JOURNAL OF MANAGEMENT AND BUSINESS SOLUTIONS

Identification and Validation of Components Affecting the Sustainability of the National Banking Network

1. Fatemeh. Khaleghi Maybodi : Ph.D. student, Department of Financial Management, Ya.C., Islamic Azad University, Yazd, Iran
2. Alireza. Rayati Shavazi *: Department of Financial Management, Ya.C., Islamic Azad University, Yazd, Iran
3. Gholamreza. Askarzadeh Dareh: Department of Financial Management, Ya.C., Islamic Azad University, Yazd, Iran
4. Seyed Yahya. Abtahi : Department of Economics, Ya.C., Islamic Azad University, Yazd, Iran

*corresponding author's email: Alireza_rayati@iau.ac.ir

ABSTRACT

The present study was conducted with the aim of identifying and validating the components affecting the sustainability of the banking network, using both qualitative and quantitative phases. In the qualitative phase, a meta-synthesis approach was employed, and based on a systematic search of reputable scientific databases, 79 articles were identified. After applying the inclusion and exclusion criteria, 16 selected studies were analyzed. The findings of this phase indicated that in the economic and financial dimension, components such as operational efficiency and sustainable profitability, credit and liquidity risk management, capital adequacy and balance sheet structure, exposure to foreign exchange risk, and asset quality play a significant role in banking stability. In the institutional and corporate governance dimension, ownership structure, effective supervisory systems, and macroeconomic conditions were identified as key factors. In the technological dimension, components such as digital transformation, development of modern banking infrastructure, cybersecurity, and the use of artificial intelligence for risk management were found to be of particular importance. In the social dimension, banks' social responsibility, transparency in communications, and enhancement of customer experience were identified as influential factors affecting public trust and social capital. In the quantitative phase, confirmatory factor analysis (CFA) was employed to validate the components extracted from the qualitative analysis. The results indicate that the sustainability of the banking network requires an integrated approach that simultaneously strengthens the economic, institutional, technological, and social dimensions.

Keywords: Banking network sustainability, meta-synthesis, risk management, digital innovation, public trust.

Introduction

The sustainability of the banking network has emerged as a central concern for policymakers, financial regulators, and banking institutions worldwide, particularly in the context of increasing economic volatility, financial globalization, and technological transformation. Banking systems serve as the backbone of national economies by facilitating financial intermediation, supporting investment, and ensuring liquidity flows across economic sectors. However, the stability and sustainability of banking networks are increasingly challenged by financial risks, institutional inefficiencies, technological disruptions, and declining public trust. These challenges underscore the need for a comprehensive and multidimensional understanding of banking sustainability, encompassing economic, institutional, technological, and social dimensions. In this regard, sustainable banking refers not only to financial

Article history:
Received 11 November 2025
Revised 08 February 2026
Accepted 16 February 2026
First Published 17 February 2026
Final Publication 01 November 2026

How to cite this article:
Khaleghi Maybodi, F., Rayati Shavazi, A., Askarzadeh Dareh, G., & Abtahi, S. Y. (2026). Identification and Validation of Components Affecting the Sustainability of the National Banking Network. *Journal of Management and Business Solutions, 4*(6), 1-22. https://doi.org/10.61838/jmbs.215

stability and profitability but also to the ability of banking institutions to maintain resilience, support economic development, and operate responsibly within environmental, social, and governance (ESG) frameworks (1, 2).

From a financial perspective, banking sustainability is closely associated with the capacity of banks to manage risks, maintain adequate capital buffers, and ensure long-term profitability while preserving systemic stability. Financial risk management, including credit risk, liquidity risk, and market risk, plays a critical role in maintaining the resilience of banking systems and preventing systemic crises. Empirical evidence demonstrates that financial risks significantly influence bank performance, stability, and sustainability, highlighting the importance of risk-sensitive strategies and regulatory oversight (3, 4). Similarly, systemic risk has been identified as a major determinant of banking network stability, as interconnected financial institutions can transmit shocks across the system, amplifying financial instability and economic disruption. Measurement and prediction of systemic risk have therefore become essential tools for monitoring and managing banking network sustainability (5, 6).

In addition to risk management, capital adequacy and financial performance indicators are essential determinants of banking sustainability. Adequate capital reserves enhance banks' ability to absorb losses and withstand economic shocks, thereby strengthening financial stability and resilience. Studies have demonstrated that internal financial factors, including capital adequacy, profitability, asset quality, and operational efficiency, significantly influence banking stability and long-term sustainability (7, 8). Furthermore, sustainable banking practices contribute positively to financial performance and stability by improving risk management, operational efficiency, and strategic alignment with long-term economic objectives (9, 10). These findings highlight the importance of integrating financial sustainability into banking operations to ensure long-term institutional viability and systemic stability.

Institutional and governance factors also play a critical role in ensuring banking network sustainability. Effective corporate governance, transparency, and regulatory oversight contribute to improved risk management, accountability, and financial stability. Governance mechanisms, including independent oversight, regulatory compliance, and effective supervisory frameworks, enhance institutional resilience and reduce vulnerability to financial crises. Moreover, country-level risk factors, including macroeconomic stability, regulatory quality, and sovereign risk, significantly influence banking sector stability, emphasizing the importance of strong institutional environments in sustaining financial systems (11, 12). Effective governance structures also enhance stakeholder confidence and strengthen institutional credibility, which are essential for maintaining public trust and financial stability.

Public confidence represents another fundamental dimension of banking sustainability. Banking systems rely heavily on trust, as depositors, investors, and financial stakeholders depend on the perceived stability and reliability of financial institutions. A decline in public confidence can trigger bank runs, liquidity shortages, and systemic crises, thereby undermining banking network sustainability. Empirical research has shown that financial stability and transparency are strongly associated with public confidence in banking institutions, emphasizing the importance of transparency, accountability, and effective communication in maintaining trust and ensuring long-term sustainability (13). In this regard, banks must prioritize transparent reporting, ethical practices, and stakeholder engagement to reinforce trust and enhance systemic resilience.

Technological innovation has emerged as a transformative force in banking sustainability, fundamentally reshaping banking operations, risk management, and service delivery. Digital transformation, artificial intelligence (AI), and advanced analytics have enhanced banks' ability to monitor risks, improve operational efficiency, and strengthen decision-making processes. The integration of AI and data-driven technologies enables banks to detect fraud, predict financial risks, and optimize financial performance, thereby enhancing sustainability and resilience. AI-driven financial technologies have also contributed to environmental sustainability by improving resource efficiency and supporting sustainable financial practices (14, 15). Furthermore, digital innovation enhances financial inclusion, improves service accessibility, and strengthens customer engagement, which are critical components of banking sustainability.

In parallel with technological innovation, sustainable banking practices have increasingly incorporated environmental and social considerations into financial decision-making. Green banking initiatives, including sustainable financing, environmental risk assessment, and ESG integration, have become essential components of banking sustainability. These practices not only contribute to environmental protection but also enhance financial performance and institutional reputation. Research has demonstrated that green banking and sustainable financial practices positively influence financial stability, operational performance, and stakeholder trust, highlighting the importance of integrating sustainability principles into banking operations (16, 17). Moreover, sustainable banking contributes to broader economic sustainability by promoting responsible investment, supporting sustainable development, and fostering financial inclusion (18).

The role of innovation and knowledge management is also critical in advancing banking sustainability. Knowledge sharing, organizational learning, and intellectual capital enhance banks' ability to develop innovative services, improve operational efficiency, and respond effectively to emerging challenges. Sustainable knowledge management practices facilitate continuous improvement and strategic adaptation, enabling banks to maintain competitiveness and resilience in dynamic financial environments (19). Innovation-driven banking systems are better positioned to manage risks, enhance operational efficiency, and support sustainable economic growth.

