Evaluation of Financial Technology (FinTech) Indicators Using a Mixed-Methods Approach in the Banking Industry

Peyman Mosayebi [1],Safiyeh Mehrinejad*[2], Mehrzad Minoei[3], Azadeh Mehrani[4]

1.Department of Industrial Management, Central Tehran Branch, Islamic Azad University, Tehran, Iran.
2. Department of Financial Management, Central Tehran Branch, Islamic Azad University, Tehran, Iran (Corresponding Author).
3. Department of Financial Management, Central Tehran Branch, Islamic Azad University, Tehran, Iran.
4. Department of Financial Management, Nowshahr Branch, Islamic Azad University, Nowshahr, Iran.

*** Corresponding author email address**: s.mehrenejad@gmail.com

Received: 2024-09-13 **Reviewed:** 2024-09-26 **Revised:** 2024-10-28 **Accepted:** 2024-11-15 **Published:** 2024-12-31

Abstract

The purpose of this study is to evaluate the indicators of Financial Technologies (FinTech) using a mixed-methods approach in the banking industry. This research is applied in nature and descriptive-analytical in terms of methodology, conducted through a cross-sectional survey. The research employs an exploratory mixed-method approach, combining qualitative (Delphi method) and quantitative (Importance-Performance Analysis) techniques. The statistical population of the study consists of two groups: the qualitative group includes banking experts with doctoral degrees in financial management and information and communication technology, while the quantitative group comprises an unlimited number of customers from the banking industry. A purposive sampling method was used, with a sample size of ... determined for the qualitative group, and 384 participants for the quantitative group based on Cochran's formula. Based on semi-structured interviews, the desired components were identified using thematic analysis. In the quantitative section, partial least squares (PLS) regression was used to determine the relationships between variables and their associated importance coefficients, with Importance-Performance Matrix Analysis used for component ranking. Based on Delphi results, a researcher-made questionnaire was applied in the quantitative phase. Excel software was used in the qualitative section, while SMARTPLS was utilized in the quantitative phase. Banks' goals and planning based on FinTech, considering the rapid changes in the market and customer needs, should be designed to adapt to these changes and innovations. Strategic planning based on FinTech helps banks to remain flexible in the face of new market challenges and opportunities, paving the way for their success.

Keywords: *Financial Technologies (FinTech), Mixed-Methods Approach, Banking Industry*.

How to cite this article:

Mosayebi P , Mehrinejad S, Minoei M, Mehrani A. (2024). Evaluation of Financial Technology (FinTech) Indicators Using a Mixed-Methods Approach in the Banking Industry. Management Strategies and Engineering Sciences, 6(5), 52-58.

1. Introduction

Indicators are crucial for banks as they help them leverage FinTech capabilities to improve services, increase operational efficiency, and enhance cust[1]omer experience. Generally, these indicators can be divided into six main categories: transaction security, payment system efficiency, accessibility and usability, innovation in services, data quality and analytics, and convergence with regulations and standards [2]. One of the most important indicators in the banking institutional environment is transaction security. With the expansion of the use of financial technologies, ensuring security in the transfer of information and the execution of transactions has become one of the primary priorities for banks [3]. This indicator involves assessing the level of data protection, preventing unauthorized intrusions, and using advanced encryption protocols to ensure the security of transactions. Banks must continually strive to reduce potential risks and build customer trust by using modern security technologies such as blockchain and two-factor authentication [4]. Indicators related to the efficiency of payment systems and accessibility to investment fund services are also of high importance. These indicators measure the speed, accuracy, and ease of conducting transactions in a digital environment. Fast and reliable payment systems enable customers to complete their transactions quickly and without issues, which is especially important in today's world where e-commerce and online shopping are rapidly expanding [5]. Additionally, access to investment fund services through various platforms, including mobile funds, internet funds, and ATMs, is part of these indicators that need to be improved to enable customers to easily benefit from financial services [6]. By utilizing big data analytics and artificial intelligence, banks can offer more personalized services to their customers and better meet their specific needs [7]. Moreover, new innovations such as open banking and the use of APIs allow banks to integrate their services with other platforms and software, creating a seamless experience for users. Finally, convergence with regulations and standards is another key indicator [8]. Banks must ensure that the financial technologies they use comply with financial regulations and international standards to avoid legal issues and uphold ethical principles. By evaluating and improving these indicators, banks can increase their productivity, enhance customer satisfaction, and establish their position in today's competitive market [9].

