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Original Research Article

An Economic–Operational Framework for Credit Risk Management in the Iranian Banking System

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Credit risk constitutes a critical economic challenge that affects financial stability, credit market efficiency, and banking sector performance. In recent years—particularly in Iran, amid prolonged recession and high inflation—it has contributed to a substantial rise in non-performing loans (NPLs), thereby weakening banks' liquidity positions, profitability, and allocative efficiency. This study develops an economic–operational framework for credit risk management in the Iranian banking system through the formulation of an integrated strategy matrix that incorporates two complementary dimensions: customer requirements and internal resource and process capabilities. Drawing upon a structured literature review, updated statistical evidence on the state of NPLs in Iran, and systematic identification of the drivers intensifying non-performing loans, key operational performance domains were determined and a portfolio of tailored strategies was formulated for each matrix segment. The proposed strategies were subsequently evaluated and prioritized according to their feasibility within the institutional structure of the Iranian banking system and their expected economic effectiveness in mitigating credit risk. The findings demonstrate that the framework offers actionable policy and managerial prescriptions for reducing loan delinquency and improving credit allocation efficiency. Recommended measures include designing credit packages aligned with macroeconomic conditions; implementing incentive-based mechanisms for low-risk borrowers (e.g., relaxed collateral requirements and expedited approvals); phased digitalization of credit evaluation processes and mechanized delinquency monitoring; and expansion of digital banking services. Overall, the framework contributes to strengthening financial stability and enhancing resource allocation within the banking sector, while remaining consistent with regulatory and institutional constraints.

Keywords: Credit Risk, Banking Sector Performance, Financial Stability, Credit Allocation Efficiency, Operational Strategy
JEL Classification*:* G21, G28, G32

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1 Introduction

Operations strategy can be defined as a coherent set of decisions that shape the long-term capabilities of operational activities and contribute to the realization of overall corporate strategy through alignment between market requirements and organizational resources. While the relevance of this concept is well established in manufacturing contexts, its importance in service industries—particularly in banking, where operational activities and asset portfolios exhibit distinctive structural complexities—is not only significant but strategic. Experience from recent financial and credit crises demonstrates that financial institutions, like other enterprises, must continuously reassess their operational configurations and adopt strategic orientations that enhance resilience against market volatility and mitigate structural vulnerabilities. The banking system is exposed to a spectrum of risks, among which credit risk is one of the most prominent. Rising levels of non-performing loans (NPLs) and the conversion of performing facilities into non-current assets not only reduce profitability and disrupt liquidity management but also increase mandatory provisioning requirements and constrain banks' lending capacity to finance productive investments. In a bank-centered economy such as Iran, these consequences extend beyond the banking industry itself and exert measurable effects on economic growth and employment. Official statistics from the Central Bank of the Islamic Republic of Iran indicate that the non-performing loan (NPL) ratio stood at 6.1% as of March 2025 (end of fiscal year 1403), representing a 9% year-on-year decline (Financial Tribune, February 2026). However, this aggregate figure conceals a sharp divergence between rial-denominated loans (NPL ratio of 4.8%) and foreign-currency loans (NPL ratio of 10.8%), the latter having risen 22.7% year-on-year (Financial Tribune, 2026). When measured on a monthly basis, Iran's NPL ratio reached 10.6% in September 2025, significantly exceeding the global average of approximately 2.0% for total gross loans, as well as benchmarks in peer economies (CEIC Data, 2025). The total volume of non-performing loans across 26 banks and credit institutions reached approximately 779 trillion tomans (779 thousand billion tomans) by end-March 2025 (EcoIran, 2025), underscoring the systemic magnitude of credit risk in Iran's bank-centered economy. These figures underscore the urgency of developing effective credit risk management mechanisms.

Given the structural characteristics of the Iranian economy—marked by limited development of capital markets and non-bank financial intermediaries—and as confirmed by recent empirical studies (e.g., Peykani

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et al., 2025; Taleblou et al., 2025), banks play a pivotal role in financing the real sector. Consequently, operational decisions in the banking industry must consider not only firm-level performance but also macroeconomic implications and national policy objectives. From the perspective of Islamic economics and economic policy—where principles such as justice, transparency, and financial sustainability are emphasized—the design of credit packages aligned with equitable access to financial resources assumes additional importance. Credit risk management should not be confined to defensive or reactive measures. Rather, it requires a systemic approach integrating customer evaluation mechanisms, credit product design, monitoring and recovery processes, and information technology enablement. The ultimate objective is to achieve an optimal trade-off between acceptable risk exposure and reasonable returns, rather than eliminating risk at the expense of profitability and productive lending. In this context, an operations strategy matrix provides a structured decision-making framework capable of simultaneously incorporating market-side considerations (customer needs, behavioral repayment patterns) and resource-side capabilities (IT infrastructure, human capital competencies, credit policies, and supervisory capacity). Such integration facilitates the identification of strategic positioning zones and the prioritization of operational initiatives.

This study aims to develop an integrated operations strategy matrix for credit risk management in Iranian banks. Through a systematic review of the literature and identification of key determinants of loan delinquency, the research extracts and classifies feasible operational options and prioritizes them based on implementation feasibility and expected impact. The analysis emphasizes operational and policy dimensions to ensure that the findings possess not only theoretical relevance but also practical transferability within the country's institutional environment and compatibility with the principles of Islamic economics and national policy objectives. The central research questions are as follows:

- Can the proposed matrix-based approach generate efficient and implementable strategies for mitigating credit risk?
- What are the most critical customer requirements and resource capabilities associated with credit risk in the Iranian banking system?
- Which operational strategies derived from the proposed matrix exert the greatest impact on reducing non-performing loans and improving operational efficiency?

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Addressing these questions provides a practical foundation for banking executives and regulatory authorities in designing and implementing effective credit risk mitigation policies.

The remainder of the paper is organized as follows: a statistical overview of credit risk, a review of the literature and theoretical foundations, the methodology and development of the operations strategy matrix, a discussion of managerial insights, and finally, conclusions with implications for policy and practice.

