

Article

Concept-Based Integration of Project Management and Strategic Management of Rubber Dam Projects Using the SWOT–AHP Method

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Abstract: The utilization of rubber dams for water supply and irrigated agriculture is becoming an emerging practice in developing countries. In this study, based on the SWOT (strengths, weaknesses, opportunities, threats) analysis, a variety of standards and processes in project management (PM) are integrated within the framework of the strategic management (SM) of an organization responsible for the management of new small-scale hydraulic infrastructures, e.g., rubber dam projects. The most important internal and external factors in PM and organizational SM of rubber dam projects in Iran are initially identified, adapted, and integrated. Thereafter, the factors are weighted, evaluated, and analyzed using the analytic hierarchy process (AHP) and combined SWOT–AHP methods. Based on the results, the total weighted scores of the internal and external factors are 2.353 and 2.718, respectively. Hence, the derived main strategy of the organization is WO. This means that the weakness factors can be reduced through the opportunities available for projects. Finally, a new methodology called “strategy matrix” resulting from “priority matrix” is proposed to prioritize and determine the organization’s possible strategies. The outputs demonstrate the first three priorities as a mix of the main strategy alternatives, e.g., W_1O_1 , W_7O_1 , and W_9O_1 . The organization, hence, is proposed to use the economic benefits of rubber dam projects to further monitor organizational units, the project’s resource management, and the project’s stakeholder management (not the project’s stakeholders). The proposed research could be conceived as a pilot for sustainable management in developing countries, where strategic project management can produce important operational benefits.

Keywords: priority matrix; project management; rubber dam projects; strategic management; strategy matrix; SWOT–AHP method

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1. Introduction

Many technical, political, economic, social, and cultural challenges are conceivable in the field of water resources. Excessive water demand for agriculture, low irrigation water efficiency, flooding, discharge of municipal and industrial wastewater, political problems, and insufficient funding for projects are among these challenges [1–3]. In the European Water Framework Directive (WFD) [4] implementation process, the proposed measures for preventing the deterioration of water resources, as well as addressing water management issues similar to the aforementioned, are classified to administrative, financial or fiscal, constructive, educational, environmental protection, and research and development, as well as to other types of measures [5]. What is of particular importance is that

the WFD measures more commonly reported as successfully implemented are the construction measures [6]. In any case, projects focused on water resources planning and management are rarely simple [7]; thus, project management practices are considered indispensable at all projects phases, i.e., planning, design, construction, operation, and maintenance.

For years, concepts such as strategic management (SM) and project management (PM), as well as their various combinations, have been studied and implemented in the different distinct units, e.g., production, operation, and R&D, of organizations or private firms and companies [8–13]. SM can be defined from different economic, social, marketing, and management points of view. In terms of management, SM is a process of defining an organization's vision, mission, objectives, and goals to create value for customers, stakeholders, and the community in general, while operating in competitive markets [14–16]. Governmental or private organizations may have a functional matrix or a projectized structure to carry out several projects simultaneously [17]. Moreover, the financial health of organizations is usually supported by SM plans to better implement their policies and programs. On the other hand, the successful implementation of projects trusts PM principles and tools, since PM emphasizes the sequential flow of actions required for the successful implementation of a project [18], which might be part of the SM of an organization.

The strategy, in most cases, is conceived as the driving force behind a project [19]. Nevertheless, there are different approaches to the relationship between SM and PM, with the SWOT (strengths, weaknesses, opportunities, threats) analysis to be considered as an appropriate methodology for integrating PM into an organization's SM [20–22]. SWOT analysis is used for investigating the internal and external factors of organizations and represents a systematic way to succeed in strategic decisions [23,24]. According to the SWOT analysis model, the hierarchical components of decision making for problem solving include goals and objectives, factors, and sub-factors. Despite the numerous benefits of the SWOT analysis, it does not provide solutions when determining the importance of each of the selected factors [25].

The decision-making process is a complex procedure; nevertheless, approaches based on multi-criteria decision analysis, also known as multi-criteria decision-making (MCDM) techniques, are valuable tools towards this direction. Applying classical or more advanced multicriteria analysis to make decisions, such as COMET and TOPSIS [26], satisfies the determination of the most reliable solutions to each problem. One of the most common and popular MCDM methods is the analytic hierarchy process (AHP) method. The AHP method, first proposed in the early 1980s [27], can be used to solve this issue in the SWOT approach, i.e., the weighting of the factors, and it has been successfully implemented in a large spectrum of domains [28–30]. AHP is a transparent, simple, and capable theory of measurement and focuses on the application of a pairwise comparison of alternatives to discrete choice problems, with the weighting of the priorities to rely on the judgments of experts [31–34]. Liu et al. [35] used an extended AHP method to evaluate the real-time compaction quality of an earth-rock dam in China and found that the proposed method makes more options for decision makers than other traditional methods. Spiliotis and Skoulikaris [5] adopted a fuzzy AHP-based multi-criteria method in the River Basin District of Central Macedonia, Greece, and demonstrated the usefulness of the proposed methodology when financial restrictions do not permit the implementation of the whole set of the proposed projects.

Currently, many problems in various sciences that are defined in terms of qualitative or as a combination of qualitative and quantitative criteria can be solved using the AHP method integrated with the SWOT analysis. The AHP method can determine the weight of SWOT factors and thus improve the reliability of this method [36]. For example, Mor et al. [37] used this method to investigate the internal and external factors in the dairy supply chain. Shahba et al. [24] proposed appropriate strategies for waste management in iron mines using the SWOT–AHP method. Amorocho-Daza et al. [38] applied multi-criteria decision making (MCDM) and concluded that stakeholder prioritization is the best way

to supply water in a Colombian city, while other researchers utilized two various kinds of MCDM including AHP to assess wastewater treatment systems [39]. Gao et al. [21] assessed the social, economic, and environmental aspects to reduce the gap between water demand and supply in China with the SWOT method, while other scholars [40] used the SWOT–AHP analytical method to investigate the stability of a dam in Iran. Ghorbani and Hamidifar [41] applied the SWOT–AHP method for strategic management and planning of rubber dam projects in Iran and concluded that ST strategy is the main strategy and external threats must be neutralized using the strength factors of the organization.

