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Comprehensive Strategic Planning for Construction Companies Using Fuzzy MADM Techniques

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Abstract: In today's volatile and competitive global markets, organizations face numerous challenges to their survival and growth. To navigate these challenges effectively, the adoption of future-oriented, environment-based planning strategies is essential. Such strategies must not only address the identification of key environmental factors but also assess their long-term impacts on the organization, alongside its interaction with these external variables. The survival and sustainable development of an organization depend on a timely understanding of emerging opportunities and market dynamics, the formulation of strategic plans, and the selection of appropriate, effective strategies. This study presents an integrated model designed to evaluate the factors influencing a construction company's performance, with a focus on conducting a comprehensive risk analysis. The model prioritizes and quantifies the significance of each element within the strengths, weaknesses, opportunities, and threats (SWOT) analysis of the company's operational context. Furthermore, two fuzzy logic-based Multiple-Attribute Decision-Making (MADM) methods, namely the Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS) and the Analytic Hierarchy Process (AHP), were employed to rank the identified factors. Based on the analysis of the collected data, the final strategic course for the company was derived. The results indicated that the TOPSIS method placed a greater emphasis on the organization's strengths and opportunities, while the AHP approach, despite prioritizing long-term safety considerations, underscored the significance of addressing weaknesses and mitigating threats. This research contributes to the understanding of how fuzzy MADM techniques can be applied to strategic planning in the construction industry, facilitating more informed decision-making processes that align with the evolving demands of the market and ensure organizational resilience.

Keywords: Strategic planning; Construction company; Fuzzy MADM; Decision-making

1 Introduction

Companies face many challenges to survive in unstable and competitive global markets. They must utilize future-oriented and environment-based plans to overcome obstacles and succeed in the competition [1]. The plans need to be in a way that both identifies environmental factors and developments and specifies their long-term impacts on organizations and the latter's interaction methods with them [2]. The survival and growth of organizations require a timely understanding of environmental opportunities and changes in markets, adopting strategic plans, and selecting convenient and effective strategies [3, 4]. An effective strategy brings competitive organization advantages and strategic superiority [5]. It implements the approaches of developing a strategy and is developed based on a collection of mathematical models and insight [6]. Organizations that understand market regulations are more likely to benefit from the opportunities. New technologies, attitudes, and methods can all transform existing rules and create utterly novel conditions [7, 8]. In this way, the developed strategies are based on the reality and circumstances of an organization, and they can lead to success and create competitive advantages if implemented conveniently [1].

It should be noted that no organization has access to unlimited resources; the dominant atmosphere is competition. Thus, developing accurate and competitive organizations is of utmost significance for organizations to achieve their intended macro-scale objectives [9]. That is because spending resources on peripheral issues is punished by losing the competitive ground to rivals concentrating their limited resources on main topics [10]. Based on the above

considerations, it can be announced that having a strategic plan is the best tool for organizations that intend to maintain their presence in markets consciously without surrendering to changes [11]. Strategic planning aims to help the enforcement of laws so that the status and the way to achieve it can be illuminated. Though various offices use different terms and labels, all should make plans to achieve success and development [12]. Some thinkers believe that strategic planning represents managers' creative power in building the future. An essential stage in this type of planning is accumulating information about the strengths and weaknesses (internal) as well as opportunities and threats (external) that an organization faces [13]. That is because each effective strategy utilizes advantages and opportunities and tries to minimize or eliminate weaknesses and threats [14]. An organization needs to specify its present status before illustrating its future. The SWOT analysis is the mechanism used to assess an organization's internal and external conditions to answer the question, "Where are we now?" It is a primary managerial instrument implemented in strategic planning, policy-making, and issue resolution [15]. It specifies future orientations, determines priorities, helps make significant decisions based on all levels and actions, improves organizational performance, and deals with ever-increasing environments conveniently [16]. The SWOT analysis attempts to analyze organizations' internal and external conditions. It offers a realistic and trustworthy basis for evaluating them, including identifying strengths, weaknesses (areas that can be improved), opportunities, and threats [17]. The information collected through the evaluation process typically results in the detection of strategic issues [18]. The primary mission of the SWOT analysis is to progress and move forward based on strengths, minimizing weaknesses, providing grounds for improvement, seizing opportunities, and eliminating threats [19]. Such internal and external analyses enable organizations to detect their unique qualities and competitive weaknesses meticulously and objectively. Through such investigations and the obtained information, managers can invest in completing competitive opportunities, reduce obstacles and threats, and eliminate their effects [20]. Identifying strengths and weaknesses enables organizations to select convenient strategies to face environmental forces [21].

Out of all feasible and alternative strategies in the SWOT analysis, making decisions about the relative importance of the various factors, figures, processes, and data in the stage of presenting the solution is a significant matter since the prominent competitive advantages that organizations target are fulfilled during this stage [13]. The MADM method is a branch of the decision-making science used to compare limited scenarios/solutions [22]. In this regard, the present study aims to offer an integrated framework and develop a strategy to analyze a construction company in dams, buildings, and roads using a combination of the SWOT analysis and the MADM method in the fuzzy environment.

2 Relevant Concepts and Studies

2.1 Strategic Management

In the modern competitive world, traditional management methods are no longer efficient, and fulfilling organizations' missions requires using strategy-based management approaches based on extensive and profound visions [23]. Strategic management is a managerial style that can significantly assist organizations in a challenging environment [24]. Strategic management refers to integrated decisions and activities to develop, implement, and control effective strategies and evaluate the obtained results [25]. Thus, activities concerning investigating, evaluating, and selecting strategies, adopting internal and external organizational policies to implement the strategies, and monitoring the performed actions make up strategic management [26].

David [27] classified the process of strategic management into the following three stages:

Stage 1: Strategy formulation. The stage involves expressing ideals and missions, understanding values, conducting a SWOT analysis, determining long-term goals, creating and selecting strategies, and following them.

Stage 2: Strategy implementation. In this stage, discussions include policies, financial competence, motivation, support mechanisms, organizational structures, change acceptance, and human resources.

Stage 3: Strategy evaluation. The stage involves the assessment of performance, adopting corrective activities, and evaluating the effects of changes/participation.

2.2 SWOT Analysis

The SWOT technique or matrix is an efficient method to understand the conditions of a system (sites, industries, and sensitive and critical centers – to name but a few) that includes the threats and opportunities existing in the external environment of a project and the recognition of its internal weaknesses and strengths. The goal is to evaluate the existing condition and develop solutions to reduce the system's vulnerability, increase its resistance threshold, and manage it optimally and sustainably [28].

Three stages can be recognized in developing the SWOT technique: a) developing techniques that assess the internal weaknesses and strengths of the system; b) developing methods that consider analyzing the threats and opportunities created by the external environments of the system; and c) developing the SWOT technique that makes the internal and external variables interact and coordinates them [13].