In recent years, FinTech has brought about significant transformations in the financial sector [10-12]. These transformations have impacted not only large banks and financial institutions but also small businesses and customers [7]. For example, the emergence of mobile payment platforms and digital wallets has simplified financial transactions for users [13]. Additionally, FinTech enables individuals and companies to obtain loans with better conditions or access diversified investments without intermediaries [14, 15]. An analysis of the role of big data in mortgage loans shows that banks can make better predictions about borrower behavior using big data, thereby reducing risk. Studies argue that FinTech negatively impacts the banking business [16, 17]. Due to strict regulations, traditional banks often cannot meet loan demand. The rise of online loans directly affects the business of investment funds in lending [8].

With the increase in the volume of financial data, the use of big data and data mining tools has become an essential need for analyzing investor behavior and market conditions. The wide-ranging developments in financial technology (FinTech) over the past decade have created unparalleled opportunities for improving the performance and efficiency of various sectors in financial markets, including investment banks in stocks. With the introduction of technologies such as blockchain, artificial intelligence, data mining, and digital platforms in the financial sector, the investment process in stock markets has changed significantly. These technologies have contributed to better investment decisions, cost reduction, and increased transparency, thereby improving the efficiency and performance of investment banks [18]. FinTech, relying on emerging technologies such as blockchain, artificial intelligence, and machine learning, provides greater security and speed in financial transactions [19]. In recent years, FinTech has created major transformations in the financial sector [12]. These transformations have influenced not only large banks and financial institutions but also small businesses and customers [7]. For example, the emergence of mobile payment platforms and digital wallets has made financial transactions much simpler for users [6]. Additionally, FinTech enables individuals and companies to obtain loans under better conditions or access diversified investments without intermediaries [14].

Other studies argue that FinTech has a negative impact on the business of asset management. Due to strict regulations, traditional banks usually cannot meet loan demands. The increase in online loans directly impacts the business of

investment funds in lending [20]. For example, Buchak et al. (2018) found that FinTech accounted for 30% of the growth of shadow banking in the United States, and FinTech lenders in the shadow banking sector have grown in the mortgage market, reducing the market share of traditional banks [21]. Qiu et al. (2018) also stated that the development of FinTech increases debt costs, which in turn raises the risk of investment fund assets [22]. Another important aspect of FinTech is its impact on improving transparency and reducing costs in financial systems. With the use of blockchain, transactions are conducted transparently and at lower costs, increasing trust between parties [23]. Moreover, investment banks, as one of the important financial tools, require the use of modern technologies to optimize data analysis, manage risk, and enhance performance. By utilizing FinTech, these banks can obtain more accurate information about market behavior and related risks. Additionally, financial technology, by creating better communication platforms, allows faster interactions with investors and financial partners, thereby increasing the speed of response to market fluctuations and sudden changes [24]. One of the major issues in the performance of investment banks is risk management and sustainable returns. Technologies such as artificial intelligence and machine learning allow bank managers to analyze and predict complex market patterns [25]. On the other hand, blockchain, by providing a secure and transparent platform for transactions, helps reduce operational errors and cut administrative costs, thereby increasing investor trust. These technologies, by providing advanced analytical capabilities, can play a crucial role in optimizing the performance of banks and attracting new investors [26, 27]. However, few studies have examined the role of financial technologies (FinTech) in the institutional environment of funds, primarily offering descriptive analysis of the potential opportunities and threats, and focusing on the relationship between specific technologies and financial performance of banks [9, 19]. Campanella et al. (2017) demonstrated that the relative equity of banks is linked to the development of the Internet of Things (IoT) [3]. Uddin et al. (2020) state that investments in information technology impact the volatility of net income and the capital buffer of a fund, both of which decrease if investments exceed threshold levels [13]. Rega (2017), in a study of 38 European funds for the period 2013-2015, investigates the relationship between FinTech and profitability and shows that the profitability of funds, measured by equity, is significantly positively correlated with FinTech innovation [28]. However, the literature is still lacking a comprehensive empirical analysis of identifying and evaluating the indicators of financial technologies (FinTech) in the institutional environment of funds, and this aspect has largely been neglected in research conducted in the country.

