Evaluate factors affecting the improvement of banking operations (Case study: Maskan bank)

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Abstract

Banks always measure different factors in different ways to improve their performance. There have always been various types of research in the field of increasing and improving the performance of banks. In this paper, by using interpretive structural modelling, we try to examine the evaluated criteria in determining the performance of banks. We have examined eight factors, including employee productivity, deposit amounts and the number of deposits, the amount of granted facilities and the number of granted facilities, satisfaction with electronic banking services, the added value of housing prices, and the percentage of facilities paid for housing construction to predict the performance of Maskan Bank. The proposed method is a qualitative method that uses the opinion of 3 experts and the mode of experts' answers to the researcher's questionnaire, we are trying to provide a suitable model to determine the effective factors in improving the performance of banks. The results showed that the amount of granted facilities and satisfaction with electronic banking services were at the minimum level and were not affected by other factors. The added value of the housing price and the percentage of facilities paid for construction with the satisfaction of electronic banking services and the amount of granted facilities have a direct and bottom-up relationship, that is, the percentage of facilities paid for construction and the added value of housing prices are influenced by the satisfaction of electronic banking services and the amount of granted facilities. The amount of deposits is directly related to the percentage of granted facilities for construction and the added value of the housing price, that is, the amount of deposits is affected by the percentage of facilities paid for construction and the added value of the housing price. The number of facilities has a direct and bottom-up relationship with the amount of deposits, that is, the number of facilities is affected by the amount of deposits. The number of deposits and employee productivity has a direct and up-down relationship with the number of facilities, that is, the number of deposits and employee productivity is influenced by the number of facilities.

Keywords: improvement of bank performance, Maskan bank, interpretive structural modeling
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1 Introduction

Banks play a decisive role in socio-economic development in any country from developed to developing countries. Banks also play a key role in the economy because they increase economic growth through the efficient allocation

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of financial resources. This role is well established by the stability of the financial system in the economy [12]. The efficiency of banks is a key factor in the success or failure of banks [3]. In the current situation where the banking sector is globally integrated, banks need to establish proper operations to avoid the possibility of failure. Operational efficiency is considered the company's ability to reduce operational costs in achieving its goal through the combination of people, processes, and appropriate technology. With the appropriate combination of resources, the business operations of any company increase the productivity of the services or goods provided [10].

Banks operate efficiently by directing savings from deposits to companies with high social and economic returns. After granting loans, banks monitor these resources to ensure effective and efficient use. On the other hand, banks that are inefficient in managing savings tend to reduce economic growth and society's welfare [2]. An efficient banking system enables financial resources to be channeled into the most productive sectors of the economy. This idea was proposed by [4] who believed that economic growth and high productivity are related to the efficiency of the financial system in the allocation of financial resources in the economy.

Today, the banking system of Iran known as the most important economic sector is subjected to several fluctuations and crises due to the increase in international sanctions. It has also faced these crises and is not prepared and resistant to economic crises. On the other hand, Maskan Bank is a state bank that has played an important role in the country's economy in areas such as investment, housing facilities, etc., and economic crises can also reduce banks' liquidity. Finally, the reduction of investment and the granting of facilities by Maskan Bank somehow affect the banking operations. Accordingly, this paper answers the main question of how the identified factors can improve Banks' performance, especially Maskan banks.

2 Theoretical foundations

2.1 Banking operations

The management of equipping and allocating resources in the money market is called banking. A set of activities in banking operations, including policy making, planning, organization, and implementation is called the banking system [1].

2.2 Banking resources

Bank resources are all the funds that individuals, whether real or legal, deposit with banks under the headings of visual or non-visual deposits. There are different ways to provide bank resources. These resources have different types, which include short-term resources of funds, current accounts and deposit accounts, long-term investment deposits, foreign currency deposits, borrowed funds, and borrowed funds from the central bank [8].

