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Effective factors on the Fintech business models in the electronic payment: A DEMATEL-ISM-ANP approach

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A B S T R A C T

In recent years, fintech has received much attention due to the introduction of new technologies in banking and electronic payment. For financial service providers to compete in the industries, they should apply the business model as a conceptual framework to improve performance. The current research is exploratory and tries to identify the factors influencing fintech design in electronic payment using the Osterwalder business model. This study aims to integrate three methods named DEMATEL, ISM, and ANP from MCDM techniques. To analyze the identified factors affecting the design of fintech in electronic payment, the indicators were examined in terms of influence and effectiveness by the DEMATEL method, then the levels of influence and effectiveness of the factors were investigated using the interpretive structural modeling method. Finally, the network analysis method was used to prioritize the factors. The findings showed that recognizing and identifying electronic payment customers is the most effective among the factors, and determining the type of relationship with customers is the most impressionable factor. In addition, after ranking the factors, the type of relationship with customers was the first rank, and the criteria of the company's cost structure and revenue streams were determined as the second and third, respectively.

1. Introduction

In recent years, technological developments and financial innovations resulting from the Internet revolution have changed the financial services industry. Innovation in information technology has led to the emergence of efficient financial services called Fintech. Fintech or financial technology is a nascent, disruptive, competitive, and sustainable industry in the economic space. It refers to a field of financial services formed based on new technology to increase speed, reduce costs, and improve the quality of financial services (Moro-Visconti et al., 2020; Polasik et al., 2020). This industry includes various financial services and has different applications in banking, lending, insurance, international money transfer, Paytech or electronic payments based on technology, investment, and personal financial management. Traditional investment options often demand significant time and expertise for effective management. Fintech has revolutionized investing through robo-advisors—automated platforms using algorithms to tailor investment portfolios based on financial goals and risk tolerance. Moreover, Fintech firms prioritize cybersecurity, employing advanced encryption to safeguard user data and prevent fraud (Liang et al., 2022). Nevertheless, the development of Paytech organizations has received mainly more attention than other fields of Fintech (Gomber et al., 2017; Hill, 2018). The term Paytech is made from the combination of two words, payment and technology, and refers to the application of technology in payment, services related to national and international payment transactions, and economic transactions. Today, customers' expectations have changed, accompanied by the development of the Fintech market, and their needs have changed compared to the past. Disruptive technologies have changed businesses and industries, providing greater comfort and lower prices (Arslan et al., 2021). Payment systems and related services are among the most important things that can shake up banking businesses and intensify their competitive environment. Electronic payment and payment systems are essential to any country's economic and financial infrastructure and play a vital role in transferring financial transactions in the banking system (Slozko & Pelo, 2015). The need for a

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secure, efficient, and fast payment system has been ever-increasing since the early dot-com busts. In addition, in an unstable competitive environment, banks and financial institutions are always looking to reduce costs, and traditional banking is not as effective as it used to be. Introducing new payment methods has recently led to increased speed and reduced costs.

The primary purpose of businesses is to create and maximize profits for stakeholders. Therefore, survival and creating competition for an organization is a business model, and not having such a suitable model plays a destructive role in the failure of a company. A business model is usually considered a concept that shows how the business functions link the business's strategic and operational approaches (Al-Debei & Avison, 2010; Globocnik et al., 2020). The rapid expansion of science and technology and increased competitors in technology industries have changed the business environment. Organizations must adapt to rapid technological changes to survive and create a competitive advantage. The high speed of technology development and the need to create innovation in active business models in financial services have changed the financial system. In the realm of electronic payment systems within financial services, Fintech's business model aims to streamline transactions, offering benefits such as cost savings, time efficiency, enhanced security, and improved accuracy. Moreover, these rapid and innovative changes have revolutionized the business environment and reshaped their traditional models. Hence, for companies to rival with ones, they should apply a business model to improve the system performance (Osterwalder & Pigneur, 2010). They should design and evaluate its risks, viability, and feasibility in considering organizational architecture (Wirtz, 2020; Gilsing et al., 2022). The development of information and the advancement of financial technologies, which has resulted in the expansion of companies in the financial services segment, has also changed the structure of the traditional banks' business model (Arner et al., 2016). Fintech has a “technology spillover effect," applying information technology to create new opportunities for traditional banks and improve asymmetric information and inefficient loan allocation (Peng & Ke, 2022). The foundation of Paytech companies is the result of the dynamic development of digital technologies since 2000 (Gomber et al., 2018). Currently, there are various platforms in the field of electronic payment for transferring and receiving different amounts through the Internet. Each platform requires a conceptual tool called a model, which includes business elements and their relationships. This research investigates the effective factors and components in designing a business model in electronic payment. Various models have been introduced in the literature, and Osterwalder's business model has been selected (Viet et al., 2021).

The most critical questions of this path are as follows:
1- What are the main effective factors in the design of the Fintech business model in the field of electronic payment?
2- What is the influence of the main effective factors in designing the Fintech business model in electronic payment on each other, and how are they ranked?

For this purpose, after reviewing the background and theoretical literature, the research coherently presents the contents related to the business model, Fintech, and the electronic payment industry. Then, the effective factors are identified, and the indicators are examined by the DEcision-MAking Trial and Evaluation Laboratory (DEMATEL) method in terms of effectiveness. In the following, by using the ISM method, the factors' levels of influence and effectiveness will be investigated. Finally, the ANP technique will prioritize the factors. Although previous studies applied MCDM methods and fuzzy sets theory to examine Fintech models (Zeng et al., 2020; Zrobek et al., 2020), few studies have been conducted so far concentrates on Paytech business models using the integration of these approaches. The main contributions of this study are as follows: the first is to apply a quantitative decision framework to identify and rank critical factors of the Fintech business model design in electronic payment. Second, it is the first time to apply a hybrid method of MCDM techniques (including DEMATEL-ISM-ANP) to achieve a more accurate process.

The remaining parts of the study are as follows: the literature is reviewed in section 2. The research method is described in section 3. Section 4 is devoted to the results and discussion. Section 5 discusses managerial insights and practical implications. The last section of the research consists of the conclusion.

