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Prioritization of stakeholders in hospitals of Guilan University of medical sciences using a combined analysis network process and DEMATEL

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Abstract The presence of different stakeholders with different interests and expectations in project implementation is one of the issues that presents project managers with serious challenges in managing stakeholders properly. The present study aims to provide useful information for stakeholder management to the heads of hospitals at Guilan University of Medical Sciences by prioritizing stakeholders.
The statistical population of the study includes; heads of hospitals at Guilan University of medical sciences and academic experts, 19 of whom participated in the research implementation process. To screen the components extracted from the theoretical foundations of the research, the fuzzy Delphi method was used, and to structure and analyze the status of the components and prioritize the stakeholders, the analytical network and DEMATEL processes were used. In addition, the snowball sampling method and questionnaire tool were used to collect data.
Using the Delphi method, 10 key factors were identified from 30 components related to stakeholder engagement, including participation, communication, motivation, and alignment of goals. Scoring 30 stakeholders based on these factors revealed that 12 stakeholders, such as employees, patients, and management, received the highest scores. The most important relationships identified through the DEMATEL technique were then analyzed in Super Decision software to prioritize the stakeholders.
According to the network analysis process, key stakeholders identified include management, contracted physicians, the University of Medical Sciences, employees, and the Ministry of Health and Care. This highlights the importance of engaging these stakeholders to achieve the hospital's goals.

Keyword: Organizational Stakeholder, Prioritization, Hospital, Network Analysis, DEMATEL Technique.

1 Introduction

The most important factors for an organization's survival are appropriate responsiveness to the expectations of organizational stakeholders. Organizations must better understand their

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stakeholders and how to manage them strategically [1]. Today, organizational stakeholders, with the right to choose, do not accept low-quality goods or services [2]. Therefore, appropriate responsiveness to stakeholder expectations is one of the most important factors for the effectiveness of organizations, especially in the healthcare system as the custodian of creating, promoting, and improving health. Stakeholder theory is one of the management theories that was first proposed by the Stanford Research Institute in 1963. Projects can have limited or diverse stakeholders. The more stakeholders a project has, the more difficult it is to manage them and simultaneously fulfill their demands. Also, motivating diverse stakeholders requires various solutions [3]. In order to survive, organizations must be responsive to changing needs and expectations of stakeholders. Stakeholders are individuals, groups, or organizations that have a significant impact on an organization's performance by meeting its needs and, in return, have specific expectations and demands from the organization. Therefore, the effectiveness, efficiency, and continuity of an organization's activities depend to a large extent on the recognition and balanced fulfillment of these needs [4]. The Stanford Research Institute defines stakeholders as "a group without whose support the organization would cease to exist" [5]. Stakeholders are individuals, groups, or institutions that have a specific interest in the project and can influence its outcome [6]. Stakeholders are individuals and organizations, permanent or temporary, who are involved in or affected by the implementation or completion of the project. Projects involve a variety of primary and secondary stakeholders with different opinions, goals, and contributions. For any project to be successful, the interests of the project's stakeholders must be understood [7]. Regardless of the definition provided in the theoretical foundations, stakeholders are not general and are not homogeneous within organizations, meaning that each of them has different needs, expectations, demands, interests and power and affects the overall functioning of the organization. Stakeholders promote a practical, efficient, effective and ethical way of managing organizations in a very complex and chaotic environment [8]. By creating value, stakeholders ensure the continuity of the organization's activities and also manage the expectations of society towards the organization. They have various sources of power such as: knowledge, legitimacy, motivation, reputation, wealth, etc., the analysis of which is of great importance in planning and formulating organizational policies. Stakeholder groups, with their extensive relationships and the influence and power they possess, influence the policy-making process of the organization and, by exerting influence on the bureaucratic procedures and hierarchies of private and public organizations, exert their opinions in the process of formulating, approving, implementing and evaluating the organization's policy and obtaining their own interests [9]. The main and most popular form of stakeholder participation in policy-making processes is to achieve consensus in decision-making. Stakeholders play a fundamental role in policy development as a cycle of the policy-making process [10]. Therefore, the importance of identifying stakeholders for the success of organizations has been widely documented and proven. Identifying stakeholders is the first step to narrowing the system of interest and ultimately defining the problem in question correctly [11].

Stakeholder prioritization is a crucial process in project management and organizational decision-making, as it helps identify and rank the importance of various stakeholders based on their influence, interest, and potential impact on a project or initiative. Stakeholder prioritization is not a one-time process. It should be revisited regularly, especially as projects evolve, new stakeholders emerge, or existing stakeholders change their level of interest or influence. Effective stakeholder prioritization ensures that organizations can navigate complex environments, manage relationships strategically, and enhance the likelihood of project success. By understanding who the stakeholders are, their levels of power and interest, and how best to

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engage them, organizations can foster collaboration, minimize resistance, and achieve their objectives more efficiently.

