TAILORING ATTRIBUTES PRIORITIZATION BASED ON THE PROJECT MANAGEMENT STANDARD

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Abstract - The project management has raised a noticeable attention with respect to its important role in successful implementation of the projects. In this course, many different guiding standards and methodologies have been developed to give a hand to more efficient management of them. On the other hand, we need to tailor the applied standard in accordance with the dominant contingency. However, there is a profound lack in the research efforts to clarify that which segments of a given project management standard are more crucial to be tailored. Hence, the problem is addressed in this paper by the fuzzy-DEMATEL method in order to provide an initial picture for prioritizing the attributes. Finally, a real case is used for executing the research.

Keywords - Project management; Tailoring; Fuzzy DEMATEL; Guiding standard attributes.

I. INTRODUCTION

Project management has been increasingly raising the managers and experts' attention in order to manage the projects more efficiently, within the last decades. In this regard, different standards, best practices, and methodologies have been developed with respect to the distinctive needs of the organizations, societies, and so on. For instance, Project Management Body of Knowledge (PMBOK) defines the project management as the application of knowledge, skills, tools, and techniques to the activities of the project to satisfy its needs [1].

It is crucial to note that a given standard or methodology should be tailored and none of them are originally perfect for a given situation. Therefore, tailoring is essential to be taken into consideration for a successful implementation of a project standard. Base on the PMBOK, tailoring can be concisely expressed as the appropriate combination of processes, inputs, tools, techniques, outputs, and life cycle phases in order to manage a project.

The necessity to paying attention toward tailoring a selected standard is repeatedly highlighted which can be addressed through different perspectives. In this regard, PMBOK mentions that the guide is suggested to be tailored since such a standard document only recognizes a subset of the project management body of knowledge. In a similar interpretation, PRINCE II reiterates that it is developed as a universal project management method, taking account for projects with different environment, size, complexity, importance, and risk [2]. Hence, it is advisable to tailor the methodology to suit each project's special needs and context since it is expected to be applied for any project type, geography or culture. On the other hand, it mentions that the purpose of tailoring is to assure that:The project management method is aligned with the business processes which may govern and support the project, such as human resources, finance and procurement. Project controls are proportional to the project's scale, complexity, importance, team capability, and risks.

II. PROBLEM DEFINITION

It is needed to apply a proper project management standard in order to manage the projects efficiently and cohesively. The issue makes more sense once the organization is to deal with a set of projects. Without regard to the standard selected, the project managers should be cautious about the required editions and tailoring. Consequently, it is of great importance to be accurate in a better application and implementation of a standard. In this regard, it is required to access an information structure by which the stakeholders can realize the importance of the items susceptible to tailoring.

Hence, the authors aim to prioritize the attributes mostly addressed in tailoring in order to distinguish the most influencing ones.

As mentioned earlier, there are many different references and standards to apply for managing the projects. Thus, the tailoring application can be taken into account with respect to the specific framework. Here, the PMBOK has been addressed as a frequently referenced framework for the associated attributes consideration. Since PMBOK is based on the knowledge areas, its tailoring is also concentrated with respect to each area. According to this standard, different items have been suggested to be investigate for the tailoring purpose for each of the areas. However, for the sake of simplicity, we have restricted our study to the extant knowledge areas.

On the other hand, it is required to utilize a model to rank these features by. To this purpose, fuzzy-decision making trial and evaluation laboratory (DEMATEL) has been used to determine the importance of tailoring for each area.

DEMATEL was originally introduced by the Battelle Memorial Institute through its Geneva Research Centre [3; 4]. It can be referred to as a cause and

effect model able to extract the relations between complex criteria. The method can determine the importance of the criteria under consideration, as well as the extent by which an attribute influences over the others.

The steps of DEMATEL are briefly explained as follows.

1. Find the pair-wise comparison matrix:

In this step, the decision-maker (DM) runs a pair-wise comparison about how criterion i influences criterion j. The comparisons are carried out by integer scores including 0, 1, 2, 3, and 4, respectively, representing "No influence", "Very low influence", "Low influence", "High influence", and "Very high influence". Eq. (1) shows the average matrix according to a group of experts' judgements (e.g., h).

$$[a_{ij}]_{n\times n} = \frac{1}{h}\sum_{k=1}^{h}[X_{ij}^{k}]_{n\times n} \quad (1)$$

where X_{ij}^{k} stands for the *k*th expert's opinion on how criterion *i* influences over criterion *j*.