2 Credit Risk in the Iranian Banking System: A Statistical Overview

To ground the subsequent operational-strategy analysis in empirical reality, this section presents key statistical indicators describing the current state of credit risk in the Iranian banking system.

2.1 NPL Ratio Trend

According to CEIC data compiled from the Central Bank of the Islamic Republic of Iran (CBI), the non-performing loan (NPL) ratio stood at 10.6% in September 2025, down from a peak of 18.1% in November 2012 and a recent low of 6.1% in March 2022 (CEIC Data, 2025). As of the end of Fiscal Year 1403 (March 20, 2025), the CBI reported that the NPL ratio had declined to 6.1%, representing a 9% improvement year-on-year (Financial Tribune, 2026). However, this aggregate figure masks a sharp bifurcation:

- Rial-denominated NPL ratio: 4.8% (March 2025), down from 5.8% in the preceding quarter and 22.6% lower year-on-year.
- Foreign-currency NPL ratio: 10.8% (March 2025), posting a 22.7% increase compared to the previous year, largely attributable to the multiple exchange-rate adjustments and borrowers' inability to service debt at prevailing market rates (Financial Tribune, 2026).

2.2 Absolute Volume

With total outstanding loans reaching 41,418.2 trillion rials by March 2025, the absolute volume of non-performing loans was estimated at 2,526.5 trillion rials (Financial Tribune, 2026). Earlier CBI data indicated that NPLs had reached 2,250 trillion rials by June 2024. Meanwhile, the total debts of 26 banks and credit institutions—a broader metric than NPLs alone—amounted to approximately 7,790 trillion rials (equivalent to 779 trillion tomans) by March 2025 (EcoIran, 2025).

2.3 International Comparison

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Despite the improving trend, Iran's NPL ratio remains elevated relative to international benchmarks. The World Bank data (2025) reports that NPL ratios in 2019 stood at 2.5% in France, 0.9% in the United States, 3.8% in Poland, and 3.1% in Brazil, with regional comparators at 5.0% (Turkey), 8.6% (Pakistan), and 8.9% (Afghanistan). Thus, despite the recent improvement, Iran's NPL ratio remains a notable credit-risk concern when compared with selected international and regional benchmarks.

Several structural features underlie these figures. First, the disproportionate weight of foreign-currency NPLs reflects the mismatch between borrowers' domestic-currency earnings and their foreign-currency obligations—a problem exacerbated by sanctions and exchange-rate volatility. Second, the improvement in rial-denominated NPLs may partly reflect penalty-waiver schemes and debt-restructuring initiatives rather than genuine improvements in underwriting quality. Third, elevated NPL levels can weaken bank balance sheets through higher provisioning requirements and reduced capacity to extend new credit, particularly when banks face persistent capital and liquidity constraints. These statistics underscore the systemic importance of credit risk and provide the empirical foundation upon which the operations strategy matrix developed in Section 4 is built.

3 Theoretical Foundations and Literature Review

This section grounds the study in the relevant theoretical and empirical foundations. It first defines credit risk and its core determinants, drawing on established banking and financial theory. Building on this theoretical base, the literature is then systematically reviewed and organized into distinct streams to map the state of existing research and to pinpoint the specific gaps that the present study is designed to address.

3.1 Theoretical Foundations

Credit risk refers to the probability of loss resulting from a borrower's failure to meet contractual obligations—either by delaying payment or defaulting entirely. In banking, this risk materializes primarily in the lending process, though it may also arise from transactional exposures where counterparty reliability and the nature of exchanged assets play a role. The consequences of neglected credit risk are substantial: rising non-performing loans (NPLs) erode profitability, tighten liquidity, increase provisioning requirements, and ultimately constrain banks' capacity to finance productive investment (Bank for International Settlements [BIS], 2011). The Global Financial Crisis demonstrated that weak credit risk management frameworks can generate

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severe systemic repercussions, underscoring the BIS's emphasis that effective frameworks must integrate accurate identification, measurement, ongoing monitoring, and control of credit exposures.

Borrower default may stem from financial distress or, in some instances, from opportunistic behavior such as strategic default driven by legal disputes or contractual fraud. Credit losses occur when the recoverable value of a claim falls below its book value, a dynamic historically illustrated by the Japanese banking crisis of the 1990s, when loans extended to high-risk sectors turned non-performing after a protracted economic stagnation. Key borrower-level determinants of credit risk include income level (higher income generally reduces default probability), guarantor solvency (which affects recovery rates), and demographic characteristics such as age. From a macro perspective, credit risk determinants are conventionally classified into two categories: idiosyncratic (bank-specific) factors—such as credit growth, profitability, capital adequacy, asset structure, and bank size—and systematic factors arising from macroeconomic shocks, including recession, inflation, exchange-rate volatility, and financial crises (Wang et al., 2026).

Empirical work on Iranian banks has confirmed the role of both sets of factors. Mehrara and Behloulvand (2015) found that liquidity risk, loan-to-deposit ratio, return on assets, capital-to-asset ratio, and bank size significantly affect credit risk. Rostamzadeh et al. (2018), using stress-testing scenarios, demonstrated that while administratively lowering lending rates reduces credit risk, exchange-rate surges, inflation, and economic contraction rapidly escalate it—particularly when past credit risk accumulates. These findings highlight that credit risk dynamics in Iran are shaped by the interaction of internal operational decisions and volatile macroeconomic conditions, reinforcing the need for a strategic framework that addresses both structural and environmental determinants simultaneously.

3.2 Literature Review

The existing literature on credit risk in the Iranian banking system, along with selected international studies, can be organized into four broad streams, each making a distinct contribution while leaving a characteristic gap.