2.3 Bank consumptions

Granting of facilities includes an important part of every bank's operation, which is important from an economic point of view economic growth and development are not possible without a small increase in the capital factor, and because it is not possible for all individuals to use personal financial facilities and resources to meet existing needs, so they inevitably turn to banks and financial and credit institutions. With their credit operations, banks enable the transfer of resources from people who are not directly willing or able to participate in economic activities, and also provide the collection of small resources of retail customers to people who need to provide or supplement capital to carry out economic affairs. It means that this will increase production and create employment in society [14].

3 Literature review

There are several empirical studies of bank efficiency that use panel data analysis that conclude that the average cost curve of US banks is relatively flat compared to European banks. Most empirical studies in Europe focus on cost functions using a single bank or country data. They found a U-shaped average cost curve and to some extent the existence of economies of scope [5]. The study [9] showed that bank efficiency in Taiwan improved after financial restructuring. This finding may be attributed to the improvement of the risk management process in the bank's operations. Financial restructuring in the banking system is said to increase competition, which in turn improves efficiency [18]. The efficiency market hypothesis states that achieving lower production costs enables banks to provide loans/credits at reasonable and affordable costs. This leads to an increase in market share as the bank develops competitive advantages over other banks.

Privatization in the banking industry increases competition, which in turn reduces operating costs [11]. This is because as competition in the industry increases, market share decreases. The concentration of banks causes the attraction of low deposits, which in turn increases the rate of loans to borrowers. This is also a sign of the operational inefficiency of banks. [13] found that bank concentration is negatively related to bank efficiency. The concentration of banks is considered in terms of competition in the banking industry. In theory, it is argued that bank concentration is negatively related to bank competition. Studies conducted by [6, 17], show that the bank's competition deficit is attributed to the information failure between borrowers and banks. Many studies conducted to determine the effect of bank concentration on bank efficiency show that bank concentration is positively related to bank efficiency. The reality behind this finding is that a large market share with well-differentiated products increases profitability, which in turn increases efficiency. Similarly, bank concentration arises due to increased market share as a result of bank efficiency. [10] study on the determinants of operational efficiency and total productivity using a sample of Cambodian financial institutions found that the efficiency of large institutions is higher and more stable than small institutions. Institutions with foreign capital accounting for more than half of the total capital are significantly inferior to local institutions in terms of overall performance. Organizations that are more flexible and operationally stable can generate higher profits. More diverse institutions are more efficient. Healthy and diverse institutions tend to increase the total productivity of their agents. And some exogenous factors, such as the increase in household financial asset reserves and the improvement of economic infrastructure, helped to improve productivity change. These observations show that further improvement of Cambodia's financial institutions requires increased operational capacity, appropriate selection of foreign ownership, improved management health, and greater diversification. Using the added value approach and the operational approach, they found a positive and significant relationship between the bank's Z score and operational efficiency. This result is similar to [16] who investigated the efficiency of banks in developing countries and found that a favorable operating environment of the bank is a factor for the efficient generation of bank profits.

4 Research method

This is applied, descriptive and field research. Data was collected using library sources and field methods. The library review examined the theoretical foundations and literature, and the field method studied the information related to the investigation of research goals and questions. This is also a qualitative method paper with a content analysis approach. In the qualitative research method, the researcher is the active part of the study, and the success of qualitative research depends on the researcher's skill in establishing relationships with others. Observance of principles such as gaining the trust of others, maintaining good relations, respecting the norms of society, and mutual relations are of great importance in the success of qualitative research. A researcher should have the necessary communication skills including being tolerant, learnt to listen to others, and knows respect for human relationships, can carry out qualitative research. The statistical population of this research consists of 3 experts in the field of research who were selected using the snowball method and filled up the researcher-made questionnaire.

First, to start analysis, it is necessary to code the indices. Table 2 shows the indices approved by the experts in the form of abbreviations to form the structural self-interaction matrix. At this stage, the opinions of 3 experts about the relationship between indices are compared according to Table 1. For this purpose, the mode index is used in such a way that among the four possible relationships between the indices, the relationship that has the most frequency according to experts will be included in the final table. Accordingly, the final structural self-interaction matrix is calculated. The dimensions of the variables of the matrix are listed in the first row and column respectively. Then the covariances of the variables are specified by symbols. The structural self-interaction matrix is formed based on the discussions and opinions of the group of experts, which is suggested to be used to determine the type of relationships based on various management techniques, including brainstorming and nominal group techniques, etc.

