OPEN ACCESS
Journal Markcount Finance
Vol. 4 No. 5. October 2026, pp. 457-487
DOI. 10.70177/jmf.v4i5.4573
Research Article

THE EVOLUTION OF NEO-BANKS: ASSESSING CUSTOMER LOYALTY AND OPERATIONAL EFFICIENCY IN THE POST-DIGITAL ERA

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Article Info

Received: May 15, 2025
Revised: April 15, 2026
Accepted: June 18, 2026
Online Version: October 27, 2026

Abstract

Neo-banks have transformed financial service delivery through digital platforms, yet sustained customer loyalty and operational efficiency remain critical challenges beyond initial market expansion. This study examines how customer engagement, institutional trust, and financial performance characterize the evolution of neo-banks in the post-digital era. A comparative secondary-data design synthesizes public financial disclosures from Nu Holdings and Monzo Bank with peer-reviewed evidence on customer retention and banking efficiency. The findings indicate that Nu Holdings expanded its customer base from 74.6 million in 2022 to 114.2 million in 2024 while maintaining relatively stable customer activity rates and servicing costs per active customer. Monzo similarly reported growing customer engagement, revenue, and adjusted profitability in its 2025 financial year. Previous empirical studies identify perceived financial security and trust as important correlates of retention, while efficiency outcomes vary across institutions. These observations show that customer growth and favorable operating metrics can coexist, but neither activity rates nor profitability alone establish loyalty or cost efficiency. The study concludes that sustainable neo-banking requires both credible customer relationships and disciplined resource management. Institution-matched longitudinal evidence is needed to test their relationship and distinguish association from causation across diverse regulatory and competitive environments as digital access becomes an industry norm.

Keywords: Customer Loyalty, Digital Banking, Neo-Banks

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Journal Homepage https://research.adra.ac.id/index.php/jmf
How to cite: Sofana, I, A., Zaki, A & Farah, R. (2026). The Evolution of Neo-Banks: Assessing Customer Loyalty and Operational Efficiency in the Post-Digital Era. *Journal Markcount Finance, 4*(5), 457–487. https://doi.org/10.70177/jmf.v4i5.4573
Published by: Yayasan Adra Karima Hubbi

INTRODUCTION

The global banking industry has undergone a fundamental transformation driven by advances in financial technology, changing consumer expectations, and the growing integration of digital platforms into everyday financial activities. Traditional banking institutions, historically dependent on physical branches and conventional service delivery mechanisms, increasingly operate within a competitive environment characterized by mobile financial applications, automated transactions, and data-driven customer engagement. The emergence of neo-banks represents a significant development within this transformation, introducing predominantly digital banking models that prioritize accessibility, convenience, and simplified financial services. Unlike conventional banks that have progressively incorporated digital channels into existing organizational structures, neo-banks are generally designed around digital-first operations and streamlined technological infrastructure. Their development has challenged established assumptions regarding customer relationships, banking service accessibility, and the economic organization of financial intermediation. The post-digital era therefore represents more than the adoption of banking technologies; it reflects a stage in which digital accessibility has become an expected service characteristic, shifting institutional competition toward customer experience, service reliability, and sustainable operational performance (Bhatnagr, 2024; Howland, 2021).

Neo-banks have emerged as increasingly visible participants in financial services markets by offering mobile-centered financial products, simplified account management, digital payment facilities, and personalized customer interactions. Their business models frequently emphasize technological scalability, reduced dependence on physical distribution networks, and automated service processes designed to improve transaction efficiency. The development of cloud-based banking infrastructure, application programming interfaces, artificial intelligence, and advanced data analytics has enabled many digital-first financial providers to introduce services with relatively flexible organizational arrangements. Their regulatory structures, however, vary considerably across jurisdictions, as some institutions operate under independent banking licenses while others provide financial services through partnerships with licensed banks. This distinction is important because the commercial advantages, institutional responsibilities, and operational risks associated with neo-banking depend partly on regulatory status and business model design. Gandasari, (2023) examined the transformation of neo-banks in Indonesia and identified improvements in profit efficiency following digital transformation, demonstrating the relevance of operational characteristics to the evaluation of emerging banking institutions.

The long-term sustainability of neo-banks depends not only on their ability to attract new users but also on their capacity to maintain customer relationships while achieving operationally efficient service delivery. Customer loyalty represents a critical dimension of institutional competitiveness because digital banking customers can compare financial products, access competing applications, and change service providers with relatively limited physical constraints. Sustained loyalty may depend on perceived security, service quality, satisfaction, trust, personalization, and the consistency of digital interactions. Operational efficiency, meanwhile, concerns the relationship between institutional resources, operating expenses, technological investment, and financial service outputs. Digital-first business models may reduce selected distribution costs, but continuous investment in cybersecurity, regulatory compliance, technological maintenance, and customer support can create substantial financial

obligations. The relationship between customer loyalty and operational efficiency is therefore central to understanding whether neo-banks can translate digital accessibility into sustainable business performance. Examining these dimensions together provides a basis for evaluating the transition from rapid customer acquisition toward enduring financial competitiveness (Bakre, 2022; Schneider, 2022).

The expansion of neo-banking services has intensified competition for customer attention, financial engagement, and long-term retention within digital financial markets. Although mobile-based banking platforms offer convenience and simplified service accessibility, the availability of similar technological features across competing institutions can weaken product differentiation. Customers may initially adopt neo-banking applications because of promotional incentives, attractive savings rates, simplified account opening, or reduced transaction fees without developing a lasting commitment to the provider. The distinction between initial adoption and sustained loyalty consequently represents a significant research problem. Continued application usage may reflect financial convenience or temporary economic benefits rather than enduring trust or institutional preference. Digital service disruptions, concerns about personal information, inadequate customer support, and perceived financial risk may further influence customers' willingness to maintain their banking relationships. The central challenge involves identifying the factors that transform positive digital experiences into sustained loyalty and determining whether these relationships remain stable as neo-banks move beyond their initial market expansion stages (Moyo, 2024; Solomon, 2021).

The operational characteristics of neo-banks create a financial management challenge because reduced dependence on physical branches does not automatically translate into higher profitability or sustainable cost efficiency. Digital-first institutions may benefit from automated transaction processing, centralized technological infrastructure, and scalable customer service platforms. These advantages can be offset by customer acquisition expenditure, cybersecurity investment, regulatory compliance costs, technological development, and the need to maintain reliable digital services. Rapid customer growth may also increase operational demands without generating proportional improvements in revenue, particularly when customers maintain limited account balances or use low-margin financial products. Shanti et al. (2024) documented differences in financial performance across Indonesian neo-banks, illustrating the importance of distinguishing technological transformation from realized efficiency improvements. The fundamental research problem concerns whether operational efficiency gains generated through digital banking infrastructure can be maintained while institutions expand their customer bases and strengthen service quality (Frimpong, 2024; Laudya, 2024).

The relationship between customer loyalty and operational efficiency remains particularly important because strategies designed to improve one dimension may create challenges for the other. Neo-banks seeking to increase operational efficiency may prioritize automation, standardized customer interactions, and reduced service delivery costs. These measures can improve processing speed and resource utilization but may also reduce opportunities for personalized assistance when customers encounter complex financial problems. Investments in responsive customer service, enhanced security, personalized financial recommendations, and complaint resolution may strengthen customer loyalty while increasing short-term operating expenses. Higher customer retention may also reduce future acquisition costs and create opportunities for deeper financial relationships, although these

benefits depend on customer profitability and actual service usage. The resulting tension raises questions about whether loyalty and operational efficiency operate as mutually reinforcing outcomes or competing strategic priorities. Understanding this relationship is necessary for determining how neo-banks can balance customer-centered service delivery with the financial discipline required for sustainable institutional growth (Dymek, 2026; Kędzior, 2021).

The primary objective of this study is to examine the determinants of customer loyalty within neo-banking services in the post-digital era. The investigation focuses on identifying how digital service quality, perceived security, institutional trust, customer satisfaction, and personalized financial experiences relate to customers' willingness to maintain long-term relationships with neo-banking providers. Customer loyalty is conceptualized through behavioral intentions and, where observable, actual customer behavior, including continued service usage, recommendation intentions, and relationship persistence. The study seeks to distinguish loyalty from initial technology acceptance by examining factors associated with customers' decisions to continue using financial services after gaining practical experience with digital banking platforms. Particular attention is directed toward the influence of trust and service reliability because financial relationships involve the management of sensitive information and monetary resources. The expected outcome is a clearer understanding of the customer-related conditions supporting sustained engagement with neo-banks beyond the initial stages of digital financial adoption (Brasil, 2022; Farmer, 2021).

The second objective is to evaluate the operational efficiency of neo-banking institutions by examining the relationship between digital business models, resource utilization, operating expenses, and financial performance. The assessment considers indicators such as cost-to-income ratios, operating expenses relative to operating income, customer acquisition costs, and financial productivity, subject to the availability and comparability of institutional data. The investigation seeks to determine whether digital-first operational structures provide measurable advantages in managing service delivery costs and supporting sustainable institutional performance. Particular attention is given to the potential influence of automation, technological scalability, and digital service integration on operational efficiency. The study also aims to distinguish efficiency from profitability because reductions in operating costs do not necessarily produce higher net earnings when revenue generation remains limited or technological investment requirements are substantial. The objective is to establish a balanced assessment of neo-bank operational performance that recognizes both the potential advantages and financial constraints associated with digitally oriented banking models (Azedi, 2023; Tepetepe, 2026).