The healthcare system, considering its specific structural, economic, and cultural characteristics, resource limitations, and growing societal demand, uses various regulatory models and tools to meet the expectations of clients in inpatient and outpatient service centers [12]. The significant growth in demand for healthcare system services and the development of its components, which have brought higher levels of quality for patients, are the result of the increasing need for policymakers to move in line with international standards. In achieving this, hospitals undoubtedly have priority over other components of the healthcare system. Therefore, any improvement in the process of providing hospital services is considered to mean a direct improvement in the performance of the healthcare system [2]. Guilan University of Medical Sciences and Health Services is the largest medical university in the north of the country, located in the city of Rasht and under the auspices of the Ministry of Health, Treatment, and Medical Education. This university has 8 hospitals and educational centers in the city of Rasht and 17 hospitals in Guilan province, many of whose clients are residents. Considering the importance of the speed and quality of hospital service provision, identifying key stakeholders and interacting with them is of great importance in meeting hospital expectations. Cooperation with stakeholders who have influence, strong relationships, and extensive communications strengthens organizational relationships and speeds up the removal of organizational implementation barriers. Regarding organizational stakeholders, various studies have been conducted on theoretical bases, of which a handful have addressed evaluation indicators. In the present study, in addition to systematically examining stakeholder evaluation indicators, the Fuzzy Delphi technique has been used for the initial evaluation and screening of the indicators identified from theoretical bases. Then, based on pairwise comparison using the DEMATEL technique and the network analysis process, the key indicators for evaluating stakeholders in hospitals of Guilan University of Medical Sciences were determined and analyzed, and finally the stakeholders of the hospitals were prioritized. In order to implement and conduct the research, the main questions and The research sub-question can be formulated as follows: **Main question:** How can we prioritize stakeholders of hospitals at Guilan University of Medical Sciences using a combined approach of analytic network process and DEMATEL? **Sub-questions:** (1) What are the key indicators for evaluating hospital stakeholders? (2) How is the prioritization of key hospital stakeholders?

Therefore, current study contributes to the academic literature on stakeholder management in healthcare settings, particularly in the context of Iranian hospitals. By applying and integrating ANP and DEMATEL, the research offers valuable insights and methodologies that can be replicated or adapted in other healthcare institutions, both nationally and internationally. The prioritization process helps align stakeholder goals with the strategic objectives of the hospital. By understanding the motivations and needs of various stakeholders, hospitals can develop strategies that not only meet organizational goals but also address stakeholder interests, fostering a collaborative environment. The combined ANP and DEMATEL methodologies provide a structured framework for analyzing complex stakeholder relationships and their influence on hospital operations. This structured approach enhances the quality of decision-making by providing clear insights into stakeholder priorities, enabling hospital administrators to allocate resources and efforts more effectively.

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2 Literature review

In theoretical foundations, various studies have been conducted on stakeholders, including: Faghihi [2] aimed to find appropriate and practical solutions to increase organizational stakeholder satisfaction using a descriptive field method and a questionnaire. The overall result of the study showed that organizational engineering factors, interpersonal relationships, communication and information systems, organizational space, and work methods lead to organizational stakeholder satisfaction. Fathi et al. [4] identified the signals that the company sends to its stakeholders. Given the company's goals of signaling, the recipients of the signals sent can be a group of company stakeholders. The research is developmental in terms of its purpose, qualitative in terms of the nature of the data, and documentary-meta-synthesis in terms of data collection. As a result of the analyses conducted, it was seen that the focus is more on some signals and also on stakeholders as recipients. Izadbakhsh and Emami [13] examined stakeholders and implemented a qualitative approach based on the "stakeholder analysis" method. In their study, after identifying and prioritizing stakeholders, strategies and solutions for interacting with stakeholders were presented. Saghafi et al. [14] examined different models, important criteria for evaluating stakeholders were extracted from theoretical foundations and, according to the opinions of experts, the most important criteria were identified and a framework for identifying value creation based on stakeholders was developed. Finally, by studying priority resources in the software industry and based on the presented framework, stakeholders of a native operating system were categorized and strategies for their management were presented. Kamali [15] examined political issues, scientific and operational recommendations were provided to policymakers. The results of the analyses conducted using the Policy Maker software showed that a fundamental factor affecting the likelihood of policy implementation is the power structure of the stakeholder groups involved in the policy proposals. Miles et al. [16] designed surveys using relational coordination theory to examine the habits of stakeholders and intergroup and intragroup relationships. The results showed that a high degree of relational coordination leads to greater satisfaction of participants in the system. Oppong et al. [17] provided a conceptual synthesis of construction performance characteristics. In this study, after determining the list of performance characteristics using the content analysis method, a conceptual model of management performance characteristics was developed. Stakeholders, including: performance objectives, success factors and performance indicators in the delivery of construction projects. Li et al. [18] conducted a study for analysis of stakeholder influence during post-occupancy evaluation of green buildings - case study in China" in 2018. They used various techniques including; score-based approach, power/interest matrix and stakeholder circle to evaluate the levels of stakeholder influence, and finally presented a comprehensive quantitative method for analyzing stakeholder influence during evaluation. Wang et al. [19] identified 30 influential factors in urban renewal were confirmed through a questionnaire and the entropy method was used to determine the weight of macro-criteria and sub-criteria, and a comprehensive benefit evaluation model of urban renewal was presented. The 16-factor evaluation index system, Including: Three subsystems were created through factor analysis theory. To calculate the result of the Leader Village Renovation Evaluation using fuzzy theory, it was shown that the comprehensive benefit evaluation of the village renovation is good. Ewurum et al. [20] conducted a conceptual model of Stakeholder Management. In this exploratory study, the opinions of 385 real estate experts and policymakers were used. The data were analyzed qualitatively using the text sorting and content analysis method and with the one-sample Kolmogorov-Smirnov test and Spearman correlation. The findings show the effectiveness of the model in identifying the interests of stakeholders and