2. Literature Review

In recent years, significant changes occurring in the market have forced organizations to promote customer relationship management. Therefore, the managers are required to create competitive advantages via the business models. Bellman and Clark introduced the term business model more than fifty years ago in 1957 (DaSilva & Trkman, 2014). Since then, business models have been used in different ways along with the evolution of information technology (Wirtz et al., 2016). The business model concept describes the values and activities of a business and the organization's relationship with its customers, mainly from the business owner’s perspective (Priem et al., 2018). In other words, a business model describes the organization's customers and needs and how the company can provide value to these customers by making a profit (Foss & Saebi, 2017). In addition, to understand how a business creates value, there must first be a common understanding of the business model. Therefore, an understanding of the business model is needed to describe the business models with a common language and make the complexities of the organization's operation simple and comprehensible. Osterwalder's business model canvas is a tool that can express the logic of the business model and shows how the organization earns money through 9 components in a suitable and understandable language. This tool is the framework of a business model. It helps companies develop their organization's value proposition (Dijkman et al., 2015). It provides a way to design the

business model using a visual language, and as a conceptual map, it helps to analyze the structure and processes of the organization (Osterwalder & Pigneur 2010). In recent years, Fintech business models have upended the financial industry by applying technology to financial services. The term Fintech combines technology and financial services and refers to the use of technology in providing financial solutions. Fintech is one of the transformative and growing areas of the financial industry and describes companies that use the Internet and new technology to provide all financial products and services in an innovative, efficient, speedy, and low-cost manner (Voelpel et al., 2004; Snihur & Bocken, 2022). Fintech emerged after the global recession in 2008 and quickly became popular and noticed by customers by differentiating themselves from traditional banking systems. Some argue that due to this crisis, customers lost confidence in conventional banking systems, which is considered a driver for Fintech development. Fintech is an appropriate instance of novelty moving beyond regulation (Liu et al., 2020). Therefore, it can be said that the increasing importance of Fintech as a disruptive innovation and its presence in the financial and banking sectors can shake traditional financial markets. Fintech includes companies that try to change the traditional ways of paying, transferring money, lending, and investing (Sironi, 2016).

Nowadays, Fintech has influenced all areas of global financial systems. Payment technology, or Paytech, is one of the most essential branches of Fintech. It gives consumers ownership over solutions for funding and personal financial management (Siddiqui & Rivera, 2022). In recent years, the payment industry has undergone a fundamental transformation, with the emergence of the digital economy, increased payment transactions, and the traditional payment system of capitalist exchange dynamically changing (Chishti et al., 2020). Reviewing other research shows that most business model design research aims to reduce cost and waste and increase speed and efficiency. Due to the importance of designing a suitable business model, much research has been done (Lee et al., 2019). In Table 1, the research conducted in the field of electronic payment business model design is reviewed.

Table 1
Summary of Subjects of previous studies

Author(s)	Subject
Nalluri & Chen (2023)	Application of fintech to improve consumer financial satisfaction
Guo and Zhang (2023)	The impact of bank fintech on liquidity creation
Lv and Xiong (2022)	The effect of fintech on improving corporate investment efficiency
Nasfi et al. (2022)	The role of fintech in Sharia Rural Bank West Sumatra
Zhao et al. (2022)	Fintech, patents, and bank performance
Wang et al. (2021)	The effect of fintech on improving the commercial bank's efficiency based on big data
Le et al. (2021)	The spillover patterns between fintech and other asset classes under COVID-19
Wang et al. (2021)	Fintech development and bank risk-taking in China
Lee et al. (2021)	The interrelation between fintech and bank efficiency
Alkhazaleh and Haddad (2021)	The impact of fintech services delivery and customer satisfaction: A scenario of the Jordanian banking sector.
Agarwal and Zhang (2020)	Fintech, lending and payment innovation: A review
Tut et al. (2020)	Fintech and the COVID-19 pandemic: Evidence from electronic payment systems
Navaretti et al. (2018)	The relationship between fintech and banking
Wonglimpiyarat et al. (2017)	Fintech banking industry: A systemic approach.

As it is clear from the review of the research, many pieces of research have been done by researchers in the field of Fintech businesses and electronic payment. However, the uncertainty about implementing financial technologies raises an important question that needs to be answered. What is the impact of Fintech development in different areas of financial services, and how does improving efficiency in banking and electronic payment happen? As can be seen, the studies conducted by these sources are common in some cases and non-common in others. In multi-criteria decision-making, there are many methods through which much research has been done (Trivedi et al., 2023; Hashemkhani Zolfani et al., 2023). In this research, we have used a combination of DEMATEL methods, ISM, and ANP.

3. Methodology

This paper outlines an integrated three-step MCDM approach. To begin with, we determined and categorized the criteria based on the reviewed papers and expert opinions. The DEMATEL method considers the interaction between several criteria as a network in this framework. It is through the application of the DEMATEL approach, along with the establishment of a cause-and-effect table and a cross-relationship diagram, that a more robust analysis of the internal relationships between the main variables of the study can be derived (e.g., Agarwal & Zhang, 2020; Thakkar et al., 2022). Consequently, we developed a concise and transparent layered model, employing ISM. By utilizing this method, the factors affecting the subject under study are first placed at different levels. At each level of the hierarchy, the relationships between these factors are explained in detail to highlight their connections. Finally, the interconnections between the parameters involved in the process were explained using the network structure as the first step of the ANP approach. Then, the network structure and criteria are used to evaluate the factors' performance. The analytic network process aims to consider the interdependence among multiple variables. The relative importance of the criteria is calculated, and the outcome of this integrated approach is assessing the relative importance of criteria regarding their mutual relationships. This integrated approach is practical and

remarkable, combining two commonly applied decision-making tools: network modeling of cause-and-effect criteria and qualitative and quantitative criteria modeling simultaneously. The steps of this research method are shown in Fig. 1.