In this research, as an advancement to the approach proposed by Ghorbani and Hamidifar [41], in addition to strategic management, basic concepts and processes of project management have been used in accordance with the PM body of knowledge (PMBOK) standard. Internal and external factors in PM processes were identified and integrated into the formulation process of an organization's SM to define the optimum and alternative strategies when new small-scale hydraulic projects, e.g., inflatable flexible membrane dams or rubber dams, are planned to be constructed. To achieve this, the SWOT–AHP hybrid model is used to identify, evaluate, and analyze the strengths, weaknesses, opportunities, and threats of both the organization and rubber dam projects. Moreover, a new approach is proposed to determine possible strategies based on their priority of importance and sensitivity to the organization and the projects. Priority matrices and strategy matrices are used to prioritize the internal and external factors and the possible strategies, respectively. The development program for constructing rubber dam projects at the national scale in Iran, together with one of the organizations in charge of the projects' implementation, constitute the case study area. It is believed that the research outputs could set this case study as a pilot in developing countries, where the projects are implemented by similar organizations, and minimize, by analyzing and proposing various solutions, the risks that could jeopardize the organization operation and the projects' implementation.

2. Methodology

2.1. Background Hypotheses and Basic Concepts of the Problem

In this study, the term “organization” coincides with one of the companies in charge of water projects in Iran. Moreover, since special emphasis is given to rubber dam projects, no other activities of the organization in the field of water projects are here considered. The organization structure is a matrix structure between the functional and projectized structures. The organization operates with a management unit and five sub-functional units, including financial or accounting, marketing, project, research and development, and information systems. The project unit, which is one of the components of SM, is considered as the point of integration of SM with PM. The project manager forms part of the project unit cooperating with the director and other managers and employees of the organization and, on the other hand, manages the projects in the PM structure.

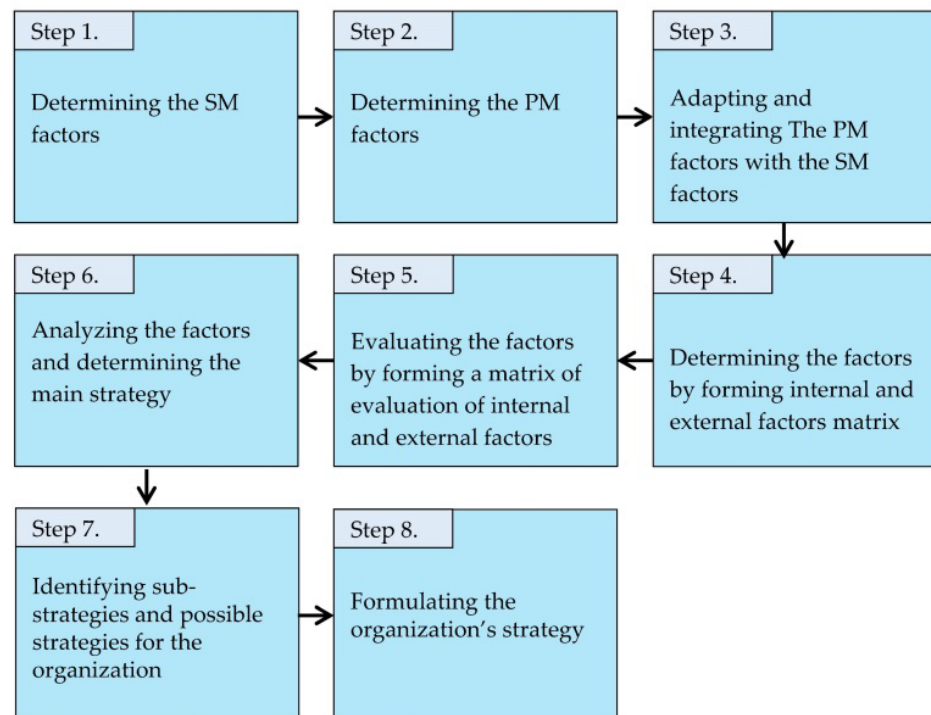
The term “project” refers to rubber dam projects that are designed and being implemented in Iran. Inflatable flexible membrane dams or rubber dams are considered among the most cost-effective and practical solutions to water management problems, given that they offer many advantages such as irrigation efficiency, urban and rural water supply, flood control, recharging of groundwater, and drought management [42]. While rubber dams are widely used in many developed countries such as Japan, Australia, and China [43], it is almost a new technology in developing countries such as Iran. Two executive phases can be considered for the implementation of rubber dams. The first phase or main phase is the design and installation of the rubber dam body, and the second phase is the installation of infrastructure for the usage of the stocked water, such as irrigation networks, water treatment plants, or small- or medium-sized hydropower plants. The implementation of both projects' phases, in terms of strategic planning, is considered based on the findings of previous studies [17,44–46].

Finally, the research discusses the way that project management components derived from the PMBOK could be integrated within the SM of an organization, which includes the formulation, implementation, and evaluation sections [47] (see Figure A1 (Appendix A) for a better comparison of SM and PM processes). The PMBOK is one of the most popular guidelines for applied works in the PM area where several tools and techniques, inputs, and outputs are clearly defined within it [13,17,46]. The strategy development of the organization is studied using the SWOT model, and the main factors and sub-factors (decision components) including strength, weakness, opportunity, and threat factors are examined. The classification of factors, subfactors, and strategies in the SWOT model are described in detail in [41]. After implementing the SWOT model, the problem strategy can be determined [48,49].