Though the set of variables considered in the SWOT matrix does not include new ones, the novelty of the technique is its ability to coordinate and find systematic relations between the variables. Many scholars in strategic planning

highlight the significance of using one's strengths and opportunities. However, other important considerations should not be ignored, such as reducing weaknesses to exploit opportunities. That is because a weakness is synonymous with the lack of strength in a section of the system, and endeavoring to alleviate the weakness can lead to developing a distinct strategy for the system. The SWOT matrix is a conceptual framework that combines an institute's internal and external factors, and strategies are created based on the interaction of such variables.

SWOT analysis systematically identifies factors that a strategy must most conveniently align with. The logic of the method states that any effective strategy needs to maximize the strengths and opportunities of the system and minimize the weaknesses and threats. A model is a strategic tool for adapting a system's internal weaknesses and strengths with extra-organizational opportunities and threats. The SWOT model offers a systematic analysis for detecting factors and selecting a strategy that can adapt the aspects in the best way possible. According to the model, a convenient strategy maximizes strengths and opportunities and minimizes weaknesses and threats [29]. The SWOT strategic analysis investigates organizations' internal and external environments, measures utilized to control and evaluate performances, and the efficiency and effectiveness of processes. Indeed, strategic management is a way to investigate the interactions between organizations' internal and external environments by developing convenient strategies.

2.3 MADM

The MADM models typically include a finite set of methods helping a decision-maker classify alternatives and select the best ones. In the MADM, a limited set of criteria usually has to be evaluated according to the relative significance of each criterion. In management and planning, the MCDM method is implemented to study techniques and trends and accommodate MADM criteria that are typically in conflict with one another [30]. The main goal of such a model is to help decision-makers combine objective values and scales with subjective judgments. This is typically carried out not based on distinct ideas but on collective ideas. In a typical MADM model, the decision-making matrix ranks all methods according to a criterion specified in the beginning. Then, the evaluation ranks are added for each scheme based on the weights of the criteria and the global evaluation scores [31]. There are several methods for adding to the MADM model, including Simple Additive Weighting (SAW) [32–34], TOPSIS [35–37], and AHP [38–40]. Moreover, the fuzzy MADM method has been proposed in several studies to evaluate the significance of the criteria and rank the methods based on each criterion and special managerial terms [41].

2.4 Quantitative Strategic Planning Matrix (QSPM) Analysis

The main stage of the strategy management process is strategy formulation, in which possible solutions are created and evaluated. David [27] argued that strategy formulation methods could be combined with decision-making frameworks. Strategies can mainly be assessed and selected according to a framework consisting of the initial stage, adaptation, and decision-making. The QSPM is the last stage of strategy formulation. The matrix utilizes the input information of the first stage and objectively evaluates all possible strategies in stage two. Moreover, it specifies the relative attractiveness of the alternative strategy and offers an objective and conceptual basis for selecting the best one.

In principle, the components of the QSPM include the specification of the main factors, evaluated strategies, rankings, the attractiveness score, the overall attractiveness score, and the total scores of overall attractiveness. From a conceptual point of view, the QSPM specifies the relative attractiveness of diverse strategies based on critical internal and external factors. The attractiveness of each strategy is calculated by determining the accumulative effect of each internal and external factor. Moreover, any number of alternative strategies can be included in the QSPM.

The following six stages need to be considered for the development of a QSPM in any organization [16]:

Stage 1: Preparing a list of external opportunities/threats and internal strengths/weaknesses (in the left column of the matrix);

Stage 2: Assigning a weight (weighting) to each critical internal and external factor;

Stage 3: Investigating the matrices of the second stage (adaptation) and determining strategies that the organization needs to consider;

Stage 4: Determining the attractiveness scores (1= no attractiveness, 2= relative attractiveness, and 3= reasonable or remarkable attractiveness) for each component of any strategy;

Stage 5: Comparing the overall attractiveness scores;

Stage 6: Calculating all methods' total attractiveness scores. The study by Barak and Javanmard [16] can be referred to for more information.

2.5 Fuzzy Logic

Decision-making in the real world is typically carried out in fuzzy environments subject to judgmental uncertainties [42]. Fuzzy sets [43] were introduced as a development of the concept of classic sets. From then on, fuzzy decision-making sets were utilized when input data were incomplete or worthless. Lee et al. [44] offered a mechanism, a combination of fuzzy cognitive maps (FCMs), to simulate strategic planning. In the mechanism, the FCMs were used to help decision-makers to understand movements between specific strategic goals and relevant environmental

factors. Lee and Lin [45] offered the fuzzy SWOT method to evaluate competitive environments consisting of diverse transportation locations as international distribution centers (IDC) in the Asia-Pacific region. The investigation showed that fuzzy logic performed better than non-fuzzy methods in specifying competitive locations and points [46–48].

2.6 Literature Review

The famous SWOT analysis and the QSPM have been commonly implemented in strategic planning [49–52]. The instruments have been selected as the best decision-making tool from the alternative strategies [28]. The first quantitative method of the SWOT analysis was the AHP-based SWOT (A'WOT) method, which was proposed by Kurttila and included the AHP [53]. The applications of the A'WOT have also been illustrated in other studies [54–56]. Agnusdei et al. [57] proposed the Analytic Network Process (ANP) to be added to the SWOT analysis. Other quantitative SWOT techniques were proposed with or without uncertainty considerations [58]. However, quantitative SWOT methods have rarely been utilized in discussions revolving around energy design. Lee et al. [59] argued that the AHP method should include a representative factor out of the SWOT teams so that the representative can have the highest score. The quantitative SWOT method provides more detailed data for the SWOT analysis [60]. The method has been adapted to the MADM method, which can utilize multi-layer schemes to simplify complex problems and simultaneously implement the SWOT analysis in several organizations. When planning processes become complicated due to multiple criteria, this can indicate the inaccurate implementation of the SWOT analysis [61]. In other words, this shows that an unclear, qualitative, and incomplete list of the factors influencing an organization's internal and external environments has been utilized.

The methods that utilize the SWOT analysis include the External Factor Evaluation (EFE) matrix, the Internal Factor Evaluation (IFE) matrix, and the Competitive Profile Matrix (CPM). However, the following shortcomings are unavoidable in all of them [62]:

(a) Ranking the main factors is performed objectively. Thus, the methods face challenges in ranking quantitative data (e.g., trade volume).

(b) Evaluators in the objective ranking of data rank the data without testing them, which may result in the loss of cohesion between the data.

To resolve the problem, Li et al. [63] combined the AHP and SWOT methods and offered a hybrid approach to improve the analysis of environments using the SWOT analysis. Moreover, Wang and Yu [60] developed a SWOT analysis using the Gray Relational Analysis (GSM) method.

Integrating the SWOT matrix with the Balanced Scorecards (BSC) resulted in an integrated and holistic strategic management system. The SWOT matrix determined the success factors that could be utilized to explain and detect BSC [64, 65]. Based on this, a structural approach could be implemented to develop, regulate, and establish opportunities and threats (e.g., competitors) that a company faces. Organizations could combine the SWOT analysis and the BSC method to balance their strengths and their competitors' weaknesses and endeavor to conveniently and optimally exploit the market opportunities.