Furthermore, regulatory and structural reforms play an essential role in maintaining banking network sustainability. Regulatory frameworks aimed at enhancing transparency, controlling shadow banking activities, and improving financial supervision contribute significantly to banking stability and risk mitigation. Effective regulatory interventions help reduce systemic vulnerabilities and promote sustainable banking practices. Empirical evidence suggests that regulatory policies aimed at improving financial transparency and risk management significantly enhance banking system stability and sustainability (20, 21). These reforms are essential for strengthening institutional resilience and preventing financial crises.

Macroeconomic conditions also exert a substantial influence on banking sustainability. Economic growth, inflation, interest rates, and fiscal conditions directly affect banking performance, credit risk, and financial stability. Macroeconomic instability can weaken banking systems by increasing default risk, reducing profitability, and undermining financial confidence. Conversely, stable macroeconomic conditions support banking sustainability by improving credit quality, enhancing financial performance, and strengthening systemic resilience (11, 18). These findings underscore the importance of macroeconomic stability in ensuring sustainable banking networks.

The increasing complexity of financial systems and the interconnected nature of banking networks have further highlighted the importance of adopting multidimensional approaches to banking sustainability. Modern banking networks operate within complex financial ecosystems characterized by interconnected institutions, technological dependencies, and regulatory frameworks. This interconnectedness increases systemic vulnerability while also providing opportunities for improved coordination and resilience. Advanced analytical methods, including factor analysis and network analysis, have been increasingly used to identify key determinants of banking stability and sustainability, enabling researchers and policymakers to develop evidence-based strategies for improving banking resilience (5, 6).

Despite extensive research on banking stability and sustainability, significant gaps remain in understanding the integrated and multidimensional nature of banking network sustainability. Many existing studies have focused primarily on financial performance indicators or isolated institutional factors, while fewer studies have adopted comprehensive frameworks that simultaneously examine economic, technological, institutional, and social dimensions. Moreover, rapid technological transformation, evolving regulatory environments, and increasing systemic interconnectedness necessitate updated and context-specific research on banking sustainability. Emerging evidence suggests that sustainable banking requires integrated strategies that combine financial stability, technological innovation, governance effectiveness, and social responsibility to ensure long-term resilience and sustainable development (2, 9).

Given the increasing importance of sustainable banking in ensuring financial stability, economic development, and public trust, it is essential to identify and validate the key components that influence banking network sustainability. Understanding these components can provide valuable insights for policymakers, regulators, and banking institutions to develop effective strategies for enhancing financial resilience and promoting sustainable banking practices. Furthermore, empirical validation of sustainability components can contribute to the development of robust models for assessing banking network sustainability and guiding strategic decision-making.

Therefore, the aim of this study is to identify and validate the key economic, technological, institutional, and social components affecting the sustainability of the national banking network using a meta-synthesis approach and confirmatory factor analysis.

Methods and Materials

The present study employed a meta-synthesis approach to systematically analyze studies related to the dimensions and components affecting the sustainability of the national banking network. Meta-synthesis is considered a transparent and structured method for identifying, evaluating, and analyzing studies conducted by researchers and experts within a specific scientific domain (Lee et al., 2008).

In this approach, only studies that have been scientifically and credibly published and are based on empirical data, analytical investigations, or systematic reviews are examined. Accordingly, the scope of the study includes all valid scientific and research articles addressing the economic, institutional, technological, and social dimensions affecting the sustainability of Iran’s banking network.

Since banking sustainability strategies have undergone significant transformations in recent years due to technological developments and economic policies, the time frame of the selected articles was limited to recent and up-to-date studies.

To collect the required information, a standardized worksheet form designed by the researcher was used to record and report the characteristics and findings of the primary studies.

During the data analysis stage, the seven-step model proposed by Lee, Wright, Rokaviana, and Pickering (2008) was applied. This model includes the stages of defining the research objective, identifying studies, screening, data extraction, analysis, synthesis of results, and reporting.

To ensure the accuracy and reliability of the coding process, four independent evaluators re-coded the findings, and inter-rater agreement was assessed using Scott's method. The calculated agreement coefficient was 0.74, indicating an acceptable level of agreement and the reliability of the coding process in this study.

$$C.R = \frac{85 + 79 + 80 + 72}{4 \times 99} \times 100 = 74.79$$

$$C.R = \frac{\text{Number of agreed category items}}{\text{Total number of category items}} \times 100$$

- **2-2. Research Method in the Quantitative Phase**

The quantitative phase of the study was conducted in two stages.

In the first stage, a questionnaire based on the components identified in the qualitative phase was designed and distributed among a sample of banking experts and managers to collect the required data.

In the second stage, the collected data were analyzed using confirmatory factor analysis (CFA) and statistical software in order to examine the validity, model fit, and reliability of the identified components and to validate the proposed research model.

In the qualitative phase, data were analyzed using a meta-synthesis approach to identify and extract the components affecting the sustainability of the banking network.

After selecting eligible studies, the data were organized and classified through open coding, axial coding, and selective coding to develop a coherent framework of key dimensions and components.

This approach enabled the integration of previous research findings and facilitated the development of a comprehensive and integrated model.

Step One: Formulating the Research Question

The first step in the meta-synthesis process involved formulating the research question. Researchers focused on defining the research questions and their parameters.

The research questions and parameters are presented in Table 1.

Table 1. Research Questions and Parameters

Parameters	Question Formulation
What (research question)	What are the factors affecting the sustainability of the banking network according to the research literature?
Who (study population)	In this study, multiple databases including Emerald, Scopus, ScienceDirect, and others were examined.
What findings and results	Studies were analyzed if their findings were related to factors affecting the sustainability of the banking network.
When (time limitation)	Studies examined in this research were limited to those published from 2012 onward.
How (method of collecting studies)	The meta-synthesis method was used. Based on predefined criteria, relevant articles were included in the review process and irrelevant studies were excluded.

Step Two: Determining the Protocol or Work Agreement

At this stage, the researcher defined the review procedures in advance to reduce bias before retrieving relevant texts.

First, the researcher determined the level and scope of the studies. This stage involved evaluating and identifying studies relevant to the research knowledge requirements. This process required defining criteria for selecting and categorizing studies.

A. Inclusion criteria included the following:

- Articles published on factors affecting the sustainability of the banking network.
- Studies that reported sufficient data and information relevant to the research objectives. Therefore, studies reporting codes related to factors affecting banking network sustainability were considered adequate.
- Studies that underwent peer review by expert reviewers and were published either online or in full-text printed format.

B. Exclusion criteria included the following:

- Studies that did not report sufficient information related to the objectives of this research, particularly studies that examined banking sustainability factors solely through quantitative relationships with other variables.
- Studies lacking sufficient scientific quality and published in non-reputable journals or conferences.
- Articles published before 2018, as their findings were considered outdated and less relevant to current conditions.

Step Three: Literature Search

This stage involved searching for resources relevant to the research objective.

Initially, all relevant scientific articles were identified using research keywords through domestic databases, including the Comprehensive Portal of Humanities, the Iranian Research Institute for Information Science and Technology, and the Persian Scientific Information Database (Elmnet), as well as international databases.

Based on the research objectives, relevant sources were retained and irrelevant sources were excluded.

To enhance the quality of the process, article searches were conducted independently by two individuals with full familiarity with search methodologies and information sources.

Additionally, three banking industry experts, particularly in the field of banking sustainability, supervised the entire research process.

This study relied on both domestic and international scientific research articles that had undergone peer review, ensuring the credibility and reliability of their findings.

Step Four: Extraction of Studies and Data Sources

At this stage, a standardized form was used. The sections of this form included the following:

- Source (journal name, article title, and author)
- Objective (purpose of the study)
- Methodology
- Overall results

To select appropriate sources, relevant keywords were searched in each database.