Table 1: Conceptual relationships in the formation of the structural self-interaction matrix

Symbol description	Symbol
i leads to j (row leads to column)	V
j leads to i (column leads to row)	A
There is a two-way relationship between i and j	X
There is no valid relationship	O

Then, the access matrix can be formed by converting the relationship symbols of the structural matrix to the numbers zero and one based on Table 3. The way to convert these symbols into the assigned conceptual symbols based on the mode index is to convert them into scores 0 and 1 according to the definition of the conceptual relations

Table 2: Abbreviated coding of approved indices

Symbol	Index	Symbol	Index
C5	Number of facilities	C1	Employee productivity
C6	Satisfaction with electronic banking services	C2	Amount of deposit
C7	Added value of housing prices	C3	Number of deposits
C8	Percentage of facilities paid for construction	C4	The amount of the facility granted

of previous numbers. In the following table, the power of influence and the power of dependence are formed. According to Table 3, the score matrix of the panel members can be obtained from the self-interaction matrix.

Table 3: Convert conceptual symbols to quantitative numbers

Convert conceptual symbols to quantitative numbers	Conceptual symbol
The cell corresponding to this pair is placed in the access matrix with the number 1 and its relative cell with the number 0.	V
The cell corresponding to this pair is placed in the access matrix with the number 0 and its relative cell with the number 1.	A
The cell corresponding to this pair is placed in the access matrix with the number 1 and its relative cell with the number 1.	X
The cell corresponding to this pair is placed in the access matrix with the number 0 and its relative cell with the number 0.	O

The algorithm used in this research includes the following steps:

1. Calculating input efficiency scores $\hat{\delta}_i$ based on data coverage analysis for each bank using linear programming in relation (4.1). At first, it is assumed that there are k input and M output data for N banks. The bank name, the input and output are respectively represented by the vectors y_i and x_i. The model used to measure efficiency is defined as follows:

$$\delta_i = \min_{\delta_i, \lambda} \left\{ \delta > 0 \,\middle|\, \delta_i y_i \leq \sum_{i=1}^n y_i \lambda; x_i \geq \sum_{i=1}^n x_i \lambda; \lambda > 0 \right\}, \quad i = 1, ..., n \tag{4.1}$$

Where, y is the bank's outputs vector (total loans, investments and non-interest income), x is the bank's inputs vector (total deposits, capital and personnel expenses) and λ is the $N \times 1$ from the constants. The $\hat{\delta}_i$ measure is the technical efficiency score (technical) for bank i. $\hat{\delta}_i = 1$ indicates a technically efficient bank, while $1 < \hat{\delta}_i$ indicates an inefficient bank.

2. Applying the maximum likelihood method to estimate discontinuous regression $\hat{\delta}_i$ on Z_i to provide an estimate of $\hat{\beta}$ and β an estimate of $\widehat{\sigma_S}$ from σ_S.

3. For each bank, $i = 1, ..., n$ is repeated B times in four steps (a to d) until a set of bootstrap estimates ($\{b = 1, ..., B\}$)$\hat{\delta}_{i,b}^*$ is obtained.

   (a) Extraction ε_i from left-truncated normal distribution with 0 mean and variance $\widehat{\sigma}_\varepsilon^2$ in $(1 - \widehat{\beta} Z_i)$
   (b) Calculate $\delta_i^* = \hat{\beta} z_i + \varepsilon_i$
   (c) Construction of pseudo-data sets $x_i^* = x_i$ where, (x_i^*, y_i^*) and $y_i^* = y_i \hat{\delta}_i / \delta_i^*$
   (d) Calculate new estimate of δ_i^* and envelopment analysis of data on pseudo-datasets (x_i^*, y_i^*)

4. Calculate bias-corrected estimates $\hat{\hat{\delta}}_i = \hat{\delta} - \widehat{bias}_i$ per bank $\widehat{bias}_i$ bootstrap estimation obtained from the bias $\widehat{bias}_i = \frac{1}{B} \sum_{b-1}^B \hat{\delta}_{i,b}^* - \hat{\delta}_i$

5. Using maximum likelihood method to estimate truncated regression $\hat{\hat{\delta}}_i$ Provide on z_i, an estimate $(\beta \cdot \sigma_\varepsilon)$ from $(\widehat{\hat{\beta}}, \widehat{\hat{\sigma}})$.