Moreover, the SWOT analysis and the BSC method could be combined with the Quality Function Deployment (QFD) approach [66]. This combination offered a planned circumstance for management to transform strategies into action. Thus, the three distinct methods were combined to create a valuable way for the strategic processes of organizations. In this integrated process, the QFD could prove effective in detecting and prioritizing organizational weaknesses that needed to be investigated and amended immediately and enhancing the qualitative performance of the organization. Indeed, the QFD could effectively understand the importance and priority of the activities that need to be performed by organizations to fulfill their customers' satisfaction. Nevertheless, it was clear that successful organizations were the ones that used up-to-date, accurate, and efficient information.

3 Methodology

The present study offers an integrated framework to analyze a construction company using the fuzzy TOPSIS-based SWOT analysis combined with the AHP method. The case study was carried out on an Iranian construction company (in constructing dams, buildings, and roads) near the capital. The data were collected using a questionnaire that was utilized to interview experts. First, the SWOT analysis factors were extracted by investigating the company and its status. The company was investigated regarding its internal and external environments at this stage. Examining the history of the company and the projects carried out by it, the curriculum vitaes (CVs) of its personnel and engineers, and the utilized equipment – to name but a few – were some of the investigations carried out to specify the SWOT factors. Then, the AHP analysis was performed in two stages on the factors so that their relative importance could be determined, and the value vector was determined using fuzzy numbers in the next stage. The experts first labeled the value vector of each factor qualitatively (from very poor and poor to good and premium). Then, the qualitative labels corresponded to convenient fuzzy numbers. In the next stage, the value vectors were normalized using the TOPSIS methods and weighted based on each factor's relative importance. Then, all elements were ranked by determining

the best and worst states and calculating the distance of each component from them. Ultimately, the ranking was considered a basis to offer suggestions for the best result.

The study implemented three analytic methods: SWOT, TOPSIS, and AHP. The SWOT analysis is a managerial and risk analysis method implemented in the construction company study. Moreover, the TOPSIS and AHP methods are among the most common MADM methods [67, 68] employed in the study to determine the most critical factors of the SWOT analysis and prioritize their importance. The TOPSIS analysis was used to achieve greater certainty and accuracy in a fuzzy way. It should be noted that three studies were designed in the present study to collect the required data. The first questionnaire was filled out by experts and managers of major construction companies to score and prioritize the factors of each group of the SWOT analysis. The second questionnaire was distributed among the experts and managers of those companies after completing the first one and identifying the most significant factor in each group so that actual ranks representing the S, W, O, and T groups could be ranked. Moreover, the third questionnaire was designed to determine the value vector of the factors for the company. The top executives and experts of the company filled it out.

4 Modeling and Results

The company's vision and strategic mission in the SWOT analysis need to be determined. Thus, the company's vision in the construction field was determined through interviews with its executives and board of directors. Considering various aspects of the construction field, the company's vision was set to reach a stage where it could have the best background and satisfaction level according to its employers. As a result, the company's strategic mission (or the ultimate goal) was to increase its efficiency and profitability and promote it to the first-grade Iranian construction engineering organization. The influential internal and external factors were investigated in the next stage. Some aspects of the strengths, weaknesses, opportunities, and threats that the company faced were specified through its investigation and interviews with its engineers and executives on the general information and characteristics. The following items were the critical considerations extracted from the interviews: the strengths included designing and performing structures meticulously and their long-term safety and implementation guarantee. The company guaranteed the safety of the systems designed and conducted by it for long periods due to the employment of experienced engineers. Moreover, the company's convenient and lengthy history was another strength compared to the third-grade companies or those with less experience. A company's working history and qualified resume can play significant roles in gaining the trust of people and organizations. Another company strength was using convenient and up-to-date equipment, which led to high accuracy and ease of implementation. In addition, using novel and optimal guidelines and design methods and new and up-to-date software (approved by monitoring bodies) was another strength of the company.

Diverse areas were found to be the weaknesses of the company. Some of the most significant ones were the disagreement of the company's engineers on design and implementation processes, financial problems, insufficient number of executive personnel in the company, the lack of market expertise (inability to predict variations in the price of materials), similar designs for all regional and climatic conditions (based on uniform guidelines), and delay in the services (unspecified responsibilities).

The company had extensive opportunities to develop from various perspectives. Thus, the present section offers more tangible items for engineers and people involved in construction. The first opportunity was related to the market of materials and construction products. Nowadays, the diversity of construction materials is so high that different choices can be made in each region of the country.

Another opportunity concerned the location of the company. As the company was located near the capital of Iran, its location was very convenient for receiving multiple projects due to the significant number of construction projects performed in the capital. Nowadays, novel design and implementation methods are created due to the progress of engineering sciences. They can make changes in terms of the duration of implementing a project, the quality of the implementation, and the total cost – to name but a few. It could be considered a positive opportunity for the company based on the high competence of its engineers and executives. Moreover, due to the increasing (though slow) trend of the construction industry and its positive growth over the past few years after a period of depression, the company could expect an increase in the number of its projects and seize the opportunity to progress more. In addition to the growth of the construction industry, implementing projects in the neighboring countries by Iranian companies was an advantage for the country and an opportunity for Iranian engineers and companies.

In terms of threats, there were many concerns for the company. Some of the most significant threats faced by the company included the following: a) Concerns about the sudden variations in the housing and material markets; and b) Concerns about the instability of the country's domestic and foreign policies and sudden changes in macro-scale areas. Other issues in this section included an unprecedented increase in civil engineers, the increased number of civil engineering companies, and the possible changes in construction guidelines. The latter could both delay project implementation and invalidate predictions about the projects under construction. The above considerations were some general items extracted from the SWOT analysis of the investigated companies, which were briefly stated. They were

meticulously examined and classified in this study.

4.1 Determining the SWOT Factors

The initial investigations provided the SWOT factors specified in Table 1.

Table 1. An initial classification of the SWOT factors

Class	Title	Factor Description
Strengths	S_1	Long-term guarantee for the safety of the structures
	S_2	Rather significant working history
	S_3	Using up-to-date civil engineering equipment, guidelines, design methods,and software
Weaknesses	W_1	Inability to predict the market of materials due to the special conditions of the country
	W_2	The shortage of executive personnel
	W_3	Unclear descriptions of tasks and the responsibilities of executives and engineers
	W_4	The inability of the designing engineers to offer designs that match particular conditions
	W_5	Financial issues and the delayed collection of the debts
	W_6	Disagreements in engineering judgments and the engineers' views concerning the processes of design and decision-making
Opportunities	O_1	The growth of the housing market after a period of depression
	O_2	The convenient location of the company (being near the capital)
	O_3	The prevalence of new methods in terms of design and construction
	O_4	The high frequency and diversity of materials and construction methods
	O_5	The entry of Iranian companies to the neighboring countries to perform large-scale projects
Treats	T_1	Sudden variations in the prices of the housing and material markets
	T_2	The instability of domestic and foreign policies and making sudden large-scale decisions
	T_3	The increased number of civil engineers and civil engineering companies
	T_4	The possibility of making changes in the guidelines of design and implementation

Table 1 was handed over to the company executives and experts for the initial poll. Based on the views offered by some participants, several factors were eliminated from the list based on causes like having weak impacts, uncertainty about the convenient classification of the factor, the multiple effects of a particular factor, and the absence of analyses on their absolute risks. The final category of the SWOT factors is presented in Table 2.

