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THE CONCEPTUAL MODEL OF SUPPLY CHAIN RISK MANAGEMENT IN THE ORGANIZATION

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ABSTRACT

Administrating of organizations in Iran generally are similar to traditional methods and using structures which are rooted to the early of twentieth century. Static functional Structures have decreased the productivity and coordination of Iranian organizations and often involved variable quality and high prices and costs. Rapid changes in the past two decades, especially in the field of information technology, has transformed intelligent systems, the method of administration, management and leadership of the organization.To get rid of these problems, methods of control, such as supply chain risk management, have been developed. In this study, the way of managing the risk of supply chain in the organization practically is studied. The implementation of risk management and evaluation of risk factors in the organization respectively is discussed by using a model. In order to operationalize the model of work breakdown structures, fuzzy TOPSIS is used. Generally, the purpose of this article is to introduce the method for providing the accurate and reliable information for the decision-making meetings of senior managers in the field of supply chain management.

Keywords: Fuzzy TOPSIS, supply chain risk management, RBS

INTRODUCTION

Supply chain risk management is one of the most commonly used and extensive concepts in the field of organization management that it is discussed from the various aspects.

Although awareness about the risk subject among the specialists is increasing, the concepts of supply chain vulnerability and risk management are still in its early stages.

So one of the issues that have been disregarded to some extent is the importance of risk and its impact on supply chain management of organizations. Although, in order to increase market share and business growth, organizations use different strategies such as outsourcing or diversifying their products or services. It should be noted that theses strategies can cause some serious damage on supply chain if they will be out of control. Regarding to the items mentioned above, methods which are used in this article are RBC model and TOPSIS respectively.

Definitions:

Risk Management: Risk management is a systematic process of identifying, analyzing and responding to the project risk. This kind of management ensures maximizing the probability of positive events and minimizing the probability of adverse events for the objectives of project. According to the PMBOK standard, risk management process includes identification, analysis, response and control of risk that it is required to reduce the probability of risks and its impact on project. In PMBOK standard, inputs, tools, techniques and outputs of each mentioned steps have been analyzed in detail.

Risk breakdown structure

This method offers an effective tool for the identification and classification of targeted risk. In fact, RBC is a hierarchical structure of the project risks. RBC potentially is able to be served as a powerful tool to understand the risks of the project. RBC can help to understand the behavior of risk distribution in the different phases of a project and provides the basis for risk management. As a matter of fact, RBC originated from the idea of WBS that currently it has become as a largest tool of project management. In practice, it shows the characteristics of WBS. In other words, it defines the scope and also work of projects. Thus, as WBS forms the basis of many aspects of project management, RBS can be used to structure and lead the process of management. To clarify the way of using RBS, a sample of risk breakdown structure is referred. Figure 1 shows risk breakdown structure that it classifies risks at various levels in addition to the breaking of risks. (F. Kazempour Lang, B. Dadashzadeh, 1390)

Level			
0	1	2	3
The risk of project	Management	Participation-Coordination	History, experience, organizational culture
			Customers, stakeholders

			Financial issues
			Other issues
		Customers of stakeholders	History, experience, culture
			Contractual arrangements
			Stability and recognition of requirements
			Other issues
	Outside issues of organization	The environment	The type of environment facilities
			Local Shopping
			Other issues
		Social Culture	Politics
			Rules
			Favorites of group
			Other issues
		Economic	Labor market
			Labor law - working conditions
			Financial issues
			Other issues
	Technology	Requirements	Uncertainties
			The conditions of using
			Complexity
			Other issues
		The method of implementation or execution of projects	Maturity of Technology
			Restriction of Technology
			Organizational experiences
			Other issues
		Using items	Experience and personal skills
			Resources
			Other issues

