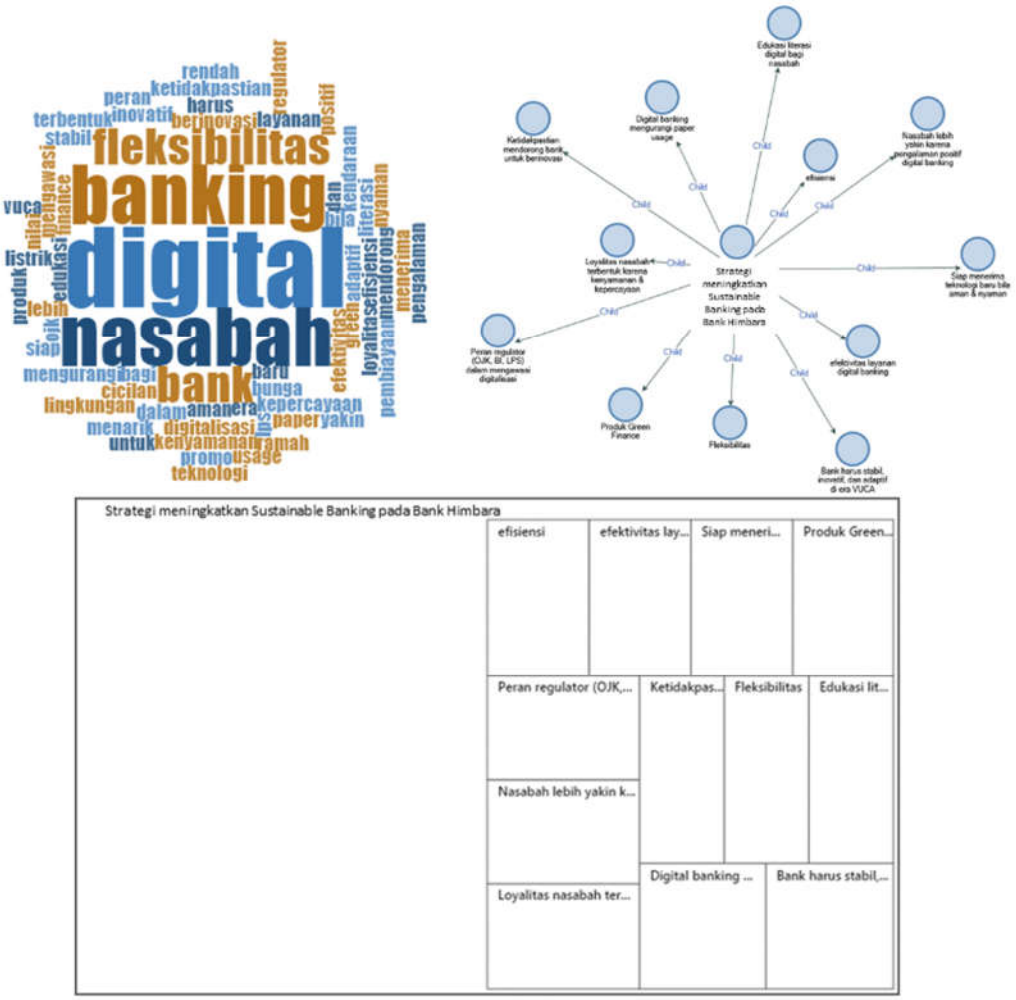

Figure 8. Word Cloud, Project Map, Hierarchy Chart

Digital banking plays a central role in enhancing customer experience and driving sustainability initiatives. The participants described that digital services enable faster and more efficient transactions while minimizing paper usage, which contributes to environmental preservation. This perception strengthens customers' comfort and loyalty toward the bank's services. Technological readiness emerges as an essential factor in creating a secure and reliable service experience. The availability of strong security features and customers' ability to adopt new technologies provide confidence when conducting digital transactions. The participants also identified digital literacy challenges among senior customers, which suggests that how customers continuous digital education is necessary to ensure service inclusivity. Green finance represents a strategic instrument for improving sustainability performance within the banking sector. The participants indicated that promotional efforts, flexible financing schemes, and alignment with environmentally conscious lifestyles increase customer interest in such products. This view highlights a strategic opportunity for banks to strengthen their sustainable value proposition. The dynamics of VUCA are perceived as external drivers that encourage continuous innovation in the banking industry. The participants stated that uncertainty and rapid changes in the environment require banks to offer adaptive and resilient services to maintain relevance and customer trust. This