A total of 70 articles (Persian and English) were initially identified based on the inclusion criteria. After reviewing all studies and applying the exclusion criteria in terms of content and scientific credibility, the findings of 20 studies were ultimately selected for analysis.

Table 2 presents an example of the database search strategy and inclusion and exclusion criteria.

Table 2. Search Strategy and Inclusion and Exclusion Criteria

Strategy	Inclusion Criteria – First Filter	Inclusion Criteria – Second Filter	Exclusion Criteria
Factors Affecting the Stability of the Banking Network	Article title, abstract, keywords / 2011 to present	Article text, valid article	Content irrelevance

Factors Affecting the Stability of the Banking Network	Article title, abstract, keywords / 2016 to present	Full article text, valid article	Content irrelevance, invalid article, book chapter, and thesis

Step Five: Quality Assessment

Every study must possess acceptable validity and objectivity, and qualitative and meta-synthesis studies are no exception.

A comprehensive search often yields a large number of relevant studies. However, not all studies possess sufficient scientific quality. Therefore, before analysis, studies must be evaluated using predefined inclusion and exclusion criteria and appropriate assessment tools.

In this study, a checklist containing multiple criteria for evaluating the quality of primary studies at high, medium, and low levels was used.

The purpose of scoring studies individually was to enhance the credibility of the research by excluding low-quality studies.

Table 3 presents an example of a quality assessment checklist based on the model proposed by Carlson et al. (2007).

Table 3. Example of Quality Assessment Checklist Based on Carlson et al. (2007)

Row	Criterion	Study 1	Study 2	Study 3	Study 4	Study 5
1	Sampling strategy	✓	✓	✓	✓	✓
2	Data collection method	✓	–	✓	✓	✓
3	Data analysis procedure	✓	–	✓	✓	✓
4	Appropriateness of research design to research objective	✓	✓	✓	✓	✓
5	Clear presentation of findings	✓	✓	✓	✓	✓
6	Adequate interpretation of findings	–	–	✓	–	✓
7	Consistency between research paradigm and selected methods	✓	–	✓	✓	✓
8	Quality level (High, Medium, Low)	High	Low	High	Medium	High

At this stage, the extracted sources were independently reviewed by at least two researchers based on the criteria presented in Table 3.

If a study was excluded, the reason for exclusion was documented.

In cases of disagreement between the two researchers, a third reviewer was appointed as an adjudicator.

In accordance with the research objective, the sixth and seventh stages of the Lee et al. (2008) model were applied in this study.

Findings and Results

Step Six: Processing, Integration, and Interpretation in the Form of a Tangible Output

Based on the research findings and considering the specified criteria, all components and indicators were initially extracted through the open coding process.

Accordingly, Table 4 was developed based on research findings derived from relevant studies. The table includes three sections: researchers, year of publication, and the identified indicators and components. The studies were numbered according to their year of publication.

Table 5. Factors Affecting the Sustainability of the Banking Network in the Literature

Row	Researcher(s)	Year	Factors Affecting Banking Network Sustainability

1	Shahchera & Naqdi	2024	Operational efficiency, Z-score, return on capital
2	Ataei	2021	Corporate governance, ESG, risk management, institutional structure
3	Goya	2021	Weak governance, lending process deficiencies, lack of specialized knowledge
4	Zangeneh et al.	2020	Transparency, data-driven technologies, specialized advisory services
5	Liu et al.	2022	Multifactor model, deposit insurance, intelligent depositor behavior
6	Afandi et al.	2023	Banking network topology, regulatory framework, systemic risk reduction
7	Carbajal et al.	2024	Debt issuance, structural risk, debt distribution mechanisms
8	Krampe et al.	2025	Factor model, sparse VAR, shared and idiosyncratic risk
9	Vallaya	2024	Cybersecurity technologies, multi-factor authentication (MFA), blockchain, artificial intelligence
10	BIS	2024	Artificial intelligence in supervision, uncertainty reduction, financial stability
11	Chering et al.	2023	Correlation and banking networks in emerging markets; network score-based systemic risk model
12	Yu et al.	2023	Network size, interbank connectivity structure, systemic risk correlation level
13	Baron et al.	2023	Risk transmission from economic policy uncertainty to credit structure and capital adequacy
14	Davis & Muller	2023	Climate disclosure quality, information asymmetry reduction, network risk mitigation
15	Keenan et al.	2023	Corporate environmental performance (CEP), corporate social performance (CSP), non-performing loans (NPL), financial product safety, bank size, national environmental quality
16	Sharma	2023	Green banking, energy-efficient buildings, green loans, digital banking, sustainability-oriented technological integration
17	Joaquin	2023	ESG integration, green finance, financial inclusion, economic justice, sustainable credit policy innovation

At this stage, researchers must present the outcomes of the qualitative meta-synthesis process in a clear and coherent manner.

To effectively present the findings, different audiences, including policymakers, banking managers, and financial researchers, must be considered.

According to Lee et al. (2008), researchers present extracted patterns and results using visual tools such as diagrams, figures, and tables to enhance conceptual clarity and practical applicability.

Initially, in the meta-synthesis process, the characteristics, elements, and strategic components of banking network sustainability were extracted.

All primary concepts and descriptions were identified through open coding.

Subsequently, in the meta-synthesis output stage, the objective was to integrate all scientific findings related to banking sustainability and achieve conceptual coherence.

At this stage, open codes were analyzed, overlapping and semantically similar concepts were merged through re-coding, and final components (axial codes) were extracted.

Axial coding was then applied to classify strategic sustainability components based on shared conceptual characteristics.

This process led to the identification of five key dimensions (selective codes), each representing a fundamental dimension of banking network sustainability.

The results of open, axial, and selective coding are presented in Table 5.

Table 5. Classification of Codes Extracted from the Literature

Selective Code (Dimension)	Axial Code (Component)	Open Code (Indicator)
Economic and Financial Dimension	Capital adequacy and balance sheet structure	Increase in Tier 1 capital
		Optimization of asset-liability composition
		Reduction of portfolio concentration risk
		Monitoring key balance sheet ratios
		Strengthening supplementary capital

	Credit and liquidity risk management	Accurate credit assessment and continuous loan portfolio monitoring
		Diversification of funding sources
		Establishment of precautionary reserves for credit losses
		Risk-based lending policy formulation
		Monitoring cash flow and regulatory liquidity ratios
		Use of hedging instruments
		Monitoring interbank risk correlation
		Improving capital adequacy ratio (CAR)
		Designing high-liquidity asset structures
	Operational efficiency and sustainable profitability	Improving cost-to-income ratio
		Diversifying revenue sources
		Optimization and digitalization of internal banking processes
		Effective asset-liability management
		Reduction of non-performing loans (NPLs)
	Asset quality	Credit risk ratio (loan-to-asset ratio)
		Ratio of doubtful claims to total claims
		Logarithmic ratio of loans to total bank assets
		Loan-to-free-resource ratio
		Doubtful claim expense ratio to total expenses
		Sectoral loan distribution ratio
	Foreign exchange risk exposure	Foreign currency assets to foreign liabilities ratio
		Current account balance to GDP ratio
		Fixed asset ratio
		Net open foreign exchange position to capital ratio
Institutional and Corporate Governance Dimension	Information transparency and disclosure quality	Timely disclosure of financial statements in accordance with international standards
		Transparent reporting of credit, liquidity, and market risks
		Public disclosure of capital adequacy ratios
		Climate and ESG disclosure
		Reduction of information asymmetry
		Digital disclosure systems
		Transparency in interbank contracts and off-balance-sheet operations
	Ownership structure and supervisory effectiveness	Ownership structure diversification
		Board independence
		Activation of specialized committees
		Effective central bank supervision
		Transparency of bank-affiliated entity relationships
		Board accountability
		Limiting tenure of senior executives
		External board performance evaluation
	Macroeconomic variables	Land price index growth
		Stock price index growth
		Economic growth rate
		Government fiscal conditions and inflation
		Low-cost funding ratio
		Sovereign risk
		Real estate price index
Technological and Digital Innovation Dimension	Digital transformation and banking infrastructure	Cloud banking implementation
		Expansion of neobanks
		Banking process automation
		Mobile banking and financial super-app development
		Open banking and API implementation
	Cybersecurity and infrastructure resilience	Advanced encryption and multi-factor authentication
		Intrusion detection and threat management systems