The third objective is to analyze the relationship between customer loyalty and operational efficiency as interconnected dimensions of neo-bank sustainability. The investigation seeks to evaluate whether operational efficiency supports customer loyalty through improved service speed, convenience, affordability, and digital reliability. It also considers whether stronger loyalty may contribute to institutional efficiency by reducing repeated customer acquisition expenses and supporting more stable financial relationships. The analysis recognizes that these relationships may involve indirect mechanisms, including service quality, customer satisfaction, institutional trust, and long-term customer engagement. A multidimensional analytical framework is proposed to examine these relationships without assuming that lower operating expenses automatically improve customer experiences. The study ultimately seeks to explain how neo-banks can balance technological productivity with

customer-centered value creation. The findings are expected to provide a conceptual and empirical foundation for understanding the strategic conditions under which customer relationship management and operational efficiency can jointly support sustainable neo-banking performance (Jenbere, 2023; Matoshko, 2026).

Existing research on digital banking has examined important determinants of customer satisfaction, trust, and continuance intention, while a related stream of financial research has investigated technological transformation, operating costs, and banking performance. Studies of digital banking users have identified relationships among perceived usefulness, data security, trust, satisfaction, and continued service usage. Research on operational efficiency has separately examined whether digital transformation improves financial performance or reduces institutional operating expenses. Reepu, (2023), for example, investigated neo-bank efficiency, while research on Islamic digital banking has examined the contribution of satisfaction and trust to continuance intention.

These studies provide valuable empirical foundations, but their different units of analysis create challenges for understanding customer loyalty and institutional efficiency within a common research framework. The relevant gap is therefore not an absence of research on either dimension, but the need to determine how customer-level relationships can be meaningfully connected with institution-level operational performance.

Digital banking research has provided extensive insights into technology acceptance, perceived usefulness, satisfaction, and customers' intentions to continue using financial applications. The increasing maturity of digital financial markets creates a need to distinguish these outcomes from durable customer loyalty and economically meaningful engagement. Continued use of a banking application does not necessarily indicate exclusive preference, resistance to competing providers, or a willingness to establish deeper financial relationships. Customers may maintain multiple digital banking accounts and transfer their financial activity according to interest rates, fees, service convenience, or promotional incentives. Recent research on Islamic digital banking in Indonesia has demonstrated the importance of trust, security, and satisfaction in explaining continuance intention, reinforcing the relevance of post-adoption relationships (Quatrochi, 2023; SenGupta, 2025).

The unresolved issue concerns how these determinants translate into different dimensions of customer loyalty within neo-banks and whether stronger customer engagement corresponds with improvements in institutional operational efficiency. Addressing this issue requires greater conceptual precision in differentiating technology adoption, continuance intention, attitudinal loyalty, and actual banking behavior.

The relationship between customer loyalty and operational efficiency may vary according to institutional maturity, regulatory arrangements, market competition, and the technological capabilities of individual neo-banks. Customer perceptions are generally measured at the individual level, whereas operational efficiency indicators are derived from institution-level financial and managerial information. Combining these dimensions without recognizing differences in analytical levels can produce misleading interpretations, particularly when individual customer responses are treated as direct measures of institutional performance. Comparative research on digital banking efficiency has demonstrated the importance of banking characteristics and financial indicators, but such evidence cannot independently explain the loyalty patterns of customers using particular institutions.

A more rigorous analytical approach should explicitly connect customer-level evidence with bank-level operational characteristics while accounting for differences in organizational size, market maturity, regulatory status, and financial performance. The resulting research gap concerns the methodological challenge of explaining how customer relationship outcomes and institutional efficiency jointly contribute to sustainable neo-banking performance.

The proposed research seeks to contribute to neo-banking scholarship through an integrated analytical framework linking customer loyalty with institutional operational efficiency. The framework combines customer-centered dimensions, including digital service quality, trust, satisfaction, personalization, and continued engagement, with organizational dimensions related to cost management, technological scalability, and financial productivity. Its potential originality lies in examining the mechanisms connecting these dimensions rather than evaluating them as isolated characteristics of digital banking performance. Customer loyalty may influence institutional outcomes through customer retention, repeated financial activity, and reduced dependence on expensive promotional acquisition strategies, while operational efficiency may influence customer experience through service reliability and the availability of affordable financial products. These relationships provide a basis for evaluating whether customer-centered value creation and operational productivity develop through complementary or competing processes. The proposed framework represents a potential conceptual contribution whose distinctiveness must be established through comparison with existing integrated digital banking and service management models (Avanesh, 2023; Feldmann, 2023).

The methodological contribution of the proposed study lies in its potential to integrate customer-level survey evidence with institution-level operational and financial data. Customer loyalty can be assessed through validated measures of trust, satisfaction, recommendation intention, and relationship continuity, while operational efficiency can be evaluated through standardized financial indicators obtained from institutional reports. The combination of these information sources would enable a more comprehensive investigation than approaches relying exclusively on customer perceptions or financial statements. A multilevel design may also help distinguish individual behavioral relationships from broader organizational performance, provided that customers can be reliably associated with the neo-banking institutions included in the analysis. Such an approach offers opportunities to examine how institutional characteristics moderate the relationship between digital service experiences and customer loyalty. The methodological value of this perspective depends on adequate data coverage, appropriate sampling, and statistical techniques consistent with the hierarchical structure of the observations. Its contribution would be particularly relevant to studies seeking to connect behavioral financial research with institutional performance analysis (Amineh, 2022; Heron, 2024).

The significance of this research lies in its potential to explain the conditions under which neo-banks can achieve sustainable performance after digital accessibility has become a common feature of financial service delivery. From a theoretical perspective, the study may contribute to relationship marketing, service quality theory, financial intermediation, and technology-enabled organizational performance by investigating the interaction between customer loyalty and operational efficiency. From a practical perspective, the findings may assist neo-bank managers in determining whether investments in security, personalization, service quality, and customer retention contribute to more sustainable financial outcomes. The

analysis may also inform strategic decisions regarding automation, technological infrastructure, customer support, and resource allocation. From a regulatory perspective, the study may provide insights into whether the pursuit of cost efficiency influences service accessibility, operational resilience, and customer protection within digitally oriented banking institutions. The research ultimately seeks to advance an understanding of neo-banking sustainability in which competitive success is evaluated not merely through technological adoption or customer acquisition, but through the ability to maintain loyal customer relationships alongside efficient and responsible financial operations.

RESEARCH METHOD

This study adopts a quantitative research approach using an explanatory and comparative research design to investigate the relationship between customer loyalty and operational efficiency in neo-banking institutions within the post-digital financial environment. The research employs a cross-sectional customer survey combined with secondary financial data to examine how digital service quality, institutional trust, customer satisfaction, and operational performance contribute to the sustainability of digital-first banking institutions. The explanatory component focuses on identifying the relationships among customer-level behavioral variables, while the comparative component evaluates differences in operational efficiency across selected neo-banks. The integration of these approaches enables the study to investigate customer perceptions alongside observable institutional performance without treating them as interchangeable measures. The post-digital era is operationally understood as a competitive banking environment in which digital accessibility has become an established service expectation and institutional differentiation increasingly depends on customer experience, relationship continuity, and efficient resource utilization. This design provides a systematic foundation for evaluating whether technological innovation supports sustainable customer relationships and organizational performance within emerging banking models (Harish, 2025; Prayudya, 2025).

Research Design

The conceptual framework incorporates digital service quality, perceived financial security, institutional trust, customer satisfaction, customer loyalty, and operational efficiency as the principal research constructs. Digital service quality encompasses accessibility, transaction reliability, responsiveness, system functionality, and convenience, while perceived financial security reflects customers' confidence in the protection of financial assets and personal information. Institutional trust refers to the perceived reliability, integrity, and competence of neo-banking providers, whereas customer satisfaction represents customers' overall evaluation of their banking experiences. Customer loyalty is assessed through intentions to continue using services, willingness to recommend the institution, and preference for maintaining an existing banking relationship. Operational efficiency is evaluated separately through institution-level indicators derived from financial statements and operational reports. The proposed analytical framework examines direct and indirect relationships among customer-level constructs and explores whether institutional efficiency is associated with differences in customer loyalty across neo-banks. The observational design allows the identification of statistically significant associations but does not independently establish causal relationships between technological characteristics, customer behavior, and financial performance.