6. Repeating the following three steps B2 times in order to obtain a set of bootstrap estimates $\left[\left(\widehat{\hat{\beta}}_b^*, \widehat{\hat{\sigma}}_b^*, b = 1, ..., B_2 \right) \right]$

   (a) Extract ε_i from normal distribution truncated from the left with mean. and variance $\hat{\hat{\sigma}}$ at $i = 1, ..., n$ for $(1 - \widehat{\hat{\beta}} Z_i)$
   (b) Calculate $i = 1, ..., n$ for $\delta_i^{**} = \widehat{\hat{\beta}} z_i + \varepsilon_i$
   (c) Reusing the maximum likelihood method to estimate truncated regression δ_i^{**} on Z_i to estimate $(\beta, \sigma_\varepsilon)$ from $(\widehat{\hat{\beta}}^*, \widehat{\hat{\sigma}}^*)$

7. Using bootstrap results to create confidence intervals

5 Research findings

First, according to the described method, the self-interaction matrix of experts' opinions is expressed. Table 4 shows the self-interaction matrix.

Table 4: Self-interaction matrix

Research variables	C1	C2	C3	C4	C5	C6	C7	C8
(C1)		A		A	O	O	A	O	O
(C2)		O			A	A	O	O	A
(C3)		A				A	A	O	A
(C4)		V					O	X	X
(C5)		A						O	A
(C6)		O							O
(C7)		V							
(C8)									

Now according to Table 3, the scores of the panel members are determined, which is shown in Table 5.

Table 5: Determining the scores of the panel members

Research variables	C1	C2	C3	C4	C5	C6	C7	C8
(C1)	1	0	0	0	0	0	0	0
(C2)	1	1	0	0	0	0	0	0
(C3)	1	1	1	0	0	0	0	0
(C4)	0	1	1	1	1	0	1	1
(C5)	1	1	1	0	1	0	0	0
(C6)	1	0	1	0	1	1	0	0
(C7)	0	0	0	1	0	0	1	1
(C8)	0	1	1	1	1	0	0	1

In this section, to determine the relationships between the variables, the output set, the input set, and the common elements should be identified first. The score for determining the level and priority of the variables, the access set, and the prerequisite set are determined per variable. The access set of each variable includes the variables that can be reached through this variable; however, the prerequisite set includes the variables according to which this and the prerequisite of the variable can be reached. Then, the commonality of the access settings of all factors is determined, and if the access set is the same as the commonality set of that factor (factors), it is considered the priority level. The level refers to the designed layers of the final model.

To obtain other levels, the previous levels must be separated from the matrix and the process repeated. After determining the levels again, the received matrix is arranged in the order of the levels, and the new matrix is called a conical matrix.

Table 6: Output set of indices

	Dependency coefficient	Penetration coefficient	Input	Output	Common elements	Score	Level
(C1)	1	5	1	1,2,3,5,6	1	4	5
(C2)	2	4	1,2	2,4,5,8	1,2	2	3
(C3)	2	5	1,3	3,4,5,6,8	3	4	5
(C4)	6	3	2,3,4,5,7,8	4,7,8	4,7,8	0	1
(C5)	4	4	1,2,3,5	4,5,6,8	5	3	4
(C6)	4	6	1,3,5,6	6	6	0	1
(C7)	3	2	1,7,8	4,7	7	1	2
(C8)	5	3	2,3,4,5,8	4,7,8	4,8	1	2

In this step, the set of output and input for each variable is obtained using the final access matrix. The set of output and input for a variable is defined as follows.