		Blockchain implementation
		Cyber crisis response and data recovery systems
	Artificial intelligence and data analytics	Credit risk prediction using machine learning
		Fraud detection
		Big data analytics
		Personalized financial services
		Operational risk simulation and modeling
Social Dimension and Public Trust	Social responsibility and development role	SME financing
		Infrastructure project investment
		Corporate social responsibility programs
		Green financial product development
	Communication transparency	Transparent customer communication
		Timely policy and service communication
		Customer digital access systems
		Performance reporting
		Complaint handling transparency
	Customer experience and service quality	Simplification of banking procedures
		Multi-channel banking services
		Financial inclusion
		Continuous employee training

In this study, the selective codes were identified across three key dimensions, namely the economic and financial dimension, the technological and digital innovation dimension, and the social dimension and public trust, each of which was elaborated through a set of axial codes and open codes.

In the economic and financial dimension, the focus is on strengthening banks' capital adequacy and balance sheet structure, managing credit and liquidity risk, and enhancing operational efficiency and sustainable profitability.

The open codes in this dimension include optimizing assets and liabilities, diversifying revenue streams, effective management of liquid assets, reducing non-performing loans (NPLs), and using prudential reserves to mitigate credit risks, all of which contribute to the financial resilience of the banking network.

In the technological and digital innovation dimension, digital transformation and the development of modern banking infrastructure, cybersecurity and digital infrastructure resilience, and artificial intelligence (AI) and data-driven analytics for risk management and performance optimization were identified as axial codes.

In this dimension, open codes such as cloud banking, neobank development, the use of blockchain, advanced encryption, intrusion detection systems, and leveraging machine learning for credit risk prediction and fraud detection contribute to identifying vulnerabilities, improving efficiency, and creating a foundation for enhanced service quality and reduced operational risk.

In the social dimension and public trust, the axial codes include social responsibility and the developmental role of banks, transparency in communications with customers and stakeholders, and improving customer experience and strengthening banking service quality.

The open codes in this domain include financing small and medium-sized projects, investment in environmental projects, transparent disclosure of banking information, rapid customer responsiveness, service personalization, and improving staff skills in customer interaction, which collectively increase social capital, enhance public trust, and support the long-term sustainability of the banking network.

This three-dimensional integration of selective, axial, and open codes provides a comprehensive picture of the factors affecting banking network sustainability.

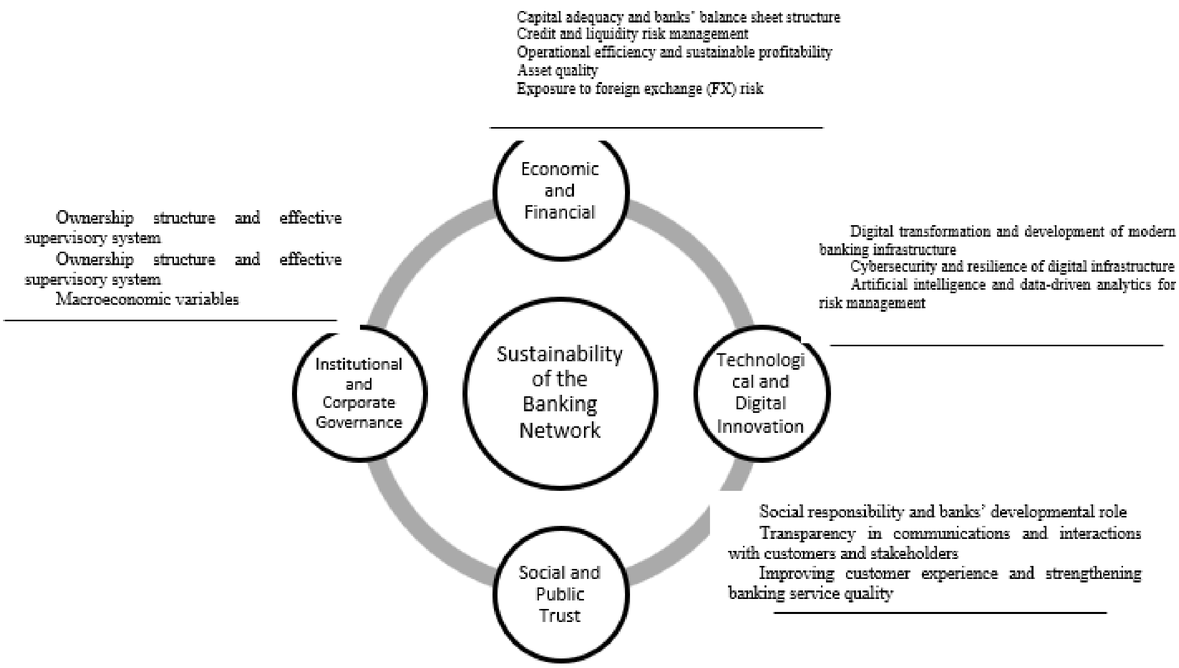

Figure 1. Dimensions and Axes of Sustainability in the National Banking System

One of the essential stages in research data analysis is examining the internal structure of variables and identifying the underlying factors affecting them.

Factor analysis, as an advanced statistical technique, is a powerful tool for data reduction, identifying latent dimensions, and grouping correlated variables.

This method enables the researcher to extract, from a large set of indicators, the principal and common factors that account for the largest proportion of variance in the variables.

In the present study, given the large number of financial, economic, and structural variables related to bank performance, the use of factor analysis appears necessary.

This method makes it possible to clarify the internal relationships among variables and to reveal the primary latent dimensions embedded in the data.

Accordingly, by identifying and validating key factors, the researcher can propose a simpler, more interpretable, and yet more scientifically grounded model for examining relationships among variables.

Factor analysis can be conducted at two levels: exploratory factor analysis (EFA) and confirmatory factor analysis (CFA).

In the first step, the objective is to discover the factor structure and identify the variables associated with each factor.

In the second step, the fit of the proposed factor structure to the data is assessed and the validity of the measurement model is examined.

In this study, both approaches were used so that the main factors were first identified and then validated using structural equation modeling (SEM).

In the quantitative phase, confirmatory factor analysis (CFA) was applied to validate the components and dimensions extracted from the qualitative phase.

As a key technique within structural equation modeling, CFA enables the assessment of relationships between latent variables and observed indicators and evaluates the fit of the theoretical model to empirical data.

To collect data for the present study, financial and performance data from 20 selected banks were used, including Iran Zamin Bank, Sina Bank, Saman Bank, Eghtesad Novin Bank, Tejarat Bank, Resalat Bank, Bank Melli Iran, Tourism Bank, Bank Mellat, Pasargad Bank, Middle East Bank, Shahr Bank, Hekmat Iranian Bank, Ayandeh Bank, Dey Bank, Ansar Bank, Karafarin Bank, Parsian Bank, Bank Saderat Iran, and Sarmayeh Bank.

The data were primarily extracted from annual financial statements and official reports published in the Central Bank's Reports and Statistics portal.

The main focus of data collection was on key indicators such as liquidity ratios, profitability indicators, macroeconomic indicators, and bank size, in order to provide a comprehensive and reliable picture of the sustainability status of the banking network.