strategic response is crucial to preserve operational stability and competitiveness. The overall FGD results confirm that achieving Sustainable Banking depends on the alignment between digital transformation, enhanced customer experience, technological readiness, strong green financial products, and proactive responses to VUCA conditions. Customer trust and loyalty operate as connecting elements between internal strategies and external demands, which eventually lead to long-term sustainability success for the banking industry.

Visual analysis using word cloud, project map, and hierarchy chart helps identify the key focus of customer and employee perceptions regarding the transformation of banking toward sustainability. Digital Banking emerges as the central theme because it offers transactional convenience, time efficiency, high security, and supports paperless practices. The contribution of these benefits strengthens customer experience, which ultimately enhances loyalty and trust in banking services. Additional value also appears in the flexibility of digital features along with faster and more convenient access.

Customer Experience holds a strategic role as the connecting element between Digital Banking, Technological Readiness, Green Finance, and the external dynamics of VUCA. The enhancement of customer interaction quality serves as an essential foundation for achieving sustainability, since positive perceptions establish long-term relationships between customers and the bank. Technological readiness becomes a crucial component to ensure that digitalization operates securely and remains accessible for all segments of society. Reliable systems, improved digital literacy, and stronger customer adaptability support the equitable utilization of digital services. Green Finance represents an integral aspect of sustainability strategies because it directly contributes to environmentally responsible financing. Green financial products, such as electric vehicle financing, provide economic value while demonstrating the bank's commitment to global sustainability goals. The conditions shaped by VUCA require banks to maintain responsive, stable, and innovative capabilities to remain relevant when facing uncertainty. The reinforcement of adaptive strategies preserves operational continuity and strengthens competitiveness within the rapidly evolving digital financial industry.

Regulators such as OJK, BI, and LPS continue to play a necessary role in ensuring that digital transformation and sustainability align with sound governance and prudential principles. The presence of regulation provides legal certainty while encouraging banks to consistently improve service innovation. The overall findings indicate that the success of Sustainable Banking depends on the integration of digital innovation, technological readiness, customer experience quality, green product expansion, and the ability to adapt to VUCA-driven pressures. Customer trust and loyalty function as the unifying factors between internal strategies and external demands, enabling sustainability to be achieved consistently over the long term.

The integration of findings reveals a strong linkage among Digital Banking, Technological Readiness, Green Finance, VUCA, Agility Strategy, Customer Experience, and Sustainable Banking. Quantitative evidence confirms causal relationships among these constructs, while qualitative insights enrich the interpretation by capturing the real experiences and perspectives of customers and banking stakeholders. Customer experience emerges as the outcome of the influence from Digital Banking, Technological Readiness, Green Finance, and VUCA. Digital services that ensure practicality and security, sufficient technological preparedness, flexible sustainable financing schemes, and the industry's demand for continuous innovation create experiences perceived as convenient and valuable. Respondents expressed that transaction simplicity, efficiency, and paperless processes demonstrate the transformation of their experience into a more positive one.