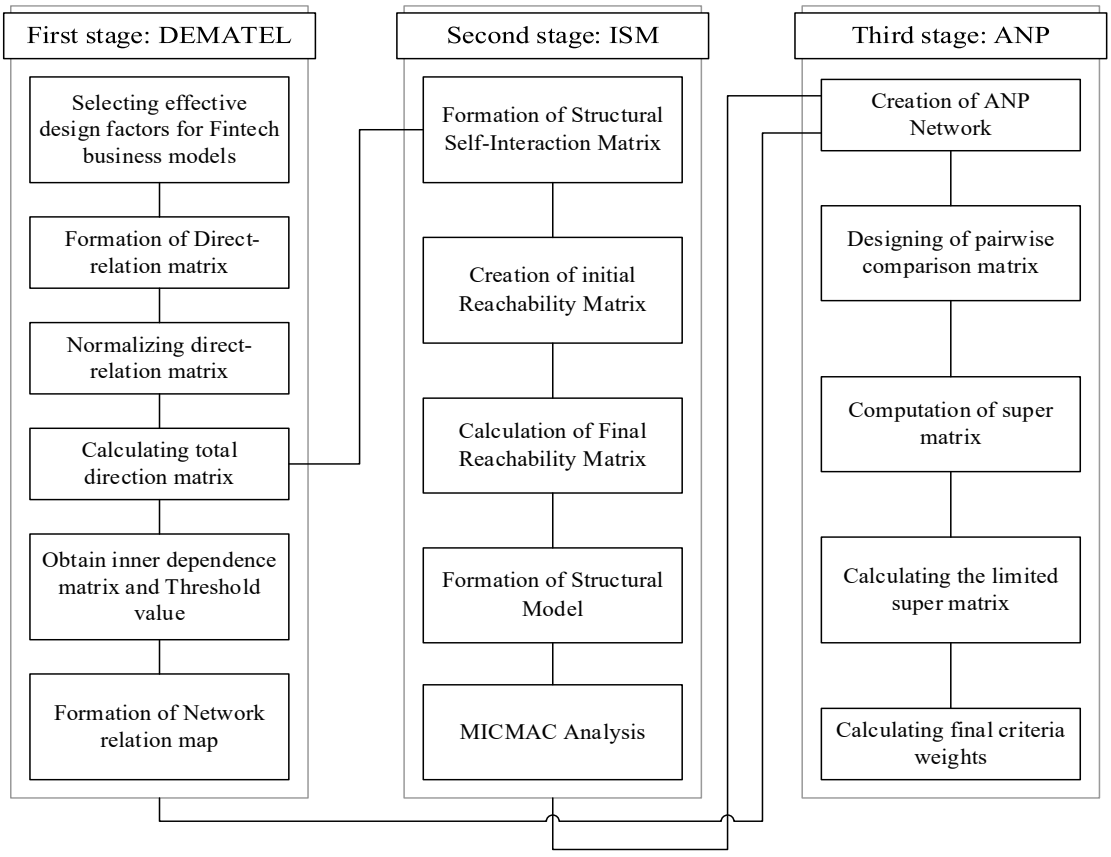

Fig. 1. The research method

The statistical population of this research includes all the Payment Service Providers (PSP) companies in the field of electronic payment in Iran. The research methodology involved interviews, questionnaires, and review of prior studies. A questionnaire was distributed to 12 active direct payment portal companies, with responses from 30 payment industry experts. The study utilized multi-criteria decision-making techniques, initially employing the integrated DEMATEL and ISM methods to model and rank influencing factors (Akyuz & Celik, 2015; Yadav et al., 2020; Feng et al., 2023). Based on the Osterwalder model, nine criteria in the field of electronic payment have been extracted, and then through interviews with the experts of the studied companies, the criterion of Shaparak regulatory rules was also added. The electronic card payment network system (Shaparak) is a network that brings together all payment service providers and their sales terminals in an integrated system and improves the efficiency, effectiveness and security of the card payment network with centralized management and supervision. Therefore, ten influential criteria accompanying their references in the literature were finalized, as seen in Table 2.

Table 2
Criteria Affecting the Design of electronic payment businesses

No.	Index
1	Recognition and identification of electronic payment customers
2	Determining the type of relationship with customers
3	Choosing distribution channels and reaching customers
4	Providing value proposition in electronic payment services
5	The main activities of the electronic payment company
6	The main resources of the electronic payment company, such as physical equipment, servers, and human resources.
7	Key partners of the electronic payment company, such as suppliers and investors.
8	Company's revenue streams
9	Cost structure (main fixed and variable costs in electronic payment business)
10	Shaparak regulatory rules

3.1 The DEMATEL-ISM-ANP integrated method

The DEMATEL is a comprehensive method that integrates matrix and graph theories to analyze and make informed decisions about complicated systems (Liang et al., 2022). The DEMATEL technique is extremely operational for recognizing causal connections between parameters and disclosing structural arrangements (Akyuz & Celik, 2015). This

approach respects the interdependence between variables in outsized systems (Yadav et al., 2020). The differences of individual thoughts and expert biases intensively affect the results of the DEMATEL technique due to it depends on expert opinion to calculate the scoring, which may cause misapprehensions of relationships. The interpretive structural model (ISM), a renowned powerful tool based on graph theory, analyzes and processes complex systems via matrix operations. The ISM can decompose disordered components into multilevel hierarchical structural models (Valmohammadi & Dashti, 2016; Wang et al., 2020, 2021). So as to appropriately weigh the main elements, and construct the hierarchical relationship of the indicator system, the ISM and DEMATEL approaches need to be mixed (Feng et al., 2023). Combining DEMATEL and ISM methods reduces computational complexity and enhances analysis accuracy. The MICMAC approach further assesses factor significance, concluding the ISM analysis by identifying key influencing factors (Panahifar et al., 2014; Feng et al., 2017). The ISM method can only exhibit the directional connections among the factors. In other words, the ISM is not capable to completely envisaging the main barriers. Nonetheless, the ISM can facilitate the ANP approach to make a representation of measurable crucial elements. The integration of ISM-ANP is a two-step process that prioritizes weights for systems with feedback and dependency relationships and also conquers the limitations of the ANP. Hence, the integration of the DEMATEL-ISM-ANP approach in the current study can efficiently and thoroughly define the interrelationships between the elements for Fintech business models in the electronic payment.

3.1.1 DEMATEL method

The DEMATEL technique is one of the multi-criteria decision-making methods and was presented by Gabos and Fontella in 1971. This technique identifies the pattern of causal relationships between variables. Using this technique, we expressed the mutual relations of indicators, and a set of indicators is divided into effective groups. In this way, a proper understanding of the influence of the factors is obtained.

In general, the DEMATEL technique is performed in the following four steps:

Step I: Form the direct relation matrix (M):

The pairwise influence of the criteria is determined using the spectrum of Table 3.

Table 3
Verbal expressions and corresponding numbers of the DEMATEL method

Amount	Name
0	no influence
1	low influence
2	medium influence
3	high influence
4	very high influence

When several people's opinions are used, the simple average is used, and we form M.

$$z = \frac{x^1 + x^2 + x^3 + \ldots + x^p}{p}$$

In this formula, p is the number of experts, and x^p is the pairwise comparison matrix of expert 1, expert 2, and expert p, respectively. The direct relation matrix of criteria is shown in Table 4.

Table 4
Direct relation matrix of criteria

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
C1	0	2.966	3.310	3.345	2.759	1.586	1.724	3.034	1.793	1.379
C2	2.103	0	2.552	2.552	1.379	1.586	1.414	2.655	1.966	1.034
C3	2.690	2.966	0	2.379	1.621	2.414	1.655	2.172	2.379	1.103
C4	1.793	2	2.310	0	2.517	2	2.207	2.517	2.276	0.655
C5	1.931	1.759	2.276	3	0	3	2.931	2.621	2.759	0.897
C6	1.310	1.034	1.759	3.034	2.724	0	2.172	2.345	2.931	1.034
C7	1.759	1.655	1.862	2.345	2.759	1.586	0	2.586	2.448	1.552
C8	2.069	3	2.379	2.690	2.552	2.345	3.034	0	2.552	1.517
C9	1.724	2.034	2.655	2.069	1.931	2.379	2	3.103	0	1.276
C10	2	2.034	1.897	2.241	2.414	2.586	2.069	2.759	2.655	0

Step II: Normalize the direct relation matrix:

$$N = k \times M$$

In this formula, M is the direct relation matrix, and N is the normalized direct relation matrix. K is calculated as follows:

$$K = \frac{1}{max_i \sum_{j=1}^{n} a_{ij}}$$

The denominator equals the maximum summation of all elements of each row of the direct relation matrix, resulting in 23.793.

In order to normalize, all the direct relation matrix rows are divided by 23.793 in Table 4. The normalized matrix is given in Table 5.