2.2. Summary of Operational Steps

For the proposed methodology, the following eight steps formulate the implementation strategy (Figure 1).

- Step 1. The factors in formulating SM are determined based on standard frameworks.
- Step 2. The factors in PM are extracted according to the PMBOK.
- Step 3. The factors extracted in Step 2 are adapted and integrated with the factors in SM (factors specified in Step 1). To achieve this, a questionnaire is first set up to survey experts. They are asked to determine the most important factors (as they are depicted in Step 2) in the management of the rubber dam projects. Then, these factors can be adapted and integrated.
- Step 4. The internal and external factors matrix is formed, and the strengths, weaknesses, opportunities, and threats are identified and placed in the matrix based on the re-survey of experts.
- Step 5. The internal and external factors evaluation matrix is formed. The questionnaire is again provided to the experts so that the importance of each of the internal and external factors (specified in Step 4) can be determined by the pairwise comparison method. Finally, the weights of all factors are extracted. The calculations for determining the weight of factors and the inconsistency ratio of matrices were performed using the relationships governing the AHP method [37,49–52]. A weighted score is determined for each internal and external factor, and the final score of the organization's evaluation to implement the rubber dam projects.
- Step 6. The analysis of the evaluation results is based on the internal and external factors analysis matrix. The main strategy of the organization is determined by placing the final score of internal and external factors in this matrix.
- Step 7. The sub-strategies are determined after determining the main strategy in Step 6. Then, possible strategies can be identified based on the main strategy, sub-strategies, and internal and external factors.
- Step 8. Finally, the PM-based organization strategy should be developed based on the previous steps, including Step 7. In other words, the organization's strategy is formulated.



2.3. Forming the Internal and External Factors Matrix

To formulate a strategy, the first step is to determine the internal and external factors, while additional specific steps include the evaluation and analyses of these factors to determine the organization's strategy and formulate the strategy [47,53–55]. In general, two categories of factors affect the organization. The first category attributes are the internal factors of the organization, are under the control of the organization's management, and include strength and weakness factors. The second category attributes are the external factors that both directly or indirectly affect the organization's activities and include opportunity and threat factors [47]. To determine the internal and external factors, the following steps must be performed.

2.3.1. Determination of the SM and PM Factors

It is necessary to observe the framework of standards and processes to determine, adapt, and integrate PM factors into internal and external factors of SM of the organization [17,46,47,53]. The important factors derived from PM standards and processes are as follows:

- Enterprise environmental factors: In the PMBOK, each project process is characterized by inputs, tools and techniques, and outputs. Enterprise environmental factors are among the most important inputs of 49 management processes in this standard, which correspond to the main factors defined in the SM standard. These factors affect the success of the project and are closely related to the management of the organization. These factors may limit or increase PM options or may have a positive or negative effect on the project [17,45].
- Organizational process assets: Organizational process assets, such as environmental factors, are one of the inputs to 49 PM processes. These assets include all or part of the assets associated with the organizational processes that exist in the project and

include formal and informal programs, policies, procedures, guidelines, organization's knowledge bases, and past project information [17,45].

- PM knowledge areas: According to the new version of the PMBOK [46], PM knowledge areas include 10 management areas. These areas of knowledge are considered as internal factors of SM of the organization so that the project manager can implement them with the cooperation of the members of the organization [17].
- Stakeholders: One of the 10 areas of knowledge in the PM standard is stakeholders, which include individuals or organizations that are actively involved (positively or negatively) in the project and can influence the project. Moreover, stakeholders are considered as influential elements on the organization in the study of micro-external factors in SM [17]. For example, Yang et al. presented a model for evaluating the relationship between project manager leadership style, teamwork, project performance, and stakeholder satisfaction [56]. They also showed that project success in terms of cost, schedule, and quality performance is highly related to stakeholder satisfaction.

2.3.2. Integration of the PM Factors into the SM Factors

Considering the concepts and definitions of the PM and SM, as well as based on standards and processes, the integrating process of the main factors and sub-factors of both SM and PM is shown in Figure 2, and the following concepts can be extracted:

- To meet the main requirements of the project, all the important factors, processes, and standards in the PM are related to one or more important factors in the SM.
- Based on the 10 PM knowledge areas in the PMBOK standard, the project manager only deals with the subject of PM. However, the manager should cooperate with other units of the organization and even manage opportunities and threats, as well as stakeholders related to the project, based on the SWOT analysis model.
- The organization manager is responsible for compiling many organizational standards and processes, providing facilities, equipment, and financial and human resources.
- Based on their duties, the other units of the organization, such as the research and development unit or the financial and accounting unit, help to advance the project. However, they do not have a significant relationship with the important factors of PM.