2. Calculate the normalized initial direct-relation matrix:

Eqs. (2) and (3) obtain the normalized direct-relation matrix M, in which all diagonal elements are considered zero.

$$\mathbf{M} = k.\mathbf{A} \quad (2)$$

$$k = \frac{1}{\max\sum_{j=1}^{n}|a_{ij}|}; \quad \forall i = 1,2,\ldots,n \quad (3)$$

3. Compute the total relation matrix:

The total-relation matrix S can be computed regarding the normalized direct-relation matrix. It can be calculated by Eq. (4), in which I stands for the identity matrix.

$$\mathbf{S} = \mathbf{M} + \mathbf{M}^2 + \mathbf{M}^3 + \ldots + \mathbf{M}^\infty = \sum_{i=1}^{\infty}\mathbf{M}^i = \mathbf{M}(1-\mathbf{M})^{-1} \quad (4)$$

4. Compute dispatcher and receiver group:

Dispatcher and receiver groups can be identified with respect to D-R and D+R values, in which R and D stand for the sum of matrix S columns and rows, respectively. D-R reiterates that how strong a criterion influences the others [5; 6].

$$\mathbf{S} = [s_{i,j}]_{n\times n}; \quad i, j \in \{1,2,\ldots,n\} \quad (5)$$

$$\mathbf{D} = \sum_{j=1}^{n} s_{i,j} \quad (6)$$

$$\mathbf{R} = \sum_{i=1}^{n} s_{i,j} \quad (7)$$

5. Set a threshold value and obtain the impact-diagraph-map:

An impact-diagraph-map can be obtained by a given threshold value as the influence level by the DM. The impact-diagraph-map can be developed by mapping the data set of (*D+R*, *D-R*), in which *D+R* and *D-R* make up horizontal and vertical axes, respectively.

The fuzzy logic has been applied to run the pair-wise comparisons in DEMATEL to deal with the extant ambiguities. Fuzzy set theory was first introduced by Zadeh[7] to account for linguistic variables, based on the membership function concept. The theory aims to mitigate the effects of subjective judgments based on the peoples' thoughts fuzziness [8]. Here, triangular fuzzy numbers (TFN) are used to address linguistic values, as a common existing way in the literature.

The algorithm implementation steps are described by Eqs. (8)-(15), supposing that $\tilde{Z}_{ij}^{k} = (l_{ij}^{k}, m_{ij}^{k}, r_{ij}^{k})$ represents the kth evaluator fuzzy assessment (*k*=1,2,…,*h*) about the effect magnitude of criterion i over criterion *j*,

Step 1. Normalization:

$$xr_{ij}^{k} = (r_{ij}^{k} - \min l_{ij}^{k}) / \Delta_{\min}^{\max} \quad (8)$$

$$xm_{ij}^{k} = (m_{ij}^{k} - \min l_{ij}^{k}) / \Delta_{\min}^{\max} \quad (9)$$

$$xl_{ij}^{k} = (l_{ij}^{k} - \min l_{ij}^{k}) / \Delta_{\min}^{\max} \quad (10)$$

where $\Delta_{\min}^{\max} \max r_{ij}^{k} - \min l_{ij}^{k}$.

Step 2. Compute right (*rs*) and left (*ls*) normalized values:

$$xrs_{ij}^{k} = xr_{ij}^{k} / (1 + xr_{ij}^{k} - xm_{ij}^{k}) \quad (11)$$

$$xls_{ij}^{k} = xm_{ij}^{k} / (1 + xm_{ij}^{k} - xl_{ij}^{k}) \quad (12)$$

Step 3. Compute total normalized crisp values:

$$x_{ij}^{k} = \left[xls_{ij}^{k}(1 - xls_{ij}^{k}) + xrs_{ij}^{k} xrs_{ij}^{k}\right] / \left[1 - xls_{ij}^{k} + xrs_{ij}^{k}\right] \quad (13)$$

Step 4. Compute crisp values:

$$Z_{ij}^{k} = \min l_{ij}^{k} + x_{ij}^{k} \times \Delta_{\min}^{\max} \quad (14)$$

Step 5. Integrate crisp values:

$$Z_{ij} = 1/h\left(Z_{ij}^{1} + Z_{ij}^{2} + \ldots + Z_{ij}^{h}\right) \quad (15)$$

The fuzzy DEMATEL method can hereafter be implemented accounting for the linguistic variables in which "no influence", "very low influence", "low influence", "high influence", and "very high influence" are substituted by (0,0,0.25), (0,0.25,0.5), (0.25,0.5,0.75), (0.5,0.75,1), and (0.75,1,1), respectively.

III. CASE STUDY AND RESULTS

The aforementioned issue, i.e., projects' attributes tailoring prioritization, is considered for a real case in Iran. The study has been carried out in a leading telecom operator, which holds a large portfolio to satisfy its capital and operational plans. According to the corresponding committee's decision, it was to design the questionnaire and run the calculation process of the fuzzy DEMATEL method, afterwards. Finally, the most influencing attributes were

extracted, while they could also develop the impact-diagraph-map.