Stream 1: Macroeconomic and econometric studies: This group regresses aggregate NPL ratios on inflation, exchange rates, GDP growth, and similar variables (e.g., Esmaeilzadeh, 2016; Mehrara & Behloulvand, 2015; Rostamzadeh et al., 2018; Abbassian et al., 2016). These studies successfully identify statistically significant macro-drivers but treat banks' internal operations as a "black box." They do not translate their findings into

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actionable operational strategies that managers could deploy to hedge against the identified shocks.

Stream 2: Bank-level panel-data analyses: Research in this stream examines how capital adequacy, liquidity, size, profitability, and ownership structure influence credit risk (Tehulu & Olana, 2014; Nadiri et al., 2019; Mohagheghnia et al., 2019). Although these studies reveal important within-bank determinants, they remain confined to financial indicators, offering no mechanism for simultaneously incorporating customer-facing requirements—such as service speed, flexibility, or reliability—into the risk-management calculus.

Stream 3: Qualitative and descriptive strategy studies: A smaller body of work applies tools like SWOT analysis to generate directional credit strategies (e.g., Hosseinzadeh & Khodadadi, 2018). While such studies provide useful context, they lack structured, matrix-based prioritization tools that can weigh competing operational objectives and resource constraints in a transparent manner.

Stream 4: Comparative Islamic-versus-conventional banking studies: Research in this category highlights the institutional specificities of Islamic finance, such as collateral inflexibility under profit-and-loss-sharing contracts and the direct transfer of credit risk to customers in participatory arrangements (Sadeghi Shahdani & Agha Babaei, 2011; Waemustafa & Sukri, 2015; Chamberlain et al., 2020). These studies underscore the need for Sharia-compatible risk mitigation instruments but stop short of proposing concrete, localized operational tools that are administratively feasible within Iran's bank-centered financial system.

International evidence further corroborates the multidimensional nature of credit risk. Studies from Sub-Saharan Africa (Noah et al., 2018), Bangladesh (Zheng et al., 2018), Ethiopia (Tole et al., 2019), and Pakistan (Ali et al., 2019) collectively show that credit risk is shaped not only by macroeconomic and bank-level variables but also by regulatory quality, market structure, and the operational environment. However, none of these studies provide a decision-making matrix that integrates market-side demands with internal resource capabilities—a gap that is particularly consequential in a bank-centered economy such as Iran, where banks remain the dominant source of external finance and where Sharia compliance introduces additional operational constraints.

Table 1 provides a structured summary of the reviewed studies, including their methodologies, key findings, and limitations. Collectively, the literature confirms that existing approaches either prioritize statistical identification

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over operational decision-making, or offer descriptive guidance without a systematic tool for prioritization and implementation. The present study directly addresses these shortcomings by constructing an integrated operations strategy matrix that simultaneously captures performance objectives from the customer perspective and decision domains from the resource-and-process perspective. The analytical details of this matrix and the strategic positioning it enables are developed in the sections that follow.

Table 1
Summary of Literature Review

Reference	Country / Context	Methodology	Key Findings	Research Limitations
Mehrara & Behloulvand (2015)	Iran; Banks	Credit risk factor analysis	Liquidity risk, loan-to-deposit ratio, ROA, capital-to-asset ratio, and bank size significantly affect credit risk	Focus solely on financial indicators; operational strategies for risk mitigation not addressed
Rostamzadeh et al. (2018)	Iran; Banks	Stress testing & scenario analysis	Administrative reduction of lending rates decreases risk; however, exchange rate fluctuations, inflation, and accumulated past risk rapidly increase credit risk	Focus on scenario and macroeconomic factors; operational capabilities and customer perspective not considered
Abbassian et al. (2016)	Iran; Loan portfolios	Portfolio diversification analysis	Portfolio diversification influences bank credit risk	Focus only on portfolio structure; operational strategies based on customer needs and internal resources not included
Esmaeilzadeh (2016)	Iran; Bank Melli	Macroeconomic factors analysis	Inflation increases credit risk; higher interest rates reduce it	Emphasis on macro factors; operational processes and organizational capabilities not considered
Hosseinzadeh & Khodadadi (2018)	Iran; Bank Melli	SWOT analysis & strategy formulation	Strengths and opportunities identified	Descriptive method; lack of quantitative or matrix-based prioritization and operationalization
Mohagheghnia et al. (2019)	Iran; 31 Banks	Regression / OLS	Credit and liquidity risks had no significant effect on profitability	Results diverge from other studies; structural or matrix analysis not provided
Nadiri et al. (2019)	Iran; Islamic banks	Panel data analysis	Management quality, capital adequacy, and liquidity reduce credit risk	Interaction with customer requirements and strategy localization not explored

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Tehulu & Olana (2014)	Ethiopia; 10 commercial banks	Balanced panel data; random-effects GLS regression	Bank size and credit growth negatively and significantly affect credit risk; ownership and operating inefficiency have positive and significant effects, while profitability, capital adequacy, and bank liquidity have negative but statistically insignificant relationships with credit risk	Focuses on bank-specific determinants and does not integrate customer-facing performance objectives or an operations-strategy framework
Sadeghi Shahdani & Agha Babaei	Iran	Comparative VaR analysis	Islamic banking faces lower flexibility in risk mitigation due to Sharia constraints	Lack of matrix-based operational strategies; operational analysis not localized
Waemustafa & Sukri (2015)	Malaysia	Multivariate regression	Banking and macro factors affect credit risk differently in Islamic vs. conventional banks	Focus on statistical analysis; matrix-based operational solutions underexplored
Ali et al. (2019)	Pakistan; Islamic banks	Panel data & regression	Credit risk is a key determinant of bank performance	Combined analysis of market needs and resource capabilities not examined
Noah et al. (2018)	Sub-Saharan Africa	Competition and risk analysis	Non-linear relationship between banking competition and credit risk	Institutional and policy factors highlighted; no operational tool provided
Zheng et al. (2018)	Bangladesh	Determinants analysis	Credit risk inversely related to profitability and bank size	Micro/macro factors analyzed without operational decision-making framework
Tole et al. (2019)	Ethiopia	Panel analysis	Macro and microeconomic variables affect credit risk	Lack of strategic prioritization mechanism based on needs and capabilities
Chamberlain et al. (2020)	Gulf countries	Credit portfolio comparison	Differences in credit risk between Islamic and conventional banking observed	Structural explanations provided; localized operational strategies not developed
Peykani et al. (2025)	Iran; Banking system	Time-varying parameter vector autoregression (TVP-VAR)	Macroeconomic shocks (exchange rate, inflation) have time-varying, asymmetric effects on NPLs; shock propagation is stronger during high-inflation episodes	Does not translate findings into operational hedging or mitigation strategies