2. Methodology

The nature of the research follows an exploratory mixed-method approach, integrating qualitative methods. In the present study, thematic analysis was used to analyze qualitative data. The process of analyzing qualitative data begins when the researcher identifies and considers meaningful propositions and phrases related to the topic. This analysis starts by reviewing and repeatedly studying the data, and after identifying the meaningful propositions relevant to the research topic, coding is applied. The process of data analysis involves four stages: preparation, familiarization, coding, and deriving main categories. For the quantitative part of the study, the SmartPLS software was utilized.

3. Findings and Results

Table 1 presents the results of the Delphi method based on the opinions of 20 experts:

Table 1. Identification of Overarching Themes

Construct	Primary Theme	Initial Code
Performance Management	Security	Customer information protection, encryption of sensitive data, management of security risks.
	Performance Evaluation	Performance evaluation system, response time, transactions per hour, successful transaction rate, processing speed, transaction efficiency, internal process performance improvement.
	Risk Management	Evaluation of the bank's ability to manage and reduce risk, prevention of cyber theft, prediction of hacker attacks, understanding of local security risks, technology-dependent performance, legal risks.
	Cost Management	Initial costs, maintenance costs, unforeseen expenses.
	Regulations and Compliance	Banking regulations, ensuring privacy compliance, localization of fintech and Islamic banking laws, customer protection laws.

Fintech Efficiency in the Banking Industry	Digital Payments	Credit and debit cards, mobile payments, online payments, online money transfer, complex financial operations online.
	Online Credit Facilities	Loan and credit facility management processes, online loans, online credit, credit lines linked to credit cards.
	Blockchain-Based Financial Services	International cryptocurrency transactions, issuance of digital securities such as tradeable tokens, blockchain encryption.
	Credit Scoring and Identity Verification	Credit scoring using biometric recognition, two-factor identity verification, facial recognition, biometric feature recognition, restricted access to information, hierarchical access control, digital encryption and encoding, digital identity and digital signature.
Customer Identification	Customer Characteristics	Demographic features, behavioral characteristics, income level, mental patterns in technology adoption, country and place of residence, family size, customer social status.
	Individual Characteristics	Risk aversion, perceived information security, perceived quality, instability of digital business culture, mass behaviors in the financial sector, fintech knowledge gaps, traditional societal thinking, perceived value, slow societal trust building, openness to innovation, emotional intelligence, susceptibility to shame.
	Customer Banking Experience	Previous experience, bank brand quality, brand recognition, commitment to the bank, perceived efficiency, customer loyalty.
Fintech Implementation Infrastructure	Fintech Infrastructure Setup	Procurement of necessary software and hardware, electronic customer relationship management, learning from successful global models, increasing bank knowledge in fintech, securing organizational resources, creating fintech advisory teams, defining digital process protocols.
	Cultural and Social Conditions	Public attitude toward new technologies, customer trust, customer awareness level, social attitudes towards fintech, customer readiness for fintech.
	Political and Regulatory Conditions	National regulatory status, implementation of international legal requirements, banking and regulatory compliance requirements, Iran's absence in international trade, political and economic sanctions.
Bank Objectives and Strategic Planning Based on Fintech	Profitability	Reducing operational costs, reducing personnel costs and physical branch space, creating competitive advantages, digital transformation of the banking industry, increasing bank revenue and financial profitability, facilitating the digital economy, creating a positive competitive environment in the banking industry, smart banking and aligning with global trends, customer-centric approach based on international standards, increasing digital banking industry growth, improving digital trade conditions, empowering human resources, international standardization, opportunities for international banking models.
	Customer Satisfaction	Retaining current customers, attracting new customers, gaining customer trust, creating word-of-mouth marketing among customers, increasing customer loyalty.

In the present study, for the quantitative part, Structural Equation Modeling (SEM) techniques, specifically Partial Least Squares (PLS), were used to test the measurement model and the research hypotheses. PLS software is advantageous as it is less dependent on sample size, does not require data normality, and focuses on maximizing variance, making it more suitable for real-world applications compared to software like LISREL and AMOS.

Once the measurement models are validated through reliability tests, convergent validity, and discriminant validity, the results from the structural model can be presented. In the structural part of the model, unlike the measurement models, explicit variables and questions are not considered; only latent variables and their relationships are examined. To evaluate the goodness-of-fit of the model, various fit indices, including the R^2 statistic, F^2 effect size, and Q^2, are utilized.