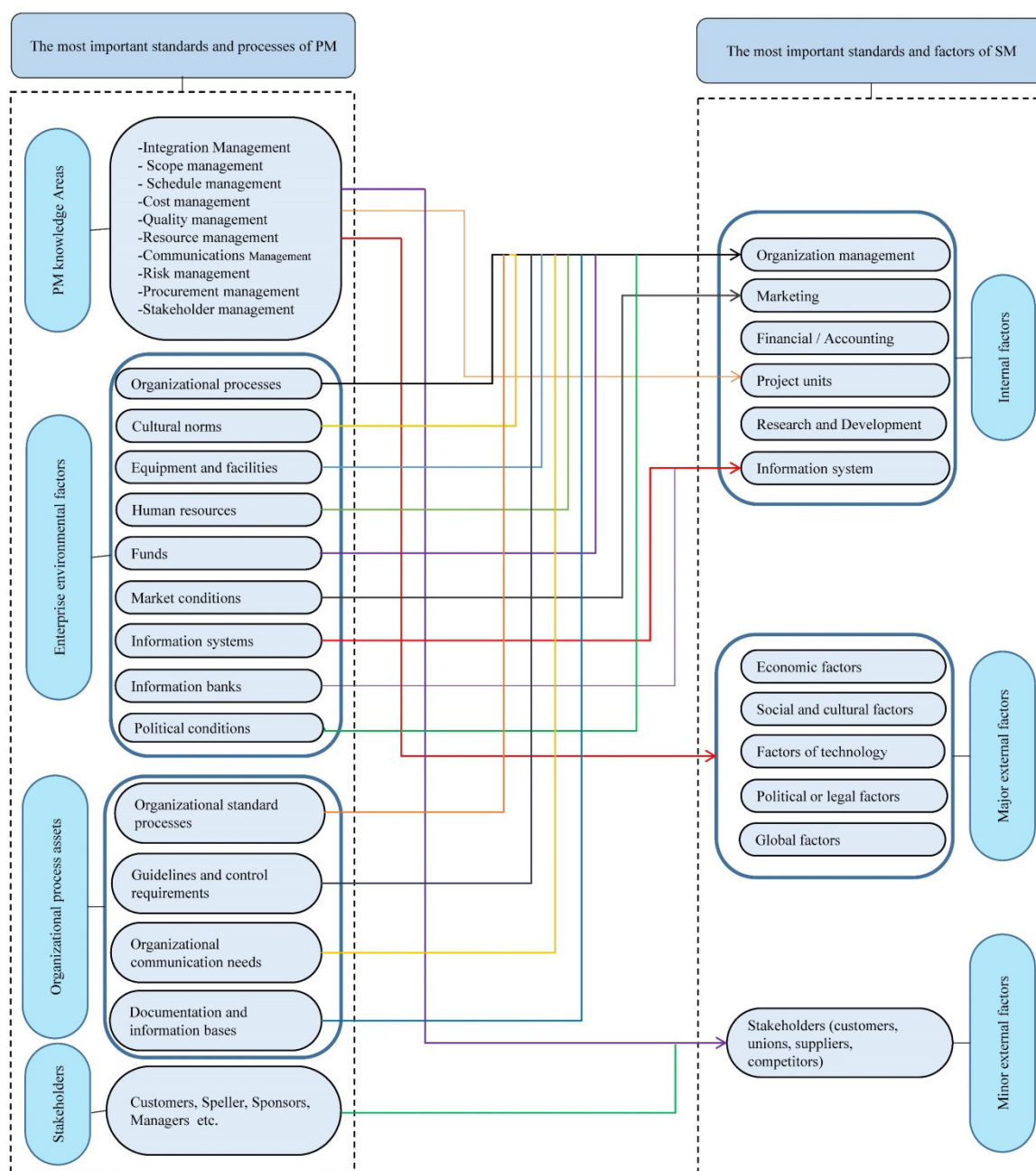


Figure 2. Integration of standards and processes of rubber dam PM in standards and factors of SM.

2.3.3. Formation of the Internal and External Factors Matrix

After discussion with experts and compliance with standards and frameworks, the internal and external factors matrix for rubber dam projects can be generalized (Tables 1 and 2).

Table 1. Internal factors matrix of the organization with rubber dam projects.

Strengths (S)			Weaknesses (W)		
Main Factors	Sub-Factors	Description	Main Factors	Sub-Factors	Description
Organization management	S ₁	Development of structure, cultural norms, and organizational processes and projects (formulation of policies, programs, and strategies of the organization as well as the development of patterns, values, rules, guidelines, standards of the organization and projects)	Organization management	W ₁	Guide and monitor the performance of all organizational units and projects (following the plans, strategies, rules, guidelines, and guidelines of the organization and project)
	S ₂	Providing the necessary resources and infrastructure (human resources including employment, training, and performance review of employees, facilities and equipment of projects, financial resources and capital facilities, communication and information infrastructure of the organization and projects)	Marketing	W ₂	Identifying and analyzing domestic and foreign markets and determining the necessary strategies for providing technical services and project implementation
Project management (PM)	S ₃	Integration management	Financial or accounting	W ₃	Necessary strategies in allocating project financial resources and earning income for the organization
	S ₄	Scope management	Project management (PM)	W ₄	Schedule management
	S ₅	Communication management		W ₅	Cost management
	S ₆	Procurement management		W ₆	Quality management
Research and development	S ₇	Studies and design of projects, research and development of new services, improvement of technology capacities in the organization and projects		W ₇	Resource management
Information system	S ₈	Creating a base of knowledge storage and retrieval of information including programs, processes, guidelines and standards of the organization and projects, and access to domestic and foreign databases		W ₈	Risk management
				W ₉	Stakeholder management

Table 2. External factors matrix of the organization with rubber dam projects.

Opportunities (O)			Threats (T)		
Main Factors	Sub-Factors	Description	Main Factors	Sub-Factors	Description
Economic factors	O ₁	The cost-effectiveness of rubber dam projects (low installation time, reduced construction costs, maintenance, including no problems with sediment, rapid return on investment)	Economic factors	T ₁	Reducing foreign investment in the country and reducing the privatization process
	O ₂	Being possible to supply the implementation costs of a rubber dam project	Social and cultural factors	T ₂	Increasing per capita water and energy consumption in the country
Technological factors	O ₃	Increasing the demand of different countries for technological and technical services	Political/legal or lawful factors	T ₃	Problems of regulations and standards in the country
	O ₄	Forcing organizations, companies, and industries to comply with water quality standards (necessity of urban and industrial wastewater treatment)		T ₄	Political conditions in the country
Stakeholders	O ₅	Farmers and people are satisfied with the implementation of the second phase of projects (including agricultural water supply networks, hydroelectric power plants, purified drinking water supply)	Global factors	T ₅	Severe climate change and droughts and floods
				Stakeholders	T ₆

3. Results and Implications

3.1. Internal and External Factors Evaluation Matrix

Hereafter, for brevity, internal and external sub-factors are referred to as internal and external factors. The internal and external factors evaluation matrix is formed and shown in Table 3 according to David and David [47]. Columns one to four and five to eight of this table are related to the evaluation of internal (strength and weakness factors) and external (opportunity and threat factors) factors, respectively. In column one, the internal factors are again marked with a symbol, which corresponds to the matrix of internal and external factors (Tables 1 and 2). Here, internal factors include eight strengths and nine weakness factors. In column two, the weighting coefficients or weight of each of the strengths and weaknesses are listed.