Ten attributes, including ten knowledge bodies of the project management were taken into consideration. They are briefly mentioned here as follows. Integration, scope management, schedule management, cost management, quality management, resource management, communications management, risk management, procurement management, and stakeholder management.

The questionnaires were distributed among a group of experts who had been asked to prioritize an attribute importance over the other ones. **Table 1** shows the linguistic assessment data gathered from a sample respondent. Afterwards, **Table 2** illustrates the total-relation matrix which is derived from the normalized direct-relation matrix.

According to the obtained results, it can be concluded that risk management, resource management, procurement management, stakeholder management, communications management, quality management, and integration are respectively the most influencing attributes which should be highly considered in tailoring. However, it should be noted that the issue has to be taken into consideration with respect to the industry and the adopted standard/methodology.

CONCLUSIONS

The paper addressed attributes tailoring of a given project management standard, since there is a serious need to care about the associated importance. In other words, it was aimed at accounting for a method by which we can realize the attributes of a specific standard essential to be tailored. Hence, we applied the fuzzy DEMATEL method to obtain the tailoring priorities according to a set of experts' judgements. Furthermore, the fuzzy set theory was used in order to deal with the unavoidable vagueness in the linguistic variables. The method was investigated for a case in the telecom industry and the obtained results were discussed.

The main purpose of the paper was to prepare a path by which more consideration can be led to the tailoring. However, it is advisable to look into the sub-attributes of the given project management standard in a more detailed study as a future research interest. Moreover, other analytical tools such as information system based frameworks can be developed as another future research direction.

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Table 1.Shows the assessment data of an expert.

	Integration	Scope MGT.	Schedule MGT.	Cost MGT.	Quality MGT.	Resource MGT.	Communications MGT.	Risk MGT.	Procurement MGT.	Stakeholder MGT.
Integration	No	H	VH	VH	VH	VH	VH	L	H	VH
Scope MGT.	L	No	H	H	L	L	H	L	L	L
Schedule MGT.	VL	L	No	L	L	H	H	L	L	H
Cost MGT.	VL	L	H	No	L	L	H	VL	L	H
Quality MGT.	VL	H	H	H	No	H	H	L	H	H
Resource MGT.	VL	H	L	H	L	No	H	L	H	H
Communications MGT.	VL	L	L	L	L	L	No	VL	H	VL
Risk MGT.	H	H	H	VH	H	H	VH	No	H	H
Procurement MGT.	L	H	H	H	L	L	L	L	No	L
Stakeholder MGT.	VL	H	L	L	L	L	VH	L	H	No

Table 2. Shows the total-relation matrix.

	Integration	Scope MGT.	Schedule MGT.	Cost MGT.	Quality MGT.	Resource MGT.	Communications MGT.	Risk MGT.	Procurement MGT.	Stakeholder MGT.	*D*	*D+R*	*D-R*
Integration	0.216	0.241	0.255	0.268	0.219	0.230	0.238	0.175	0.188	0.230	2.26	4.35	0.17
Scope MGT.	0.207	0.207	0.316	0.312	0.186	0.303	0.294	0.191	0.212	0.285	2.513	5.114	-0.088
Schedule MGT.	0.196	0.214	0.198	0.224	0.216	0.271	0.268	0.236	0.257	0.322	2.402	5.118	-0.314
Cost MGT.	0.192	0.197	0.237	0.187	0.204	0.214	0.266	0.175	0.206	0.317	2.195	5.028	-0.638
Quality MGT.	0.209	0.319	0.332	0.339	0.199	0.326	0.279	0.237	0.328	0.319	2.887	5.162	0.612
Resource MGT.	0.174	0.280	0.269	0.328	0.237	0.203	0.315	0.277	0.310	0.296	2.689	5.261	2.689
Communications MGT.	0.182	0.192	0.194	0.219	0.217	0.233	0.201	0.215	0.262	0.218	2.133	4.887	2.133
Risk MGT.	0.311	0.306	0.325	0.368	0.344	0.326	0.359	0.221	0.344	0.317	3.221	5.392	3.221
Procurement MGT.	0.210	0.314	0.348	0.352	0.237	0.228	0.219	0.203	0.214	0.229	2.554	5.17	2.554
Stakeholder MGT.	0.193	0.331	0.242	0.236	0.216	0.238	0.315	0.241	0.295	0.185	2.492	5.21	2.492
R	2.09	2.601	2.716	2.833	2.275	2.572	2.754	2.171	2.616	2.718			

★★★