Figure 1: Risk Structure Breakdown

Supply Chain: an integrated approach to plan and control of material and information that from suppliers to customers is flowing and aims to optimize the process of the project implementation. Supply chain as turning point in the competitive advantage of business has been proposed. The studies of supply chain emphasizes on maximizing the overall value of the supply chain by appropriately use of resources in all sectors of organization. Supply chain is a sets of value creating activities that links the suppliers of organizations to its customers. The main activity of supply chain is supplying of raw materials –value added - delivering to clients. Supply chain includes all partners which directly or indirectly are involved in meeting the customer demand. Supply chain includes manufacturers, suppliers, carriers, storekeeper, retailers and even customers. Within any organization, such as manufacturers, supply chain acquires all ongoing operations and meets the customer demand. These functions include new

product development, marketing, production, distribution, finance, customer service and other operations related to customer needs.(christoph taller herbert kotzeb, 2011).

To create and maintain a competitive advantage in manufacturing and service organizations effective management of the supply chain is vital.

Model:

In our model (Fig. 2), supply chain risk for the local conditions, a common condition with contractors, supply chain processes related to supply chain and executive conditions of supply chain are studied and for each of the variables, set of risks are defined (Cherestoph Taller. Herbert Kotzeb, 2011).
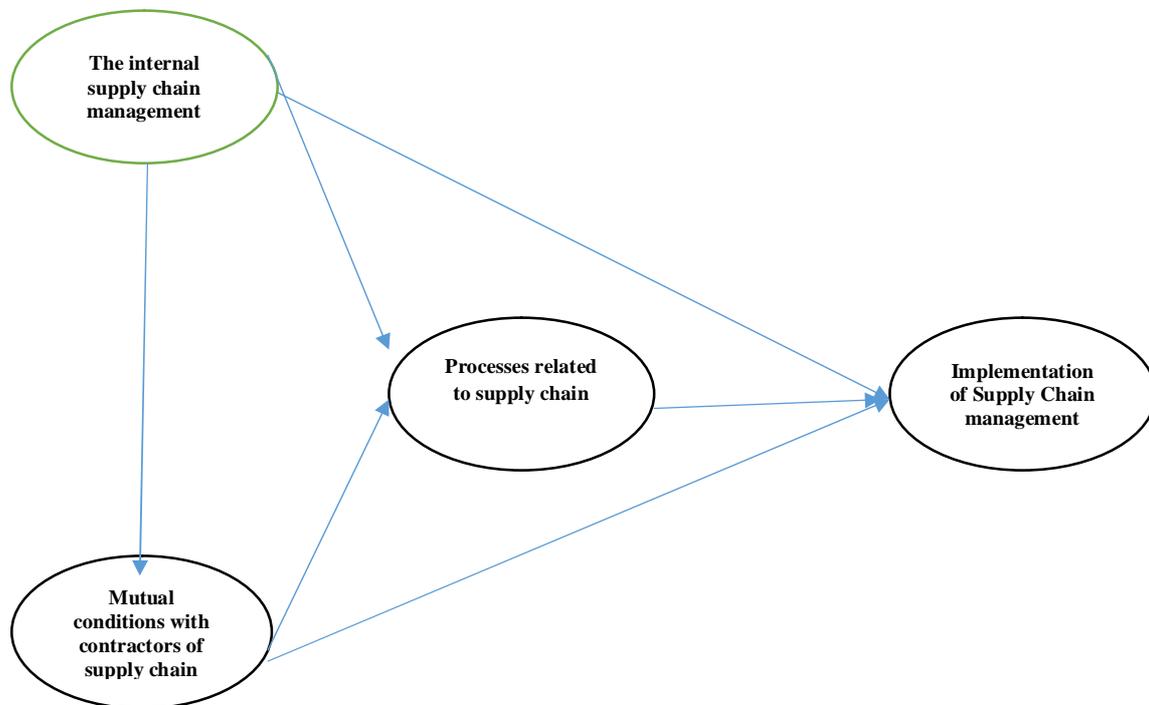
Figure 2: Model shows the importance of conditions (risk) of supply chain.