Based on the survey of experts and pairwise comparisons conducted by AHP with the Expert Choice software and according to Table 4, the weighting coefficients of strength and weakness factors were obtained [37,49,57–59]. The values of these coefficients are between zero and one, and the sum of the weighting coefficients of all internal factors should be equal to one (Table 3). The highest weight factor among strength factors is related to the S_i factor. This means that, according to experts, this factor has been more important than other factors. In column three, the grades of each of the internal factors are placed

based on their key or normal role in the strength or weakness of the organization and according to the criteria of Table 5. Grades of each internal factor vary between one and four.

Table 3. Internal and external factors evaluation matrix of the organization for the rubber dam project.

Internal Factors				External Factors			
Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7	Col. 8
Sub-Factors	Weight	Grade	Weighted Score	Sub-Factors	Weight	Grade	Weighted Score
S ₁	0.114	2.7	0.308	O ₁	0.141	3.7	0.522
S ₂	0.102	4.0	0.408	O ₂	0.157	4.0	0.628
S ₃	0.023	2.6	0.060	O ₃	0.063	2.6	0.164
S ₄	0.027	2.7	0.073	O ₄	0.056	2.8	0.157
S ₅	0.026	3.0	0.078	O ₅	0.183	3.0	0.549
S ₆	0.024	2.8	0.067	T ₁	0.049	2.3	0.113
S ₇	0.037	3.0	0.111	T ₂	0.099	1.0	0.099
S ₈	0.061	3.6	0.220	T ₃	0.084	1.8	0.151
W ₁	0.111	1.6	0.178	T ₄	0.090	1.9	0.171
W ₂	0.035	2.4	0.084	T ₅	0.042	2.2	0.092
W ₃	0.059	2.0	0.118	T ₆	0.036	2.0	0.072
W ₄	0.063	2.1	0.132				
W ₅	0.073	1.8	0.131				
W ₆	0.077	2.0	0.154				
W ₇	0.070	1.0	0.070				
W ₈	0.031	2.0	0.062				
W ₉	0.066	1.5	0.099				
Total	1	-	2.353	Total	1	-	2.718

Table 4. Grade for pairwise comparisons in AHP method [31,41,60].

Definition	Grade
Extremely preferred	9
Very strongly preferred	7
Strongly preferred	5
Moderately preferred	3
Equally referred	1
Used to represent a compromise between the priorities listed above	2, 4, 6, 8

Table 5. Determining the grade of internal and external factors for the SWOT analysis.

Factors	State	Grade
Strength/Opportunity	High	4
	Ordinary	3
Weakness/Threat	High	1
	Ordinary	2

According to the rules governing the SWOT model, the number 2.5 is considered as the boundary between strength and weakness factors [44]. For example, the grade of S₃ is 2.6 and close to the limit of 2.5, which means that if the organization does not strengthen this factor, it may become a weakness in the near future. On the other hand, the concept of weighting coefficients (column two) differs from grades (column three). In column four, the weighted score of each factor is stated, which is obtained by multiplying the weight

factor by the grade. The total weighted score of the organization's internal factors is 2.353. The fact that the total weighted score of the internal factors is close to the average value in the range one to four shows that the model does not have a severe weakness and strong threat in terms of internal factors and follows a balanced behavior.

It should be mentioned that the rules and regulations mentioned above are the same for internal and external factors. The symbols indicating external factors are shown in column five of Table 3. In column six, the weights of each of the opportunity and threat factors are listed. The value of these coefficients is between zero and one. On the other hand, the sum of the weighting coefficients of all external factors is equal to one. In column seven, each of the external factors is ranked according to their key or normal role in the opportunity or threat of the organization and according to the Table 5. The scores of each external factor vary between one and four. In column eight, the weighted score of each factor is stated, which is obtained by multiplying the weight factor by the grade. The total weighted score (or final score) of the external factors of the organization is 2.718.

Since the total weighted score of the external factors is close to the average value of range of one to four, it gives confidence that the model follows a balanced behavior, i.e., it does not confront severe threats and strong opportunities in terms of external factors.

To determine the weighting coefficients of internal and external factors by pairwise comparisons in AHP, the inconsistency ratio (IR) should be less than or equal to one to ensure the high accuracy of expert responses. In the present study, it is not possible to determine the IR with 17 internal factors. However, the fact that the IR of the 11 external factors is 0.03 is acceptable according to [49].

3.2. Forming the Internal and External Factors Analysis Matrix

3.2.1. Determination of the Main Strategy and Sub-Strategies

The main strategies and sub-strategies are identified according to the results of the internal and external factors evaluation matrix (i.e., Table 3) and based on the internal and external factors analysis matrix [20,44,47,61,62].

As shown in Table 3, the sums of the weighted scores of internal and external factors are 2.353 and 2.718, respectively. So, according to the matrix in Figure 3, the main strategy of the organization should be WO. The weakness opportunity (WO) strategy is sometimes called the opportunity-focused strategy, which minimizes weaknesses and maximizes opportunities; this strategy can be chosen in a risky situation in which strengths are low and threads are increasing [60].

The organization should take advantage of its (ahead) opportunities to mitigate its weaknesses, i.e., it should take a conservative approach to the implementation of rubber dam projects. Thus, the organization should identify the factors of weakness and pathologies in more detail and apply conservative behavior to reduce or eliminate these weak factors while taking care of the current situation and maintaining its strengths.