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Taleblou et al. (2025)	Iran; Bank Melli	Machine learning (XGBoost, Random Forest, Logistic Regression)	ML models substantially outperform logistic regression (ROC-AUC = 99.73% vs. 75.34%) in default prediction	Does not embed predictive models within a strategic operations framework
Ehenzi et al. (2025)	Iran; Banking sector	DEMATEL-ANP (DANP)	Credit risk ranked second among 8 banking risks (weight = 0.1426) under uncertainty	Descriptive prioritization without operational decision-making tools

Note. Compiled by the authors based on the studies listed in the References.

4 Research Gap and Innovation of the Present Study

As summarized in Table 1, the extant literature on credit risk in the Iranian banking system can be classified into four broad streams: (i) macroeconomic and econometric studies that regress NPL ratios on inflation, exchange rates, and GDP growth (e.g., Mehrara & Behloulvand, 2015; Rostamzadeh et al., 2018; Esmaeilzadeh, 2016); (ii) bank-level panel-data analyses that examine the role of bank-specific characteristics, including capital adequacy, liquidity, size, and profitability, in explaining credit risk (e.g., Nadiri et al., 2019; Tehulu & Olana, 2014); (iii) qualitative and descriptive strategy studies, often employing SWOT analysis, that offer general directional guidance without operational prioritization (e.g., Hosseinzadeh & Khodadadi, 2018); and (iv) comparative Islamic-versus-conventional banking studies that highlight Sharia-related constraints in risk mitigation (e.g., Sadeghi Shahdani & Agha Babaei, 2011; Waemustafa & Sukri, 2015; Chamberlain et al., 2020).

Three critical gaps persist across these streams, which the present study directly addresses. First, although the macroeconomic and panel-data traditions have identified a wide array of credit-risk determinants, they treat operational processes and resource capabilities as a "black box" rather than as decision variables that managers can reconfigure. The current study opens this black box by translating credit-risk drivers into actionable operational strategies. Second, the qualitative-strategy studies provide useful contextual insights but lack a structured, matrix-based mechanism for simultaneously weighting customer-side requirements (demand) and internal resource capabilities (supply). The operations strategy matrix proposed here fills this methodological void. Third, the comparative Islamic-banking literature underscores institutional specificities—such as collateral inflexibility under profit-and-loss-sharing contracts—yet stops short of proposing localized operational tools that are both Sharia-compatible and administratively feasible within Iran's bank-centered economy. By integrating the operations strategy

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framework with the institutional features of Iranian banking, this study bridges the gap between abstract institutional analysis and practical decision-making.

Empirically, several very recent studies reinforce the urgency of closing these gaps. Peykani et al. (2025) employ time-varying parameter vector autoregressions to confirm that macroeconomic shocks—especially exchange-rate volatility and inflation surges—propagate rapidly through NPL portfolios in Iran, yet they do not translate these findings into operational hedging strategies. Taleblou et al. (2025) demonstrate that machine-learning models (XGBoost, random forest) substantially outperform traditional logistic regression in predicting loan default using a dataset of 56,965 contracts from Bank Melli Iran, but they do not embed their predictive tools within a broader strategic framework that considers customer-service objectives. A recent DANP-based risk-prioritization study (2025) identifies credit risk as the second-highest-ranked banking risk (weight = 0.1426), yet remains at the descriptive-prioritization level without offering a decision matrix for strategy implementation. The present study directly builds upon these contemporary findings by constructing an integrated operations strategy matrix that simultaneously captures market-side performance objectives (quality, speed, reliability, flexibility, cost) and supply-side decision domains (organizational development, process technology, supply network, human resources capacity), thereby providing both a theoretical contribution to the operations-strategy literature in service contexts and a practical tool for Iranian bank executives.

In sum, the innovation of this research lies not in identifying new determinants of credit risk, nor in testing hypotheses about their statistical significance, but in synthesizing the scattered insights accumulated over more than four decades of empirical research into a structured, multidimensional decision-making framework that is both academically rigorous and operationally implementable within Iran's unique institutional and regulatory environment.

5 Operations Strategy Framework and Methodology

This section outlines the conceptual lens and the step-by-step research design adopted in the study. It begins by introducing the operations strategy perspective as the theoretical foundation for the matrix-based framework, and then details the five-stage methodological process through which the framework was constructed—linking the statistical evidence, literature synthesis, and operational analysis into an integrated decision-making tool for credit risk management.

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6 The Operations Strategy Perspective

Given that a substantial portion of credit risk originates in banks' operational processes—customer assessment, loan approval, collateral management, and post-disbursement monitoring—the operations strategy approach (Slack & Lewis, 2017) provides a systematic lens for addressing it. Operations strategy is defined as a coherent pattern of decisions that shapes the long-term capabilities of operational activities and aligns market requirements with organizational resources (Slack & Lewis, 2017). It translates customer expectations into five generic performance objectives—quality, speed, reliability, flexibility, and cost—and develops the resource and process capabilities needed to deliver them.

For credit risk management in banking, this perspective is particularly apt because it avoids treating risk as a purely financial or statistical phenomenon. Instead, it situates risk mitigation within a structured decision-making framework that simultaneously accounts for what customers demand from credit services and what internal resources and processes the bank can deploy. The core analytical tool derived from this perspective is the operations strategy matrix, which cross-tabulates performance objectives (the demand side) with operational decision domains (the supply side) to identify strategic positioning zones and corresponding operational interventions.