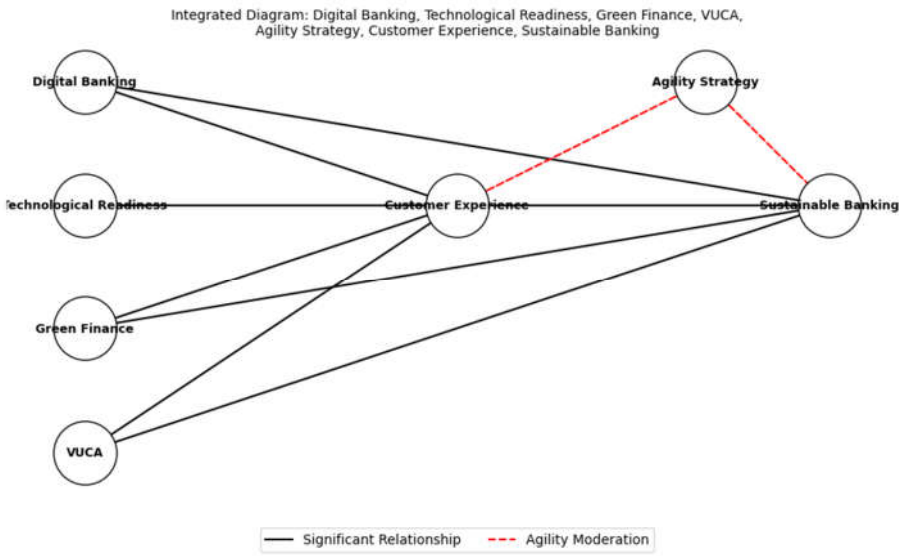

Figure 9. Integrative Diagram

Sustainable banking gains substantial reinforcement from favorable customer experience. Loyalty, trust, and comfort established during service interactions shape customers' willingness to support the bank's sustainability initiatives. Findings from the FGD illustrate that customers become more receptive to sustainability programs when they consistently experience smooth and reliable services. Sustainable banking also receives direct influence from Digital Banking, Technological Readiness, Green Finance, and VUCA. Digitalization enhances operational efficiency, technological readiness ensures long-term innovation capability, sustainable financing contributes to Net Zero Emission (NZE) targets, and the challenges of uncertain business environments encourage greater adaptability and competitiveness. These direct influences become stronger when mediated by a positive customer experience.

The agility strategy strengthens the relationship between customer experience and sustainable banking. Banks that maintain adaptability and innovation provide customers with long-term confidence, allowing positive experiences to transform into stronger support for sustainability practices. The moderating effect requires banks to preserve strategic alignment with sustainability objectives to prevent agility from shifting toward short-term efficiency gains at the expense of long-term value creation. The alignment between both data strands supports a consistent conclusion. Customer experience acts as a critical bridge that connects digitalization, technological readiness, sustainable financing, and the capability to respond to VUCA conditions, ultimately advancing sustainable banking practices. These findings validate the conceptual model statistically and demonstrate its practical relevance in modern banking services.

Conclusion

This study shows that Customer Experience (CX) is the key mechanism connecting digital banking, technological readiness, green finance, and VUCA capability to Sustainable Banking. All four antecedents significantly improve CX, and stronger CX increases customer support for sustainable banking. Digital banking and technological readiness and green initiatives create direct sustainable banking benefits because their sustainability effects increase when customers

experience better customer experiences. Sustainable banking performance depends on four factors which include technological innovation and customer readiness and environmental responsibility and adaptive capability. Agility Strategy moderates the CX–Sustainable Banking link negatively, suggesting that overly rapid or reactive agility may reduce CX consistency and weaken its contribution to sustainability outcomes. The model's R^2 values indicate reasonable explanatory power. The study's major constraints stem from three factors which include the selection of Greater Jakarta state-owned banks that employed young well-educated people as respondents and network survey design and participant self-reporting methods. The study results showed multiple small effect sizes. Future research should expand to other bank types and regions use longitudinal designs combine perceptions with objective sustainability indicators e g green loan volumes sustainable asset portfolio quality emissions resource efficiency metrics strengthen mixed method coverage with broader stakeholder input test group differences age digital literacy and unpack agility into dimensions while exploring specific technologies e g AI personalization blockchain transparency digital green reporting.

Conflict of Interest

The authors declare that they have no conflict of interest.

Ethical Approval

This study was conducted in accordance with institutional, national, and international ethical standards. Ethical approval for all procedures involving human participants was obtained from the relevant institutional review board. Informed consent was obtained from all individual participants included in the study.