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creating a sustainable interaction framework. Sharp et al. [21] presented a set of criteria to predict stakeholder behavior in environmental management decisions. Beack et al. [22] used correlational, bibliographic, and social network analysis on stakeholder theory in urban fabric. Franco-Trigol [23] presented a planning process was designed that involved key stakeholders and how to use stakeholder analysis in health innovation planning processes.

The above-mentioned backgrounds indicate that in organizations, identifying and prioritizing stakeholders and determining how to appropriately interact with key stakeholders are crucial for planning, decision-making, and project implementation. However, no research has examined, identified, and analyzed hospital stakeholders so far, and the present study is innovative and novel in this regard. It can also be concluded from the background analysis that identifying stakeholders, prioritizing them, and determining how to interact with them are important factors in ensuring the success of services and programs in the health care system, which is the main custodian of creating, promoting, and improving health in society, and can be a fundamental factor in improving their performance.

3 Methodology

The present study has investigated the key indicators of hospital stakeholder evaluation in hospitals of Guilan University of Medical Sciences. Therefore, it is applied in terms of purpose and descriptive-analytical in terms of method. Two methods of library and field methods have been used to collect data. The library method includes; studying various Persian and English texts and articles in order to extract hospital stakeholder evaluation indicators (Table 1) and the field method includes using a questionnaire tool to determine the key indicators affecting the selection of hospital stakeholders. This questionnaire has been developed in an adapted and innovative manner.

Table 1 Stakeholder prioritization indicators

Creteria	References
Power	[8], [3], [9], [13], [7], [22], [11]
Participation,	[3], [9], [24], [13], [2], [7], [23], [15], [22], [11], [10]
Satisfaction,	[24], [13], [23], [11], [10]
Conflict,	[15], [10]
Flexibility,	[2], [23]
Position,	[8], [3]
Interest,	[9], [2], [11]
Innovation,	[14], [11]
Interaction,	[3], [7], [15]
Influence, Information,	[8], [3], [9], [13], [7], [15], [22], [11]
Communication,	[8], [3], [9], [13], [7], [22], [11]
Trust,	[3], [9], [24], [13], [2], [7], [23], [15], [22], [11], [10]
Legitimacy,	[24], [13], [23], [11], [10]
Coordination,	[15], [10]

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Need,	[2], [23]
Value Creation,	[8], [3], [9], [13], [7], [22], [11]
Dependence,	[3], [9], [24], [13], [2], [7], [23], [15], [22], [11], [10]
Social	[24], [13], [23], [11], [10]
Responsibility,	[15], [10]
Benefits,	[2], [23]
Potential,	[15], [10]
Motivation,	[2], [23]
Relationships,	[8], [3]
Understanding,	[9], [2], [11]
Planning,	[14], [11]
Objectives,	[3], [7], [15]
Monitoring and Control,	[15], [10]
Leadership,	[2], [23]
Importance	[8], [3]
Necessity	[9], [2], [11]

The statistical population of the study includes; hospital experts (heads of hospitals in Guilan University of Medical Sciences) numbering 27 people and university experts (professors of public administration at Islamic Azad University, Payam Noor and University of Guilan in Rasht who have written in the field of "stakeholder theory") numbering 14 people. Among the two groups of experts, 9 hospital heads and 10 university professors agreed to cooperate with the researcher. Delphi methods, analytic network process (ANP) and DEMATEL were also used to analyze the research data. The ANP and DEMATEL methods provide a robust framework for prioritizing medical stakeholders by addressing the complexities and interrelationships inherent in healthcare systems. Their ability to integrate qualitative and quantitative data, facilitate consensus, and adapt to changing dynamics makes them valuable tools for healthcare decision-makers aiming to enhance stakeholder engagement and improve overall healthcare delivery.