After determining the main strategy of the organization, the other three strategies, including ST, SO, and WT, are considered sub-strategies. A comparison between the Ghorbani and Hamidifar [41] study and the present study shows that the integration of strategic management into project management has changed the main strategy of the organization from ST to WO. In other words, external threat factors that could have made the project face unknown challenges have been weakened, and there are only striking weakness factors within the organization. At first glance, this change in strategy is a milestone for similar organizations, provided they consider integrating strategic management and project management rather than merely strategic management. Moreover, the organization can strengthen its weakness factors by selecting and prioritizing appropriate strategies using the new method of strategy matrix presented in the current study. This method is a logical approach and identifies possible strategies without any confusion. The above two points show the usefulness of this methodology for all similar organizations working in the field of design and implementation of rubber dam projects.

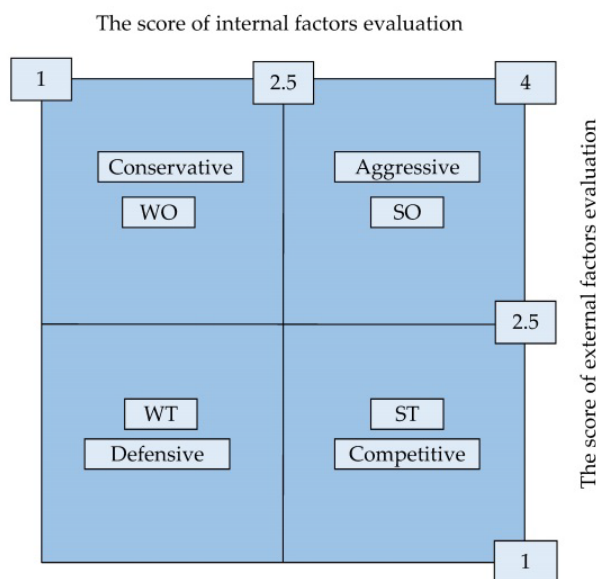


Figure 3. Internal and external factors analysis matrix in SWOT model to determine the main strategy of the organization (S: strengths, W: weaknesses, O: opportunities, T: threats) (adopted from [41]).

3.2.2. A New Method for the Determination of Possible Strategies

All strategies that are described after determining the main strategy and sub-strategies using the internal and external factors matrix (i.e., Tables 1 and 2) are used to determine possible strategies. Here, to determine the priority of possible strategies, a simple and new method is presented following the principles governing the SWOT analytical model. This methodology is more comprehensive than methods based solely on the weighting coefficient, grade, and weighted score of internal and external factors or based on the analysis of charts or standard deviation of scores in previous studies [22,41,61–63]. The proposed new method is a combination of both the weight and grade of internal and external factors. Therefore, the criterion for prioritization in this method relies on both the importance and sensitivity of the factors in the organization for the rubber dam project. In the following, two steps are described that should be taken to apply the proposed method.

- Forming the priority matrix

Table 6 represents the priority matrix for the internal and external factors to prioritize the organization’s possible strategies and is proposed as a new approach for prioritization. In part A of this table, the matrix of strength and opportunity factors is formed while the matrix of weakness and threat factors is formed in part B. This step is explained by the following example. Suppose that the prioritization of the organization’s weaknesses is in terms of importance and sensitivity. First, the average of weighted coefficients of all of the factors of the organization’s weakness is determined. Then, the weighted coefficients of the desired weakness factor are compared with the average value of the weighting coefficients. Moreover, the grade of this factor is determined according to Table 5. If the weighting coefficient of the factor is higher than the average value of the weighting coefficients of all of the weakness factors and also the grade of the factor is lower than 1.75, then that factor is critical with high importance. Hence, this factor should be considered as the first priority of the organization, according to Table 6, to reduce or eliminate it.

Table 6. Internal and external factors priority matrix.

Weight Factor (between Zero and 1)	Grades (between 2.5 and 4)	Weight Score Status	Priority
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A. Priority matrix of strengths and opportunities

High (higher than the average weighting coefficient of all the strength or opportunity factors)	High (above 3.25)	High	Excellent strength or exceptional opportunity with high importance	First
	Low (below 3.25)	Medium	Ordinary strength or opportunity with high importance	Second/Third
Low (lower than the average weighting coefficient of all the strength or opportunity factors)	High (above 3.25)	Medium	Excellent strength or exceptional opportunity with low importance	Second/Third
	Low (below 3.25)	Low	Ordinary strength or opportunity with low importance	Fourth

B. Priority matrix of weaknesses and threats

High (higher than the average weighting coefficient of all the weakness or threat factors)	High (above 1.75)	High	Ordinary weakness or threat with high importance	Second/Third
	Low (below 1.75)	Medium	Critical weakness or serious threat with high importance	First
Low (lower than the average weighting coefficient all the weakness or threat factors)	High (above 1.75)	Medium	Ordinary weakness or threat with low importance	Fourth
	Low (below 1.75)	Low	Critical weakness or serious threat with low importance	Second/Third

As can be seen in this method, both the weighting coefficient of the factors and their grade have been considered. The provided results are based on the values of Table 5 (namely, determining the grade of factors), the SWOT analysis matrix, and a series of calculations. The first to fourth priorities for strengths and opportunities are that the organizations should take advantage of strengths or opportunities that are more important regarding their weight and grade. Moreover, for weaknesses and threats, prioritization means that organizations need to prioritize the elimination of critical weaknesses or threats with high importance. It is recommended to prioritize the second and third priorities together, both of which are mediocre and depend on the conditions in the organization as well as the decision makers. Moreover, the fourth priority in terms of importance and grade is quite the opposite of the first priority.

In addition, the priority of internal and external factors of the rubber dam project has been determined using Table 6 and then presented in Table 7.

Table 7. Priorities of internal and external factors of SM of the organization for the rubber dam project.