After data collection, the compiled information was reviewed through data cleaning, standardization, and coding procedures to prepare it for statistical analysis.

In this process, each bank's financial ratios were calculated on an annual basis and then normalized to enable comparability and cross-bank analysis.

The selection of these indicators was based on the existing theoretical literature and prior studies on banking network sustainability.

Finally, the prepared dataset was used as the input for confirmatory factor analysis (CFA) to test the validity and significance of the identified components.

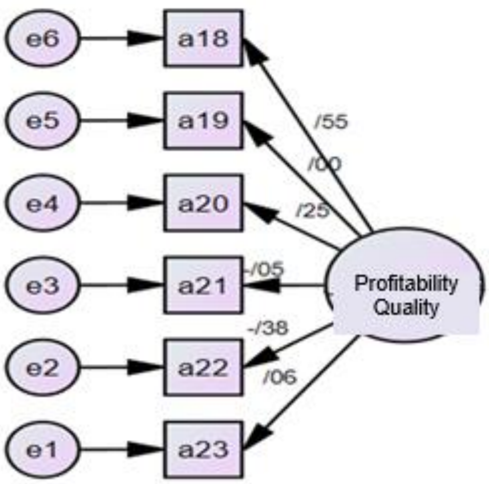

Figure 2. Measurement Model of the Latent Variable "Profitability Quality"

The factor-analytic model indicates that the factor "profitability adequacy" was measured through six indicators (a18 to a23).

Based on the estimated coefficients, certain variables such as the current assets ratio (a18) and accounts receivable collection period (a20) show a relatively acceptable association with the latent construct.

However, indicators such as the inventory-to-working-capital ratio (a21) and current working capital turnover (a22) display very weak and even negative coefficients.

A factor loading close to zero for the inventory holding period (a19) and fixed asset turnover (a23) also indicates that these indicators have limited explanatory power for the construct.

Therefore, only a subset of indicators established a statistically meaningful and acceptable relationship with “profitability adequacy.”

From a financial analysis perspective, these indicators represent different dimensions of asset quality.

The current assets ratio reflects the capacity to meet short-term obligations.

The receivables collection period and inventory holding period indicate the speed of converting assets into liquidity.

The inventory-to-working-capital ratio, current working capital turnover, and fixed asset turnover measure the efficiency and productivity of capital and assets.

The weakness of factor loadings for some indicators suggests that revising or removing unsuitable indicators could improve model stability and enhance the validity of measuring “profitability adequacy.”

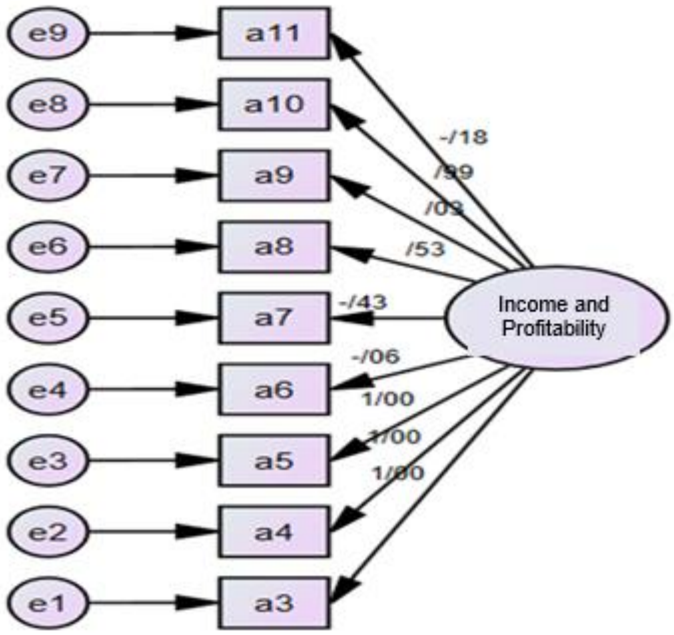

Figure 3. Measurement Model of the Latent Variable “Income and Profitability”

The structural equation model in Figure 3 shows that the latent variable “income/profitability” is measured through financial indicators a3 to a11, each capturing a dimension of firm efficiency and return.

The results indicate that gross profit margin (a4), operating profit margin (a5), and working capital return (a9), with factor loadings close to 1, play the strongest role in explaining profitability and are considered the core indicators of the model.

In contrast, some indicators such as return on capital (a7) and loan profitability (a11) have negative loadings, indicating an inverse effect on the main construct, while return on assets (a6) does not demonstrate a statistically meaningful relationship.

These findings suggest that profitability is influenced by multiple indicators, but only a subset possesses strong explanatory power, and focusing on these core indicators can provide a basis for strengthening financial strategies and improving organizational efficiency.

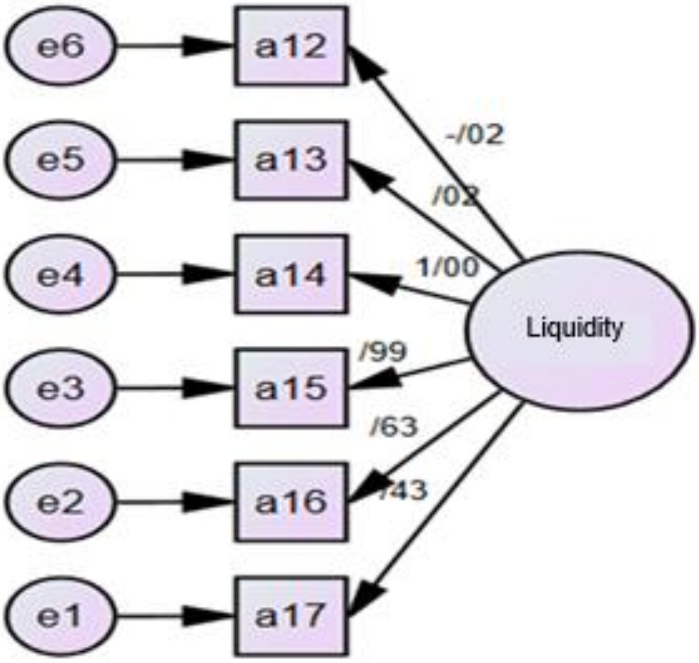

Figure 4. Measurement Model of the Latent Variable "Liquidity"

The structural equation model in Figure 4 related to the latent variable "liquidity" indicates that this construct is measured by six indicators (a12 to a17).

The factor loadings show that indicators a14 and a15, with coefficients of 1.00 and 0.99 respectively, have the strongest associations with the liquidity construct and function as the primary indicators for explaining this variable.

Indicator a16, with a coefficient of 0.63, and a17, with a coefficient of 0.43, also show relatively acceptable associations with the latent variable.

In contrast, indicators a12 and a13, with coefficients of -0.02 and 0.02, respectively, show virtually no meaningful relationship with the latent construct.

In this section, indicators a12 to a17 focus on assessing liquidity conditions, credit risk, and the firm's capacity to meet financial obligations.

The ratio of overdue loans to total gross loans (a12) reflects the share of non-performing loans and serves as a proxy for asset quality.

The ratio of overdue loans to total capital (a13) indicates the impact of these loans on the firm's financial strength and capital position.

The current ratio (a14) measures the capacity to cover short-term liabilities using current assets, while the quick ratio (a15), by excluding inventories, provides a more precise measure of immediate liquidity.

The liquidity ratio (a16) assesses cash and near-cash assets relative to current liabilities, and net working capital (a17), as the difference between current assets and current liabilities, reflects excess short-term resources and financial flexibility.