3.1 Fuzzy Delphi Method

The Delphi method is a structured process based on group communication and is used in cases where it is not possible to gather experts for various reasons or this has fundamental limitations. In addition, this method does not have the limitations that are observed in terms of the use of mathematical rules, formulas, and models (24). In this study, the fuzzy Delphi method was used to screen hospital stakeholder evaluation factors in theoretical bases. The steps of this method are: 1. Identifying research indicators using a comprehensive review of the theoretical bases of the research 2. Preparing and distributing the Delphi questionnaire in the first round. In this step, a questionnaire containing the stakeholder evaluation criteria factors will be sent to the experts to determine the importance of each factor based on a Likert scale from very low (1) to very high (5) (Table 2).

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Table 2 Verbal expression of the importance of indicators

Variable	Numerical valie
Very low	(0, 1, 3)
Low	(1, 3, 5)
Medium	(3, 5, 7)
High	(5, 7, 9)
Very High	(7, 9, 10)

1. Preparation and distribution of the Delphi questionnaire in the second round: After collecting and reviewing the questionnaires, the results of the first round opinions will be sent to the experts in the form of a questionnaire again so that they can present their opinions after reviewing the results of the initial stage and receiving feedback.

2. Achieving consensus of the experts' opinions: After collecting and analyzing the experts' opinions in the second round, the average difference is examined. If this difference is less than 0.2, consensus is achieved and the fuzzy Delphi stages are completed. Otherwise, the analysis of the results of this round will be sent to the experts again. This process continues until the experts reach a consensus on all the criteria.

3. Determination of the final indicators: Finally, in order to confirm and screen the criteria, the acquired value of each criterion is compared with the threshold value. The threshold value is calculated in several ways, and usually the value of 0.7 is considered as the threshold value. To calculate the average of the opinions of n respondents, the geometric mean of their opinions is calculated.

3.2 DEMATEL Technique

The analysis tool in this study is the DEMATEL technique, which is used for hierarchical structuring of factors. The DEMATEL technique was presented by Fontella and Gabos in 1971, which is a type of decision-making method based on pairwise comparisons. It uses the judgment of experts to extract the factors of a system and systematically structure them using the principles of graph theory, providing a hierarchical structure of the factors in the system along with influence and interaction relationships, in a way that determines the intensity of the effect of the aforementioned relationships in the form of a numerical score. This technique is used to structure a sequence of given information, in such a way that the intensity of the connections is examined in the form of a score, the feedbacks are investigated along with their importance, and the non-transferable relationships are accepted [2]. DEMATEL helps visualize and analyze the cause-and-effect relationships among stakeholders. It identifies which stakeholders are influential and how they affect each other, providing insights into the dynamics within the healthcare system. The following algorithmic steps are followed to implement the DEMATEL technique.

Step 1: We identify the elements that make up the system using the Delphi method (or other methods).

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Step 2: We place the given elements at the vertices of a diagram and determine the relationships that should govern the connections between the stations or (vertices) using expert judgment.

Step 3: We specify a group decision rule for the purpose of collective agreement of expert judgment for the possible relationship between the elements.

Step 4: We specify the intensity of the final relationships between the elements (alternatives) in the form of a score (for example, from 0 to 4, from 0 to 10, or from 0 to 100) and determine it on the graph.

Step 5: Forming the direct relationship matrix (M): When the viewpoints of several people are used, the simple average of the opinions is used and we form M.

Step 6: Normalizing the direct relationship matrix (D): The relative intensity governing direct relationships

D=Alpha*Sum Row

Alpha=1/max (Sum Row)

Step 7: Calculate the relative intensity of direct and indirect relationships and form the final matrix

D*(1-D)-1

Step 8: We specify the hierarchy or possible structure of the elements. (Creating a causal diagram).