Table 5
Normalized matrix of DEMATEL method

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
C1	0	0.125	0.139	0.141	0.116	0.067	0.072	0.128	0.075	0.058
C2	0.088	0	0.107	0.107	0.058	0.067	0.059	0.112	0.083	0.043
C3	0.113	0.125	0	0.1	0.068	0.101	0.070	0.091	0.100	0.046
C4	0.075	0.084	0.097	0	0.106	0.084	0.093	0.106	0.096	0.028
C5	0.081	0.074	0.096	0.126	0	0.126	0.123	0.110	0.116	0.038
C6	0.055	0.043	0.074	0.128	0.114	0	0.091	0.099	0.123	0.043
C7	0.074	0.070	0.078	0.099	0.116	0.067	0	0.109	0.103	0.065
C8	0.087	0.126	0.1	0.113	0.107	0.099	0.128	0	0.107	0.064
C9	0.072	0.086	0.112	0.087	0.081	0.1	0.084	0.130	0	0.054
C10	0.084	0.086	0.080	0.094	0.101	0.109	0.087	0.116	0.112	0

Step III: Calculate matrix T

$$T = N \times (I - N)^{-1}$$

“I” is a square matrix with a dimension of ten to calculate the total relation matrix, and N is a normalized matrix. Then, we subtract the same matrix from the normalized matrix and invert the resulting matrix. Finally, we multiply the normalized matrix by the inverse matrix. The overall relationship matrix is given in Table 6.

Table 6
The matrix of the total relation of the criteria

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
C1	0.395	0.553	0.594	0.646	0.561	0.498	0.503	0.634	0.551	0.296
C2	0.398	0.355	0.476	0.516	0.423	0.412	0.406	0.519	0.462	0.236
C3	0.452	0.502	0.420	0.555	0.471	0.478	0.450	0.548	0.518	0.260
C4	0.403	0.449	0.486	0.442	0.484	0.446	0.454	0.537	0.495	0.233
C5	0.453	0.490	0.540	0.616	0.444	0.532	0.531	0.602	0.570	0.271
C6	0.385	0.414	0.467	0.556	0.494	0.372	0.456	0.533	0.521	0.247
C7	0.408	0.443	0.478	0.539	0.500	0.440	0.377	0.548	0.509	0.270
C8	0.474	0.551	0.562	0.624	0.556	0.526	0.550	0.523	0.580	0.303
C9	0.416	0.468	0.516	0.542	0.481	0.477	0.464	0.577	0.427	0.266
C10	0.450	0.494	0.519	0.581	0.528	0.513	0.494	0.599	0.559	0.230

Step IV: Create a causal structure:

The summation of each row element (D) indicates the influence degree of the factor on others (the variables influence degree). The summation of the column elements (R) indicates the influence degree of the factor on others (the variables influence degree). Then, the (D + R) is the influence degree of the factors (the horizontal vector). Hence, the bigger an agent's "D + R" value, the more interaction the agent has with others.
The vertical vector (D - R) expresses each factor's influence. Generally, the positive value of D - R represents the causal variable, and the negative one represents an effect variable.

A Cartesian coordinate (Fig.2) shows a diagram where a point identifies each factor position with coordinates (D – R, D + R). According to Table 7, the D index indicates the effectiveness of the factors. The greater the D number of a factor, the more influential one in the system. Accordingly, the company's revenue streams have the most influence in this study. The higher the R number of a measure, the more effective it is in the system. Based on this, the company's revenue streams have the most influence. According to Table 7, we can draw the causal diagram. Accordingly, the factors above the X-line have positive D-R. These factors have a causal viewpoint, and their influence is more potent than their effectiveness. The criteria that are under the X-line have negative D-R. These factors have an effective viewpoint; that is, they have a more substantial influence.

Table 7
Importance and impact of criteria

Criterion	Criterion Code	D	R	D+R	D-R	Criterion Nature
Recognition and identification of electronic payment customers	C1	5.229	4.233	9.462	0.996	Cause
Determining the type of relationship with customers	C2	4.203	4.719	8.921	-0.516	Effect
Choosing distribution channels and reaching customers	C3	4.654	5.059	9.713	-0.405	Effect
Providing value proposition in electronic payment services	C4	4.429	5.617	10.046	-1.188	Effect
The main activities of the electronic payment company	C5	5.047	4.941	9.988	0.107	Cause
The main resources of the electronic payment company, such as physical equipment, servers, and human resource.	C6	4.445	4.693	9.138	-0.249	Effect
Key partners of the electronic payment company, such as suppliers and investors.	C7	4.512	4.685	9.197	-0.173	Effect
Company's revenue streams	C8	5.250	5.619	10.868	-0.369	Effect
Cost structure (main fixed and variable costs in electronic payment business)	C9	4.633	5.194	9.827	-0.560	Effect
Shaparak regulatory rules	C10	4.968	2.612	7.580	2.357	Cause

Fig. 2 shows the causal diagram of the identified factors.

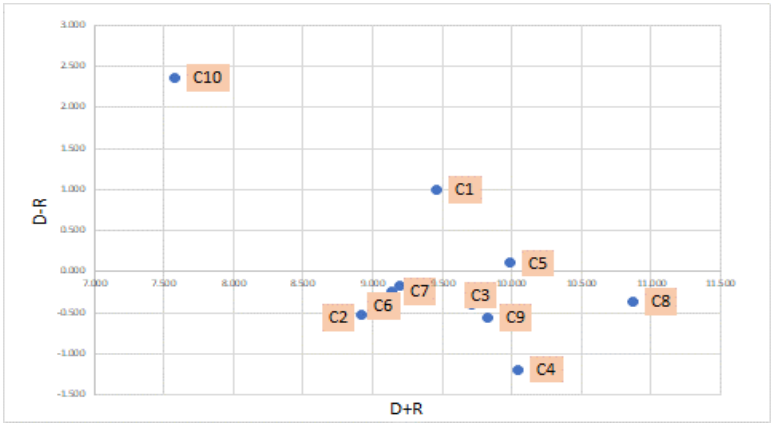

Fig. 2. Causal chart of factors

3.1.2 Interpretive Structural Modeling (ISM) method

In this section, the levels of influence and effectiveness of the factors are investigated. In the first step, the output of the DEMATEL method is used as the input of ISM to check the influence levels. The ISM method was presented in 1973 by Warfield. This method analyzes the complexity of relationships between criteria and their direction. In this section, using the ISM method, the levels of influence and effectiveness of the factors are investigated. Using the output of the DEMATEL method as the input of ISM is an efficient tool for checking the influence levels using DEMATEL relations (Wang et al., 2018). The nature of the two methods, DEMATEL and ISM, are almost similar to each other, and when two questionnaires are used for the analysis of each, due to the differences in the inputs of the two methods, the results obtained from the two methods may be different from each other. Therefore, using the combined method of DEMATEL and ISM can achieve more accurate results. The following are the steps of this method.

Step I: Formation of the initial acquisition matrix

In this step, the arithmetic means threshold value is calculated from the total relation matrix of DEMATEL. The domains greater than the threshold value are set to 1 to obtain the acquisition matrix, and the others are set to zero. The threshold was determined based on the opinion of experts, and its value is 0.53. The cells with a number 1 indicate a significant relationship between the column and row criteria. This process is shown in Table 8, the same as the initial acquisition matrix.