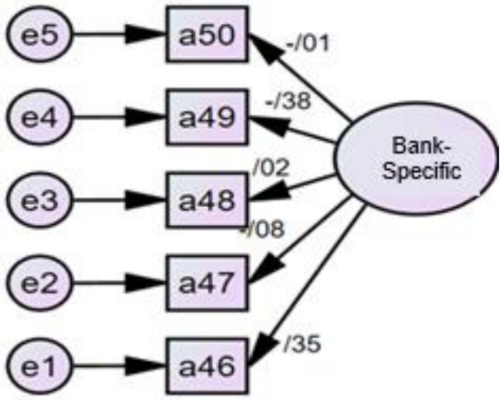

Figure 5. Measurement Model of the Latent Variable "Bank-Specific Factors"

The measurement model of the latent variable "bank-specific factors" includes five indicators (a46 to a50).

The results show that only the bank size indicator (a46), with a factor loading of 0.35, has a positive and relatively meaningful role in explaining this construct.

In contrast, the other indicators either exhibit a very weak relationship (a48) or even negative factor loadings (a47, a49, a50), indicating insufficient alignment with the main construct.

These indicators capture structural and institutional aspects of banks.

Bank size reflects the scale and scope of operations, bank type indicates ownership characteristics and legal structure, corporate governance reflects management and oversight quality, institutional governance reflects the role of regulators, and bank age represents operational experience and institutional history.

Accordingly, focusing on indicators with positive loadings—especially bank size—may be more important for both scientific and practical analysis of this construct.

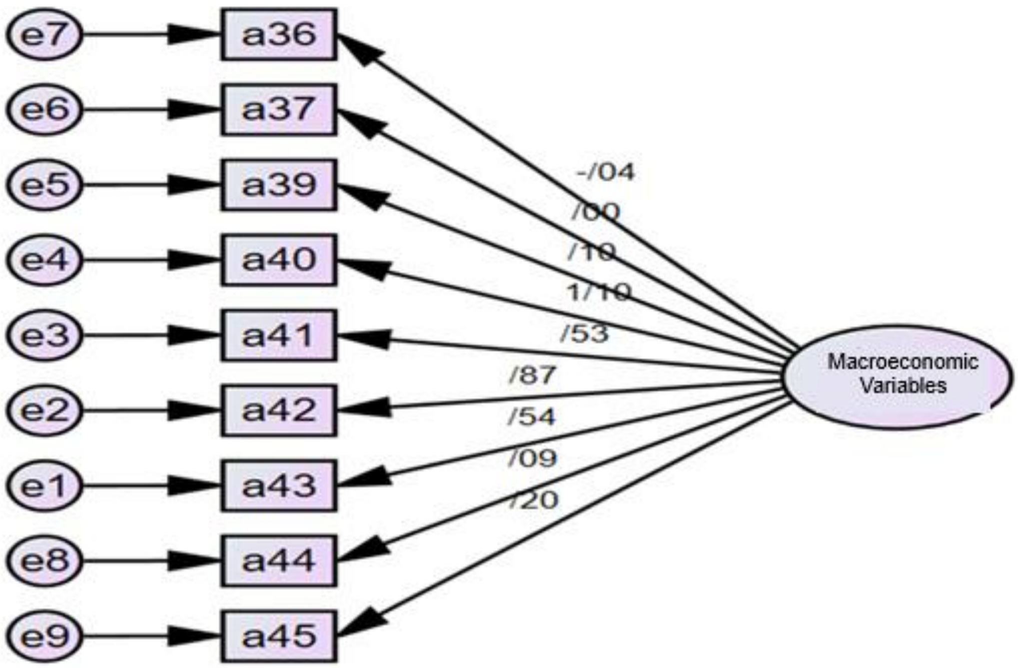

Figure 6. Measurement Model of the Latent Variable "Macroeconomic Variables"

The structural equation model indicates that the latent variable "macroeconomic variables" is measured by nine indicators (a36 to a45).

The factor loadings show that the sovereign risk indicator (a40), with a coefficient of 1.10, plays the strongest role in explaining this construct.

In addition, real estate price (a41), net interest income (a42), share of private banks (a44), and interest rate risk (a45) demonstrate positive associations with the latent construct.

In contrast, indicators such as land price growth (a36), economic growth (a37), and annual loan growth (a39) have minimal or even negative roles in explaining the construct and display weak explanatory power.

The indicators used represent diverse dimensions of the macroeconomic and financial environment, including asset market variables such as land and real estate prices, macroeconomic indicators such as economic growth, inflation, and government fiscal conditions, as well as banking variables such as loan growth, interest and operating income, the role of private banks, and interest rate risk.

Among these, sovereign risk and indicators related to income and the competitive structure of the banking system have stronger explanatory roles, and emphasizing them may be particularly important for analyzing and improving banking network sustainability.

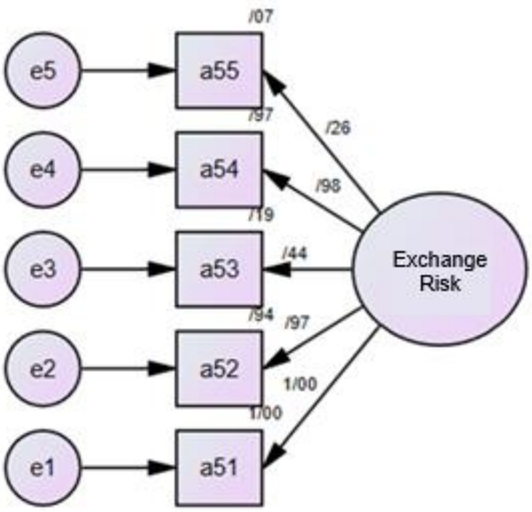

Figure 7. Measurement Model of the Latent Variable "Foreign Exchange Risk Variables"

To identify patterns and similar groups among the studied banks, factor scores obtained from confirmatory factor analysis (CFA) were used as inputs for the KMeans clustering model.

In this method, each bank is positioned within a multidimensional space defined by latent constructs (profitability, liquidity, bank-specific factors, and macroeconomic variables) and is then classified into clusters with similar characteristics.

For graphical representation, the results were reduced to two principal components (PC1 and PC2) using principal component analysis (PCA).

Figure 8 shows that banks with similar financial structures and performance indicators are grouped within the same cluster, which can provide valuable insights into sustainability patterns within the national banking network.

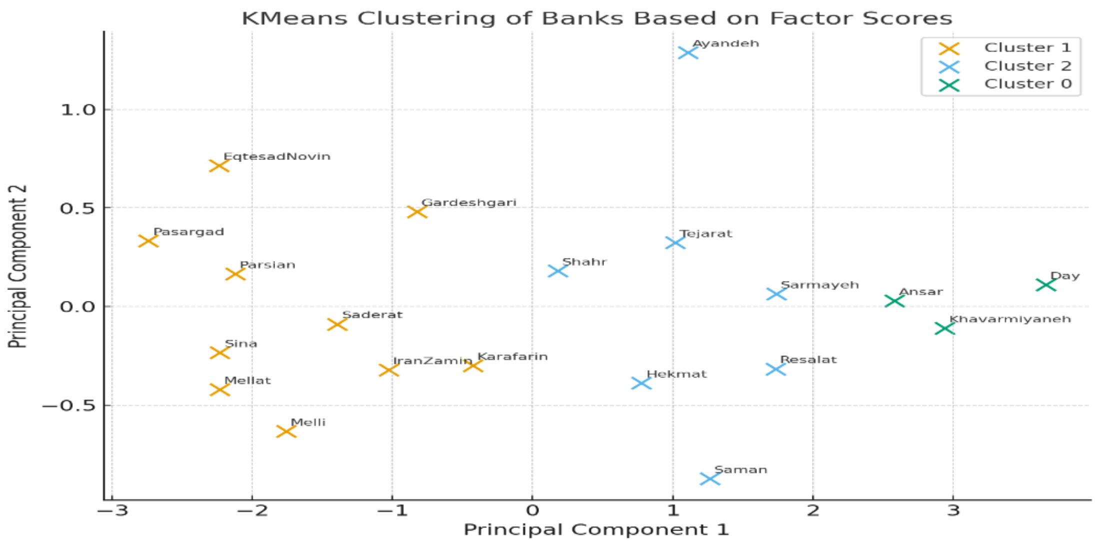

Figure 9. Clustering Plot Based on KMeans Analysis

The first cluster includes banks that are in a more favorable position in terms of profitability and liquidity indicators and exhibit greater stability due to their larger size and higher market share in the banking sector.