3.3 Analytical Network Process (ANP)

The analytical network method was proposed by Saati and Taki Zavar in 1986. The ANP method is a generalization of the AHP method. In many cases, hierarchical relationships do not necessarily prevail and there are internal relationships between and within clusters. In this case, the simple hierarchical pattern is transformed into a network of relationships. For this reason, the ANP technique is called the network analysis process. The basis of the AHP and ANP processes is based on pairwise comparisons based on the experts' perspective [25]. The ANP method is particularly effective in situations where stakeholders have complex interrelationships. In healthcare, stakeholders such as patients, healthcare providers, insurance companies, and regulatory bodies often influence each other. ANP allows for the modeling of these interdependencies, enabling a more comprehensive analysis of how stakeholders impact one another. The steps in implementing the network analysis process are:

a) Modeling and converting the problem into a network structure: The issue or problem should be clearly and explicitly drawn as a logical system, such as a network. This network structure can be obtained through brainstorming or any other method such as nominal group or Delphi method [26].

b) Forming a pairwise comparison matrix and determining priority vectors: Decision makers should compare elements or clusters themselves pairwise. In addition, the interdependencies between elements of a cluster should also be compared pairwise. The effect of each element on another element can be represented through a special vector [26]. The relative importance of elements based on criteria R1-9 is determined hourly [27].

c) Formation of the supermatrix: In this step, to obtain the overall priorities in a system with dependent effects, we will form the final supermatrix through the following steps:

Step 1- Formation of the initial supermatrix: The priority vectors calculated in the second step are placed in the corresponding column in the supermatrix. The resulting matrix is called the initial supermatrix.

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Step 2- Calculation of the weighted or random supermatrix: This matrix is obtained from the normalization of the initial supermatrix. In this way, we divide each of the elements of the columns by the sum of the elements of the corresponding column.

Step 3- Calculation of the final supermatrix: This matrix is calculated using the following equation, which shows the final priorities of the absolute.

Final supermatrix = (weighted supermatrix) $^{2K+1}$

d) Selection of the best option: The priority vectors of the options are found in the option row of the final supermatrix. The option that has the highest weight is selected as the desired option [27].

4. Results

In order to implement the research, in the first round of the fuzzy Delphi method, using the opinions of experts from the criteria extracted from the research literature regarding hospital stakeholder evaluation indicators and integrating similar criteria, 30 stakeholder evaluation indicators were identified, including: power, participation, satisfaction, conflict, flexibility, position, interest, innovation, interaction, effectiveness, influence, information, communication, trust, legitimacy, coordination, need, value creation, dependency, social responsibility, interests, potential, motivation, relationships, understanding, planning, goals, monitoring and control, leadership, and importance. They were finalized in the form of a Delphi questionnaire for evaluation. Next, in order to calculate the importance of the indicators, the questionnaire prepared in the first round of the Delphi technique was sent to the experts to determine the importance of each indicator. After summing up the results, the second round of the Delphi questionnaire was sent to the experts, indicating the final score of each indicator. Reviewing the results of the second round and summing up the scores showed that in 5 indicators, the difference in the average opinions of the experts in the first and second rounds was more than 0.2. Therefore, the third round of Delphi questionnaire was sent to the experts again, stating the final score of each indicator in the second round. Table (3) shows the final results of the implementation of the second round of the fuzzy Delphi technique, along with the non-fuzzy average of the experts' opinions in the second round, the difference in the average opinions of the experts in the first and second rounds, and the result of approving or rejecting the indicator. Given that in this round, the difference in the average of the indicators with the scores of the second round is less than 0.2, a consensus has been reached. Therefore, the indicators whose scores are higher than the threshold (0.7) are determined as the final evaluation indicators.

Table 3 Fuzzy Delphi method for selecting hospital stakeholders

Creteria	Very low	Low	Medium	High	Very High	Non-fuzzified average of expert opinions	Difference in average expert opinions
Power	3	11	3	2		6.533	0.009
Participation,	7	8	4			7.254	0.105
Satisfaction,	6	7	4	2		6.737	0.096
Conflict,	1	7	7	4		5.518	0
Flexibility,	5	5	8	1		6.430	0.096
Position,		2	13	4		4.789	0

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Interest,	5	7	6	1		6.640	0
Innovation,	5	5	5	3	1	6.044	0
Interaction,	3	13	2	1		6.868	0.105
Influence, Information,	3	13	3			6.974	0.114
Communication,	4	8	3	4		6.228	0.070
Trust,	10	7	2			7.754	0.096
Legitimacy,	7	9	3			7.360	0.105
Coordination,	6	6	6	1		6.737	0
Need,	1	4	14			5.623	0
Value Creation,	3	9	6		1	6.377	0
Dependence,	7	9	3			7.360	0.114
Social	1	10	8			6.254	0.105
Responsibility,		2	13	3	1	4.719	0
Benefits,	3	8	6	2		6.237	0
Potential,	8	5	6			7.140	0.096
Motivation,	5	5	9			6.535	0
Relationships,	5	10	4			7.061	0
Understanding,	7	6	5		1	6.868	0.105
Planning,	2	7	7	3		5.825	0
Objectives,	8	8	1	1	1	7.175	0.035
Monitoring and Control,	8	7	2	2		7.140	0.096
Leadership,	8	5	5	1		7.035	0.105
Importance	6	8	4	1		6.947	0.105
Necessity	10	7	2			7.754	0

As can be seen in Table (3), 10 indicators: participation, information, communication, level of need, benefits of cooperation, motivation, ability to plan, alignment of the goals of the stakeholder with the organization, possibility of monitoring the stakeholder, and the importance and necessity of the position of the stakeholder are recognized as basic indicators for evaluating stakeholders.