Step II: Determining the level of variables

In this step, based on the acquisition matrix, we calculate the input and output criteria set for each criterion and then determine the common criteria. Then, the criterion with the highest level is that the output set is equal to the common set. After identifying this variable(s), the relevant row and column will be removed from the table and reiterate the operation on other criteria. Inputs and outputs are obtained from the adapted prime acquisition matrix. The total number of 1s in each row represents the output, and the total number of 1s in the column represents the input. Table 10 shows the first level.

Step III: Drawing the network of interactions

This step creates a network of interactions according to the criteria levels and the relationships between them. The network of ISM interactions is drawn using the levels obtained from the criteria. A directional arrow shows a relationship between i and j. The final diagram obtained by removing the multiple modes and using the segmentation of the surfaces is shown in Fig. 3.

MICMAC analysis

MICMAC analysis relies on the driving force and the dependence degree of each variable and provides the possibility of further investigation of the range of each variable. The variables are classified into four factors: Driving, Dependent, Link, and Independent (Kannan & Haq, 2007). *Driving factors*: they have little dependence and guiding capability. These criteria are usually extracted from the system. Since they have weak mutual connections, their change does not cause a significant modification in the system. *Dependent factors:* these variables have strong dependence and weak direction.

Generally, they have little influence on the system. *Independent factors:* these variables have high direction and low dependence; in other words, great and low influences are the features of these kinds of factors. *Link factors:* These variables have guiding power and high dependence; in other words, these criteria' influence is high, and small change in these variables causes substantial adjustments. The research model can be shown based on the influence of power and dependence in Fig. 4. Upon the criteria for identifying and recognizing electronic payment customers (C1), the primary resources of an electronic payment company (e.g., physical equipment, servers, and human resources) (C6), and Shaparak's regulatory rules (C10) are independent variables. These variables have high direction and low dependence; thus, high and low influences are the characteristics of these variables. The criterion for determining the kind of relationship with customers (C2) is dependent. This criterion has low dependence and high direction. Fig. 3 shows the influence-dependence matrix of the criteria.

Table 8
Significant relationships between factors

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
C1	0	1	1	1	1	0	0	1	1	0
C2	0	0	0	0	0	0	0	0	0	0
C3	0	0	0	1	0	0	0	1	0	0
C4	0	0	0	0	0	0	0	1	0	0
C5	0	0	1	1	0	1	1	1	1	0
C6	0	0	0	1	0	0	0	1	0	0
C7	0	0	0	1	0	0	0	1	0	0
C8	0	1	1	1	1	0	1	0	1	0
C9	0	0	0	1	0	0	0	1	0	0
C10	0	0	0	1	0	0	0	1	1	0

Formation of a compatible initial acquisition matrix

After obtaining the initial acquisition matrix, its internal consistency must be established. In Table 9, the cells marked with 1* are the relationships created in the adapted and consistency matrix.

Table 9
Adapted primary acquisition matrix

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	leverage
C1	1	1	1	1	1	1*	1*	1	1	0	9
C2	0	1	0	0	0	0	0	0	0	0	1
C3	0	1*	1	1	1*	0	1*	1	1*	0	7
C4	0	1*	1*	1	1*	0	1*	1	1*	0	7
C5	0	1*	1	1	1	1	1	1	1	0	8
C6	0	1*	1*	1	1*	1	1*	1	1*	0	8
C7	0	1*	1*	1	1*	0	1	1	1*	0	7
C8	0	1	1	1	1	1*	1	1	1	0	8
C9	0	1*	1*	1	1*	0	1*	1	1	0	7
C10	0	1*	1*	1	1*	0	1*	1	1	1	8
Dependence	1	10	9	9	9	4	9	9	9	1	

Table 10
Level 1 criteria

Criterion	Output	Input	Common	Level
C1	C1-C2-C3-C4-C5-C6-C7-C8-C9	C1	C1	
C2	C2	C1-C2-C3-C4-C5-C6-C7-C8-C9-C10	C2	**1**
C3	C2-C3-C4-C5-C7-C8-C9	C1-C3-C4-C5-C6-C7-C8-C9-C10	C3-C4-C5-C7-C8-C9	
C4	C2-C3-C4-C5-C7-C8-C9	C1-C3-C4-C5-C6-C7-C8-C9-C10	C3-C4-C5-C7-C8-C9	
C5	C2-C3-C4-C5-C6-C7-C8-C9	C1-C3-C4-C5-C6-C7-C8-C9-C10	C3-C4-C5-C6-C7-C8-C9	
C6	C2-C3-C4-C5-C6-C7-C8-C9	C1-C5-C6-C8-	C5-C6-C8	
C7	C2-C3-C4-C5-C7-C8-C9	C1-C3-C4-C5-C6-C7-C8-C9-C10	C3-C4-C5-C7-C8-C9	
C8	C2-C3-C4-C5-C6-C7-C8-C9	C1-C3-C4-C5-C6-C7-C8-C9-C10	C3-C4-C5-C6-C7-C8-C9	
C9	C2-C3-C4-C5-C7-C8-C9	C1-C3-C4-C5-C6-C7-C8-C9-C10	C3-C4-C5-C7-C8-C9	
C10	C2-C3-C4-C5-C7-C8-C9-C10	C10	C10	

In Table 10, level 1 criteria have been extracted, which includes C2 criteria. Now, to determine the second-level criteria, the row and column of this criterion should be removed from the adapted primary acquisition matrix, and the calculations should be used to determine the output and input again. Table 11 shows the results.

Table 11
Level 2 criteria

Criterion	Output	Input	Common	Level
C1	C1-C3-C4-C5-C6-C7-C8-C9	C1	C1	
C3	C3-C4-C5-C7-C8-C9	C1-C3-C4-C5-C6-C7-C8-C9-C10	C3-C4-C5-C7-C8-C9	2
C4	C3-C4-C5-C7-C8-C9	C1-C3-C4-C5-C6-C7-C8-C9-C10	C3-C4-C5-C7-C8-C9	2
C5	C3-C4-C5-C6-C7-C8-C9	C1-C3-C4-C5-C6-C7-C8-C9-C10	C3-C4-C5-C6-C7-C8-C9	2
C6	C3-C4-C5-C6-C7-C8-C9	C1-C5-C6-C8-	C5-C6-C8	
C7	C3-C4-C5-C7-C8-C9	C1-C3-C4-C5-C6-C7-C8-C9-C10	C3-C4-C5-C7-C8-C9	2
C8	C3-C4-C5-C6-C7-C8-C9	C1-C3-C4-C5-C6-C7-C8-C9-C10	C3-C4-C5-C6-C7-C8-C9	2
C9	C3-C4-C5-C7-C8-C9	C1-C3-C4-C5-C6-C7-C8-C9-C10	C3-C4-C5-C7-C8-C9	2
C10	C3-C4-C5-C7-C8-C9-C10	C10	C10	

In Table 11, level 2 criteria are extracted, including C3, C4, C5, C7, C8, and C9. Now, to determine the criteria of the second level, the rows and columns of these six criteria should be removed from the initial adapted matrix, and perform the calculations to determine the output and input again. The results are given in Table 12.