Table 2. Final SWOT factors

Class	Title	Factor Description
Strengths	S_1	Long-term guarantee for the safety of the structures
	S_2	Using up-to-date civil engineering equipment, guidelines, design methods, and software
Weaknesses	W_1	Inability to predict the market of materials due to the special conditions of the country
	W_2	The shortage of executive personnel
	W_3	Unclear descriptions of tasks and the responsibilities of executives and engineers
	W_4	The inability of the designing engineers to offer designs that match particular conditions
	W_5	Financial issues and the delayed collection of the debts
	W_6	Disagreements in engineering judgments and the engineers' views concerning the processes of design and decision-making
Opportunities	O_1	The growth of the housing market after a period of depression
	O_2	The convenient location of the company (being near the capital)
	O_3	The prevalence of new methods in terms of design and construction
	O_4	The high frequency and diversity of materials and construction methods
Treats	T_1	Sudden variations in the prices of the housing and material markets
	T_2	The instability of domestic and foreign policies and making sudden large-scale decisions
	T_3	The increased number of civil engineers and civil engineering companies

It should be noted that the figures corresponding to the priority ranking of the questionnaires are given in Table 3.

4.2 Calculating the Weights of SWOT Factors

This section implements the AHP method to calculate the relative importance of the factors extracted from the questionnaire that the civil engineering experts, executives, and specialists filled out. In the end, according to the

experts, a number was assigned to each factor as its weight.

Table 3. Converting the priority ranks to numbers

Priority	Title
Maximum	9
High	7
Average	5
Low	3
Equal	1

4.2.1 Ranking each group's factors

Based on the data from the first questionnaire, the factors making up the SWOT were ranked, and the results are provided in Tables 4-7. It should be noted that the data with a significant distance from other data (the so-called "outliers") were eliminated from the study. Then, the mean of the remaining data was calculated. In the next stage, the tables illustrating the mean values were normalized according to the principles of the AHP method, and the results were provided as the output of the questionnaires.

Table 4. AHP results in strengths

Factors	S_1	S_2	W_s
S_1	1	5	0.83
S_2	0.20	1	0.17
	CI		0.00

As can be observed in Table 4, the experts believed that S_1 had average priority compared to S_2, indicating that S_1 is five times more important than S_2 based on the mean values of the questionnaire data. Consequently, it was shown that the long-term safety guarantee of structures constructed by the company was a significant advantage. Its priority was almost five times more than using novel civil engineering equipment, guidelines, design methods, and software. It could be attributed to the significant importance of the safety of structures and, consequently, the trust of people and employers, and the observed degree of importance seemed logical.

Table 5. AHP results in weaknesses

Factors	S_1	S_2	S_3	S_4	S_5	S_6	W_w
W_1	1	0.50	2	0.50	5	5	0.18
W_2	2	1	3	0.50	7	7	0.27
W_3	0.20	0.14	0.50	0.14	2	1	0.05
W_4	0.20	0.14	0.50	0.14	1	0.50	0.04
W_5	2	2	5	1	7	7	0.37
W_6	0.50	0.33	1	0.20	2	2	0.08

In Table 5, according to the experts' views, financial issues and the delayed collection of debts gained the highest scores. Financial problems were among the factors that facilitated the collapse of a company, and thus, the significance assigned to it is justifiable. Moreover, the executive personnel shortage ranked next, indicating the critical importance of the number of organizational forces in a construction company. Following the above two factors, the inability to predict the market of materials due to the unclear economic condition of the country and disagreements between engineers' judgments and views concerning the processes of design and decision-making ranked next, and the inability of the designing engineers to offer plans that matched particular conditions and the unclear specification of the tasks and the responsibilities of executives and engineers ranked as the less significant weaknesses of the company, respectively.

In the set of opportunities, the entry of Iranian companies to the neighboring countries to perform large-scale projects received more than 50% of the total significance of the group. It was selected as a high-priority and significant opportunity by the experts, showing that the construction projects of the neighboring countries could be considered the best opportunity for the country's construction companies to increase their profitability and experiences and produce more revenues. The second rank was assigned to the company's convenient location (near the capital). The company's site undoubtedly significantly influences the number of projects it receives. Based on the rank, the significance of the good or bad location of the company was evaluated to be less critical than its entry into the markets of the neighboring

countries. At the same time, it was assessed to be more important than the growth of the construction market after a period of depression and the high diversity and frequency of construction materials and methods. Thus, though the revived growth of the construction market was another convenient opportunity for construction companies, the third rank assigned to the factor could be attributed to the current slow growth rate of the construction industry.

Table 6. AHP results in opportunities

Factors	$\mathbf{O_1}$	$\mathbf{O_2}$	$\mathbf{O_3}$	$\mathbf{O_4}$	$\mathbf{W_o}$
O_1	0.20	3	0.14	1	0.18
O_2	0.50	5	0.27	2	0.27
O_3	0.14	1	0.06	0.33	0.05
O_4	1	7	0.53	5.00	0.04
		CI			0.02

Table 7. AHP results in threats

Factors	$\mathbf{T_1}$	$\mathbf{T_2}$	$\mathbf{T_3}$	$\mathbf{W_t}$
T_1	5	2	1	0.58
T_2	3	1	0.50	0.31
T_3	1	0.33	0.20	0.11
		CI		0.02

In the group of threats, the sudden variations of the housing and material market were determined as the most significant threat, with a rather considerable distance from other factors. This significance rate reflected the profound concerns of civil engineering executives and experts about the sudden price variations in the construction industry. Thus, the risk was somehow among the main risk factors of the field. Following that, the instability of the domestic and foreign policies of the country and the sudden large-scale decisions ranked next, which indicated the impact of the large-scale policies of the government on the construction industry. As the country's policies remained constant only for short periods and changed ceaselessly, the people involved in the construction industry considered the relevant impacts.

4.2.2 Ranking the SWOT groups

The most significant factors in each group were specified based on the tables presented in the previous sections. This section compares the characteristics representing the fourfold SWOT groups, which the experts evaluated based on the AHP method. The analysis was carried out according to the data obtained using the second questionnaire, which the experts in the second stage of the study filled out. The scores and weights of different SWOT groups were determined in this section, and the final results are offered in Table 8.