At this stage, using the opinions of 6 experts who were heads of government hospitals in Gilan province, 30 stakeholders identified from the research literature, including: hospital staff, patients, patient companions, hospital contract doctors, suppliers of hospital goods and services, other hospitals and health and treatment centers, spinal cord injury center, covered community, electricity, water, gas and telecommunications organizations, welfare, forensic medicine, law enforcement, Imam Khomeini Relief Committee, consumer protection groups, newspapers and media, hospital management, Ministry of Health, University of Medical Sciences, university vice-chancellors and affiliated centers, Martyr and Veterans Affairs Foundation, insurance organizations, medical system, nursing system, municipality, financial institutions and banks, representatives of the Islamic Consultative Assembly, representatives of the city council, political groups, government, Friday prayer leader, were rated with stakeholder evaluation indicators and 12 stakeholders obtained the highest scores, including: hospital staff, patients, patient companions, hospital contract doctors, suppliers of hospital goods and services, other hospitals and health and treatment centers, hospital management, Ministry of Health, University

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of Medical Sciences, vice-chancellors and affiliated centers, Martyr and Veterans Affairs Foundation, insurance organizations, medical system, nursing system, municipality, financial institutions and banks, representatives of the Islamic Consultative Assembly, representatives of the city council, political groups, government, Friday prayer leader. Health, University of Medical Sciences, Insurance Organizations, Medical System, Nursing System. To determine the relationships between the indicators and the pairwise comparison matrix and calculate their relative weights, the network analysis technique was used. As calculated in the DEMATEL method, among the possible relationships, the relationship between the criteria and the stakeholders that were more important was identified and entered into the Super Decision software environment and the relationships between the indicators and the stakeholders were determined and prioritized in the super matrix based on weight. According to the results of the final super matrix, the 5 stakeholders, namely hospital management, doctors contracted with the hospital, University of Medical Sciences, staff, and the Ministry of Health and Welfare, received the highest scores.

Table 4. Final super matrix

Super Decisions Main Window: Hasani2.sdmod: Weighted Super M...

Cluster Node Labels		Alternatives													Criteria										Goal
		A1	A2	A3	A4	A5	A6	A7	A8	A8	A9	A10	A11	A12	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	G
Alternatives	A1	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.047096	0.027226	0.043206	0.040437	0.020386	0.042803	0.048917	0.047606	0.043783	0.047100	0.000000
	A2	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.037004	0.020765	0.030548	0.046044	0.020567	0.037534	0.020428	0.031403	0.029222	0.036650	0.000000
	A3	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.032988	0.017351	0.029950	0.036815	0.019208	0.034072	0.024984	0.029496	0.027637	0.025700	0.000000
	A4	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.049406	0.028975	0.049635	0.048971	0.029809	0.053943	0.058781	0.053475	0.053936	0.055000	0.000000
	A5	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.039465	0.023079	0.039768	0.037212	0.023074	0.033971	0.027538	0.029697	0.042792	0.032850	0.000000
	A6	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.041172	0.021555	0.035980	0.028778	0.022893	0.025140	0.032294	0.030600	0.026795	0.029950	0.000000
	A7	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.051515	0.029455	0.055017	0.049765	0.030927	0.054244	0.066191	0.053475	0.059335	0.055000	0.000000
	A8	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.038912	0.242072	0.043555	0.043712	0.027393	0.046817	0.054925	0.050565	0.048240	0.047950	0.000000
	A9	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.046845	0.027452	0.052924	0.048277	0.048277	0.030927	0.051986	0.058280	0.053475	0.052549	0.051550	0.000000
	A10	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.040268	0.021555	0.040814	0.044109	0.044109	0.028269	0.043305	0.034547	0.044947	0.043882	0.047100	0.000000
	A11	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.033490	0.019185	0.037077	0.034533	0.034533	0.221379	0.034373	0.031393	0.033459	0.030559	0.033600	0.000000
	A12	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.041839	0.021329	0.041527	0.041345	0.041345	0.025167	0.041814	0.041722	0.041802	0.041272	0.037550	0.000000
Criteria	C1	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.200457	0.161852	0.000000	0.000000	0.179756	0.262009	0.125000	0.216023	0.000000	0.109923	0.253361
	C2	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.122542	0.000000	0.000000	0.000000	0.140565	0.000000	0.000000	0.500000	0.128472	0.162289
	C3	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.184863	0.186079	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.178329	0.232364
	C4	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.034848	0.000000	0.000000	0.061330	0.000000	0.125000	0.063913	0.000000	0.041430	0.049743
	C5	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.080449	0.000000	0.000000	0.102823	0.102823	0.000000	0.000000	0.125000	0.100423	0.000000	0.023504	0.029318
	C6	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.051704	0.000000	0.000000	0.058671	0.058671	0.085034	0.000000	0.125000	0.119641	0.000000	0.000000	0.020136
	C7	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.043897	0.049573	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.066234
	C8	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.111874	0.111874	0.110355	0.097426	0.000000	0.000000	0.000000	0.000000	0.047971
	C9	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.044968	0.000000	0.020722	0.038069	0.038069	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.031192
	C10	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.138016	0.069567	0.110463	0.188562	0.188562	0.063525	0.000000	0.000000	0.000000	0.000000	0.018342	0.107391
Goal	G	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