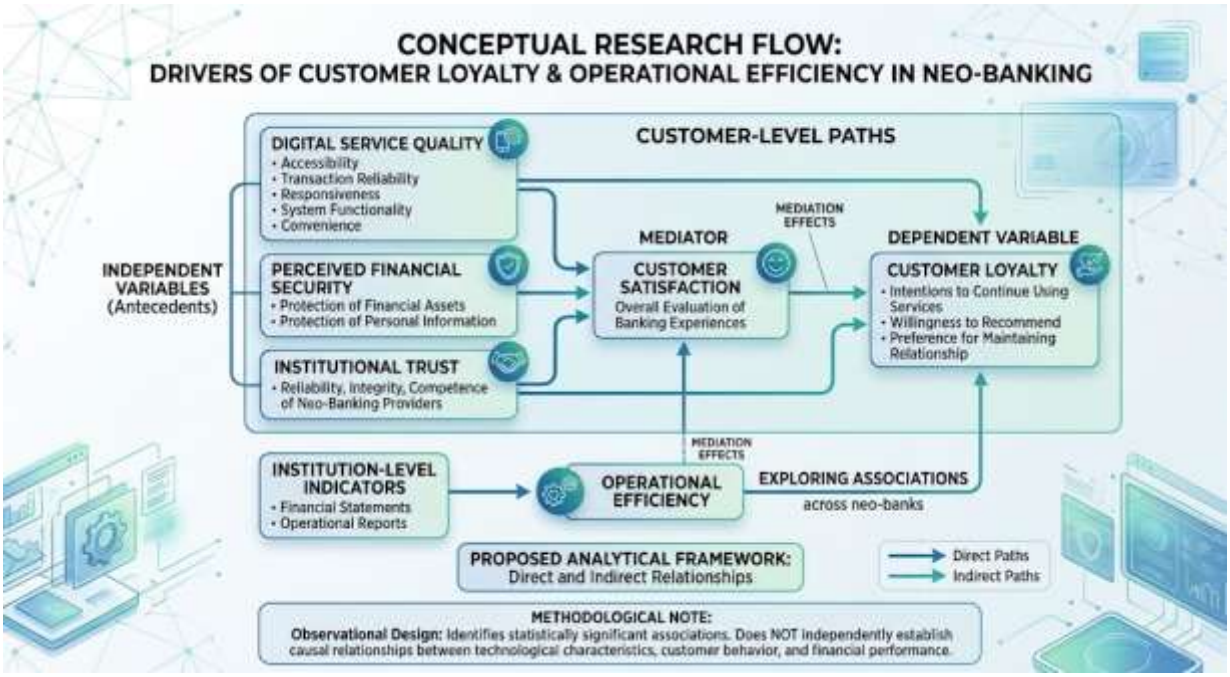


Figure 1. Conceptual Framework Incorporates Digital Service Quality

The analytical strategy combines structural equation modeling with institutional financial performance analysis to address the distinct levels of measurement represented in the research. Partial Least Squares Structural Equation Modeling (PLS-SEM) is proposed to evaluate the measurement properties of customer-level constructs and estimate relationships among digital service quality, perceived financial security, institutional trust, satisfaction, and loyalty. Institutional operational efficiency is assessed through financial ratio analysis, including cost-to-income ratios and other indicators available consistently across the selected institutions. A multilevel analytical approach may subsequently be employed to examine whether banking efficiency is associated with customer loyalty after accounting for individual characteristics and the clustering of customers within institutions. Such analysis requires a sufficient number of participating neo-banks to support reliable estimation of institution-level relationships. Where institutional coverage is insufficient, the investigation will be restricted to separate customer-level modeling and descriptive institutional comparisons rather than unsupported cross-level inference. This analytical distinction strengthens the methodological consistency of the research and ensures that conclusions remain aligned with the structure and quality of the available evidence.

Population and Samples

The target population comprises adult customers who actively use digital-first banking services provided by neo-banking institutions within the selected research jurisdiction. Eligible institutions include independently licensed digital banks and digital-first financial service providers operating through regulated banking partnerships, provided that their institutional characteristics and financial reporting arrangements can be clearly identified. These categories will be distinguished during sampling because differences in licensing structures may influence operating expenses, regulatory obligations, and the comparability of financial performance indicators. The customer population includes individuals who use neo-banking applications for financial activities such as savings, electronic transfers, bill payments, financial management, and other available banking services. The institutional population consists of neo-banks for

which reliable operational and financial information can be obtained from audited financial statements, official institutional publications, or regulatory disclosures. The study adopts two related units of analysis: individual customers for the assessment of loyalty and its behavioral determinants, and banking institutions for the evaluation of operational efficiency. This distinction allows the investigation to preserve the economic and statistical meaning of each variable while examining potential relationships between customer experiences and institutional performance.

The sampling procedure employs a multistage approach combining purposive institutional selection with customer recruitment based on predefined eligibility criteria. Neo-banking institutions will be selected according to their operational status, accessibility of financial information, relevance to the digital-first banking model, and availability of customers who can participate in the survey. Customer respondents must be at least 18 years old, possess an active account with one of the selected neo-banks, and have used its financial services for a minimum of six months. The minimum usage period is established to ensure that respondents have sufficient practical experience to evaluate service quality, trust, satisfaction, and relationship continuity. Customers who have registered an account but have never completed a financial transaction will be excluded because their responses may reflect expectations rather than actual service experiences. Where probability-based customer lists are unavailable, purposive and quota-based recruitment will be employed to obtain variation in customer age, gender, educational background, banking experience, and usage intensity. The sampling strategy will also seek adequate representation across participating institutions to support meaningful comparative analysis (Ayinde, 2024; Bond, 2023).

The required sample size will be determined through an a priori statistical power analysis based on the complexity of the proposed structural model, the expected effect sizes, the desired statistical power, and the selected significance level. A statistical power target of at least 0.80 and a significance threshold of 0.05 will be considered when evaluating the minimum number of customer responses required to test the proposed relationships. Sample size requirements for PLS-SEM will be assessed according to the number of predictors influencing the most complex endogenous construct and the anticipated magnitude of the relationships rather than relying exclusively on simplified sampling rules. The final customer sample will also account for incomplete responses, potentially invalid questionnaires, and variation in respondent distribution across institutions. Institution-level analysis will require separate consideration of the number of participating neo-banks because a large number of customer responses cannot compensate for insufficient variation at the institutional level. The final sample composition, recruitment outcomes, institutional coverage, and exclusion decisions will be reported transparently to support the interpretation and reproducibility of the findings.

Instruments

The primary data collection instrument is a structured questionnaire designed to measure customer perceptions and behavioral intentions concerning neo-banking services. The questionnaire consists of respondent background information, digital banking usage characteristics, and measurement items representing the principal customer-level constructs. Digital service quality is assessed through indicators involving system accessibility, ease of navigation, transaction accuracy, responsiveness, and perceived reliability. Perceived financial security is measured through customers' confidence in data privacy, transaction protection, and the institution's ability to safeguard financial information. Institutional trust is evaluated

through perceptions of competence, honesty, reliability, and the provider's commitment to customer interests. Customer satisfaction is measured through respondents' evaluations of their overall banking experiences, while customer loyalty is assessed through continued usage intentions, recommendation intentions, and preference for maintaining their relationship with the provider. Each construct will be measured using multiple statements adapted from established digital banking and service management literature, with wording adjusted to reflect the characteristics of neo-banking applications. Responses will be recorded using a five-point Likert scale ranging from strongly disagree (1) to strongly agree (5).

The questionnaire development process includes content evaluation, language refinement, preliminary testing, and statistical assessment of measurement quality. An expert review will be conducted to examine the relevance, clarity, and conceptual appropriateness of the proposed questionnaire items. The expert panel should include specialists in financial technology, banking management, consumer behavior, and quantitative research methodology. A pilot study will subsequently be undertaken with eligible neo-bank customers who are not included in the main analytical sample, allowing potentially ambiguous statements and technical terminology to be identified before full-scale data collection. The measurement model will be evaluated through indicator loadings, internal consistency reliability, convergent validity, and discriminant validity. Cronbach's alpha and composite reliability will be used to assess internal consistency, with values of approximately 0.70 or higher generally considered acceptable for established reflective measurement scales. Average Variance Extracted (AVE) values of at least 0.50 will be used to assess convergent validity, while the Heterotrait–Monotrait Ratio (HTMT) will support the evaluation of discriminant validity. These thresholds will be interpreted in conjunction with the theoretical justification and empirical behavior of individual indicators rather than applied mechanically.

The secondary data collection instrument consists of a standardized financial data extraction sheet developed to evaluate operational efficiency across the selected neo-banking institutions. Financial information will be obtained from audited annual reports, regulatory disclosures, and other verifiable institutional sources covering a consistently defined reporting period. The primary operational efficiency indicator will be the cost-to-income ratio, calculated as operating expenses divided by operating income and expressed as a percentage. Lower ratios generally indicate that an institution uses fewer operating resources relative to the income generated, although differences in business maturity, growth strategies, and accounting classifications may affect their interpretation. Additional financial indicators may include operating expenses relative to total assets, operating income per employee, and return on assets, subject to data availability and consistency. Profitability measures will be treated as complementary performance indicators rather than direct substitutes for operational efficiency. The financial data extraction procedure will document the reporting period, accounting definitions, institutional licensing arrangements, and relevant adjustments to ensure comparability. Information obtained from institutions operating through banking partnerships will be examined carefully to avoid attributing financial performance reported by a partner bank exclusively to the neo-banking service provider (Swathi, 2026; Yankovskaya, 2022).