Table 8. AHP results on the fourfold SWOT groups

Factors	$\mathbf{S_k}$=$\mathbf{S_1}$	$\mathbf{W_k}$=$\mathbf{W_5}$	$\mathbf{O_k}$=$\mathbf{O_4}$	$\mathbf{T_k}$=$\mathbf{T_1}$	$\mathbf{W_g}$
S_k=S_1	2	5	3	1	0.48
W_k=W_5	0.50	2	1	0.33	0.16
O_k=O_4	0.33	1	0.50	0.20	0.09
T_k=T_1	1	3	2.00	0.50	0.27
		CI			0.05

As seen in Table 8, the data from the second questionnaire indicated that the long-term safety guarantee of the structures was considered the most significant factor across all groups with high priority. It could be attributed to the fact that the most crucial factor in progressing and promoting a construction company was guaranteeing the quality of the work, according to the executives and experts. Thus, if the quality of the work carried out by a company was so high that employers could sufficiently trust it, the company could have a high yield. The above table showed that sudden changes in the prices of the housing and material markets and financial issues, and the delayed collection of debts ranked next in terms of their significance.

Furthermore, the experts believed that the group of strengths was the most significant among the fourfold SWOT groups, indicating that, according to the experts, construction companies could gain the most effective results by concentrating on their strengths. Moreover, the group of threats ranked next, which indicated the necessity of paying attention to the dangers that a construction company faced so that convenient strategies could be developed to

counteract any of them. In addition to the results illustrated above, the score of each group was specified in Table 7. Thus, the priority ranking of the groups can be displayed in the following manner: S > T > W > O.

Then the scores given to each group were implemented as their priority coefficients. The significance and priority of each factor are introduced below based on a coefficient. The coefficient was obtained by multiplying the number obtained from ranking the factors of each group by the number obtained from the ranking of the groups.

$$w_i = w_{(S,W,O,T)i} * w_{Gi} \tag{1}$$

Thus, the weights of the factors are given in Table 9.

Table 9. SWOT factor weights based on AHP

Factors	$W_{(S, W, O, T)i}$	W_g	W_i
S_1	0.83	0.48	0.40
S_2	0.17	0.48	0.08
W_1	0.18	0.16	0.03
W_2	0.27	0.16	0.04
W_3	0.05	0.16	0.01
W_4	0.04	0.16	0.01
W_5	0.37	0.16	0.06
W_6	0.08	0.16	0.01
O_1	0.14	0.09	0.01
O_2	0.27	0.09	0.02
O_3	0.06	0.09	0.01
O_4	0.53	0.09	0.05
T_1	0.58	0.27	0.16
T_2	0.31	0.27	0.08
T_3	0.11	0.27	0.103

The overall importance of each factor based on the coefficients obtained from the AHP analyses carried out on the factors of each group and the fourfold SWOT groups is illustrated in Table 9. S_1 (i.e., the long-term safety guarantee of structures) was the most crucial factor in the SWOT analysis as it contributes to enhancing the efficiency and profitability of the company and its promotion to the 1st grade by 40%. The factor ranked first by a significant distance from the other factors, which indicated that the experts regarded it as the most critical factor in the company's progress. Following that, sudden variations in the prices of the housing and material markets, the instability of the domestic and foreign policies of the country, large-scale impulsive decisions, and the use of up-to-date civil engineering equipment, guidelines, design methods, and software ranked next. The results indicated that the company needs to consider the specified factors according to the above ranking.

4.3 Ranking the Factors (fuzzy TOPSIS)

This section deals with ranking the SWOT factors using the TOPSIS method and the application of the fuzzy theory. In this stage, the weights of the factors obtained in the previous section were utilized to enhance the scientific accuracy of the analysis. Moreover, fuzzy numbers were implemented in the study to consider the uncertainties of the experts' views.

The matrix of values was formed based on the third questionnaire. Similar to the previous sections, the questionnaire needs to be interpreted. Thus, the data obtained from the questionnaire were investigated; the outliers were eliminated from the calculation; and the remaining data were averaged and rounded. The matrix of values obtained from the questionnaire and the fuzzy numbers corresponding to the qualitative scoring are separately given in Table 10. Thus, the fuzzy numbers [69], which study the relationship between fuzzy numbers and qualitative variables, were assigned to the factors.

As was observed, the experts of the investigated company believed that the entry of Iranian companies to the neighboring countries to perform large-scale projects and the company's convenient location (being near the capital) were the most significant factors influencing the company. Indeed, the elements were remarkably evident in the company, and most of its engineers and executives felt its existence. According to the company's experts, the entry of Iranian companies into foreign projects and the company's convenient location were two convenient opportunities for the company's progress. Thus, they felt that paying attention to and making plans for the above two factors were the best options and most significant decisions for the company based on its existing capabilities and personnel so that it could enhance its profitability and efficiency.

On the other hand, the increased number of civil engineers and civil engineering companies, the instability of the domestic and foreign policies of the country, and the sudden large-scale decisions were not felt significantly in the company (i.e., they were not influential in the company). The judgment of those engineers and executives could be attributed to the company's immunity against such threats or their less significant influence on the company. By taking into account the internal and external affairs of the company and its capabilities and history, the company's experts and executives believed that the company's progress depended on taking note of opportunities and planning actions to seize them. Then, the strengths needed to be consolidated and exploited.

Table 10. Value vector and relevant fuzzy numbers

Factors	Mean of Numbers (Questionnaire)	Factor Value (Qualitative)	Corresponding Fuzzy Number
S_1	5.20	Average	(4,5,6,7)
S_2	4.70	Average	(4,5,6,7)
W_1	5.00	Average	(4,5,6,7)
W_2	4.10	Rather weak	(3,4,5,6)
W_3	4.10	Rather weak	(3,4,5,6)
W_4	4.90	Average	(4,5,6,7)
W_5	3.80	Rather weak	(3, 4, 5, 6)
W_6	5.10	Average	(4,5,6,7)
O_1	5.30	Average	(4,5,6,7)
O_2	7.60	Very strong	(7,8,9,10)
O_3	6.10	Rather strong	(5,6,7,8)
O_4	8.30	Very strong	(7,8,9,10)
T_1	3.00	Weak	(2,3,4,5)
T_2	2.80	Weak	(2,3,4,5)
T_3	1.80	Very weak	(1,2,3,4)

In the next stage, some plans needed to be made to eliminate or reduce the weaknesses. Actions to counteract the threats made up the last stage. In this analysis stage, the vector values of the factors became dimensionless to enable comparisons between factors with different types and dimensions carried out in two different modes using the TOPSIS method:

If the factor n represents expenses (i.e., its lower values are desirable), then the following can be obtained:

$$\tilde{n}_i = \left(\frac{\min\limits_i \{e_{i1}\}}{e_{i4}}, \frac{\min\limits_i \{e_{i1}\}}{e_{i3}}, \frac{\min\limits_i \{e_{i1}\}}{e_{i2}}, \frac{\min\limits_i \{e_{i1}\}}{e_{i1}} \right) \tag{2}$$

If the factor n represents profits (its higher values are desirable), then the following can be obtained:

$$\tilde{n}_i = \left(\frac{e_{i1}}{\max\limits_i \{e_{i4}\}}, \frac{e_{i2}}{\max\limits_i \{e_{i4}\}}, \frac{e_{i3}}{\max_i \{e_{i4}\}}, \frac{e_{i4}}{\max\limits_i \{e_{i4}\}} \right) \tag{3}$$

Eqs. (2) and (3) were utilized to calculate the normalized values of the vector value of each factor. The results are provided in Table 11.