7 Methodological Approach

This study is applied in purpose and descriptive–analytical in nature, employing a qualitative structured analysis design. The overarching objective is to develop an integrated operations strategy matrix for credit risk management tailored to the Iranian banking context. The research was executed in five sequential stages:

- **Stage 1 –** Compilation of Updated Statistical Evidence: Recent official and secondary data on non-performing loans (NPLs) in the Iranian banking system were collected from the Central Bank of the Islamic Republic of Iran (CBI), CEIC, and other credible sources. This empirical snapshot, presented in Section 2, grounds the subsequent strategic analysis in the current reality of Iranian banking.
- **Stage 2 –** Identification of Credit Risk Factors and Determinants: A comprehensive review of the literature on credit risk—covering macroeconomic, bank-level, and operational determinants—was conducted. The output was a consolidated set of variables and drivers that intensify NPL formation in the Iranian context, as synthesized in the preceding literature review.

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- **Stage 3 –** Translation of Customer Needs into Performance Objectives: Drawing on the operations strategy literature, particularly the market-requirements perspective of Slack and Lewis (2017), the customer requirements relevant to banking credit services were conceptually mapped onto five generic performance objectives: quality, speed, dependability, flexibility, and cost. These formed the demand-side (rows) of the operations strategy matrix.
- **Stage 4 –** Mapping Internal Capabilities to Operational Decision Domains: Internal bank capabilities critical to credit risk mitigation were identified and mapped to four operational decision domains recognized in the operations strategy literature: human resources capacity, supply network and external interactions, process technology, and organizational development (Slack & Lewis, 2017). These formed the supply-side (columns) of the matrix.
- **Stage 5 –** Construction of the Operations Strategy Matrix and Extraction of Strategies: Performance objectives and decision domains were integrated into a two-dimensional matrix. For each of the 20 cells, specific operational strategies were formulated. A strategy was assigned to a cell only if it simultaneously addressed (a) at least one performance objective from the customer perspective, and (b) at least one operational decision domain from the resource-capability perspective. The resulting strategies were qualitatively assessed along two dimensions: implementation feasibility within Iran's institutional and regulatory environment and expected effectiveness in reducing credit-risk exposure and NPL formation. Each strategy was classified as having high, medium, or low feasibility and expected impact based on its regulatory compatibility, resource and technological requirements, implementation complexity, and anticipated contribution to credit-risk mitigation.

8 Development of the Operations Strategy Matrix

In developing the matrix, the four decision domains were refined as follows for the Iranian banking context:

- Human resources capacity: The ability of credit staff to accurately assess applications, monitor repayments, and respond to early-warning signals, which is important for maintaining credit quality.
- Supply network / external interactions: Institutionalized collaboration with credit bureaus, insurance firms, and regulatory databases (e.g., the CBI's Samat platform) to access reliable borrower data and reduce

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information asymmetry (Coordination Headquarters for Combating Economic Corruption, 2019).

- Process technology: The IT infrastructure enabling digital loan origination, automated credit scoring, real-time delinquency tracking, and data-driven portfolio monitoring.
- Organizational development: The internal policies, governance structures, and procedural frameworks that ensure credit operations comply with regulatory mandates and Sharia principles while maintaining operational efficiency.

These domains were selected because the banking literature and practical experience in Iran consistently identify them as exerting the greatest leverage on credit risk outcomes. Table 2 presents the resulting operations strategy matrix, with each cell containing actionable strategies that concurrently enhance a customer-facing performance objective and strengthen an internal capability.

Table 2
Operations Strategy Matrix for Credit Risk Management in Banking Systems

		Decision Domains			
		Organizational Development	Process Technology	Supply Network	Human Resources Capacity
Performance Objectives	Quality	Designing diversified credit packages based on customer risk, creating internal protocols for continuous file quality checks	Using automated credit scoring and data analytics for precise customer evaluation	Sharing information with credit bureaus and insurance companies to reduce systemic risk	Specialized training for credit staff in risk assessment and customer behavior
	Speed	Creating dedicated teams to expedite sensitive file reviews, standardizing administrative procedures	Implementing digital systems for loan application and disbursement, mobile and internet banking	Establishing direct communication channels with official bodies for facilitating verifications	Assigning a dedicated officer for each customer file, reducing internal steps
	Reliability	Developing clear risk management guidelines, issuing periodic reports on customers' credit status	Automated monitoring of repayments and alerting staff/customers in case of delays	Contracting with credit rating firms to automatically assess new customers	Continuous monitoring and evaluation of staff performance, providing transparent reports to management

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	Flexibility	Implementing automatic deferral policies or staggered repayments for reliable customers	Allowing online changes to repayment plans and loan terms without in-person visits	Using market data and external networks to offer special conditions for high-quality customers	Granting limited authority to staff for offering loans under special conditions
	Cost	Revising fees and interest structures to reduce operational and customer costs	Employing automation to reduce processing and credit monitoring costs	Collaborating with external partners to reduce repayment and collection costs	Optimizing staff utilization and designing productivity metrics to minimize operational costs

Source: Research findings

The matrix underscores the intersection of market demands and operational capabilities, providing a structured, multidimensional tool for credit risk management decisions. Its logic, analysis, and the managerial implications derived from it are elaborated in the sections that follow.

9 Analysis of the Operations Strategy Matrix

The matrix presented in Table 2 is not merely a descriptive inventory of possible actions; it is a structured decision-support tool that reveals the strategic logic connecting customer-facing performance objectives to the bank's internal resource and process capabilities. By systematically examining the interactions embedded in the matrix, four strategic patterns emerge. Each pattern represents a distinct cluster of synergies that directly inform the phased implementation roadmap elaborated in the subsequent Managerial Insights section.

Pattern 1 – Human Capital as the Foundation of Quality, Speed, and Reliability.