Procedures

The research procedures begin with a systematic examination of scientific literature addressing neo-banking, digital service quality, institutional trust, customer satisfaction, loyalty, and operational efficiency. This preliminary stage will establish the theoretical

foundations of the study, identify relevant measurement constructs, and formulate hypotheses concerning the relationships among customer-level variables. The research instrument will then be developed by adapting measurement items from established literature and aligning their wording with the specific characteristics of neo-banking services. Expert evaluation and pilot testing will be conducted to establish the relevance and clarity of the questionnaire before main data collection. Institutional selection will proceed through an assessment of regulatory status, operational characteristics, and the availability of reliable financial information. Ethical procedures will include informed consent, voluntary participation, confidentiality protection, and secure handling of respondent information. Participants will receive an explanation of the research purpose, the intended use of their responses, and their right to discontinue participation. The survey will not request banking passwords, account authentication credentials, or other information unnecessary for the research objectives.

The main data collection stage will involve distributing the structured questionnaire to eligible neo-bank customers through appropriate digital and institutional communication channels. Respondents will be screened according to the established participation criteria before completing the survey. Customer responses will be collected using a standardized electronic questionnaire to ensure consistent item presentation and response recording. Each participant will identify the neo-banking institution used as the reference for evaluating service quality, trust, satisfaction, and loyalty. Respondents who maintain accounts with multiple neo-banks will be instructed to evaluate the institution they use most frequently, allowing individual observations to be associated with a clearly defined provider. Questionnaire submissions will be examined for missing information, duplicate responses, inconsistent answers, and other indicators of insufficient response quality. Financial data collection will be conducted separately by extracting the required institutional indicators from official financial publications. The reporting periods used for financial comparisons will be aligned as closely as possible with the customer survey period to reduce temporal inconsistencies between behavioral observations and institutional performance measures.

The data analysis procedure will begin with descriptive statistical analysis to summarize respondent characteristics, digital banking usage patterns, and the distribution of principal research variables. Frequencies, percentages, means, and standard deviations will be used to characterize the customer sample and identify patterns in perceived service quality, trust, satisfaction, and loyalty. Preliminary screening will examine missing data, unusual observations, response distributions, and potential common method bias associated with self-reported questionnaire measures. PLS-SEM will then be employed to evaluate the measurement model and estimate relationships among the customer-level constructs. The structural model will be assessed using standardized path coefficients, confidence intervals, explained variance, effect sizes, and predictive relevance measures where appropriate. Bootstrapping procedures will be used to evaluate the statistical uncertainty of estimated relationships, with results interpreted according to the corresponding confidence intervals and significance levels. Mediation analysis will examine whether institutional trust and customer satisfaction help explain the relationship between digital service quality and customer loyalty. Model evaluation will distinguish statistical significance from practical importance to avoid overstating relationships that are statistically detectable but economically or behaviorally limited (Gnanakumar, 2024; Muñoz-Arce, 2022).

RESULTS AND DISCUSSION

The descriptive assessment of neo-banking development demonstrates substantial growth in customer acquisition and digital financial engagement during the observed period. Public financial disclosures from Nu Holdings, the parent company of Nubank, indicate that its reported customer base expanded from 74.6 million in 2022 to 93.9 million in 2023 and 114.2 million in 2024. Monthly active customers increased from 61.2 million to 94.9 million over the same period, while the reported activity rate remained relatively stable at approximately 82–83%. These figures indicate that customer growth was accompanied by continued engagement among a substantial proportion of registered users. The data also demonstrate that expanding customer numbers do not necessarily require proportional declines in platform activity as digital banking operations grow. The relative stability of the activity rate suggests that Nubank maintained broad platform utilization during a period of rapid customer acquisition. Nevertheless, the activity rate measures financial usage rather than attitudinal loyalty, making it an incomplete indicator of customer commitment, satisfaction, or resistance to competing banking providers.

Table 1. Customer Growth and Digital Banking Activity at Nu Holdings, 2022–2024

Indicator	2022	2023	2024
Total customers (millions)	74.6	93.9	114.2
Monthly active customers (millions)	61.2	78.0	94.9
Customer activity rate (%)	82	83	83
Monthly revenue per active customer (USD)	7.8	9.6	11.1
Monthly cost to serve per active customer (USD)	0.8	0.8	0.8

The secondary financial indicators provide evidence that growth in neo-banking activity can occur alongside improvements in customer-level operating economics. Nu Holdings reported that average monthly revenue per active customer increased from USD 7.8 in 2022 to USD 11.1 in 2024, representing an increase of approximately 42.3%. Average monthly cost to serve per active customer remained at USD 0.8 across the same three-year period. The combination of increasing revenue and relatively stable servicing costs indicates an improvement in the spread between revenue generation and reported customer servicing expenditure. These observations are consistent with the possibility that digital-first banking infrastructure can accommodate expanding customer activity without proportionate increases in selected operating costs. The figures do not establish comprehensive institutional cost efficiency because the reported servicing metric does not encompass every expenditure associated with customer acquisition, technological investment, regulation, credit losses, or corporate operations. The descriptive results nevertheless demonstrate the relevance of examining customer engagement and resource productivity together when assessing the economic sustainability of neo-banking business models.

The observed increase in Nubank's customer base illustrates the potential scalability of financial service models built around digital distribution and standardized technological infrastructure. Digital-first banking applications can facilitate account registration, payment processing, and customer interactions without requiring each additional customer to be served through a new physical branch. The persistence of a relatively stable customer activity rate during substantial customer expansion suggests that the institution continued generating financial engagement among existing and newly acquired users. The increase in monthly

revenue per active customer further indicates that the economic contribution of active customers strengthened during the reported period. Such growth may reflect changes in transaction volume, product usage, customer balances, pricing, or the composition of financial services. The available aggregated data do not permit the contribution of each mechanism to be measured separately. These findings consequently indicate that platform expansion and customer activity can develop together, but they do not independently establish the psychological or behavioral factors responsible for long-term customer loyalty.

The operational evidence suggests that technology-enabled banking models may achieve favorable customer-level servicing economics when expanding activity is supported by scalable infrastructure. Nubank's reported increase in revenue per active customer, alongside stable average servicing costs, illustrates how digital operations may support improving unit economics during institutional growth. The relationship between digital transformation and operational efficiency, however, is not necessarily immediate or uniform across neo-banking providers. Shanti et al. (2024), examining seven Indonesian neo-banks using Stochastic Frontier Analysis and panel-based methods, found improvements in profit efficiency after digital transformation while identifying substantial implementation costs and temporary efficiency deterioration during transformation periods. Their findings indicate that infrastructure investment, technological development, organizational adjustment, and marketing expenditure can initially constrain institutional performance.

The comparative evidence therefore suggests that favorable cost structures may emerge over time rather than automatically accompanying the introduction of digital services. Differences in institutional maturity and technological investment must be considered before generalizing customer-level servicing metrics into industry-wide efficiency advantages.

The assessment of customer loyalty identifies several dimensions that cannot be adequately represented by registered customer numbers or transaction frequency alone. Customer retention concerns the continuation of an existing banking relationship, while attitudinal loyalty includes institutional preference, trust, positive evaluations, and willingness to recommend a financial provider. Behavioral engagement can be observed through account activity, transaction frequency, and recurring service use, although these measures may also reflect convenience or temporary economic incentives. Evidence from Puente, Cavazos-Arroyo, and Puente-Díaz (2025), based on an online survey of 305 neo-bank customers in Mexico, indicates that perceived financial security and institutional trust play important roles in explaining customer retention. The study supported six of seven hypotheses and identified trust as a mediating variable between perceived financial security and customer retention.

These findings demonstrate that continued engagement with neo-banking applications has important psychological and relational dimensions. The combination of published behavioral evidence and institutional activity measures suggests that sustainable customer relationships require both measurable financial engagement and confidence in the institution providing the services.

The comparative analysis identifies operational efficiency as a multidimensional institutional outcome involving cost management, service productivity, revenue generation, and the effective utilization of financial and technological resources. Customer servicing costs provide information about the direct economic burden associated with maintaining active users, while cost-to-income ratios indicate the proportion of operating income consumed by institutional operating expenses. Revenue per active customer offers an additional perspective

on financial productivity but cannot independently establish operational efficiency. Profitability measures such as return on assets may support interpretation, although they reflect influences beyond service delivery efficiency, including asset quality, funding costs, and credit risk. Shanti et al. (2024) employed Stochastic Frontier Analysis to estimate profit efficiency among Indonesian neo-banks and found that efficiency improvements varied across institutions and stages of digital transformation.

Their findings reinforce the importance of evaluating efficiency according to consistent accounting definitions and institutional characteristics. The combined evidence indicates that operational efficiency should be assessed through several complementary measures rather than inferred from platform growth, mobile application performance, or the absence of physical branches.