As seen in this table, the strengths and opportunities are of the profit type, i.e., they are more desirable when more vital. On the other hand, the weaknesses and threats are of the expense type, meaning they are more desirable when they become weaker and less significant. The above classification completely matches the expected one.

The value vector was assigned with weights using the coefficients obtained from the AHP analysis before carrying out the final stages of the fuzzy TOPSIS method to increase the accuracy and efficiency of the study. Indeed, the effect of each factor in decision-making was modified based on the relative importance of that factor concerning other factors. Thus, the value of each element was multiplied by its relative importance (weight coefficient) provided in Table 9.

Moreover, based on Eq. (4), the vector values of the factors are provided in Table 12.

$$n_i^w = n_i * w_i \tag{4}$$

Table 12 illustrates the weighted vectors. The numbers indicate that each factor's value reflects the effect of a factor's importance relative to any of the other factors and the impact of the significance of the fourfold SWOT groups.

According to the TOPSIS method, the ideal option is $\tilde{n}^p = (1,1,1,1)$, and the least ideal option is $\tilde{n}^n = (0,0,0,0)$. Thus, the ideal option is the maximum of a fuzzy number in the fuzzy range [0,1], which is depicted as $\tilde{n}^p$. On the other hand, the least ideal option is a fuzzy number in the fuzzy range, which is depicted as $\tilde{n}^n$.

Table 11. The normalized value vector of each factor

Factors	Initial Vector Value	Factor Type	Normalized Vector Value
S_1	(4,5,6,7)	Profit	(0.40,0.50,0.60,0.70)
S_2	(4,5,6,7)	Profit	(0.40,0.50,0.60,0.70)
W_1	(4,5,6,7)	Expense	(0.14,0.17,0.20,0.25)
W_2	(3,4,5,6)	Expense	(0.17,0.20,0.25,0.33)
W_3	(3,4,5,6)	Expense	(0.17,0.20,0.25,0.33)
W_4	(4,5,6,7)	Expense	(0.14,0.17,0.20,0.25)
W_5	(3,4,5,6)	Expense	(0.17,0.20,0.25,0.33)
W_6	(4,5,6,7)	Expense	(0.14,0.17,0.20,0.25)
O_1	(4,5,6,7)	Profit	(0.40,0.50,0.60,0.70)
O_2	(7,8,9,10)	Profit	(0.70,0.80,0.90,1.00)
O_3	(5,6,7,8)	Profit	(0.50,0.60,0.70,0.80)
O_4	(7,8,9,10)	Profit	(0.70,0.80,0.90,1.00)
T_1	(2,3,4,5)	Expense	(0.20,0.25,0.33,0.50)
T_2	(2,3,4,5)	Expense	(0.20,0.25,0.33,0.50)
T_3	(1,2,3,4)	Expense	(0.20,0.25,0.33,0.50)

Table 12. The weighted value vector of each factor

Factors	Normal Vector Value	Weighted Vector Value
S_1	(4,5,6,7)	(0.40,0.50,0.60,0.70)
S_2	(4,5,6,7)	(0.40,0.50,0.60,0.70)
W_1	(4,5,6,7)	(0.14,0.17,0.20,0.25)
W_2	(3,4,5,6)	(0.17,0.20,0.25,0.33)
W_3	(3,4,5,6)	(0.17,0.20,0.25,0.33)
W_4	(4,5,6,7)	(0.14,0.17,0.20,0.25)
W_5	(3,4,5,6)	(0.17,0.20,0.25,0.33)
W_6	(4,5,6,7)	(0.14,0.17,0.20,0.25)
O_1	(4,5,6,7)	(0.40,0.50,0.60,0.70)
O_2	(7,8,9,10)	(0.70,0.80,0.90,1.00)
O_3	(5,6,7,8)	(0.50,0.60,0.70,0.80)
O_4	(7,8,9,10)	(0.70,0.80,0.90,1.00)
T_1	(2,3,4,5)	(0.20,0.25,0.33,0.50)
T_2	(2,3,4,5)	(0.20,0.25,0.33,0.50)
T_3	(1,2,3,4)	(0.20,0.25,0.33,0.50)

The distance of each factor from the most and least ideal options was determined according to the fuzzy relations to assess the significance and priority of that factor using Eqs. (4) and (5), indicating the distance between two fuzzy numbers.

$$D(\tilde{A},\tilde{B}) = \sqrt{\frac{1}{6}\left\{ \begin{array}{c} (a_1-b_1)^2+(a_2-b_2)^2+(a_3-b_3)^2+(a_4-b_4)^2+ \\ (a_1-b_1)(a_2-b_2)+(a_2-b_2)(a_3-b_3)+(a_3-b_3)(a_4-b_4) \end{array} \right\}} \tag{5}$$

Eq. (5) was utilized to obtain the distance of all factors from the most and least ideal options. The distance from the ideal choice is represented by d_i^+, while the distance from the least ideal option is shown by d_i^-.

When the distances were calculated, a coefficient was defined as an index to compare and rank the factors. The index is the coefficient of closeness (CC) to the ideal option calculated using Eq. (6):

$$CC_i = \frac{d_i^-}{d_i^- + d_i^+} \qquad \text{for } \forall i \in S,W,O,T \tag{6}$$

The distance from the most and least ideal options and the coefficient of closeness were calculated for each factor. The results are separately presented in Table 13. Being close to the ideal choice and far from the least ideal option is

more desirable for each factor. In other words, as a particular factor is nearer to the ideal option, it is more critical, according to the experts. The CC considers the distance from both the most and least ideal options and the index importance of the factors, with higher values indicating higher significance of the investigated factor.

Table 13. The factor distances from the most and least ideal options

Factors	Distance from d_i^+	Distance from d_i^-	CC_i
S_1	0.24231	0.8423	0.22341
S_2	0.04846	1.0324	0.04484
W_1	0.00593	1.0743	0.00549
W_2	0.01119	1.0692	0.01036
W_3	0.00201	1.0782	0.00186
W_4	0.00126	1.0789	0.00117
W_5	0.01539	1.0651	0.01424
W_6	0.00274	1.0774	0.00253
O_1	0.00735	1.0729	0.00681
O_2	0.02236	1.0579	0.02069
O_3	0.00369	1.0765	0.00342
O_4	0.04323	1.0372	0.04001
T_1	0.05637	1.0262	0.05207
T_2	0.02997	1.0514	0.02771
T_3	0.01794	1.0639	0.01658

Based on the results illustrated in Table 13 (obtained using the fuzzy TOPSIS analysis), the importance of each factor involved in the company's risk analysis could be specified by considering the view of the executives and specialists of the company and experts from other companies or relevant organizations. In the investigation, the long-term safety guarantee of the structures ranked first, indicating the specialists' significant attention to the quality of work and accurate engineering work in the construction industry. Following that, sudden changes in the prices of the housing and material markets ranked next, reflecting the specialists' remarkable concerns about sudden changes in the price of construction materials and the cost of housing. The problem could be due to the unpleasant experiences of the specialists over the past years, which have led to significant losses suffered by construction companies. Thus, the issue needed to be taken into consideration. Moreover, the use of modern equipment, guidelines, design methods, and engineering software and the entry of Iranian companies into the neighboring countries to carry out large-scale construction projects were two other important factors pointed out by the specialists, which indicated that focusing on strengths and exploiting the existing opportunities to advance in the field of construction was highly prioritized.