Table 12
Level 3 and 4 criteria

Criterion	Output	Input	Common	Level
C1	C1-C6	C1	C1	4
C6	C6	C1-C6	C6	3
C10	C10	C10	C10	3

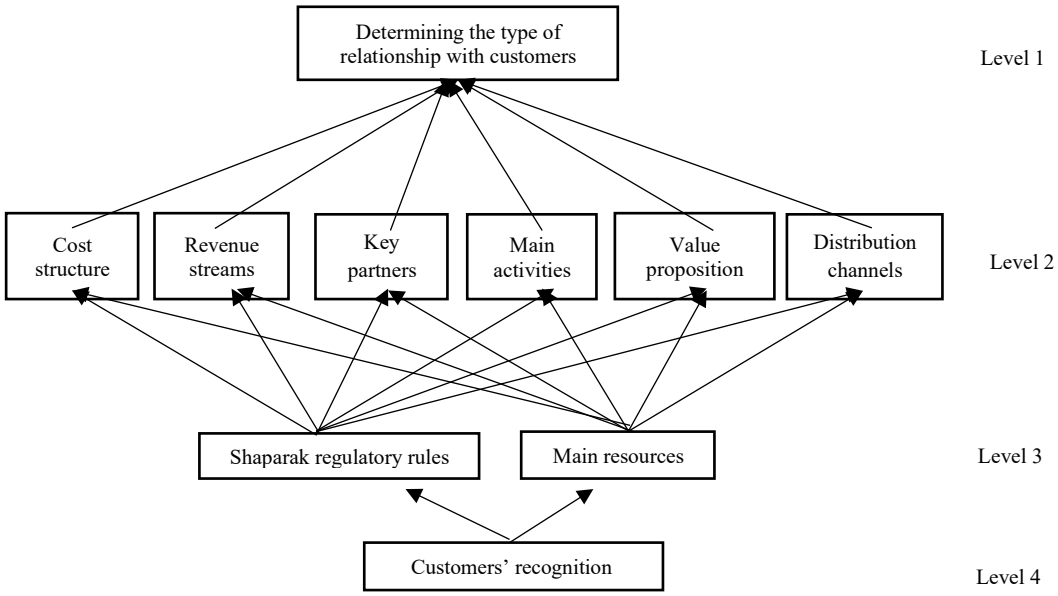

Fig. 3. The ISM framework

According to Fig. 3, the research model includes four levels. The fourth level, the recognition of electronic payment customers (C1), is the most effective and directly affects the criteria in level 3, which means the main resources of the electronic payment company, such as physical equipment, servers, and human resources (C6), and Shaparak regulatory rules (C10) are affected. Level one, the index of determining the type of relationship with customers (C2), is considered the most impressible level.

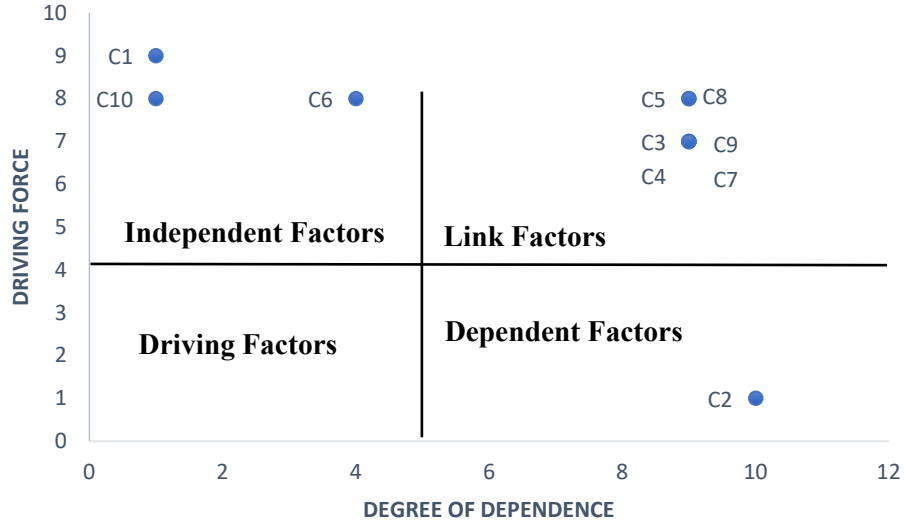

Fig. 4. Influence-dependency power matrix

3.1.3 Network analysis process (ANP)

After determining influence and influence relationships by the ISM method, the ANP method determines the weight and rank of factors. For this purpose, the pairwise comparisons of the criteria are made considering the internal relationships extracted from the ISM and provided to the experts to define the importance of the pairwise criteria based on the range of 1 to 9. The network analysis process is a multi-criteria decision-making method used to weigh the criteria and choose the optimal one. The ANP method shows the relationships between different decision levels in a network framework. Super Decision software is used to perform ANP method calculations. The steps of the ANP method are as follows:

Step I: Forming an ANP network model

In this section, first, the internal relationships between the research factors are identified, and in this research, these relationships will be determined based on the ISM technique. These internal relationships are also given in Table 13. In the cells with an asterisk, it indicates the influence of the row criterion on the column criterion.

Step II: pairwise comparisons

In this section, criteria and sub-criteria are compared one by one based on internal relationships, and the degree of importance of each criterion is determined. For this, a standard method can be used. The way it works is that a number from 1 to 9 is assigned to each binary comparison.

Step III: The initial hypermatrix

This section forms the initial hypermatrix based on the weights calculated in the second step, including all research factors that were compared in pairs, and their weights were calculated in the second step.

Step IV: The normalized hypermatrix

In this section, each element of the primary hypermatrix calculated in the third step is divided by the sum of each column to form the balanced hypermatrix.

Step V: The limit hypermatrix

In this step, the normalized hypermatrix is brought to power so that it converges, and this process causes the formation of the final balance in the limit hypermatrix.

Table 13
Internal relationships between criteria

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10
C1						*				*
C2										
C3		*								
C4		*								
C5		*								
C6			*	*	*		*	*	*	
C7		*								
C8		*								
C9		*								
C10			*	*	*		*	*	*	

In the next step, it was integrated using the geometric mean method; the results are shown below. After completing the pairwise comparison matrices by the experts, who are 30 people in this research, the calculated matrices inconsistency rate resulted in less than 0.1, so the matrices are compatible. The weights have been determined by using the Super Decisions software. Fig. 5 shows the research network model.