Table 2. Indicators Used to Assess Customer Loyalty and Operational Efficiency

Analytical dimension	Indicator	Measurement approach	Interpretation
Customer engagement	Monthly active customer rate	Active users / total users	Observable platform utilization
Customer retention	Continued relationship	Longitudinal account or survey data	Persistence of banking relationships
Attitudinal loyalty	Recommendation and preference	Validated questionnaire	Customer commitment
Institutional trust	Perceived reliability and security	Validated questionnaire	Confidence in the provider
Servicing productivity	Cost per active customer	Institutional cost data	Customer-level operating expenditure
Revenue productivity	Revenue per active customer	Institutional revenue data	Customer-level monetization
Operational efficiency	Cost-to-income ratio	Operating expenses / operating income	Institution-level cost efficiency
Profit efficiency	Stochastic frontier score	Frontier estimation	Performance relative to estimated frontier

The available inferential evidence concerning neo-bank customer loyalty is derived from previously published empirical research rather than newly collected survey observations. Puente et al. (2025) applied Partial Least Squares Structural Equation Modeling and bootstrapping procedures to a cross-sectional sample of 305 neo-bank customers in Mexico. Their analysis supported six of seven proposed hypotheses, identifying relationships involving perceived financial security, customer trust, retention, and switching considerations. The researchers found that perceived financial security influenced customer trust and retention, while its relationship with the cost of switching to a traditional bank was not supported. Trust also performed a mediating function within the examined relationships.

These findings provide empirical support for treating financial security and institutional trust as relevant determinants of customer retention. Their statistical conclusions, however, apply to the population and model examined in that original study. The absence of a newly administered questionnaire prevents the estimation of original path coefficients, reliability

measures, confidence intervals, or significance levels for the customer-level structural model proposed in the present research.

The inferential evidence concerning neo-bank operational efficiency is informed by the published study of Shanti et al. (2024), which examined financial data from seven Indonesian neo-banks during 2016–2023. The researchers employed Stochastic Frontier Analysis to estimate profit efficiency and a Pooled Mean Group approach within a panel autoregressive distributed lag framework to investigate relationships between digital transformation and efficiency. Their findings indicated that digital transformation was associated with improved profit efficiency and that the relationship extended beyond the immediate transformation period. The analysis also identified short-term efficiency pressures associated with technological investment and organizational restructuring.

These results provide institution-level evidence that digital transformation may contribute to operational improvements under particular market and organizational conditions. They do not, however, establish an inferential relationship between customer loyalty and bank-level efficiency in the present study. A valid test of that relationship would require customer observations linked to the same institutions for which financial efficiency measures are available, together with an estimation strategy accounting for differences between individual and institutional units of analysis.

The relationship between customer engagement and operational productivity is illustrated by Nubank's reported customer and financial metrics during 2022–2024. The institution expanded its active customer base while maintaining a relatively stable reported activity rate and average monthly servicing cost per active customer. The simultaneous increase in average monthly revenue per active customer suggests that higher platform participation can coexist with improvements in customer-level revenue productivity. The evidence supports the possibility of complementary relationships between digital scalability, active customer engagement, and servicing efficiency. The observed patterns do not establish that stronger customer loyalty caused improvements in financial productivity because activity rates do not directly measure loyalty and the financial indicators are reported at an aggregate institutional level. Other factors, including product diversification, customer characteristics, market conditions, and changes in revenue composition, may have contributed to the reported results. The findings therefore support a distinction between the coexistence of favorable customer engagement and operating outcomes and a statistically demonstrated relationship between the two.

The combined institutional and behavioral evidence indicates that customer trust and service reliability are relevant considerations when interpreting operational performance in digital-first banking. Published customer research identifies financial security and trust as important factors associated with retention, while institutional financial reports demonstrate that neo-banks can increase active customer populations without necessarily increasing reported servicing costs proportionately. These findings suggest a potential relationship between customer-centered service quality and operational sustainability, particularly when satisfied customers maintain financial relationships and engage with additional products. The strength and direction of this relationship remain untested in the present analysis because the available customer-level and institution-level datasets originate from different research contexts. Trust and satisfaction may influence customer retention, but the financial consequences of these behavioral outcomes depend on revenue generation, service costs, and

the duration of customer relationships. The comparative evidence consequently indicates that customer loyalty and operational efficiency are theoretically complementary dimensions of neo-bank sustainability, while their direct empirical association requires appropriately matched and longitudinal observations.

The experience of Monzo Bank provides a complementary institutional case illustrating the expansion of digital-first banking services and customer engagement. Monzo's 2025 Annual Report, covering its financial year ended March 2025, reported more than 12 million customers following the acquisition of approximately 2.4 million additional customers during the financial year. The institution also reported an increase in weekly active customers from 5.4 million to 6.9 million, representing approximately 27.8% growth. Customer deposits increased by 48% to GBP 16.6 billion, while the number of customers holding subscription products exceeded one million. These indicators demonstrate expansion across customer acquisition, service activity, deposit mobilization, and the adoption of additional financial products. The increase in weekly active customers indicates broader engagement with the platform, while subscription uptake suggests that a segment of customers was willing to maintain paid financial service relationships. These measures provide evidence of platform usage and commercial engagement but do not independently establish attitudinal loyalty or eliminate the possibility of customers maintaining competing banking relationships.

Monzo's financial disclosures also provide evidence of increasing revenue generation during a period of substantial customer expansion. The bank reported revenue of approximately GBP 1.2 billion for its financial year ended March 2025, representing a 48% increase from the preceding year. Adjusted profit before tax reached GBP 113.9 million, approximately eight times the previous year's reported adjusted figure. Total assets increased by 41% to GBP 18.3 billion, accompanied by growth in customer deposits and engagement with savings products. The increase in revenue and adjusted profitability indicates improving commercial performance alongside the expansion of the institution's customer base. The adjusted profit measure, however, differs from statutory profit and should not be interpreted as an equivalent indicator without reviewing the underlying reconciliation. Revenue and asset growth also do not independently establish improvements in cost efficiency, since operating expenditure, business mix, and funding conditions may affect profitability. The case provides evidence that a digital-first institution can combine customer growth with stronger financial performance, although the causal contribution of customer loyalty remains undetermined.

Table 3. Selected Customer and Financial Performance Indicators of Monzo Bank, FY2025

Indicator	2018	2023	2024
Adjusted absolute Scope 1 and 2 emissions (million tonnes CO_2e)	136.3	98.5	101.9
Adjusted emissions intensity (tCO_2e per tonne of crude steel)	1.85	1.78	1.75
Change in intensity relative to 2018	Baseline	−3.8%	−5.4%

Indicator	Reported value
Total customers	More than 12 million
New customers during the year	2.4 million
Weekly active customers	6.9 million
Previous-year weekly active customers	5.4 million

Weekly active customer growth	Approximately 27.8%
Customer deposits	GBP 16.6 billion
Deposit growth	48%
Annual revenue	GBP 1.2 billion
Revenue growth	48%
Adjusted profit before tax	GBP 113.9 million
Total assets	GBP 18.3 billion

Source: Monzo Bank, Annual Report 2025, financial year ended March 2025. The table includes reported institutional figures and a calculated percentage for weekly active customer growth.

The Monzo case illustrates the capacity of a digital-first banking institution to expand its customer base while increasing the use of financial products and services. Growth in weekly active customers demonstrates that platform expansion was accompanied by additional customer participation rather than being reflected exclusively in account registrations. The increase in customer deposits suggests that the institution also attracted financial balances through its banking products. Subscription adoption provides an additional indicator of customer engagement beyond basic account ownership because customers voluntarily maintained access to services requiring payment. These patterns are consistent with a business model in which an expanding digital platform supports additional financial activities and recurring customer interactions. The reported figures do not reveal whether customers increased their engagement because of improved satisfaction, attractive pricing, product availability, or other institutional characteristics. The case therefore indicates that observable customer engagement may accompany financial growth, but customer loyalty must be assessed through separate behavioral or attitudinal measures before its role in that growth can be established.

The financial development of Monzo demonstrates that customer acquisition and increased platform engagement can coexist with stronger revenue generation and adjusted profitability. The institution's reported revenue growth and improved adjusted profit before tax indicate progress in converting banking activity into financial returns during the observation period. Such outcomes may be associated with increased product adoption, expanding customer balances, improved revenue diversification, and the scaling of technological infrastructure. The available figures, however, do not permit these mechanisms to be isolated or quantified independently. The comparison with Nubank also requires caution because the two institutions operate under different regulatory, economic, and reporting environments. Nubank reports a specific monthly servicing cost per active customer, whereas the selected Monzo disclosures emphasize aggregate customer and financial performance. Their efficiency levels cannot therefore be ranked directly using these different indicators. The two cases collectively show that neo-bank growth can be accompanied by favorable financial developments, while revealing the importance of consistent measurement when evaluating operational efficiency across institutions.