By combining RBS technique and variables of the model, the major risk of supply chain will be broken and categorized (F Kazempour Lang, B. Dadashzadeh, 1390).

In the following figure (Table 3) all conditions that can end to risk during of supply chain of a project-based organizations are broken and examined in three separate level. Depending on conditions and the type of chain, this distinction can be extended more.

Level		
2	**1**	**0**
Are personnel / human resources available for supply chain management?11x	**Internal situation of supply chain management**	**Supply chain**
Is funding resources available for supply chain management issues?12x		
Do senior managers in your organization support supply chain management issues?13x		
Were domestic purposes existing before the start of the supply chain management projects?14x		
Are employees able to use the IT systems for supply chain management issues?15x		
Does your organization have IT systems that are able to process information from other partners in supply chain management?16x		
Is there an agreement on exchanging information policies with other organizations in the supply chain?		
Are employees trained to help supply chain management projects?18x		
Does your organization have design and project groups which are composed of people who are working in different areas?19x		
Does your organization have experience to start and maintain a supply chain relationship?110x		
Is your organization willing to be coordinated with the other parts of the supply chain?111x		
Are personnel /human resources available in supply chain management issues? 112x		
Are financial resources available in supply chain management issues?113x		
Do senior managers in your organization support supply chain management issues?13x		
Is there a reciprocal arrangement in assessment of supply chain processes with other parts of supply chain?	**Common situations with (contractors of) supply chain**	
Is there an agreement on bilateral purposes with other parts of supply chain?		
Do planning groups of supply chain accompany with other members of the supply chain? 23x		
Does your organization aware that their decisions may affect the other members of the supply chain? 24x		
Does your organization willing to trust the other members of the supply chain? 25x		
Does your organization have long-term relationships with other members of the supply chain? 26x		
Is there equal distribution of power among all members of the supply chain? 27x		
Is there equal distribution of benefits and harms between your organization and other members of the supply chain? 28x		
Is there a bilateral tie between your company and other members of supply chain?29x		
Does your organization shares information among other members of the supply chain with respect to the levels of stokes?210X		
Does your organization exchange predictable information with other members of supply chain? 211X		
Does your organization exchange production developing information with other members of supply chain?212X		
Is your mass culture similar to other members of supply chain?213x		
Is your collective decision making similar to other members of supply chain?214x		
Is your organization able to meet customer service in accordance with the agreed terms of quantity and frequency?31x	**Dependent processes to supply chain**	
Does your organization able to predict future customer demand?32x		
Is your organization able to adapt their production capacity or services in accordance with customer demand?33x		
Is your organization able to inform customers about the meeting of their expectation? 34X		

Is your organization able to concentrate key accounts and manufacturers with production development process?35x		
Is your organization able to deal with returns and return packets? 36X		
Is your organization able to concentrate key accounts in marketing development programs?37x		
Is your organization able to build multiple cooperative with important and strategic suppliers? 38x		
Is your organization have centralized resource, logistics, market, development of production or services and other area with their manufactures?41x	**Implementing supply chain Management**	
Is your organization have centralized resource, market, development of production or services and other area with their customers?412x		
Is your organization have centralized resource, logistics, market, development of production or services and other area?43x		

Figure 3: RBS impact on the variables of the model

At this stage, following factors were extracted from the evaluation of supply chain risk management by a questionnaire tool:

1. Importance factor of each variables of model in the eyes of assessed staffs

2. Importance factor of each variables of model in the form of reality. we do it in the assessed organization (Karbassian Azam khaboshani, M. Javanmardi, M. 1391)

It should be noted that the calculation is carried on in the project oriented organization specialized in Metro area.

The number of experts is 30 people that are from the organization managers. Authors are excused to mention the name or other details of organization.