References

Ahatsi, E., Akpan, J., & Olanrewaju, O. A. (2025). The effect of electronic banking services on customer satisfaction: An empirical analysis. In Proceedings of the 2025 Annual IEEE Conference on Information Communication Technology and Society (ICTAS 2025). https://doi.org/10.1109/ICTAS64866.2025.11155443

Aldaarmi, A. A. (2024). Fintech service quality of Saudi banks: Digital transformation and awareness in satisfaction, re-use intentions, and the sustainable performance of firms. Sustainability, 16(6), Article 2261. https://doi.org/10.3390/su16062261

Aljazzaf, Z., Rashed, A., Qureshi, K., & Manuel, P. (2025). Understanding barriers to customer engagement center adoption in digital service systems: Evidence from Kuwait. Journal of Logistics, Informatics and Service Science, 12(5), 271–288. https://doi.org/10.33168/JLISS.2025.0515

Al-Nattar, B. A., & Alazzawi, A. (2020). Data analytics of strategic agility and competitiveness in operation performance: A case of banking sector in Saudi Arabia. 2020 International Conference on Decision Aid Sciences and Application (DASA 2020), 293–298. https://doi.org/10.1109/DASA51403.2020.9317295

Alsmadi, A. A. (2025). Navigating new realities: The impact of Metaverse technologies on financial innovation. Journal of Metaverse, 5(2), 112–123. https://doi.org/10.57019/jmv.1621145

Asdullah, M. A., Watto, W. A., Ijaz, A., & Zeshan, M. (2025). Banking for a greener future: A systematic review of sustainable initiatives in South Asia. Journal of Banking Regulation, 26(3), 610–626. https://doi.org/10.1057/s41261-025-00279-w

Az-Zahra, S., Widjaja, G., & Prasetyo, A. (2023). The explanation of e-service quality and actual use of m-banking. Jurnal Manajemen dan Informatika, 2023.

Bağcı, R. B., & Taşçıoğlu, M. (2024). Proactive and collaborative strategies to boost customer-brand engagement and experience: A complexity theory approach. Journal of Internet Commerce, 23(3), 262–283. https://doi.org/10.1080/15332861.2024.2350324

Bansal, N., Taneja, S., & Ozen, E. (2023). Green financing as a bridge between green banking strategies and environmental performance in Punjab, India. International Journal of Sustainable Development and Planning, 18(10), 3155–3167. https://doi.org/10.18280/IJSDP.181017

Bennett, N., & Lemoine, G. J. (2014). What *VUCA* really means for you. *Harvard Business Review*, 92(1/2), 27–42.

Berru, Y. T., Jimenez, S., Chicaiza, L., & Loayza, V. E. (2024). Emotions and customer satisfaction in the mobile banking era: An empirical analysis. In Lecture Notes in Networks and Systems (Vol. 1156, pp. 247–260). https://doi.org/10.1007/978-3-031-73125-9_15

Bhatnagr, P., Rajesh, A., & Misra, R. (2025). Understanding critical service factors in neobanks: Crafting strategies through text mining. Journal of Modelling in Management, 20(3), 894–922. https://doi.org/10.1108/JM2-01-2024-0021

Çakaloğlu, M. (2022). Customer experience in the banking industry. In Handbook of research on interdisciplinary reflections of contemporary experiential marketing practices (pp. 383–402). https://doi.org/10.4018/978-1-6684-4380-4.ch018

Campanella, F., Serino, L., & Crisci, A. (2023). Governing fintech for sustainable development: Evidence from Italian banking system. Qualitative Research in Financial Markets, 15(4), 557–571. https://doi.org/10.1108/QRFM-01-2022-0009

Chauhan, S., Akhtar, A., & Gupta, A. (2022). Customer experience in digital banking: A review and future research directions. International Journal of Quality and Service Sciences, 14(2), 311–348.

Debrah, C., Darko, A., & Chan, A. P. C. (2023). A bibliometric-qualitative literature review of green finance gap and future research directions. Climate and Development, 15(5), 432–455. https://doi.org/10.1080/17565529.2022.2095331

Doz, Y., & Kosonen, M. (2008). Fast strategy: How strategic agility will help you stay ahead of the game. *Long Range Planning*, 41(2–3), 191–207.