The R^2 coefficient is used to connect the measurement and structural components of Structural Equation Modeling and represents the amount of variation in each dependent variable that is explained by independent variables. A crucial point here is that R^2 is calculated only for endogenous (dependent) constructs, and for exogenous constructs, the value of this statistic is zero. The higher the R^2 value for the endogenous constructs in a model, the better the model fit. Chin (1998) defined values of 0.19, 0.33, and 0.67 as weak, medium, and strong model fit, respectively. Based on the results of the R^2 coefficient, the endogenous constructs of the research model are deemed satisfactory. The R^2 value for the dependent components indicates that 47% of the variance in the model's variables is explained by the combined effects of independent and dependent variables, which is strongly acceptable.

The Goodness-of-Fit (GOF) index pertains to the overall fit of Structural Equation Models. This criterion allows researchers to assess the overall fit of the model after evaluating the fit of both the measurement and structural components. The GOF index was developed by Tenenhaus et al. (2005), and in this study, a value of 0.576 was obtained, confirming the model's adequacy based on the GOF.

The F^2 effect size is another fit index for the structural part of the model and applies to exogenous independent

variables. The F^2 effect size index was introduced by Jacob Cohen (1988), and it is also discussed in the context of Cohen's guidelines. The F^2 index indicates the change in the estimation of a dependent variable when the effect of a specific independent variable is removed. According to Cohen, values of 0.02 (small), 0.15 (medium), and 0.35 (large) are used to interpret the size of the effect. To calculate the effect size, the R^2 coefficient is first computed considering the effect of the independent variable of interest, and then the same calculation is repeated after removing its effect. The computed value is interpreted based on Cohen's suggested thresholds. In this study, a value of 0.511 indicates a good model fit.