Internal Factors		External Factors	
Priority	Factors	Priority	Factors
Second/Third	S ₁	First	O ₁
First	S ₂	First	O ₂
Fourth	S ₃	Fourth	O ₃
Fourth	S ₄	Fourth	O ₄
Fourth	S ₅	Second/Third	O ₅
Fourth	S ₆	Fourth	T ₁
Fourth	S ₇	First	T ₂
First	S ₈	Second/Third	T ₃
First	W ₁	Second/Third	T ₄
Fourth	W ₂	Fourth	T ₅
Fourth	W ₃	Fourth	T ₆
Fourth	W ₄		
Second/Third	W ₅		
Second/Third	W ₆		
First	W ₇		
Fourth	W ₈		
First	W ₉		

As it is shown in Table 7, the strength factors S_2 (providing the necessary resources and infrastructure) and S_8 (creating a base of knowledge storage and retrieval of information) prove to have the first priority because, according to the values of the grades and the weight scores of these factors in Tables 3 and 6, they fall into “high” classification.

- Forming the strategy matrix

Once the main strategy and sub-strategies and the priority of all internal and external factors have been determined, then it is possible to prioritize the possible strategies of the organization as the strategy matrix (Figure 4). There are two priority categories and six priorities. The category of priorities and the six priorities are presented in black on the right side and in blue on the left side of Figure 4, respectively. The first priority category is re-prioritized, but the prioritization of the second priority category depends on the specific circumstances of those factors and the organization’s decisions, although they are prioritized here. Each strategy includes an internal factor and an external factor. Internal factors (strengths and weaknesses) are marked in red in the left column and external factors (opportunities and threats) are shown in green in the right column. For example, the WO strategy is a strategy that is made up of weakness (W) factors and opportunity (O) factors. Each blue rectangle is a strategic priority. The internal and external factors of that strategy are identified and placed in these rectangles according to Table 6. Therefore, dozens of possible strategies for the organization can be prioritized and then implemented.

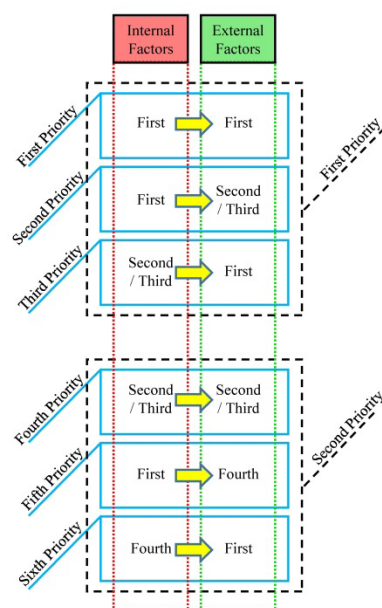


Figure 4. Strategy matrix (prioritization guide of organization’s strategies).

Tables 8 and 9 list potential strategies based on the main WO strategy and the ST sub-strategy for the rubber dam project organization, respectively. However, the fourth priority of internal and external factors and the fourth, fifth, and sixth priorities of these strategies have not been considered, for brevity. The selection of priorities for each internal and external factor and the prioritization of possible strategies are based on Table 7 and Figure 4, respectively. In Table 10, some of the possible strategies for the organization are listed separately. The order of priority of the possible strategies is based on the information summarized in Tables 8 and 9.

Table 8. Types of possible strategies based on the main WO strategy of the organization (the fourth priority of internal and external factors, as well as the fourth, fifth, and sixth priorities of possible strategies, are neglected).

Based on Priority Matrix Described in Table 6			Based on Strategy Matrix Shown in Figure 4		
Priority	Weakness (W)	Opportunity (O)	First Priority WO	Second Priority WO	Third Priority WO
First	W ₁	O ₁	W ₁ O ₁	W ₁ O ₅	W ₅ O ₁
	W ₇	O ₂	W ₇ O ₁	W ₇ O ₅	W ₅ O ₂
	W ₉		W ₉ O ₁	W ₉ O ₅	W ₆ O ₁
Second/Third	W ₅	O ₅	W ₁ O ₂		W ₆ O ₂
	W ₆		W ₇ O ₂		
			W ₉ O ₂		

Table 9. Types of possible strategies based on the ST sub-strategy of the organization (the fourth priority of internal and external factors, as well as the fourth, fifth, and sixth priorities of possible strategies, are neglected).

Based on Priority Matrix Described in Table 6			Based on Strategy Matrix Shown in Figure 4		
Priority	Strength (S)	Threat (T)	First Priority ST	Second Priority ST	Third Priority ST
First	S ₂	T ₂	S ₂ T ₂	S ₂ T ₃	S ₁ T ₂
	S ₈		S ₈ T ₂	S ₂ T ₄	
Second/Third	S ₁	T ₃		S ₈ T ₃	
		T ₄		S ₈ T ₄	

Table 10. Some of the possible strategies of the organization with the rubber dam project.

Possible Strategies	Description
W ₁ O ₁	Use project economics to finance the oversight process in the organization.
W ₇ O ₁	Cost-effectiveness of projects can help increase and improve project resources and thus better resource management.
W ₉ O ₁	Economic efficiency of projects in different ways can be effective on stakeholder management (e.g., reducing water demand).
W ₁ O ₂	Considering different economic aspects, the performance of organizational units and projects should be monitored.
W ₇ O ₂	Utilization of the economic conditions and opportunities in the project, resource management can be applied optimally.
W ₉ O ₂	Taking advantage of the existing economic conditions, stakeholders' management must be improved.
W ₁ O ₅	The stakeholders' potential can be used to improve project and even organizational performance.
W ₇ O ₅	Resources management can be better applied by obtaining help from project stakeholders.
W ₉ O ₅	Using project stakeholders as a suitable opportunity to apply the stakeholders' management.