4.4 The General Factor Ranking (AHP and Fuzzy TOPSIS)

Based on the calculations in the previous sections, all four SWOT analysis factors were ranked using the AHP and fuzzy-TOPSIS analyses. The results are offered in Table 14.

The importance degree distribution in the factors is almost similar in the two methods. No severe differences can be observed, indicating the comparable results of the two methods and, consequently, the overlapping results obtained. The overlapping could also reflect the accuracy of the methodology and the data analysis. In the meantime, some factors received lower coefficients in both methods. Thus, they could be eliminated from the risk analysis and replaced by other factors with higher coefficients, reducing wasted time and energy on the investigation of the factors and their dimensions as the specialists believed that the factors were not likely to significantly influence the progress of the company and advance toward its ultimate goal, i.e., increasing the company's profitability and yield, and its promotion to the first-grade list of construction companies. Moreover, the long-term safety guarantee of the structures received the highest priority in both methods, and the sudden changes in prices in the housing and material markets ranked next. The similar ranking was due to the significant importance of the two factors both in the general mode and the investigated company. In other words, both the specialists of the company and all experts involved in the construction industry emphasized the high priority of the two factors and the actions needed to fulfill them. However, the remaining factors were ranked differently in the two methods, which could be attributed to the specialists' varying views concerning the effects and visibility of the factors in the investigated company.

In the AHP method, the ranking was performed just according to the coefficients of the relative importance of the factors to other factors and the relative significance of the fourfold SWOT groups, regardless of the value of the factor in the investigated company. However, the ranking using the fuzzy TOPSIS method utilized the coefficient of the total relative importance and the values obtained for the factors in the studied company. Indeed, the visibility of the factors in the researched company was another effective parameter in prioritizing the factors in the fuzzy TOPSIS

method. For instance, the factor of financial issues had average importance relative to other factors (0.059), which indicated that the overall significance of the factor in construction works is neither high nor low. However, the TOPSIS ranking showed that the factor's closeness coefficient to the ideal mode was 0.014, which indicated that the factor of financial issues is both significant and visible in the company to some degree. The factor ranked fifth according to the AHP analysis and eighth in the fuzzy TOPSIS analysis. The difference reflected the effects of visibility and the consequences of the weakness on the company based on its importance. Generally, the fuzzy TOPSIS method ranking emphasized the factors related to strengths and opportunities. In contrast, the AHP method (regardless of its focus on the long-term safety guarantee of the structures, which was deemed very important by the two methods) focused more on the significance of weaknesses and threats.

Table 14. The factor distances from the most and least ideal options

Factors	Relative Importance Coefficients (W_i)	Ranking Based on Importance Coefficient (AHP)	CC_i	Ranking Based on Fuzzy TOPSIS
S_1	0.4020	1	0.22341	1
S_2	0.0804	4	0.04484	3
W_1	0.0286	9	0.00549	11
W_2	0.0429	7	0.01036	9
W_3	0.0077	13	0.00186	14
W_4	0.0061	14	0.00117	15
W_5	0.0590	5	0.01424	8
W_6	0.0132	11	0.00253	13
O_1	0.0122	12	0.00681	10
O_2	0.0242	10	0.02069	6
O_3	0.0052	15	0.00342	12
O_4	0.0468	6	0.04001	4
T_1	0.1580	2	0.05207	2
T_2	0.0840	3	0.02771	5
T_3	0.0298	8	0.01658	7

4.5 Determining the Company's General Strategy

The company's general strategy was determined using the SWOT matrix after specifying the ranks of the factors and scoring them using the MADM. As was mentioned above, selecting a company's strategy made it necessary to specify the attractiveness of the internal and external factors of the investigated factors and offer a suitable strategy for the company by matching the obtained information on the SWOT matrix.

It was mentioned that the CCi coefficient could be a convenient parameter to determine the attractiveness of the internal and external factors. Thus, it was utilized to determine the final score of the internal and external factors. According to the table, the most critical factors of the groups were determined according to the CC coefficient, and the results were implemented in the QSPM strategy matrix. The weighted average of the coefficients of the factors (i.e., the CCi) was implemented in the TOPSIS analysis to determine the attractiveness score of the axes, including internal factors (weaknesses and strengths) on the horizontal axis in Eq. (7) and external factors (opportunities and threats) on the vertical axis in Eq. (8). The utilized equations are as follows:

$$IFE = 2.5 + \left(\frac{CC_S - CC_W}{CC_S + CC_W} * 4\right) \tag{7}$$

$$EFE = 2.5 + \left(\frac{CC_O - CC_T}{CC_O + CC_T} * 4\right) \tag{8}$$

The most important factors of the fourfold SWOT groups and their coefficients are as follows:

The group of strengths: S_1 with a coefficient of 0.2234

The group of weaknesses: W_5 with a coefficient of 0.0142

The group of opportunities: O_4 with a coefficient of 0.04

The group of threats: T_1 with a coefficient of 0.052

Then, the scores of the internal and external factors were calculated using Eqs. (7) and (8):

$$IFE = \left(\frac{0.2234 - 0.0142}{0.2234 + 0.0142}\right) + 2.5 = 3.3804$$

$$EFE = \left(\frac{0.04 - 0.052}{0.04 + 0.052}\right) + 2.5 = 2.3695$$

The final strategy of the company was determined based on the above values and the QSPM matrix. Figure 1 shows the matrix of the company's final strategy.