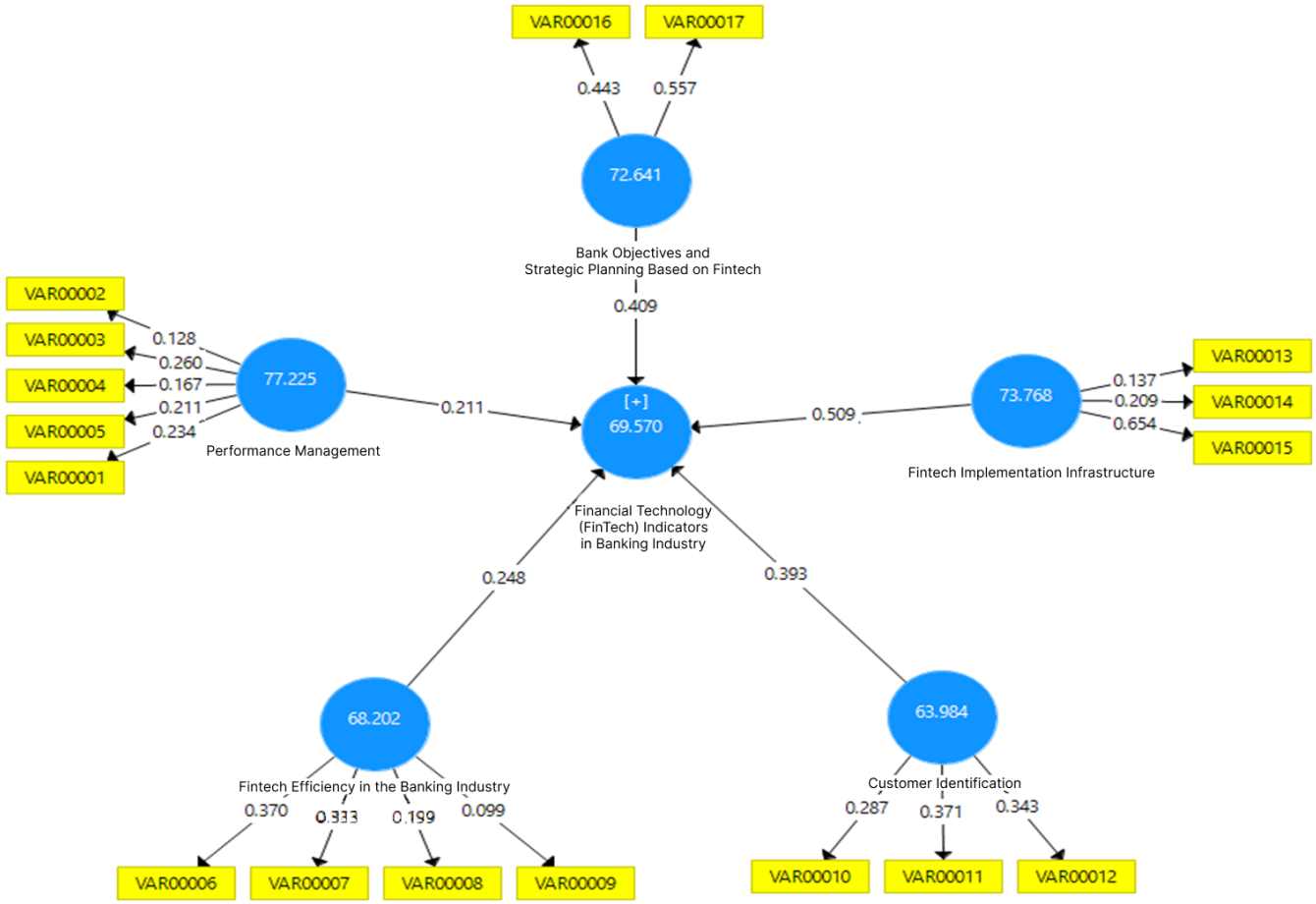

Figure 1. Main Structural Model of the Study

4. Discussion and Conclusion

Fintech in the banking industry, as another fundamental component, plays a crucial role in improving the quality of banking services and increasing customer satisfaction. Fintech technologies, by providing innovative and efficient solutions, enable banks to deliver financial services more quickly and at lower costs. This leads to increased competitiveness in the market and the attraction of new customers. Additionally, the efficiency of fintech can help banks manage financial risks and reduce operational costs, which improves their overall performance. Therefore, investing in fintech and effectively utilizing these technologies can assist banks in achieving their strategic goals and increasing their market share.

In the model for evaluating financial technologies (fintech) in the banking industry, the roles of key components such as performance management, fintech efficiency in the banking industry, customer identification, fintech implementation infrastructure, and bank objectives and planning based on fintech are highly important and decisive. In this model, performance management, as one of the core elements, plays a key role in measuring and evaluating the impact of fintech on the productivity and efficiency of banks. Performance management, through the precise analysis of data and continuous evaluation of

operational processes, allows for the identification of strengths and weaknesses of fintech in banks. This component helps banks optimize their performance and develop appropriate strategies to improve efficiency and productivity in complex and competitive environments.

Customer identification and fintech implementation infrastructure are fundamental factors in the success of the fintech evaluation model in the institutional banking environment. By using big data and complex analytics, customer identification enables banks to more accurately and personally understand customer needs and offer services tailored to those needs. This not only leads to increased customer satisfaction but also enhances customer loyalty. Additionally, fintech implementation infrastructure, including modern information and communication technologies, plays a critical role in the effective deployment of fintech in banks. These infrastructures enable banks to manage financial processes securely and efficiently, preventing security issues from arising. Furthermore, bank objectives and planning based on fintech, considering rapid changes in the market and customer needs, must be designed to adapt to new changes and innovations. Strategic planning based on fintech helps banks remain flexible in the face of market challenges and opportunities, thereby paving the way for their success.

- **Increasing Data Security**: Establishing secure and stable infrastructures using encryption technologies to protect customer information and sensitive data is of utmost importance.
- **System Updates**: Software systems and financial technology infrastructures must be regularly updated to remain compatible with technological changes and market needs.
- **Increasing Scalability**: By developing scalable execution infrastructures, banks can easily optimize and adapt these infrastructures as they grow and attract more investors.
- **Creating Accurate Customer Profiles**: Collect and analyze detailed information about customer behavior and needs, using it to design more suitable products and services.
- **Developing Personalized Services**: By leveraging customer data, provide services that specifically address each customer's needs, increasing their attractiveness.
- **Continuous Communication with Customers**: Use digital platforms to maintain continuous communication with customers and incorporate their feedback to improve the fund's performance and products.
- **Improving Regulatory Compliance**: Use advanced technologies such as artificial intelligence to comply with financial laws and regulations, reducing legal and compliance risks.
- **Employee Training**: Educate bank employees on new financial technology skills so they can make better use of fintech tools and enhance productivity.

Authors' Contributions

Authors equally contributed to this article.

Acknowledgments

Authors thank all participants who participate in this study.

Declaration of Interest

The authors report no conflict of interest.

Funding

According to the authors, this article has no financial support.

Ethical Considerations

All procedures performed in this study were under the ethical standards.

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