Forgas-Coll, S., Huertas-Garcia, R., Andriella, A., & Alenyà, G. (2023). Social robot-delivered customer-facing services: An assessment of the experience. Service Industries Journal, 43(3–4), 154–184. https://doi.org/10.1080/02642069.2022.2163995

Frempong, M. F., Mu, Y., Adu-Yeboah, S. S., Hossin, M. A., & Amoako, R. (2022). Corporate sustainability and customer loyalty: The role of firm's green image. Journal of Psychology in Africa, 32(1), 54–60. https://doi.org/10.1080/14330237.2021.2017153

Gulzar, R., Bhat, A. A., Mir, A. A., Athari, S. A., & Al-Adwan, A. S. (2024). Green banking practices and environmental performance: Navigating sustainability in banks. Environmental Science and Pollution Research, 31(15), 23211–23226. https://doi.org/10.1007/s11356-024-32418-7

Han, X., Samad, S., Kim, W., & Wei, F. (2025). From corporate responsibility to green loyalty: How CSR initiatives shape sustainable choices among banking consumers in China. Acta Psychologica, 255, Article 104944. https://doi.org/10.1016/j.actpsy.2025.104944

Hridhya, P. K., Desai, K., Ananthan, S., Manickam, T., Devaraja Nayaka, K., & Joel Jebadurai, D. (2025). Green finance and sustainability: Landscape of Indian financial institutions. In Financial Innovation for Global Sustainability (pp. 359–383). https://doi.org/10.1002/9781394311682.ch15

Hussain, S., Rehman, S. U., Rehman, K. U., & Khasawneh, M. A. S. (2025). Digital transformation and green finance: The role of financial technology adoption in banking sustainability among Asian online users. Journal of Islamic Marketing. Advance online publication. https://doi.org/10.1108/JIMA-03-2025-0213

International Monetary Fund. (2024). Fintech applications for boosting climate finance. IMF Staff Climate Note.

Johansen, B. (2012). *Leaders make the future: Ten new leadership skills for an uncertain world*. Berrett-Koehler.

Junfeng, W., & Butkouskaya, V. (2024). The nexus of customer agility and sustainability performance across tourism firms of various sizes. Tourism Recreation Research. Advance online publication. https://doi.org/10.1080/02508281.2024.2424627

Katuri, S. (2025). Cybersecurity threats in digital banking: A comprehensive analysis. International Journal on Science and Technology, 16(1), 1–20.

Kim, S. H. (2025). The effect of digital quality on customer satisfaction and brand loyalty in banking. Sustainability, 17(8), 3500.

Kumar, L., Nadeem, F., Sloan, M., Restle-Steinert, J., Deitch, M. J., Ali Naqvi, S., Kumar, A., & Sassanelli, C. (2022). Fostering green finance for sustainable development: A focus on textile and leather small medium enterprises in Pakistan. Sustainability, 14(19), Article 11908. https://doi.org/10.3390/su141911908

Kuosuwan, B., Risman, A., Dudukalov, E., & Kozlova, E. (2024). Digital banking and environmental impact: How fintech supports carbon footprint reduction. BIO Web of Conferences, 145, Article 05017. https://doi.org/10.1051/bioconf/202414505017

Lemon, K. N., & Verhoef, P. C. (2016). Understanding customer experience throughout the customer journey. *Journal of Marketing*, 80(6), 69–96.

Malc, D., Dlačić, J., Pisnik, A., & Milfelner, B. (2023). The development of e-banking services quality measurement instrument: MPQe-BS. Sustainability, 15(16), Article 12659. https://doi.org/10.3390/su151612659

Mihardjo, L. W. W., Sasmoko, & Rukmana, R. A. N. (2019). Customer experience and organizational agility driven business model innovation to shape sustainable development [Doświadczenie klienta i sprawność organizacyjna model w dziedzinie biznesu, kształtujący zrównoważony rozwój]. Polish Journal of Management Studies, 20(1), 293–304. https://doi.org/10.17512/pjms.2019.20.1.26