The capacity dimension runs as a vertical thread through the matrix, indicating that human resources constitute an important lever for simultaneously advancing quality, speed, and reliability in credit operations. Specialized training in credit risk assessment and customer behavior analysis equips staff to make more accurate underwriting decisions, directly improving the quality of the loan portfolio. When this capability is complemented by assigning dedicated officers to individual customer files—thereby minimizing handovers and internal delays—processing speed increases without compromising thoroughness. Continuous performance monitoring and transparent reporting further strengthen reliability by assuring both customers and management that credit decisions follow consistent, auditable standards. In the Iranian banking context, where the digitalization of credit assessment

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remains an important strategic challenge, the capacity dimension assumes particular importance.

Pattern 2 – Digital Technology as an Accelerator and Cost-Reducer.

The process technology dimension exhibits the highest density of synergies across multiple performance objectives. Automated credit scoring and data analytics enhance evaluation accuracy (quality) while digital loan origination and mobile banking platforms drastically compress approval cycle times (speed). Automated repayment monitoring with real-time alerts to staff and customers strengthens reliability, and online mechanisms for adjusting repayment terms inject flexibility into what would otherwise be rigid contractual structures. Critically, technology-based interventions also yield measurable cost reductions by lowering the per-application processing burden and enabling more efficient credit monitoring. This finding carries particular significance for Iran, where recent empirical work has validated the superiority of machine-learning-based credit scoring over traditional methods—yet such tools remain largely unembedded within a broader strategic framework. The matrix explicitly ties these digital capabilities to multiple customer-facing outcomes, providing a structured justification for investment in IT infrastructure that goes beyond a purely technical business case.

Pattern 3 – External Networks as a Risk-Mitigation and Flexibility Multiplier.

The supply network dimension illustrates that a bank's credit risk profile is not solely determined by internal processes. Systematic information-sharing with credit bureaus, insurance companies, and official registries—including the CBI's Samat platform—can reduce information asymmetry and adverse-selection problems, thereby supporting more accurate borrower screening and credit-risk assessment (Choudhary & Jain, 2020). Direct communication channels with official bodies expedite the verifications that often create bottlenecks in loan origination, contributing to speed improvements. Perhaps most distinctively, external networks enable a level of flexibility that isolated internal resources cannot achieve: market data and networked relationships allow banks to extend preferential terms to high-quality borrowers based on verified external track records, rather than relying solely on internal behavioral history. For Iranian banks operating under sanctions-related constraints that limit access to international banking and financial networks, optimizing domestic information-sharing arrangements becomes a strategic priority.

Pattern 4 – Organizational Development as the Integrating Mechanism.

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The organizational development dimension functions as an integrating layer that coordinates and amplifies the contributions of the other three domains. Standardized administrative protocols and dedicated review teams reduce the human errors that compromise quality. Clear risk-management guidelines and periodic credit-status reporting foster reliability and trust among both customers and regulators. Policies enabling automatic deferrals and staggered repayment schedules inject flexibility into the credit relationship without requiring individually negotiated exceptions. When fee structures and interest rate frameworks are rationally revised, cost efficiencies flow to both the bank and its borrowers. Without this organizational layer, investments in human resources, technology, and external networks risk remaining fragmented initiatives rather than components of a coherent credit risk management system.

10 From Matrix Analysis to Managerial Action

These four patterns do not prescribe an undifferentiated "implement everything" agenda. Rather, they point toward a natural sequencing logic. The capacity and organizational development dimensions offer near-term opportunities: clarifying criteria for good-standing customers, activating electronic delinquency tracking within existing systems, and rationalizing administrative procedures can be achieved within months through executive directives and limited reallocation of resources. The technology and supply-network dimensions require longer investment horizons: building integrated data lakes, deploying machine-learning credit-scoring infrastructure, and formalizing institutional agreements with external data providers demand sustained commitment and capital outlay. This sequencing logic is precisely what structures the three-phase implementation roadmap presented in Managerial Insights, where short-term quick wins build momentum and generate the operational headroom needed to justify subsequent medium- and long-term investments.

In summary, the operations strategy matrix provides not only a taxonomy of possible credit risk interventions but also a diagnostic lens through which bank managers can read their own institutional priorities. By identifying which matrix cells are currently underserved—and which strategic patterns are therefore underdeveloped—an Iranian bank can tailor the implementation roadmap to its specific risk profile, resource constraints, and competitive positioning within the country's financial system.

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11 Managerial Insights

Building on the four strategic patterns identified in the matrix analysis—and the sequencing logic they imply—this section translates the proposed framework into a concrete, phased implementation roadmap for Iranian bank executives. Rather than offering abstract prescriptions, the roadmap specifies concrete interventions, assigns institutional responsibility, and defines measurable success indicators.

11.1 Phase 1: Short-Term Quick Wins (0–6 months)

These interventions require minimal capital investment and can be implemented through executive directives and reconfiguration of existing processes.

11.1.1 "Good-Standing Customer" Incentive Program

- Action: Define objective, transparent criteria for classifying borrowers as "good-standing," based on a satisfactory repayment history, absence of material non-performing obligations, and a favorable credit report. For this segment, implement three operational incentives: (a) expedited loan processing — reduce the approval cycle time relative to the bank's current baseline; (b) collateral relaxation — apply risk-based collateral requirements for qualifying low-risk borrowers, subject to applicable regulatory and bank-specific requirements; (c) guarantor simplification — streamline guarantee requirements for qualifying low-risk borrowers, subject to credit risk assessment and applicable regulations.
- Responsible Unit: Credit Risk Department, in coordination with Branch Operations.
- KPI: Average loan approval cycle time for good-standing vs. standard customers; NPL rate among good-standing customers at 6 and 12 months post-disbursement.
- Alignment with Matrix: This action directly addresses the Speed-Flexibility intersection (capacity and organizational development decision domains).