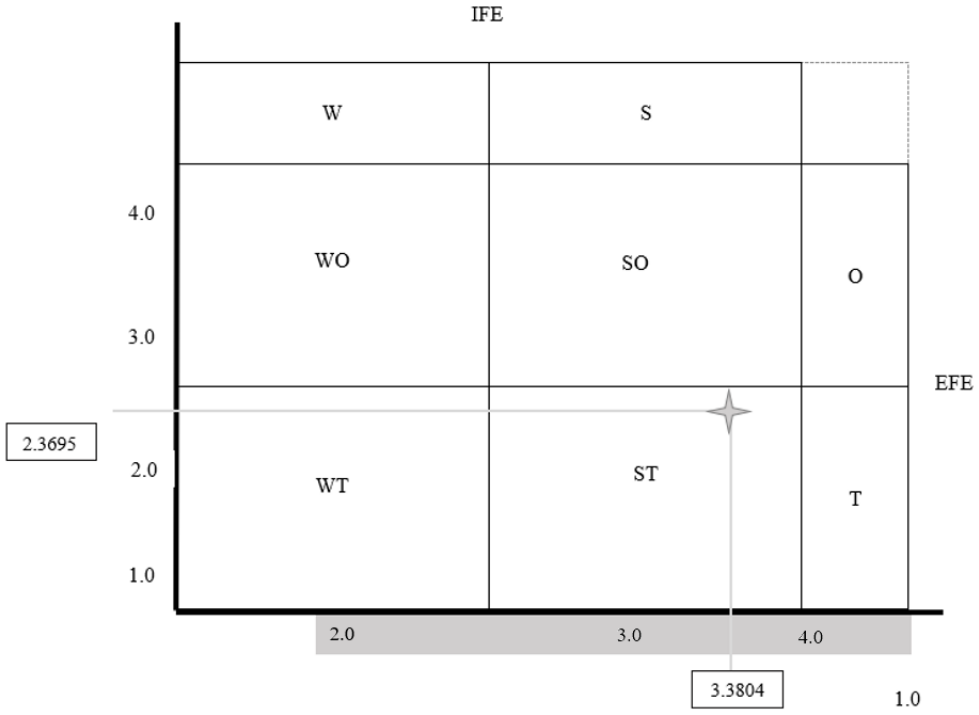

Figure 1. The matrix of the company's final strategy

5 Conclusions

Nowadays, civil engineering companies face many problems and risks due to the present conditions in Iran and its construction industry and are significantly influenced by them. Managerial risk analysis methods and planning convenient actions are ways to counteract the risks and manage activities to help companies progress and promote. The SWOT analysis is one method that investigates and creates strategies for reducing risks in the market of various projects based on the fourfold factors of strengths, weaknesses, opportunities, and threats.

The present study aims to investigate a construction company, perform a risk analysis, and study the relevant SWOT factors. Moreover, it aims to prioritize and specify the importance of each SWOT factor in the company. The latter was carried out using two MADM methods, including the AHP and TOPSIS methods. The TOPSIS method was combined with the fuzzy theory and the numbers based on it to enhance the accuracy and certainty of the collected data. Finally, the most critical factors were specified by investigating and analyzing the data, and the company executives' views on each factor to achieve their desired goals were offered. Finally, the QSPM matrix was implemented to determine the ultimate strategy of the company to advance its goals. The following subsections present the most important results and suggestions to plan the necessary actions to fulfill the company's goal.

5.1 Significant Results

The results obtained in different parts of the study are as follows:

(a) Investigating the records and general information of the company showed that it had no significant strengths, though its strengths had high advantages.

(b) The company suffered from multiple weaknesses, and financial issues were among the most significant. All of the executives and specialists participating in the study confirmed a considerable number of weaknesses.

(c) The opportunities of the company were evaluated as almost positive. Moreover, it should be noted that the people involved with the company believed that the opportunities did not exist in the past and were considered promising grounds for the company's future.

(d) The company's executives and specialists believed that the threats faced by the company were hazardous and significant. Most of them pointed to the gloomy economic conditions of the country.

(e) Some of the factors provided in the initial list were eliminated based on the reasonable reasons of the executives. Some of the primary reasons were the low effects, uncertainties about the existence of the factor, the multidimensional nature, and the influence of an element on more than one SWOT group.

(f) In ranking according to the AHP method, the following factors were evaluated as the most important and prioritized ones in each group:

- Strengths: Long-term safety guarantee of the structures;
- Weaknesses: Financial issues and the delayed collection of debts;
- Opportunities: The entry of Iranian companies into the neighboring countries to perform large-scale projects;
- Threats: Sudden changes in the price of the housing and material markets.

(g) In ranking according to the AHP method, the most significant factors according to a pairwise comparison could be prioritized as follows: strengths $<<$ threats $<<$ weaknesses $<<$ opportunities.

(h) The factors with the highest degree of importance based on the combination of the importance coefficient of each factor with the importance coefficient of the group it belonged to were as follows: long-term safety guarantee of the structures, sudden changes in the price of the housing and material markets, the instability of the domestic and foreign policies of the countries and the large-scale impulsive decisions, and using modern civil engineering equipment, guidelines, design methods, and software.

(i) The following three factors were found to be the most significant ones in the poll to determine the factors' effects and visibility in the company (according to the managers and specialists of the company): the entry of Iranian companies into the neighboring countries to perform large-scale projects, the suitable location of the company (being near the capital), and the high frequency and diversity of the materials and construction methods.

(j) The following four factors were ranked as the most important ones in the ranking according to the fuzzy TOPSIS method using the CC coefficient: long-term guarantee safety of structures, sudden changes in the price of the housing and materials markets, utilizing modern civil engineering equipment, guidelines, design methods, and software, and the entry of Iranian companies into the neighboring countries to perform large-scale projects.

(k) In both AHP and fuzzy TOPSIS rankings, long-term safety guarantee of the structures and sudden changes in the prices of the housing and material markets received the highest degree of significance.

(l) Except for the factors mentioned in the previous paragraph, the remaining factors received various ranks in the two methods.

(m) The AHP method focused on strengths, threats, and weaknesses. On the other hand, the fuzzy TOPSIS method mainly highlighted strengths, emphasized opportunities and threats equally, and paid the slightest attention to weaknesses.

(n) Finally, the QSPM matrix was utilized to determine the ultimate strategy of the company as a competitive one.

5.2 Suggestions for the Company's Long-Term Planning

The following suggestions were proposed to improve the company's performance, reduce its risks, achieve profitability and efficiency in the shortest time possible, and promote it to the list of first-grade companies. The executives of the company were recommended to make convenient plans in the following areas:

(a) The obtained results showed that a long-term safety guarantee of the structures was the most critical factor; thus, the first actions and plans need to focus on improving this factor. The element belongs to a group of profit-based factors, and its effects must be augmented. The advantage has to be proved to employers and contractors in various ways and utilized to compensate for the company's weaknesses.

(b) The sudden price changes in the housing and material markets ranked second. The factor was a threat the company faced, and its status reflected that it existed in previous experiences. Thus, convenient plans must be made so that the company can appropriately respond when facing a threat. The program can include considering confidence intervals for the prices and sectional purchases. Moreover, the factor has to be taken into consideration in contracts.

(c) Following the above two significant factors, the utilization of modern civil engineering equipment, guidelines, design methods, and software needs to be considered. This strength can increase the company's profitability and efficiency by expanding the company's equipment, adding to the volume of the new equipment and software utilized in the construction industry, and keeping the company engineers' technical knowledge up-to-date.

(d) The instability of the domestic and foreign policies of the country, sudden decisions in macro-scale areas, and the entry of Iranian companies into the neighboring countries to perform large-scale projects are other factors that need to be considered so that the company can advance more significantly.

(e) As the competitive strategy was selected as the ultimate strategy of the company to achieve its goals and visions, the company needs to exploit its highly significant strength, i.e., long-term safety guarantee of the structures, to reduce the effects brought about by the sudden changes of the price of the housing and material markets on its performance.

Data Availability

The data supporting our research results are included within the article.

Conflicts of Interest

The authors declare no conflicts of interest to report regarding the present study.

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