These banks have achieved a stable position in the national banking network through effective asset–liability management, credit risk reduction, and improved financial efficiency.

A shared characteristic of this cluster is strong capacity to meet short-term obligations, high levels of public trust, and active participation in financing various economic sectors.

Therefore, the first-cluster banks can be considered the stable core of the national banking network and play a key role in strengthening overall financial system sustainability.

Banks in the second cluster generally have medium size and moderate performance levels.

These banks show acceptable profitability and liquidity conditions; however, due to limited financial resources and lower market share, they are more vulnerable to macroeconomic shocks than larger banks.

Their main strength is relatively high flexibility and a greater capacity to adapt quickly to environmental changes, although in the long run they require stronger capital bases and higher operational efficiency to improve their position within the national banking network.

Banks in the third cluster include smaller or newer banks that typically face serious challenges in liquidity and profitability.

These banks have limited size and financial resources and are more exposed to credit risk and pressures arising from economic volatility.

Although some of these banks have attempted to increase their market share by adopting innovative approaches and expanding digital services, they still require regulatory support, improved financial transparency, and stronger capital structures to achieve sustainability.

Accordingly, the third cluster can be considered the vulnerable segment of the banking network which, if not reformed, may generate systemic risk.

Discussion and Conclusion

The present study aimed to identify and validate the key components affecting the sustainability of the national banking network through a mixed-methods approach combining meta-synthesis and confirmatory factor analysis (CFA). The findings demonstrated that banking network sustainability is a multidimensional construct influenced by economic and financial factors, technological and digital innovation, institutional and governance structures, and social and trust-related dimensions. The empirical validation of these components confirmed that sustainability in the banking network is not solely determined by financial indicators but is instead shaped by an integrated system of financial resilience, technological capability, governance quality, and stakeholder trust. These findings align with the broader literature, which emphasizes that sustainable banking systems must maintain financial stability, manage risks effectively, and adopt adaptive strategies in response to evolving technological and economic conditions (1, 2).

One of the most significant findings of the present study is the central role of economic and financial factors, particularly capital adequacy, profitability, liquidity, and asset quality, in determining banking network sustainability. The CFA results indicated that profitability-related indicators such as gross profit margin, operating profit margin, and working capital return exhibited strong factor loadings, confirming their critical role in sustaining banking performance. These results suggest that profitability remains a fundamental pillar of banking sustainability, as financially viable institutions are better able to withstand economic shocks and maintain operational stability. This finding is consistent with prior research demonstrating that sustainable financial performance enhances institutional resilience and long-term banking stability (8, 10). Moreover, internal financial factors, including capital structure, operational efficiency, and asset quality, have been identified as key determinants of financial stability, supporting the conclusion that strengthening financial performance is essential for maintaining banking network sustainability (7).

The findings also highlighted the importance of liquidity management as a fundamental component of banking sustainability. The measurement model showed that liquidity indicators such as the current ratio and quick ratio had strong explanatory power, indicating that banks with stronger liquidity positions are more capable of fulfilling short-term obligations and maintaining operational continuity. These results support previous research indicating that liquidity risk is a major determinant of banking performance and financial resilience. Effective liquidity management enhances banks' ability to absorb shocks, maintain depositor confidence, and ensure financial stability (3, 4). Furthermore, liquidity strength contributes to systemic stability by reducing the risk of bank failures and preventing financial contagion across interconnected banking institutions.

Another important finding relates to the role of systemic and macroeconomic factors in influencing banking sustainability. The results indicated that sovereign risk, interest rate risk, and macroeconomic indicators such as real estate prices and banking income structure significantly contributed to explaining banking network sustainability. This finding reflects the strong interdependence between banking stability and macroeconomic conditions, as economic volatility, policy uncertainty, and sovereign risk can significantly affect banking performance and financial resilience. Previous research has similarly demonstrated that country-level risk factors, including macroeconomic instability and regulatory uncertainty, significantly influence banking sector stability and sustainability (11, 12). In addition, systemic risk measurement studies have emphasized that interconnected banking networks are particularly vulnerable to external shocks, highlighting the importance of monitoring macroeconomic risk indicators to maintain financial stability (5, 6).

The present study also confirmed the importance of technological and digital innovation as a critical dimension of banking sustainability. The qualitative and quantitative findings demonstrated that digital transformation, artificial intelligence, cybersecurity, and data-driven risk management play significant roles in enhancing banking resilience and operational efficiency. The increasing integration of digital technologies into banking operations has improved risk monitoring, fraud detection, and decision-making processes, thereby strengthening institutional stability. These findings align with previous studies demonstrating that artificial intelligence and digital banking technologies enhance financial stability by improving operational efficiency and enabling predictive risk management (14, 15). Digital innovation also enhances financial inclusion and improves customer service quality, contributing to broader banking sustainability.

The findings further emphasized the role of institutional and governance factors in maintaining banking network sustainability. Transparency, effective regulatory oversight, and governance quality were identified as critical determinants of sustainability. Strong governance structures enhance risk management effectiveness, improve accountability, and increase institutional resilience. These findings are consistent with prior research demonstrating that regulatory frameworks and governance mechanisms play essential roles in strengthening banking stability and preventing systemic crises (21). Additionally, regulatory reforms aimed at improving financial transparency and supervision have been shown to significantly enhance banking system stability and sustainability (20). Effective governance structures also help mitigate risks associated with institutional inefficiencies and regulatory gaps, thereby enhancing overall financial stability.

Another key finding of this study is the importance of social and trust-related factors in banking sustainability. The qualitative analysis identified social responsibility, transparency, and customer experience as essential components of sustainable banking. These findings suggest that banking sustainability is closely linked to public trust, stakeholder engagement, and institutional legitimacy. Public confidence is a critical determinant of banking stability, as loss of trust can trigger liquidity crises and systemic instability. Previous research has demonstrated that financial stability and transparency significantly influence public confidence in banking institutions, reinforcing the importance of trust in maintaining sustainable banking networks (13). Furthermore, sustainable banking practices, including ethical conduct and responsible financing, contribute to improved stakeholder relationships and long-term institutional sustainability (18).

The study also highlighted the importance of sustainability-oriented banking practices, including green banking and ESG integration, in promoting banking network sustainability. Sustainable banking practices enhance institutional reputation, improve financial performance, and contribute to environmental and social sustainability. These findings are consistent with previous research demonstrating that sustainable banking practices positively influence banking stability, financial performance, and institutional resilience (9, 17). Green banking initiatives and ESG integration also contribute to sustainable economic development and environmental protection, reinforcing the broader societal role of banking institutions (16).

In addition, the clustering analysis provided important insights into the heterogeneity of banking sustainability across institutions. The results showed that larger banks with stronger profitability and liquidity positions exhibited higher sustainability levels, while smaller and newer banks faced greater financial vulnerabilities. This finding suggests that institutional size, financial strength, and operational efficiency significantly influence banking sustainability. Larger banks benefit from economies of scale, diversified revenue streams, and stronger risk management capabilities, which enhance their resilience and stability. These findings align with previous research indicating that internal financial strength and operational efficiency significantly contribute to banking stability and sustainability (7, 10).