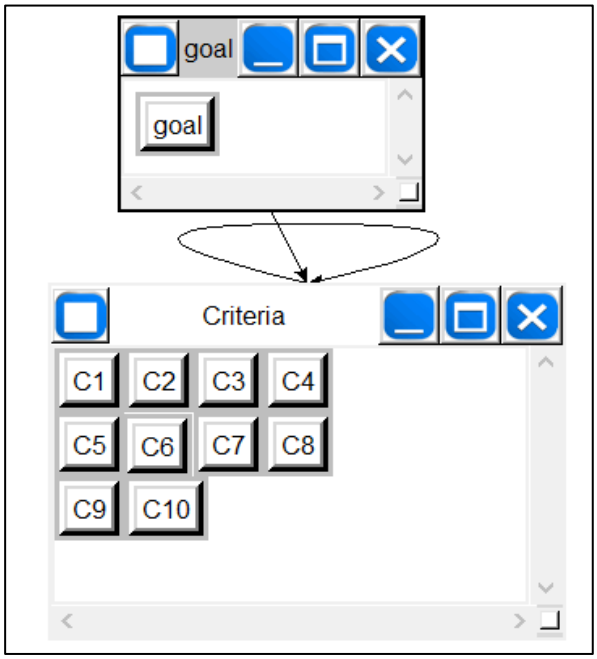

Fig. 5. The ANP model of the research

Step VI: Pairwise comparison of criteria concerning the goal

This research has three main criteria which need to be compared pairwisely. Table 14 shows the pairwise comparison of criteria concerning the target.

Table 14
Pairwise comparison of criteria concerning the target (inconsistency rate: 0.059)

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	weight
C1	1	1.189	0.654	0.364	1.488	2.087	2.862	0.557	0.586	0.578	0.0838
C2	0.841	1	0.238	0.225	1.586	1.53	0.917	0.468	0.289	0.485	0.0557
C3	1.529	4.202	1	0.389	1.334	0.985	0.965	0.299	0.342	1.435	0.0902
C4	2.747	4.444	2.571	1	1.707	1	2.449	0.616	0.75	1.251	0.1414
C5	0.672	0.631	0.750	0.586	1	0.423	1.553	0.287	0.364	0.537	0.0543
C6	0.479	0.654	1.015	1	2.364	1	0.872	0.331	0.339	0.369	0.0657
C7	0.349	1.091	1.036	0.408	0.644	1.147	1	0.319	0.338	0.965	0.0585
C8	1.795	2.137	3.344	1.623	3.484	3.021	3.135	1	0.586	0.733	0.1592
C9	1.706	3.460	2.924	1.333	2.747	2.950	2.959	1.706	1	1.364	0.1768
C10	1.730	2.062	0.697	0.799	1.862	2.710	1.036	1.364	0.733	1	0.1146

Step VII: Formation of ANP hypermatrices

In the ANP method, to prioritize the final weights of the factors by considering the internal relationships, first, the initial hypermatrix is formed. This hypermatrix includes the factors' relative weights and the weights of internal relationships.

Then, the balanced hypermatrix is formed, and a limit hypermatrix is created by raising it to power and converging it. All these steps are done automatically in Super Decisions software. The initial, balanced, and limit hypermatrix are given in Tables 15-17, respectively.

Table 15
Initial hypermatrix

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	Goal
C1	0	0	0	0	0	0	0	0	0	0	0.0838
C2	0	0	1	1	1	0	1	1	1	0	0.0557
C3	0	0	0	0	0	0.0670	0	0	0	0.0749	0.0902
C4	0	0	0	0	0	0.1478	0	0	0	0.1489	0.1414
C5	0	0	0	0	0	0.1593	0	0	0	0.1476	0.0543
C6	0.3146	0	0	0	0	0	0	0	0	0	0.0657
C7	0	0	0	0	0	0.0996	0	0	0	0.0933	0.0585
C8	0	0	0	0	0	0.2471	0	0	0	0.2487	0.1592
C9	0	0	0	0	0	0.2792	0	0	0	0.2866	0.1768
C10	0.6854	0	0	0	0	0	0	0	0	0	0.1146
Goal	0	0	0	0	0	0	0	0	0	0	0

Table 16
Normalized hypermatrix

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	Goal
C1	0	0	0	0	0	0	0	0	0	0	0.0838
C2	0	0	1	1	1	0	1	1	1	0	0.0557
C3	0	0	0	0	0	0.0670	0	0	0	0.0749	0.0902
C4	0	0	0	0	0	0.1478	0	0	0	0.1489	0.1414
C5	0	0	0	0	0	0.1593	0	0	0	0.1476	0.0543
C6	0.3146	0	0	0	0	0	0	0	0	0	0.0657
C7	0	0	0	0	0	0.0996	0	0	0	0.0933	0.0585
C8	0	0	0	0	0	0.2471	0	0	0	0.2487	0.1592
C9	0	0	0	0	0	0.2792	0	0	0	0.2866	0.1768
C10	0.6854	0	0	0	0	0	0	0	0	0	0.1146
Goal	0	0	0	0	0	0	0	0	0	0	0

Table 17
Limit hypermatrix

	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	Goal
C1	0.0365	0.0365	0.0365	0.0365	0.0365	0.0365	0.0365	0.0365	0.0365	0.0365	0.0365
C2	0.4363	0.4363	0.4363	0.4363	0.4363	0.4363	0.4363	0.4363	0.4363	0.4363	0.4363
C3	0.0477	0.0477	0.0477	0.0477	0.0477	0.0477	0.0477	0.0477	0.0477	0.0477	0.0477
C4	0.0788	0.0788	0.0788	0.0788	0.0788	0.0788	0.0788	0.0788	0.0788	0.0788	0.0788
C5	0.0412	0.0412	0.0412	0.0412	0.0412	0.0412	0.0412	0.0412	0.0412	0.0412	0.0412
C6	0.0402	0.0402	0.0402	0.0402	0.0402	0.0402	0.0402	0.0402	0.0402	0.0402	0.0402
C7	0.0365	0.0365	0.0365	0.0365	0.0365	0.0365	0.0365	0.0365	0.0365	0.0365	0.0365
C8	0.0980	0.0980	0.0980	0.0980	0.0980	0.0980	0.0980	0.0980	0.0980	0.0980	0.0980
C9	0.1099	0.1099	0.1099	0.1099	0.1099	0.1099	0.1099	0.1099	0.1099	0.1099	0.1099
C10	0.0750	0.0750	0.0750	0.0750	0.0750	0.0750	0.0750	0.0750	0.0750	0.0750	0.0750
Goal	0	0	0	0	0	0	0	0	0	0	0

4. Results and Discussion

The research factors can be ranked using the weights obtained from the limit hypermatrix. According to Table 18, the criterion for determining the type of relationship with customers has the first rank with a weight of 0.4363. Cost structure (main fixed and variable costs in electronic payment business) with a weight of 0.1099 has won second place, and the company's revenue streams with a weight of 0.0980 have a third place.

Table 18
Weighting and ranking of the criteria

Rank	Final Wight	Criterion
9	0.0365	C1
1	0.4363	C2
6	0.0477	C3
4	0.0788	C4
7	0.0412	C5
8	0.0402	C6
10	0.0365	C7
3	0.0980	C8
2	0.1099	C9
5	0.0750	C10

The final ranking and prioritization of criteria can be seen in Fig. 6.