The combined secondary evidence indicates that neo-banking institutions can experience substantial customer growth, sustained digital engagement, and improving financial productivity, although these outcomes vary according to institutional characteristics and measurement approaches. Nubank's expansion during 2022–2024 demonstrates the coexistence

of increasing customer activity, higher revenue per active customer, and relatively stable reported servicing costs. Monzo's financial year 2025 results similarly illustrate growth in customer participation, deposits, revenue, and adjusted profitability. Published behavioral research identifies financial security and institutional trust as important determinants of customer retention, while separate institutional research demonstrates that digital transformation can contribute to improvements in profit efficiency. The convergence of these findings supports the interpretation that customer relationships and operational performance are both relevant to the long-term sustainability of neo-banking institutions. Their direct relationship, however, has not been statistically established within a unified dataset. The evidence therefore supports an integrated analytical perspective without demonstrating that stronger customer loyalty necessarily causes superior institutional efficiency.

The overall interpretation highlights the importance of distinguishing digital customer acquisition, sustained financial engagement, attitudinal loyalty, and institutional operational efficiency when evaluating neo-bank performance. Customer numbers and activity rates demonstrate the scale and intensity of platform utilization but do not fully explain why customers maintain banking relationships or whether they prefer one institution over competing providers. Similarly, increases in institutional revenue and profitability provide evidence of financial development but do not necessarily establish improvements in resource efficiency. The available findings suggest that technological scalability, trust, service quality, and revenue productivity may represent interconnected dimensions of sustainable neo-banking performance. A definitive examination of these relationships requires a common research design linking validated customer loyalty measures to the operational indicators of the same neo-banking institutions. The present analysis provides descriptive evidence of institutional development and identifies empirically supported behavioral and efficiency mechanisms from existing studies. Its principal conclusion is that neo-bank sustainability should be evaluated through the combined consideration of customer relationship quality and institutional operating performance, while avoiding unsupported assumptions concerning causality or direct statistical relationships.

The findings of this study reveal that the evolution of neo-banks is characterized by an increasingly important relationship between digital customer engagement and institutional operating performance. The comparative analysis of Nu Holdings and Monzo Bank demonstrates that digital-first financial institutions can experience substantial customer growth while simultaneously improving selected indicators of financial productivity. Nu Holdings increased its customer base from 74.6 million in 2022 to 114.2 million in 2024, while its monthly active customer rate remained relatively stable at approximately 82–83%. The institution also reported an increase in monthly average revenue per active customer from USD 7.8 to USD 11.1, accompanied by a relatively stable average servicing cost of USD 0.8 per active customer. These observations indicate that customer expansion can coexist with improving revenue productivity without a proportional increase in selected customer servicing expenses. The findings suggest that technological scalability may contribute to favorable operating economics, although increased customer activity should not automatically be interpreted as stronger attitudinal loyalty.

The comparative findings concerning Monzo Bank provide additional evidence that customer engagement and institutional financial performance can develop simultaneously within digital-first banking environments. Monzo reported more than 12 million customers

during its financial year ended March 2025, accompanied by an increase in weekly active customers from 5.4 million to 6.9 million. The institution also reported revenue of approximately GBP 1.2 billion and adjusted profit before tax of GBP 113.9 million, indicating substantial commercial development alongside expanding financial service usage. These results suggest that neo-banking institutions can move beyond initial customer acquisition toward broader financial engagement and increasing revenue generation. The observed growth in customer deposits, subscription products, and platform activity further illustrates the importance of maintaining relationships that extend beyond basic account registration. Institutional revenue growth and adjusted profitability, however, do not independently establish improvements in comprehensive operational efficiency. Differences in accounting methods, financial products, and customer characteristics must be considered before interpreting these outcomes as evidence of superior operational performance across the neo-banking industry.

The customer loyalty findings derived from published empirical research emphasize the importance of institutional trust and perceived financial security in sustaining customer relationships. Evidence from George, (2026) demonstrates that perceived financial security is associated with customer trust and retention among neo-bank users in Mexico. Their structural equation analysis also identifies trust as a mediating variable linking perceived security with customer retention and switching-related considerations. These results indicate that convenient access to digital banking services is insufficient to explain the development of lasting customer relationships. Customers must also perceive that their financial resources, personal information, and transactions are managed through reliable institutional arrangements. The broader interpretation suggests that customer loyalty depends on both functional service experiences and psychological confidence in financial service providers. The present comparative analysis supports the relevance of these behavioral mechanisms, although it does not independently estimate their statistical effects because original customer-level survey data were unavailable.

The overall findings indicate that customer engagement and operational efficiency are potentially complementary dimensions of neo-bank sustainability, but their relationship cannot be reduced to a simple linear association. Digital financial institutions may achieve increasing service productivity through automated transactions, scalable technological infrastructure, and broader product utilization. Customer loyalty may support such developments when sustained relationships encourage recurring financial activities and reduce dependence on repeated promotional acquisition strategies. The available institutional evidence demonstrates favorable patterns of customer engagement and financial development, while prior behavioral research identifies trust and security as relevant determinants of customer retention. These findings originate from different analytical settings and cannot establish a direct causal relationship between customer loyalty and institutional efficiency. The principal outcome of the comparative analysis is therefore a differentiated understanding of neo-bank performance in which customer activity, attitudinal loyalty, revenue productivity, and operating efficiency are treated as related but distinct constructs. This distinction provides an important foundation for evaluating the sustainability of digital-first financial institutions within increasingly competitive banking markets (Huong, 2025; Zajda, 2022).

The findings are consistent with the research conducted by Shanti et al. (2024), who examined digital transformation and profit efficiency among seven Indonesian neo-banks using Stochastic Frontier Analysis and panel-based econometric techniques. Their study demonstrated that digital transformation can contribute to improvements in profit efficiency

while generating financial pressures associated with technological investment and organizational restructuring. The present analysis identifies a related pattern through the reported performance of Nu Holdings, where substantial customer expansion occurred alongside increasing revenue per active customer and relatively stable customer servicing costs. The relationship between these findings suggests that technological infrastructure may support operating improvements as banking institutions expand their activities. The distinction lies in the level of measurement and institutional context. Shanti et al. evaluated profit efficiency across Indonesian banking institutions, whereas the present study examines company-reported customer and operating metrics from selected international neo-banks. The convergence of these observations supports the potential importance of digital scalability while highlighting the need to distinguish customer-level operating economics from comprehensive institutional profit efficiency.

The comparative findings also provide an important contrast with the research of Citterio, Marques, and Tanda (2025), who examined the performance and risk characteristics of 65 European neo-banks relative to traditional banking institutions. Their study found that neo-banks generally performed worse than conventional banking counterparts and incurred higher non-staff expenses, despite evidence suggesting potential economies of scale and scope. The favorable customer-level operating metrics observed at Nu Holdings and the financial expansion reported by Monzo do not invalidate these findings. The differences suggest that neo-bank performance may vary substantially according to organizational maturity, operating scale, financial product composition, and institutional strategy. Established digital-first institutions with substantial customer populations may possess greater opportunities to distribute technology-related expenditure across recurring financial activities. Smaller or less diversified neo-banks may face higher relative costs associated with technological infrastructure, advertising, and regulatory obligations. The combined evidence challenges generalized assumptions that digitally oriented financial institutions are either inherently more efficient or consistently less efficient than traditional banks (Köberlein-Neu, 2026; Tumewang, 2026).

The behavioral interpretation of customer engagement is consistent with Puente et al. (2025), whose research established the relevance of perceived financial security and institutional trust to customer retention. Their findings demonstrate that customer decisions to maintain neo-banking relationships involve psychological evaluations of financial reliability rather than dependence exclusively on technological accessibility. The present study extends this discussion conceptually by considering customer retention alongside the economic characteristics of institutional service delivery. Customer activity rates, recurring product utilization, and financial engagement provide observable indicators of continued service participation, while trust and perceived security offer potential explanations for why such engagement may persist. The difference between the two research perspectives is methodological. Puente et al. employed original customer survey data to estimate behavioral relationships, whereas the present analysis relies on corporate disclosures and published research findings. The available evidence therefore supports an integrated interpretation of customer loyalty and financial productivity without demonstrating that the trust relationships identified in Mexico directly explain the reported performance of Nu Holdings or Monzo.

The comparison with previous research reveals a broader distinction between digital banking adoption, customer retention, and the economic sustainability of banking institutions.

Studies emphasizing technological adoption frequently examine perceived usefulness, convenience, and customers' willingness to use digital financial services. Research on institutional efficiency generally focuses on operating expenses, profitability, resource allocation, and financial performance. The current findings indicate that these dimensions cannot be evaluated independently when discussing the long-term development of neo-banks, although integrating them requires methodological precision. The empirical patterns reported by Nu Holdings and Monzo suggest that customer engagement can accompany favorable operating and financial outcomes. The findings of Shanti et al. and Citterio et al. demonstrate that such outcomes are not uniform across institutions, while Puente et al. identify psychological factors supporting customer retention. The research evidence collectively suggests that neo-bank sustainability depends on the interaction of customer relationships, institutional maturity, and operational capabilities. The distinctive contribution of the present analysis is the comparative interpretation of these dimensions rather than the establishment of a newly validated causal model.