Furthermore, the results underscore the importance of innovation, knowledge management, and organizational learning in enhancing banking sustainability. Sustainable banking requires continuous adaptation to evolving technological, regulatory, and economic environments. Knowledge sharing and innovation contribute to improved service quality, operational efficiency, and risk management effectiveness, thereby enhancing institutional sustainability. Previous research has demonstrated that knowledge-sharing practices and intellectual capital significantly contribute to service innovation and organizational sustainability in banking institutions (19).

Overall, the findings of this study confirm that banking network sustainability is a multidimensional and dynamic construct influenced by financial, technological, institutional, and social factors. Sustainable banking systems require integrated strategies that combine financial stability, technological innovation, effective governance, and stakeholder trust. These findings contribute to the existing literature by providing empirical evidence supporting the integrated nature of banking sustainability and highlighting the importance of adopting comprehensive and multidimensional approaches to ensure long-term financial stability and institutional resilience.

Despite its important contributions, this study has several limitations that should be acknowledged. First, the quantitative analysis relied on financial data from selected banks, which may limit the generalizability of the findings to other banking systems with different regulatory environments, institutional structures, or economic conditions. Second, although confirmatory factor analysis provided valuable insights into the validity of sustainability components, the cross-sectional nature of the data limits the ability to examine causal relationships between sustainability factors and banking performance over time. Third, some sustainability dimensions, particularly social and technological components, may be influenced by qualitative organizational factors that are difficult to measure using quantitative indicators. Finally, the clustering analysis, while useful for identifying sustainability patterns, may be sensitive to model assumptions and parameter selection, which could influence cluster classification outcomes.

Future research should adopt longitudinal designs to examine the dynamic relationships between sustainability components and banking performance over time. Such studies could provide deeper insights into causal mechanisms and long-term sustainability trends. Additionally, future studies should incorporate additional variables related to digital transformation, ESG integration, and organizational culture to provide a more comprehensive understanding of banking sustainability. Comparative studies across different countries and regulatory environments could also enhance the generalizability of findings and provide insights into the role of institutional contexts. Furthermore, advanced analytical methods such as machine learning, network analysis, and dynamic structural equation modeling could be used to improve the accuracy and predictive power of sustainability models.

Banking managers and policymakers should adopt integrated sustainability strategies that simultaneously strengthen financial stability, technological capabilities, governance quality, and stakeholder trust. Banks should prioritize strengthening capital adequacy, improving liquidity management, and enhancing operational efficiency to ensure financial resilience. Investment in digital technologies, including artificial intelligence, cybersecurity systems, and advanced data analytics, is essential for improving risk management and operational performance. Regulatory authorities should strengthen supervisory frameworks, enhance transparency, and promote sustainable banking practices to improve systemic stability. Additionally, banks should enhance customer engagement, improve service quality, and strengthen social responsibility initiatives to build public trust and ensure long-term sustainability.

Acknowledgments

We would like to express our appreciation and gratitude to all those who helped us carrying out this study.

Authors' Contributions

All authors equally contributed to this study.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

All ethical principles were adheried in conducting and writing this article.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

Funding

This research was carried out independently with personal funding and without the financial support of any governmental or private institution or organization.

References

1. Gautam V. Understanding the sustainable banking practices: Empirical evidence from an emerging economy. International Social Science Journal. 2023.
2. Sharma S, Gupta C, Malhotra RK, Upreti H, editors. Sustainable banking practices: Impact, challenges and opportunities. E3S Web of Conferences; 2024 2024.
3. Huyen Khanh N, Hang Thi Thu T. The impact of financial risks on bank performance: evidence from Bayesian analysis in Vietnam's commercial banks. Discover Sustainability. 2025;6:515. doi: 10.1007/s43621-025-01246-1.
4. Ngo HK, Trinh HTT. The impact of financial risks on bank performance: evidence from Bayesian analysis in Vietnam's commercial banks. Discover Sustainability. 2025;6:515. doi: 10.1007/s43621-025-01246-1.
5. Liu T, Wang C, Zhao X. Measurement and prediction of systemic risk in China's banking industry. Research in International Business and Finance. 2022;64:101874-. doi: 10.1016/j.ribaf.2022.101874.
6. Zanganeh T, Rastegar MA, Chavoshi K, Fallah Shams MF. Dynamic measurement of the stability of the Iranian interbank network. Scientific-Research Quarterly of Financial Management. 2022;17(68):167-97.
7. Affandi S, Mohamad Azmin NA, Abu Hassan Asari FF. Unlocking financial stability: Exploring internal factors in Malaysian commercial banks. International Journal of Academic Research in Accounting, Finance and Management Sciences. 2023;13(3). doi: 10.6007/IJARAFMS/v13-i3/19037.
8. Raza A, Alavi AB, Asif L. Sustainability and financial performance in the banking industry of the United Arab Emirates. Discover Sustainability. 2024;5:223-. doi: 10.1007/s43621-024-00414-z.
9. Salim K, Disli M, Ng ABK, Dewandaru G, Nkoba MAR. The impact of sustainable banking practices on bank stability. Renewable & Sustainable Energy Reviews. 2023;178:113249-. doi: 10.1016/j.rser.2023.113249.

10. Rao PK, Shukla A. Strategic sustainability in Indian banking industry: A performance analysis. International Journal of Productivity and Performance Management. 2024;73(6):2016-34. doi: 10.1108/IJPPM-04-2023-0199.
11. Athari SA, Irani F, AlAl Hadood A. Country risk factors and banking sector stability: Do countries' income and risk level matter? Evidence from global study. Heliyon. 2023;9(10):e20398-e. doi: 10.1016/j.heliyon.2023.e20398.
12. Barón A, Rodríguez H. Uruguay's banking system exposure to transition risk. Latin American Journal of Central Banking. 2024. doi: 10.1016/j.latcb.2024.100148.
13. Chernykh L, Davydov D, Sihvonen J. Financial stability and public confidence in banks. Journal of Financial Stability. 2023;69:101187-. doi: 10.1016/j.jfs.2023.101187.
14. Sharif A, Yong L, Siddik A, Du A, Vigne S. Harnessing artificial intelligence for enhanced environmental sustainability in China's banking sector: a mixed-methods approach. British Journal of Management. 2025.
15. Shawabkeh KMA. The Impact of Strategic Orientations on Sustainable Performance: The Moderating Role of Business Intelligence at Jordanian Commercial Banks. Journal of Intelligence Studies in Business. 2024;14(1):13-30. doi: 10.37380/jisib.v14.i1.2486.
16. Ajaz A, Bhat AA. Green banking and sustainability - A review. Arab Gulf Journal of Scientific Research. 2022;40(3):247-63. doi: 10.1108/AGJSR-04-2022-0017.
17. Zahid I, Akram MS, Rao ZUR. Unlocking Green Potential: A Mediation-Moderation Analysis of Bank Policies-Related Practices and Green Financing Sustainability in Pakistan. International Journal of Ethics and Systems. 2024. doi: 10.1108/ijoes-02-2024-0057.
18. Espinosa-Garcia J. The impact of banking on sustainable financial practices toward an equitable economy2023 2023. 65-80 p.
19. Abubakr K, Kalifa W. The Impact of Sustainability Knowledge Sharing on Service Innovation in Libyan Banks: The Mediating Role of Intellectual Capital and Organizational Learning. Sustainability. 2025. doi: 10.3390/su17083545.
20. Yu Z, Xiao X, Ge G. Shadow banking regulation and the stock price synchronicity: A quasi natural experiment based on China's new asset management regulation. Borsa Istanbul Review. 2023;24(1):118-36. doi: 10.1016/j.bir.2023.11.004.
21. Ataei Ghara Cheh M, Davoudi SMR, Hortamani A. Presenting and examining a sustainable banking model with an emphasis on the role of a resistance economy using thematic analysis and interpretive structural modeling (ISM). Strategic Management Thought (Management Thought). 2022;15(1):397-438.