The output set for a specific dimension/component consists of that variable itself along with other variables that are influenced by it, in other words, the variables that can be reached through this variable. For each variable, the input set includes that variable itself along with other variables that affect it, and finally, the common elements refer to the shared dimensions of the output set and the inputs of the variables in the interpretive- structural model as a high-level variable. In other words, these variables are not effective in creating any other variables. After determining the output elements, input elements, and common elements, the index that has the same output elements and common elements is determined as the first level. After determining this level, we remove that index and check the same indices of input and common elements and select it as the next level. This operation is repeated until the components of all levels of the system are determined. According to Table 6, the factors (C6 and C4) i.e. the factors of satisfaction with electronic banking services and the amount of granted facilities are at level 1. To determine other levels, other levels are determined by checking the sameness of output elements and common elements.

At this stage, the research model is presented according to the levels of variables and the final access matrix. In this research, the factors are placed in 5 levels, the highest level is the factors of employee productivity and the number of deposits, and the lowest level is satisfaction with electronic banking services and the amount of granted facilities. It should be noted that factors that are at a higher level are less effective and are more influenced by factors at lower levels. Lower level factors are considered as basic infrastructure and foundation. Other relationships are specified in Figure 1.
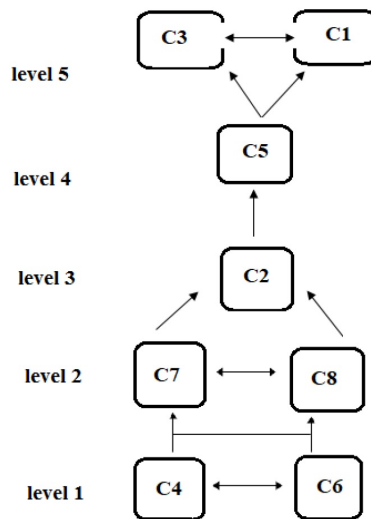

Figure 1: Structure-interpretive model of indices

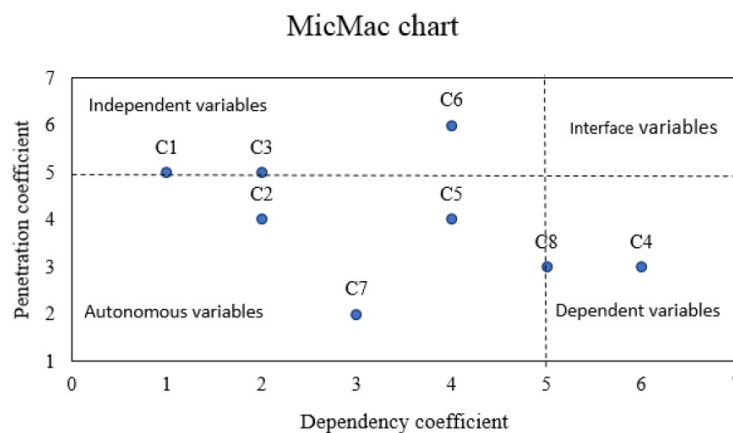Next, the face analysis MicMac chart is shown in Figure 2.

Figure 2: MicMac

The autonomous variables have a low degree of dependence and guiding power. These criteria are generally separated from the system because they have a weak relationship with the system. A change in these variables does

not cause a serious change in the system. The dependent variables have strong dependence and weak direction, these variables are highly influenced by the system and have less influence on the system. Independent variables have low dependence and high directivity, in other words, they are less influenced by the system and highly influence on the system. The interface variables have high dependence and high directing power, in other words, the effectiveness of these criteria is very high, and any small change in these variables causes fundamental changes in the system.