The findings signify that neo-banking has entered a stage of institutional development in which technological accessibility alone is insufficient to explain competitive performance. Digital account registration, mobile transactions, and automated financial services have become widely recognized characteristics of contemporary banking. The expansion of digital-first financial institutions consequently places greater importance on the ability to maintain customer engagement and generate sustainable financial returns. The reported experience of Nu Holdings demonstrates that substantial customer growth can coexist with relatively stable activity rates and favorable customer-level operating economics. Monzo's expansion similarly illustrates the importance of converting increasing customer participation into broader financial relationships and revenue generation. These developments suggest that the competitive focus of mature neo-banking institutions may be shifting from customer acquisition toward sustained financial engagement and effective resource utilization. The findings should not be interpreted as evidence that every financial market has entered an identical stage of digital maturity. Their significance lies in demonstrating that the long-term competitiveness of neo-banks requires performance assessments extending beyond digital adoption and application availability.

The observed customer engagement patterns signify that measurable platform activity and genuine customer loyalty represent different dimensions of financial relationships. A customer may continue using a neo-banking application because of convenience, attractive pricing, or established transaction habits without developing a strong emotional or attitudinal commitment to the institution. The relatively stable activity rates reported by Nu Holdings indicate continued platform utilization during rapid expansion, but they do not reveal whether customers would maintain their relationships when alternative providers offer better financial conditions. The findings from Puente et al. (2025) provide an important explanation by demonstrating that perceived financial security and institutional trust are associated with customer retention. This distinction suggests that sustainable digital banking relationships depend on more than frequency of financial transactions. Customer loyalty involves confidence, satisfaction, perceived value, and the willingness to maintain a relationship despite competitive alternatives. The broader meaning of these observations is that neo-bank success should be evaluated through both observable customer behavior and validated measures of relationship quality (Wang, 2021; Zhang, 2023).

The operational findings signify that digital infrastructure creates opportunities for scalability without eliminating the economic constraints associated with financial service provision. Automated processes can reduce certain transaction and servicing expenses, particularly when technological systems accommodate increasing customer volumes without equivalent increases in personnel or physical infrastructure. Nu Holdings' reported customer servicing metrics provide an illustration of this potential. The contrasting evidence from European neo-banks demonstrates that technological orientation may also generate substantial expenditure involving software development, advertising, compliance, and operational infrastructure. These differences indicate that digital efficiency is not an inherent property of technology but an outcome shaped by institutional scale, resource management, and business model characteristics. Financial institutions may require substantial investment before technological infrastructure generates sustainable economic benefits. The findings therefore signify a transition from understanding digital transformation as a technological achievement toward evaluating it as an organizational capability. The relevant question is not whether a bank uses advanced financial technology, but whether that technology improves financial service delivery while supporting responsible and sustainable resource utilization.

The combined findings signify the emergence of a more complex understanding of neo-bank sustainability in which customer relationships and institutional performance must be examined as interconnected but analytically distinct outcomes. Customer loyalty can potentially support financial sustainability by encouraging repeated service usage and reducing the need for continuous customer replacement. Operational efficiency may also contribute to positive customer experiences through reliable transactions, responsive digital platforms, and affordable financial services. These mechanisms are economically plausible, but the present evidence does not establish their direction or relative importance through a unified statistical model. The reported institutional performance patterns and published behavioral findings instead demonstrate the relevance of examining these relationships more systematically. The broader interpretation is that sustainable neo-banking depends on the successful coordination of technological capabilities, financial discipline, and customer-centered service delivery. Institutional growth that neglects service quality may weaken customer relationships, while customer acquisition strategies that disregard operational costs may undermine long-term financial performance. The findings consequently support a balanced conception of competitiveness grounded in both customer value and organizational efficiency.

The findings have theoretical implications for understanding customer loyalty in technology-intensive financial services. Traditional relationship marketing perspectives emphasize trust, satisfaction, perceived value, and relationship continuity as foundations of long-term customer commitment. Neo-banking introduces a service environment in which these relationships are established and maintained predominantly through digital interactions rather than conventional face-to-face communication. The evidence concerning perceived financial security and trust suggests that the absence of physical interaction does not eliminate the importance of institutional credibility. Digital financial relationships may instead require customers to evaluate reliability through transaction performance, security arrangements, communication quality, and consistency of service experiences. The institutional observations further indicate that continued customer engagement can coexist with favorable financial performance, creating opportunities to connect relationship marketing theory with organizational efficiency perspectives. The theoretical implication is that neo-bank

sustainability should be understood through a combination of behavioral and institutional mechanisms. A comprehensive explanation requires identifying how digital service experiences influence customer commitment and whether such commitment contributes to measurable economic outcomes.

The managerial implications concern the importance of balancing customer acquisition strategies with long-term engagement and operating discipline. Neo-bank managers frequently prioritize the expansion of customer registrations and transaction volumes as indicators of market development. The present findings suggest that these measures should be accompanied by indicators of active participation, customer relationship continuity, revenue productivity, and servicing expenditure. Nubank's reported operating metrics demonstrate the analytical value of monitoring customer activity and financial productivity simultaneously. Monzo's financial development further illustrates the importance of product engagement and revenue growth as institutions mature. Managers should nevertheless avoid interpreting high platform activity as sufficient evidence of customer loyalty. Regular assessment of trust, satisfaction, perceived security, and customer retention would provide additional information about the sustainability of financial relationships. Institutional decision-making may benefit from integrating behavioral and financial performance measures to identify whether growth strategies are generating durable customer value or merely increasing the number of registered accounts.

The findings also have implications for technological investment and operational resource allocation. Digital-first banking institutions must balance the financial advantages of automation with the costs associated with cybersecurity, technological maintenance, regulatory compliance, and customer assistance. The evidence from European neo-banks indicates that non-staff operating expenses can constrain financial performance, particularly among smaller or less diversified institutions. These observations suggest that technology investment should be evaluated according to its contribution to operational resilience, service quality, and long-term financial productivity rather than its novelty alone. Automated customer service may reduce certain operating expenses, but inadequate responses to complex financial problems can create dissatisfaction and potentially weaken customer confidence. Investment decisions should therefore consider both the financial efficiency of technological systems and their influence on service reliability. The practical implication is that cost optimization should not be pursued independently of customer experience. Sustainable efficiency requires institutions to identify expenditure that supports essential service quality while reducing avoidable operational costs.

The regulatory and policy implications concern the relationship between digital business models, institutional soundness, and customer protection. Neo-banks operate within financial markets where technological convenience may accelerate customer acquisition and financial transactions, creating new demands for effective supervision and operational resilience. The comparative evidence demonstrates that favorable customer growth does not necessarily indicate strong profitability or efficient resource utilization. Regulatory assessments should therefore distinguish indicators of platform expansion from measures of institutional financial strength, governance quality, and service continuity. The importance of perceived financial security and trust further suggests that consumer protection remains central to sustainable digital banking. Clear disclosure of banking arrangements, reliable transaction systems, effective complaint mechanisms, and transparent communication concerning financial risks can support customer confidence. Regulatory approaches should also recognize differences

between independently licensed neo-banks and financial technology providers operating through banking partnerships. The findings suggest that responsible digital financial development requires a supervisory environment capable of supporting innovation while maintaining accountability, financial resilience, and appropriate protection for customers.

The observed relationship between customer expansion and favorable servicing economics can be explained partly by the scalability of digital banking infrastructure. Neo-banks generally rely on centralized technological platforms, automated transaction processing, and mobile applications that can serve substantial customer populations without requiring proportional expansion of physical distribution networks. These characteristics may reduce the marginal cost of processing additional transactions and maintaining selected customer services once the necessary infrastructure has been established. The reported experience of Nu Holdings is consistent with this explanation because its active customer base expanded considerably while average monthly servicing costs remained relatively stable. Increased revenue per active customer may also reflect broader financial product adoption and more frequent use of banking services among existing customers. The economic mechanism resembles economies of scale, in which fixed technological expenditure can be distributed across a larger volume of financial activity. The present evidence cannot independently determine the extent to which scale economies caused the observed operating outcomes. Variations in revenue composition, financial market conditions, customer characteristics, and operating strategies may also have contributed to institutional performance.

The importance of financial security and trust in customer retention can be explained by the distinctive characteristics of banking relationships, which involve financial uncertainty, personal information, and expectations of institutional reliability. Customers entrust financial institutions with monetary assets and sensitive data while relying on their ability to process transactions accurately and maintain uninterrupted service availability. Neo-banking environments may intensify the significance of these considerations because customers frequently interact with institutions through digital interfaces rather than personal relationships with banking employees. The absence of physical interaction can increase dependence on perceived technological reliability, transparent communication, and confidence in digital security arrangements. Puente et al. (2025) found that perceived financial security influenced trust and customer retention, providing empirical support for the relevance of these psychological mechanisms. Their findings suggest that institutional trust helps transform confidence in application security into stronger customer relationships. The broader explanation is that digital convenience may facilitate banking participation, whereas perceived institutional reliability influences customers' willingness to maintain their relationships over time.