11.1.2 Activation of Electronic Delinquency Tracking

- Action: Configure the existing Core Banking System (or Samat platform) to automatically flag accounts that are 15, 30, and 60 days past due. Trigger automated SMS, email, and in-app notifications to both the customer and the assigned credit officer. For accounts reaching 60 days past due, automatically restrict the customer from accessing new credit

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facilities across all bank branches (utilizing the CBI's Samat centralized database).
- Responsible Unit: IT Department and Collections Unit.
- KPI: Percentage of delinquent accounts contacted within 48 hours of the first missed payment; cure rate (proportion of 30-day delinquent accounts that become current within 30 days).
- Alignment with Matrix: Reliability–Process Technology cell.

11.1.3 Identification of "Critical Zones" for Targeted Resource Allocation

- Action: Using the operations strategy matrix (Table 2), each branch or regional office should identify the three matrix cells most relevant to its portfolio composition. For branches with high NPL concentration in a specific sector (e.g., construction), allocate dedicated credit-monitoring personnel to those cells.
- Responsible Unit: Regional Credit Risk Supervisors.
- KPI: NPL ratio by branch, compared before and after focused resource allocation.

11.2 Phase 2: Medium-Term Structural Improvements (6–18 months)

These interventions require moderate investment in technology, process redesign, and staff retraining.

11.2.1 Phased Digitalization of Credit Processes

- Action: Implement an electronic workflow for loan origination, credit scoring, and approval that integrates with the CBI's Samat database. The workflow should: (a) auto-populate applicant data from national registries (National Organization for Civil Registration, Tax Administration) to reduce manual data-entry errors; (b) incorporate an automated credit-scoring model—initially a logistic-regression model, with a migration pathway to machine-learning algorithms (Random Forest or XGBoost) as validated by Taleblou et al. (2025) for the Iranian context; (c) provide real-time dashboards for branch managers showing portfolio-at-risk by customer segment.
- Responsible Unit: IT Development Department, with external vendor support if needed.
- KPI: Reduction in manual data-entry time per loan application; improvement in default-prediction accuracy (AUC) over the baseline manual-assessment model.

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- Alignment with Matrix: Process Technology–Quality cell.

11.2.2 Dynamic Credit Package Design

- Action: Develop a suite of credit products whose terms (interest rate, tenor, collateral requirements, grace period) are parameterized by macroeconomic indicators. For instance: (a) during high-inflation episodes, offer shorter-tenor working-capital facilities with floating rates indexed to the CBI's policy rate; (b) for export-oriented borrowers earning foreign currency, offer forex-denominated facilities with repayment schedules aligned to their export-receivable cycles; (c) for agricultural borrowers, incorporate seasonal grace periods aligned to harvest cycles.
- Responsible Unit: Product Development Department, in coordination with the Economic Research Unit.
- KPI: Default rate by product type compared to the baseline one-size-fits-all product; customer uptake rate of new products.
- Alignment with Matrix: Organizational Development–Quality and Flexibility cells.

11.2.3 Establishment of a Specialized Credit Assessment Unit

- Action: Create a centralized unit staffed by credit analysts trained in sector-specific risk assessment (e.g., specialists for construction, manufacturing, trade, and agriculture). This unit should: (a) conduct second-level review for all credit applications exceeding a materiality threshold; (b) maintain sector-level risk dashboards; (c) provide monthly sectoral-risk briefs to branch managers. Training should cover financial-statement analysis, cash-flow-based lending (as distinct from collateral-based lending), and early-warning-signal identification.
- Responsible Unit: Human Resources (recruitment and training) and Credit Risk Department (operational supervision).
- KPI: Proportion of credit applications undergoing second-level review; default rate on loans exceeding the materiality threshold vs. those below it.
- Alignment with Matrix: Human Resources Capacity–Quality and Reliability cells.

11.3 Phase 3: Long-Term Strategic Investments (18–36 months)

11.3.1 Data-Driven Credit Scoring Infrastructure

- Action: Build an internal data lake consolidating: (a) internal loan-performance history (at least 5 years); (b) external data from credit

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bureaus, insurance companies, and the CBI's Samat platform; (c) macroeconomic time series (inflation, exchange rates, sectoral GDP). Deploy and continuously retrain machine-learning credit-scoring models. Initiate a pilot at 3–5 branches selected for diversity (geographic, sectoral exposure, size) before system-wide rollout.

- Responsible Unit: Data Analytics Unit (newly created or expanded) and IT Infrastructure.
- KPI: Model discrimination (AUC), model stability (Population Stability Index), reduction in NPL ratio among pilot branches relative to control branches.
- Alignment with Matrix: Process Technology and Supply Network cells.

11.3.2 Governance Mechanism: Credit Risk Reduction Task Force

- Action: Establish a permanent, cross-functional task force with representatives from Credit, IT, Legal, Internal Control, and Risk Management. Mandate: (a) review the operations strategy matrix semi-annually and update cell priorities based on portfolio performance; (b) approve all Phase 2 and Phase 3 interventions before implementation; (c) monitor defined KPIs quarterly and present findings to the Board Risk Committee.
- Responsible Unit: Chief Risk Officer (convener).
- KPI: Number of matrix cells for which KPI targets are met; time from matrix review to approved action plan.

11.3.3 Incentive Realignment

- Action: Revise branch and credit-officer incentive structures to weight portfolio quality at least as heavily as loan volume. For instance, calculate bonuses as a function of: (a) volume of performing loans disbursed (60% weight); (b) NPL ratio of the officer's/book's portfolio (25% weight); (c) recovery rate on delinquent loans (15% weight). This shifts behavior from "originate and forget" toward lifetime portfolio stewardship.
- Responsible Unit: Human Resources (compensation design) and Risk Management (metric definition).
- KPI: Correlation between individual officer bonuses and portfolio NPL ratio; year-on-year change in the volume-weighted NPL ratio.

Implementation Considerations: Given the unique institutional features of Iran's banking system, implementation must be conscious of three constraints. First, any change in credit policy may have macroeconomic implications, requiring proactive coordination with the CBI and the Money and Credit Council. Second, credit products and incentive mechanisms must

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comply with the applicable legal and Sharia framework governing banking operations in Iran (Islamic Consultative Assembly, 2023). Third, the phased pilot approach recommended above serves not only to test effectiveness but also to build organizational buy-in before full-scale deployment.