5 Discussion

As mentioned, in the current conditions, the most important factors for the survival of the organization are responding to the demands of the organizational stakeholders, who in specific circumstances and when the organization needs them, respond to the expectations of the organization. Estimating these needs and expectations and interacting with stakeholders who have different degrees of power is a difficult task and requires precise goal setting and planning. Hospital managers face many problems due to numerous shortcomings in various executive areas, achieving the organization's goals, and satisfying the stakeholders. Key indicators

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include: stakeholder participation and cooperation with the organization, stakeholder information, stakeholder communication, level of need for stakeholders, benefits of cooperation, stakeholder motivation, and stakeholder ability to Planning, alignment of stakeholder goals with the organization, possibility of monitoring and controlling the stakeholder, importance of the position of the stakeholder and key stakeholders include: hospital staff (A1), its patients (A2), patients' companions (A3), hospital contract physicians (A4), hospital goods and services suppliers (A5), other hospitals and health and treatment centers (A6), hospital management (A7), Ministry of Health (A8), University of Medical Sciences (A9), insurance organizations (A10), medical system (A11) and nursing system (A12). Based on the DEMATEL technique and network analysis, hospital stakeholders have been prioritized based on their importance to the organization. Based on the results, the most important hospital stakeholders are identified as hospital management, hospital contract physicians, University of Medical Sciences, staff, and patients. The final weights of the stakeholders in the final super matrix were determined as follows: Management (A7): 1; Contract Physicians (A4): 0.957; University of Medical Sciences Medical (A9): 0.939; Staff (A1): 0.839; Ministry of Health and Welfare (A8): 0.776. Therefore, the final prioritization of stakeholders is as follows:

$$A7 > A4 > A9 > A1 > A8$$

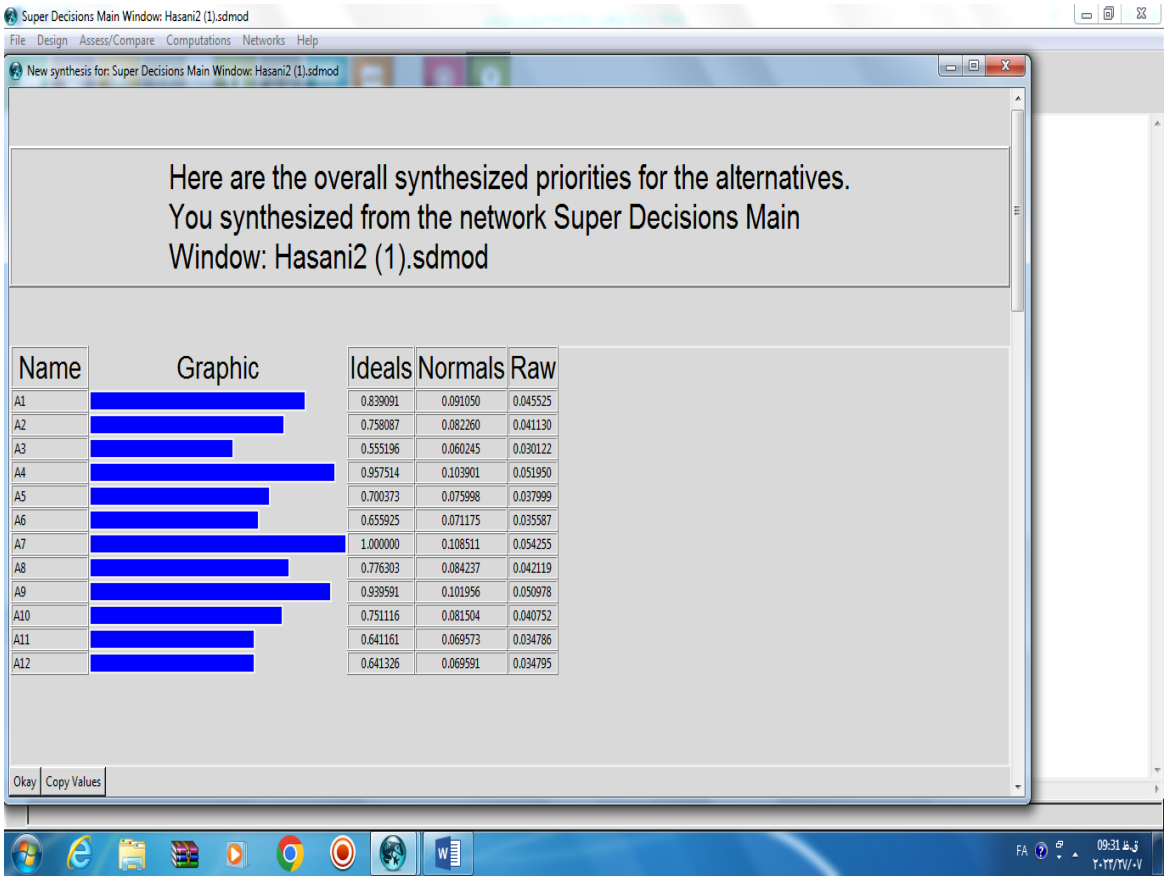

Fig. 2 Overall prioritization of hospital stakeholders

This is because it is important for managers of the organization to identify their various stakeholder groups and, by determining the position of each of them in their internal and

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external environment and the interest and power they have to influence and intervene in decision-making, adopt an appropriate way to interact with them.

6. Conclusion

The prioritization of stakeholders in hospitals affiliated with Guilan University of Medical Sciences through the combined analysis of the Analytic Network Process (ANP) and Decision-Making Trial and Evaluation Laboratory (DEMATEL) has proven to be a vital strategy for enhancing stakeholder engagement and operational effectiveness. By systematically identifying and assessing the influence of various stakeholders, this approach facilitates informed decision-making that aligns with both organizational goals and stakeholder needs. Moreover, the integration of ANP and DEMATEL provides a robust framework for continuous assessment and adaptation of stakeholder relationships, ensuring that hospitals remain responsive to the evolving healthcare landscape. As a result, this study not only contributes to the operational strategies of hospitals within Guilan University of Medical Sciences but also offers valuable insights for other healthcare institutions seeking to enhance their stakeholder management practices.

The present study, in line with the studies conducted by Mills et al. [16], Oppong et al. [17], McCollum et al. [28], Ewurum et al. [20], Vedluga and Mikkelskin [29], Tedder and Kay-Mary [10], Oliveira and Rabcini [6], Li et al. [30], Radet et al. [31], Saghafi et al. [14], Kamali [15], and Ahangar et al. [9], has developed the relevant literature from another perspective. In this study, in addition to identifying key indicators for evaluating hospital stakeholders, stakeholders were analyzed and prioritized using the fuzzy Delphi method, the DEMATEL technique, and network analysis. Key indicators and stakeholders were identified by consensus of experts in this study.

The main limitation of this research is that the results obtained are highly dependent on the judgment of the experts who participated in it. Despite the participation of most experts in the research, the addition of opinions of other experts may cause minor changes in the results obtained. Also, the combined use of ANP and DEMATEL can be complex, requiring a deep understanding of both methodologies. Implementing these methods may involve intricate calculations and interpretations, which can be challenging for practitioners without sufficient expertise. Both ANP and DEMATEL rely on subjective assessments, such as pairwise comparisons and evaluations of cause-and-effect relationships. Stakeholders' perceptions and biases can influence these judgments. Conducting a thorough analysis using ANP and DEMATEL can be resource-intensive, requiring significant time, effort, and personnel involvement. This may include training staff, gathering data, and conducting workshops for stakeholder engagement. The focus on specific stakeholders may lead to the neglect of other important groups or factors that influence hospital operations and patient care.

Considering the results of the research, it is suggested that hospital managers design their management policies while participating, cooperating and interacting with key stakeholders in a way that results in the greatest benefit and the least loss. It is also suggested to future researchers to analyze and prioritize the organization's stakeholders in the form of a network by examining and analyzing the components of stakeholder evaluation and the feedback relationships between these factors, through methods such as fuzzy cognitive mapping or system dynamics.

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