The differences in operational performance among neo-banking institutions can be explained through variation in organizational maturity, technological investment requirements, market conditions, and business model diversification. Newly established digital banks may incur substantial expenditure when developing platforms, acquiring customers, obtaining regulatory authorization, and establishing reliable financial service infrastructure. These expenses may initially exceed the revenue generated by relatively small customer populations. Established institutions with larger operating scales may gradually distribute fixed expenses across more customers and financial products, creating opportunities for improved resource productivity. Citterio et al. (2025) identified higher non-staff expenses among European neo-

banks compared with conventional counterparts, while also documenting evidence consistent with potential economies of scale and scope. Shanti et al. (2024) similarly reported improvements in profit efficiency following digital transformation, alongside financial pressures associated with implementation. These findings indicate that operational outcomes may depend on the stage of institutional development rather than solely on the adoption of digital technology. The comparative evidence therefore provides a plausible explanation for why favorable financial outcomes at selected mature institutions can coexist with weaker performance among other neo-banking providers.

The uncertain empirical relationship between customer loyalty and operational efficiency can be explained by differences in measurement, financial reporting, and the timing of organizational outcomes. Customer loyalty is generally evaluated through individual-level behavioral observations or psychological constructs, while operational efficiency is measured through financial information reported at the institutional level. These variables may also respond to institutional strategies over different periods. Investments in customer support, security, and personalized financial services may increase current operating expenditure while potentially strengthening customer relationships over longer periods. Improved retention may subsequently reduce the need for extensive acquisition expenditure, although such benefits depend on actual customer behavior and revenue contribution. Cross-sectional customer surveys and annual institutional financial statements may therefore capture different stages of the underlying economic relationship. The present evidence is further limited by the use of customer behavior findings and financial performance observations from different institutional settings. These methodological characteristics explain why the analysis identifies plausible relationships without establishing direct statistical effects. A stronger investigation would require longitudinal, institution-matched data capable of examining how customer relationship outcomes and efficiency indicators evolve together.

The findings indicate that future research should prioritize integrated empirical designs capable of connecting customer loyalty with institution-level operational efficiency. Subsequent investigations should combine validated customer surveys with financial performance information from the same neo-banking institutions, allowing customer relationship outcomes to be examined alongside objectively measured organizational characteristics. Customer loyalty should be operationalized through distinct indicators of continued service usage, recommendation intention, institutional preference, and actual relationship persistence where appropriate data are available. Operational efficiency should be assessed through consistent financial indicators, including cost-to-income ratios, servicing expenses, and resource productivity measures. Longitudinal data would be particularly valuable because changes in customer relationships may influence financial performance over periods extending beyond the initial observation. Research involving multiple institutions should also account for the hierarchical organization of customer observations within banking providers. Multilevel modeling or appropriately specified panel approaches may provide a more defensible basis for examining cross-level relationships than interpreting separate survey and institutional findings as direct statistical evidence.

The development of future research models should also incorporate mechanisms explaining why customer loyalty and operational efficiency may reinforce or constrain one another. Digital service quality, perceived financial security, institutional trust, and customer satisfaction represent relevant customer-level constructs, while technological scalability,

operating expenditure, organizational maturity, and revenue diversification provide information about institutional performance. A theoretically specified framework could examine whether service quality influences loyalty through trust and satisfaction and whether institution-level efficiency modifies these behavioral relationships. Customer retention may also be examined as a potential contributor to long-term financial productivity, although this direction requires information capable of establishing temporal ordering and accounting for alternative explanations. The combined findings suggest that customer loyalty should not be treated simply as an automatic outcome of efficient technological operations. Service improvements may require additional expenditure, while cost-reduction strategies may generate unintended consequences for customer experiences. Future studies should therefore evaluate complementary relationships and potential trade-offs rather than assuming that higher operational efficiency always produces stronger customer commitment.

The strategic direction for neo-banking institutions involves developing performance management systems that integrate customer relationship indicators with financial and operational measures. Banking managers should monitor active customer participation, actual retention, customer satisfaction, perceived security, and service reliability alongside servicing costs, revenue productivity, and institutional profitability. The comparative observations from Nu Holdings and Monzo demonstrate the importance of examining customer growth together with the financial contribution generated by expanding banking activity. These indicators can support the identification of institutional strategies that increase customer engagement without creating unsustainable operating expenses. Technological investments should be evaluated according to their measurable contribution to transaction reliability, operational resilience, and customer value rather than their capacity to introduce additional digital features alone. Customer support arrangements should remain sufficiently responsive to financial disputes and security concerns even when automated processes are extensively employed. The findings suggest that sustainable neo-banking strategies require a balance between technological productivity and the institutional credibility necessary to maintain long-term customer relationships.

The broader research direction emerging from this study is the development of a multidimensional understanding of neo-bank sustainability that moves beyond technological adoption and isolated financial performance indicators. The comparative evidence demonstrates that selected digital-first institutions have achieved substantial customer expansion and favorable commercial development, while previous research identifies important limitations concerning operating expenses, institutional maturity, and the persistence of customer relationships. The behavioral evidence further indicates that trust and perceived financial security are relevant to customer retention, emphasizing the importance of maintaining confidence within predominantly digital financial environments. The principal contribution of the present analysis lies in bringing these dimensions together to explain why customer relationship quality and operational resource management should be evaluated jointly. The absence of a unified customer-level and institution-level dataset prevents the estimation of their direct statistical relationship, making further empirical verification necessary. The findings nevertheless support a meaningful conclusion: the future competitiveness of neo-banks will depend not merely on expanding digital access or acquiring additional users, but on their capacity to establish durable customer relationships while achieving efficient, reliable, and financially sustainable operations.

CONCLUSION

The findings of this study reveal that the evolution of neo-banks in the post-digital era is characterized by the growing importance of customer engagement, institutional trust, and operational efficiency in sustaining competitive performance. The comparative analysis of Nu Holdings and Monzo Bank demonstrates that digital-first financial institutions can achieve substantial customer growth alongside improvements in selected indicators of revenue productivity and financial performance. The most distinctive finding is that increasing customer activity and favorable operational outcomes can coexist, although these developments do not necessarily indicate stronger customer loyalty or superior institutional efficiency. Evidence from previous empirical studies further highlights the importance of perceived financial security, institutional trust, and customer satisfaction in maintaining long-term banking relationships. These findings suggest that technological accessibility alone is insufficient to establish sustainable competitive advantages. Neo-bank sustainability depends on the capacity to translate digital innovation into meaningful customer engagement while maintaining effective resource utilization and reliable financial services. The relationship between customer loyalty and operational efficiency is therefore best understood as potentially complementary rather than automatically causal.

The principal contribution of this research lies in its integrated conceptual perspective connecting customer loyalty and operational efficiency as complementary dimensions of neo-bank sustainability. The study contributes to the theoretical understanding of digital financial intermediation by emphasizing that technological scalability must be accompanied by institutional credibility, customer relationship quality, and effective operational resource management. The proposed framework integrates customer-centered constructs, including digital service quality, perceived financial security, institutional trust, and customer satisfaction, with organizational indicators reflecting cost efficiency, revenue productivity, and financial performance. This approach offers an analytical perspective that extends beyond evaluating neo-banking success exclusively through customer acquisition, technological adoption, or institutional profitability. The methodological contribution involves a comparative synthesis of publicly available financial disclosures and published empirical evidence to identify patterns of customer engagement and operating performance across digital-first banking institutions. The framework also distinguishes observable customer activity from attitudinal loyalty and financial productivity from comprehensive operational efficiency. These distinctions provide a foundation for future empirical investigations examining how customer relationships and institutional performance interact within evolving digital banking environments.

The limitations of this study primarily concern its reliance on secondary institutional disclosures and previously published empirical findings, which restrict the ability to establish direct statistical relationships between customer loyalty and operational efficiency. The comparative analysis focuses on selected neo-banking institutions operating in different financial and regulatory environments, limiting the generalizability of the observed patterns across the broader banking industry. Customer activity rates, revenue productivity, and institutional profitability provide valuable information about digital banking performance but cannot independently capture customers' psychological commitment or the complete economic efficiency of banking operations. Differences in reporting practices and financial indicator

definitions also complicate direct comparisons between institutions. The absence of original customer survey data, institution-matched observations, and completed inferential analysis prevents definitive conclusions regarding causal relationships. Future research should integrate validated customer loyalty instruments with objective institutional efficiency indicators through longitudinal and multilevel research designs. Broader comparative investigations across countries, regulatory systems, and institutional maturity levels may clarify the conditions under which customer loyalty and operational efficiency reinforce one another. Such investigations would strengthen the empirical foundation for developing sustainable, customer-centered, and operationally resilient neo-banking models.

DECLARATION OF AI AND AI ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

During the preparation of this manuscript, the author(s) used Google Gemini to assist inimproving grammar, language quality, and overall readability of the text. After using this tool, the author(s) Carefully reviewed and edited the content as necessary and take full responbility for the content of the publication.

AUTHOR CONTRIBUTIONS

Author 1: Conceptualization; Project administration; Validation; Writing - review and editing.

Author 2: Conceptualization; Data curation; In-vestigation.

Author 3: Data curation; Investigation.

DECLARATION OF COMPETING INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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