There may be situations where an internal factor (such as a strength factor) and an external factor (such as a threat factor) cannot support each other, for example, the strategy of combining these two factors cannot be defined or applicable. Two combined factors (an internal factor with an external factor) may become less important after the assessments have been made. Therefore, such strategies can be ignored. For example, the possible S₂T₂ strategy is not a key strategy relevant to the present study. However, after setting priorities, the correct vision of the problem or project can be more effective in determining the right strategies.

As shown in Table 10, the organization should implement the strategies of W₁O₁, W₇O₁, W₉O₁, W₁O₂, etc., respectively. In this table, only nine possible strategies are

mentioned for abbreviation, and the rest of the strategies can be determined according to Tables 8 and 9. According to this table, the organization should first apply the W_1O_1 strategy to improve processes and reduce the weakness factors within the organization associated with the project.

As another example, the organization should, if necessary, prefer the W_7O_2 strategy over the W_9O_2 strategy, i.e., by using existing economic potentials, it prefers improving resources management over improving stakeholders' management to achieve the supreme goals of the organization more favorably. One of the branches of resources management is human resources management. In a higher level, strategic human resources management can be considered for the W_7O_2 strategy that includes a wide range of topics such as choosing the right resources, changing human cultures and structures, developing abilities, and increasing productivity [15,16]. Simultaneously, considering human resources strategy management in rubber dam projects increases the performance of the organization, and it may not be necessary to apply future strategies.

4. Conclusions

In this paper, significant strategic factors for rubber dam projects have been integrated within the SM of the organization by integrating the SWOT and AHP methods. The following remarks could be drawn from the applied methodology and the results:

- Selecting the right projects, for example, a rubber dam project with many benefits, low costs, and good efficiency, is a priority in many countries around the world. Along with the right project's selection, implementing the SM of the organization, which is responsible for its implementation, with valid standards and rules is a high priority but still not enough. SM of the organization along with the integration of PM is helpful to the coherence and coordination of activities and therefore is proposed as the first priority of the organization.
- Comparing the Ghorbani and Hamidifar [41] study with the current study shows that integrating PM into SM for rubber dam projects can transform the organization's main strategy from ST to WO. This can be a positive point for the same organizations because the effects of external threats can nicely be weakened. Moreover, in the previous study, the priority of strategies did not follow a specific method, but in the current study, a priority matrix and then a strategy matrix were used to prioritize and determine the possible strategies of the organization based on two effective factors of grades and weight scores.
- While the focus of previous studies was usually on the projectized structure that SM applies in PM, this research tries to integrate PM within SM based on concepts from both management processes by using an intermediate matrix structure. In this case, the other organizational units of the organization, while paying special attention to the projects and their coordination together with the project manager, have finance, marketing, research and development, and goals. Moreover, the project manager's focus is on knowledge management.
- Integrating PM in organizational management has been conducted based on the principles governing the SWOT model. Hence, the process of evaluating factors and determining as well as formulating the strategy of the organization by auditors and evaluators can be achieved in a more principled and faster way and therefore facilitates the achievement of the goals of the organization.
- Identifying and evaluating the strengths, weaknesses, opportunities, and threats of the organization, together with determining the main strategy and sub-strategies, as well as prioritizing and analyzing the possible strategies with the proposed new method of the "priority matrix" and of "strategy matrix", and finally applying conscious management in line with possible strategies lead the organization to excellence.

- Despite the conditions, assumptions, and limitations of the rubber dam project organization in Iran, many possible strategies can be determined. For example, the opportunity of existing financial resources and economic benefits of rubber dam projects must be used to further monitor the various units of the organization and also to help manage the project unit (as an organizational unit). At the same time, the expectations of stakeholders, on the one hand, and their management inside and outside the project environment, on the other hand, can have a significant impact on the activities of the organization, which unfortunately has been neglected so far.

Concluding, to advance the model and as future research directions, fuzzy logic techniques that take into consideration the data uncertainties are proposed. Although in the research the rank reversal paradox produced by the AHP method was solved by improving the viewpoints of experts and thus spontaneously refining the data, novel and advanced methods that are free of rank reversal, such as the SPOTIS or COMET methods [26,64–70], are proposed as research alternatives.

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Abbreviations

AHP	Analytic Hierarchy Process
COMET	Characteristic Object METHOD
IR	Inconsistency Ratio
MCDM	Multi-Criteria Decision Making
O	Opportunity
PM	Project Management
PMBOK	The Project Management Body of Knowledge
R&D	Research and Development
S	Strength
SPOTIS	The Stable Preference Ordering Towards Ideal Solution
SWOT	Strength, Weakness, Opportunity, Threat
SM	Strategic Management
T	Threat
W	Weakness
WFD	Water Framework Directive

Appendix A

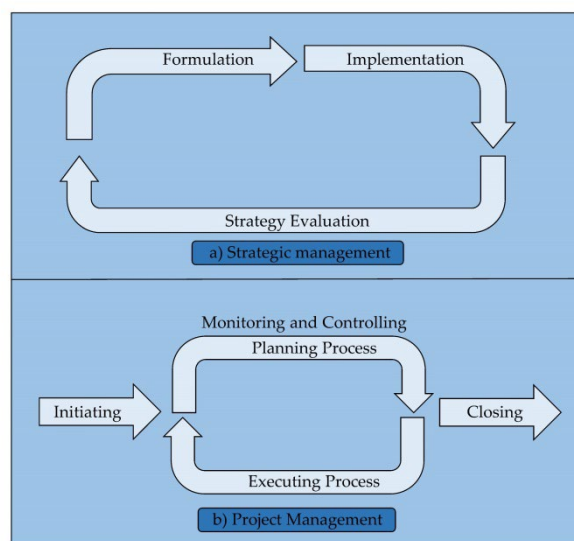


Figure A1. Comparison of the processes in the SM and PM: organizational SM processes (part (a)), and PM processes (part (b)) [17,44].

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