Table 7: Basic models of DEA(BCC and CCR)

Orientation	Primal	Dual
Being input-oriented	Max $\quad z = uy_j - (u_j)^*$ s.t. $\quad vx_j = 1$ $-vX + uY - (u_je)^* \leq 0$ $v \geq 0, u \geq 0, (u_j \text{ free in sign})^*$	Min $\quad \theta$ s.t. $\quad \theta x_j - X\lambda \geq 0$ $Y\lambda \geq y_j$ $(e\lambda = 1)^*$ $\lambda \geq 0$
Being result oriented	Min $\quad z = vx_j - (v_j)^*$ s.t. $\quad uy_j = 1$ $vX + uY - (v_je)^* \geq 0$ $v \geq 0, u \geq 0, (v_j \text{ free in sign})^*$	Max $\quad \eta$ S.t. $\quad x_j - X\lambda \geq 0$ $\eta y_j - Y\lambda \leq 0$ $(e\lambda = 1)^*$ $\lambda \geq 0$

There are two approaches to obtaining efficiency scores. The first is to be input-oriented or to minimize input under the condition of output stability, and the second is to be output- oriented or to maximize output under the condition of input stability. In this paper, input minimization orientation is used based on the assumption that during the period under study, banks strategically emphasize reducing (or minimizing) costs. It is worth mentioning that the analytical model covering the data can be estimated using the assumptions of both constant return to scale and variable return to scale, but because the economic conditions and the conditions of banks are usually not the same in the study, the assumption of variable returns to scale is used.

In the second step, Daouia et al. [7] present the following model to consider the effect of environmental variables on efficiency.

$$\hat{\delta}_i = Z_i\beta + \varepsilon_i$$

where, $\hat{\delta}_i$ is the corrected estimates of bank i efficiency scores in time, Z is a vector of environmental variables that explains the productive efficiency among the investigated banks, and β is a vector of parameters and ε_i is a statistical error, and it is assumed that it has zero mean, σ_ε^2 variance and is independent of Z_i.

Daouia et al. [7] point out that simple regression models can lead to problems of correlation and dependence of performance scores that may violate the assumption of regression that is ε_i independent of Z_i. The importance of the method of Daouia et al. [7] is that it creates unbiased estimates $\widehat{\delta_I}$, thus creating valid estimates of the parameters of the regression model [15].

6 Conclusion

Figure 1 shows that the two factors of satisfaction with electronic banking services and the amount of granted facilities are not dependent on other variables and are at the lowest level, which is a natural thing because the macro policies of Maskan Bank and the bank's investment and decisions by the senior managers of this bank are involved, so it can be said that these issues are far from the main topic of this paper and these factors are recommended to be addressed in further research. In the second level, there are the factors of the percentage of facilities paid for construction and the added value of the housing price, which are related to the first level. It can be argued that the added value of the housing price and the percentage of the facility paid to the bank both originate from the first level

and the amount of the facility granted has a direct effect on the added value of the price, as well as the percentage of the facility paid for construction originates from satisfaction. It is the demand of customers from the bank and also the added value of housing prices. In the third level, the only factor is the amount of the deposit, and the relationship between this level and the previous level can be expressed as follows: the demand for receiving facilities is dependent on the added value of the housing price, as well as the impact of the facilities paid for construction, which is the creation of deposits and the amount of the deposit. It has a direct impact on the amount of facilities received from customers. The fourth level is the number of facilities, which indicates that the amount of deposits is directly related to the number of bank facilities. At the last level, there is the number of deposits and employee productivity, which are affected by all their previous levels. The higher the number of facilities, the more the number of bank deposits, and also one of the criteria for evaluating the performance of bank employees is the increase in the number of bank deposits. The main goal was to investigate the effective factors in increasing the performance of the bank, and eight criteria were evaluated in this research. The relationship between these variables can be expressed that the amount of granted facilities and satisfaction with electronic banking services are at the lowest level and are not affected by other factors. The added value of the housing price and the percentage of facilities paid for construction with the satisfaction of electronic banking services and the amount of granted facilities have a direct and bottom-up relationship, that is, the percentage of facilities paid for construction and the added value of housing prices are influenced by the satisfaction of electronic banking services and the amount of granted facilities. The amount of deposits is directly related to the percentage of granted facilities for construction and the added value of the housing price, that is, the amount of deposits is affected by the percentage of facilities paid for construction and the added value of the housing price. The number of facilities has a direct and low-to-high relationship with the amount of deposits, that is, the number of facilities is affected by the amount of deposits. The number of deposits and employee productivity has a direct and up-down relationship with the number of facilities, that is, the number of deposits and employee productivity is influenced by the number of facilities.

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