Mir, A. A., Bhat, A. A., Al-Adwan, A. S., Farooq, S., Jamali, D., & Malik, I. A. (2025). Green banking practices and customer satisfaction—Way to green sustainability. Innovation and Green Development, 4(2), Article 100221. https://doi.org/10.1016/j.igd.2025.100221

Miyan, M. S., Cheong, C. W. H., Sharif, A., & Afshan, S. (2024). Three decades of green finance: The state of the art and way forward. International Journal of Energy Economics and Policy, 14(6), 88–105. https://doi.org/10.32479/ijeep.16718

Mutambik, I. (2023). Customer experience in open banking and how it affects loyalty intention: A study from Saudi Arabia. Sustainability, 15(14), Article 10867. https://doi.org/10.3390/su151410867

Probojakti, W., Utami, H. N., Prasetya, A., & Riza, M. F. (2024). Building sustainable competitive advantage in banking through organizational agility. Sustainability, 16(19), Article 8327. https://doi.org/10.3390/su16198327

Sambamurthy, V., Bharadwaj, A., & Grover, V. (2003). Shaping agility through digital options: Reconceptualizing the role of information technology in contemporary firms. *MIS Quarterly*, 27(2), 237–263.

Sami, F., Faiz, U., & Khan, I. H. (2025). Sustainable finance: Pathways to a green economy. In Adaptive Strategies for Green Economy and Sustainability Policies (pp. 425–442). https://doi.org/10.4018/979-8-3693-7570-9.ch025

Sardianou, E., & Stauropoulou, A. (2025). Unlocking customer loyalty: Can spreading sustainability practices decode the intention to switch banks? In Business sustainability: Strategies, practices and global implications (pp. 25–39).

Sasono, I., Cahya Kumoro, D. F., Sutisna, F., Apriani, D., Cholisoh, N., Andayani, D., & Kamil, M. F. (2025). Enhancing user engagement in mobile banking through personalized recommendation algorithms. In Proceedings of the 2025 4th International Conference on Creative Communication and Innovative Technology (ICCIT 2025). https://doi.org/10.1109/ICCIT65724.2025.11167207

Sathwika, B., Hameed, A., Rajesh Sharma, R., Babu, T., Chinnaiyan, R., & Sungheetha, A. (2024). Influence of digital transformation on the banking industry. 4th International Conference on Innovative Practices in Technology and Management 2024 (ICIPTM 2024). https://doi.org/10.1109/ICIPTM59628.2024.10563790

Serdarušić, H., Pancić, M., & Zavišić, Ž. (2024). Green finance and fintech adoption services among Croatian online users: How digital transformation and digital awareness increase banking sustainability. Economies, 12(3), Article 54. https://doi.org/10.3390/economies12030054

Serdarušić, H., Pancić, M., & Zavišić, Ž. (2024). Green finance and fintech adoption services among Croatian online users: How digital transformation and digital awareness increase banking sustainability. Economies, 12(3), Article 54. https://doi.org/10.3390/economies12030054

Siswanti, I., Riyadh, H. A., Cahaya, Y. F., Prowanta, E., & Beshr, B. A. H. (2024). Unlocking sustainability: Exploring the nexus of green banking, digital transformation, and financial performance with foreign ownership moderation. Discover Sustainability, 5(1), Article 379. https://doi.org/10.1007/s43621-024-00597-5

Tanchangya, T., Rahman, J., Siddiqi, K. O., Islam, N., Sarker, T., Naher, K., Das, S., & Chowdhury, S. (2025). Factors affecting green banking technology adoption in Bangladesh. Discover Sustainability, 6(1), Article 1252. https://doi.org/10.1007/s43621-025-02143-3

Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, 18(7), 509–533.

Tsou, H.-T., Hsu, H.-Y., & Liao, Y.-T. (2025). A study on enhancing the intention to purchase green financing products through gamification mechanisms. Management Review (Taiwan), 44(3), 123–145. https://doi.org/10.6656/MR.202507_44(3).ENG003

World Economic Forum. (2023). The Global Risks Report 2023 (18th ed.). World Economic Forum.