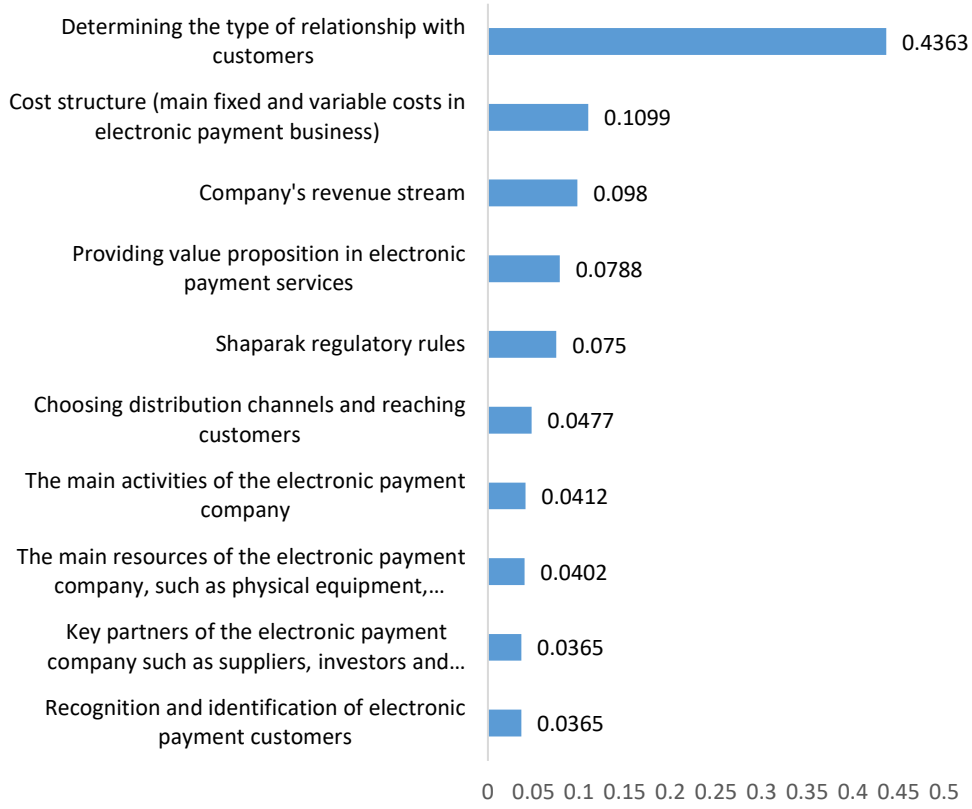

Fig. 6. Weight and final priority of criteria

The current research aimed to identify and rank the factors affecting Paytech's business models. The factors extracted from expert interviews and the literature. The research was initially started by interviewing ten experts in the electronic payment industry. As a result, the main variables of the questionnaire were extracted. The designed questionnaire was distributed among 12 active PSP companies in Tehran, and 30 payment industry experts responded to this questionnaire. The investigation of the relationship between the identified factors affecting the issue is done using the multi-criteria decision-making technique in such a way that first, a model was presented for the leveling of the effective factors using the combined method of DEMATEL and ISM. Then, these indicators were ranked using the ANP method.

According to the outcomes of the calculations of the DEMATEL technique, the drawing of the causal diagram of the criteria, and their leveling with the ISM method, several factors had a more significant influence, such as determining the type of relationship with customers, choosing distribution channels and reaching customers, providing value proposition in services electronic payment, electronic payment company essential resources, electronic payment company key partners, cost structure, and revenue streams. In addition, the recognition and recognition of electronic payment customers, the main activities of the payment company, and the regulatory laws of Shaparak had a higher impact. In the meantime, "recognition of electronic payment customers" was determined as the most influential criterion, which directly affects other criteria, and the factor "determining the type of relationship with customers" was determined as the most impressible criterion. After analyzing the data using the combined method of DEMATEL and ISM, the research factors were prioritized by the ANP method in terms of their importance. Based on this, the criterion of the type of relationship with customers was ranked first, and the company's cost structure and revenue streams were ranked second and third, respectively.

In competitive markets, accurate analysis of customers and proper management of customer relations are the main reasons for the success of companies, so knowing and recognizing different types of customers is vital for making profitable decisions. By identifying potential customers, companies active in the field of electronic payment can find out who the payment service customers are, in what position or social conditions they are, and what kind of payment services can be offered to each group. Also, correctly determining the type of relationship with each group of customers allows companies to manage customers more efficiently, improve customer service and support, and create new values for each group of customers. Determining the type of relationship with customers can begin with preparing various channels of access to customers. In addition, examining the cost structure allows electronic payment companies to adjust their resource consumption, allocate funds to more important areas of the business, and pay more attention to critical areas. Also, companies can analyze the costs coherently and manage the business with less capital after removing the extra costs. Paying

attention to revenue streams also helps companies determine the business logic for generating revenue and the value the customer is willing to pay.

5. Managerial insights and practical implications

In competitive markets, understanding diverse customer types and managing relationships is crucial for company success. Identifying and retaining customers becomes increasingly important amid market competition. Electronic payment providers can enhance service by understanding customer demographics, preferences, and needs, tailoring offerings and improving customer relationships through efficient management and targeted service channels. In addition, examining the cost structure allows electronic payment companies to adjust their resource consumption, allocate funds to more important business areas, and pay more attention to critical areas. Also, companies can analyze the costs coherently and manage the business with less capital after removing the additional costs. Paying attention to income streams also helps companies determine the business logic for generating income and what value the customer is willing to pay. The growth of economic activities has led to an increase in payment transactions; due to infrastructure development, the demand of customers for payment services increases. However, it is necessary to address the hidden issues of the current payment process and the needed factors to facilitate the payment.

6. Conclusion

In recent years, technological developments have changed the behavioral patterns of customers toward financial services. These rapid changes transform all processes and even the entire business model of payment companies in the electronic payment industry. High dynamism in technological solutions in the financial industry provides the foundations for new business model innovation. Designing a suitable business model helps companies understand the organization's challenges in interacting with the environment and design a suitable strategy. In this study, ten effective factors were identified using the Strowalder business model and from interviewing experts in electronic payment. According to the results of DEMATEL technique calculations, drawing a causal diagram of the criteria and leveling them with the ISM method, some factors were more effective, which are determining the type of relationship with customers, choosing distribution channels and reaching customers, providing value proposition in electronic payments services, key resources, and partners of the electronic payments company, cost structure, and revenue stream.

In addition, identifying electronic payment customers, the main activities of the payment company, and the regulatory laws had a higher impact. In the meantime, "identifying customers and electronic payment" was recognized as the most effective criterion, which directly affects other criteria, and the factor "determining the type of relationship with customers" was recognized as the most effective criterion. After analyzing the data using the combined method of DEMATEL and ISM, the research factors were prioritized by the ANP method in terms of their importance. Based on this, the criterion of the type of relationship with customers was ranked first, and the company's cost structure and revenue stream were ranked second and third, respectively.

There were also some limitations for conducting the current research. The first, finding qualified experts on the Fintech business model. The second, gathering the data of the payment sector due to privacy, security, and cultural considerations.

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