12 Conclusion and Recommendations

In banking operations, credit granting represents a core activity inherently associated with risk, among which credit risk is recognized as the primary threat to operational stability, liquidity, and profitability. Findings from this study indicate that the widespread exposure of Iranian banks to Non-Performing Loans originates from a combination of macroeconomic factors, process deficiencies in loan granting, and misalignment between customer needs and internal resource capabilities. Therefore, effective credit risk management requires an approach beyond purely financial or statistical analysis—one that simultaneously considers market dimensions (customer behavior and needs) and organizational capacities (IT infrastructure, human resource structure, policies, and internal regulations). This research proposed an integrated operations strategy matrix that combines customer requirements and resource capabilities, enabling the extraction, classification, and prioritization of operational strategies to reduce credit risk. The analysis is grounded in both scientific evidence and expert banking experience, highlighting that customer trust and satisfaction, in interaction with internal bank processes, play a critical role in mitigating credit risk. Matrix-based strategies—including designing dynamic credit packages responsive to macroeconomic conditions, prioritizing and rewarding good-standing customers, digitizing credit processes and delinquency tracking, and facilitating guarantor conditions for reliable clients—can effectively reduce NPLs and improve the credit portfolio's risk–return ratio while providing a structured operational framework for managerial decision-making. However, full realization of these outcomes requires field monitoring, credit metric measurement, and phased evaluation of strategy implementation to validate their effectiveness in reducing credit risk. Such interventions are most effective when coordination is ensured among credit, IT, legal, and internal control units. This study is qualitative–analytical, with the primary aim of proposing an operations strategy matrix. Its actual impact can be assessed in future studies using field data. Implementing certain proposed strategies necessitates consideration of local constraints, including investments in IT infrastructure, staff retraining, and process and regulatory adjustments. Any change in banking credit policy within Iran's bank-centered economy may

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have macroeconomic consequences; hence, alignment with regulatory authorities and compliance with Shariah and national policy frameworks is essential. To minimize unnecessary costs and enhance organizational acceptance, it is recommended that strategies be implemented in phased pilots at selected branches, allowing empirical results and cost–benefit analyses to guide gradual expansion. Regarding policymaking and internal management, the study offers practical, prioritized recommendations: defining clear criteria and incentives for good-standing customers, activating and strengthening electronic delinquency tracking mechanisms, designing credit packages responsive to economic scenarios, and establishing dedicated governance structures to monitor credit risk reduction policies. Continuous measurement through defined indicators—NPL rate, average loan cycle time, recovery rate, and per-loan processing cost—is essential to evaluate effectiveness and enable feedback-driven improvements. Finally, while the proposed matrix provides a structured and practical tool for banking managers, it must be rigorously evaluated and refined in future studies through field testing, economic scenario simulations, and quantitative assessment of strategy impacts on credit indicators to ensure both theoretical rigor and practical scalability and effectiveness.

13 Implications for Policy, Practice, and Future Research

The findings of this study carry distinct implications for three stakeholder groups.

- For banking executives, the operations strategy matrix provides a structured antidote to the prevailing reactive and ad-hoc approach to credit risk management. By explicitly linking customer-facing performance objectives (quality, speed, reliability, flexibility, cost) to internal resource and process capabilities (organizational development, process technology, supply networks, human resources capacity), the matrix enables managers to move beyond the false dichotomy of "aggressive growth" versus "excessive conservatism." The phased implementation roadmap—spanning quick-win process adjustments (Phase 1), structural capability-building (Phase 2), and long-term infrastructure investments (Phase 3)—offers a sequenced pathway that is both ambitious and administratively feasible. Critically, the emphasis on incentive realignment addresses the root cause of credit indiscipline: misaligned performance metrics that reward volume over quality.
- For regulatory authorities and policymakers, the framework underscores the necessity of complementing macroprudential tools (reserve

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requirements, lending ceilings, NPL provisioning norms) with operational-level interventions. The statistical evidence presented in Section 2 demonstrates that aggregate NPL ratios, while improving, conceal substantial heterogeneity—particularly the persistent divergence between rial and foreign-currency NPLs. Regulation that incentivizes banks to adopt the operational strategies identified in the matrix (e.g., dynamic credit packages, automated early-warning systems) could amplify the effectiveness of existing macroprudential measures. Furthermore, given Iran's bank-centered financial structure, improvements in credit allocation efficiency are not merely a micro-level banking concern but a macroeconomic imperative with direct implications for investment, employment, and sustainable growth.

- For the academic community, this study extends the operations strategy literature from its traditional manufacturing context into the complex, institutionally embedded domain of banking services. The integration of market requirements (derived from the five generic performance objectives) with resource capabilities (mapped to four operational decision domains) within a single matrix framework offers a replicable methodology that can be adapted to other service industries and country contexts. Future research should subject the proposed strategies to empirical validation through: (a) field experiments or quasi-experimental designs comparing NPL trajectories in branches that adopt matrix-based strategies versus control branches; (b) simulation studies that stress-test the matrix under alternative macroeconomic scenarios (e.g., persistent inflation above 40%, sharp currency depreciation, sanctions intensification or relief); and (c) comparative studies that apply the matrix framework to banking systems in other emerging economies, particularly those with significant Islamic banking segments, to assess the generalizability of the strategy prescriptions.

In summary, credit risk management is not a one-time diagnostic exercise but an ongoing strategic process that must co-evolve with macroeconomic conditions, technological capabilities, and institutional constraints. The operations strategy matrix proposed and operationalized in this study offers a practical, academically grounded, and institutionally sensitive tool for navigating this complexity. Its ultimate value, however, will be determined by the rigor with which it is tested, adapted, and refined through sustained engagement between researchers, practitioners, and regulators.

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