Table 4: The number of options for each risk

The number of risk	very low	low	intermediate	high	So high
1	5	5	20	0	0
2	0	5	25	0	0
3	2	5	23	0	0
4	0	25	5	0	0
5	0	0	20	10	0
6	0	20	5	5	0
7	0	10	15	5	0
8	10	5	15	0	0
9	0	0	10	20	0
10	0	10	20	0	0
11	5	15	10	0	0
12	0	15	15	0	0
13	0	15	15	0	0
14	10	15	5	0	0
15	15	10	5	0	0
16	0	5	15	10	0
17	1	4	15	10	0
18	10	5	10	5	0
19	15	3	12	0	0
20	20	5	5	0	0
21	7	7	16	0	0
22	13	10	7	0	0
23	23	6	1	0	0
24	10	16	4	0	0
25	12	15	3	0	0

The number of risk	very low	low	intermediate	high	So high
26	17	10	3	0	0
27	6	10	14	0	0
28	10	3	14	3	0
29	17	12	1	0	0
30	0	18	12	0	0
31	10	8	12	0	0
32	5	5	18	2	0
33	8	14	8	0	0
34	17	10	3	0	0
35	0	6	24	0	0
36	0	0	20	10	0
37	0	3	7	10	10
38	12	13	4	1	0
39	0	14	15	1	0
40	0	5	20	5	0

1. Fuzzy TOPSIS

After extraction of coefficient using a questionnaire, prioritization of the variables of model in self-assessment organization using fuzzy TOPSIS is performed (MJ Asgharpour, 1382).

Step 1: Making a decision matrix is done by equation 1.

$$
D = \begin{array}{c} \\ A_1 \\ \vdots \\ A_i \\ \vdots \\ A_m \end{array}
\begin{array}{ccccc}
x_1 & \cdots & x_j & \cdots & x_n
\end{array}
\left[\begin{array}{ccccc}
x_{11} & \cdots & x_{1j} & \cdots & x_{1n} \\
\vdots & & \vdots & & \\
x_{i1} & \cdots & x_{ij} & \cdots & x_{in} \\
\vdots & & \vdots & & \vdots \\
x_{m1} & \cdots & x_{mj} & \cdots & x_{mn}
\end{array} \right]
$$

$$W = (w_1, \ldots, w_j, \ldots, w_n)$$

Table 5: Fuzzy numbers corresponding to verbal expressions

very low	low	intermediate	high	So high
1, 1, 0.75	**1, 0.75, 0.5**	**0.75, 0.5, 0.25**	**0.5, 0.25, 0**	**0.25, 0, 0**

Table 6: Process of fuzzing

The number of risk	1 1 0.75			1 0.75 0.5			0.75 0.5 0.25			0.5 0.25 0			0.25 0 0		
1	5	5	3.75	5	3.75	2.5	15	10	5	0	0	0	0	0	0
2	0	0	0	5	3.75	2.5	18.8	12.5	6.25	0	0	0	0	0	0
3	2	2	1.5	5	3.75	2.5	17.3	11.5	5.75	0	0	0	0	0	0
4	0	0	0	25	18.8	12.5	3.75	2.5	1.25	0	0	0	0	0	0

The number of risk	1 / 1 / 0.75			1 / 0.75 / 0.5			0.75 / 0.5 / 0.25			0.5 / 0.25 / 0			0.25 / 0 / 0		
5	0	0	0	0	0	0	15	10	5	5	2.5	0	0	0	0
6	0	0	0	20	15	10	3.75	2.5	1.25	2.5	1.25	0	0	0	0
7	0	0	0	10	7.5	5	11.3	7.5	3.75	2.5	1.25	0	0	0	0
8	10	10	7.5	5	3.75	2.5	11.3	7.5	3.75	0	0	0	0	0	0
9	0	0	0	0	0	0	7.5	5	2.5	10	5	0	0	0	0
10	0	0	0	10	7.5	5	15	10	5	0	0	0	0	0	0
11	5	5	3.75	15	11.3	7.5	7.5	5	2.5	0	0	0	0	0	0
12	0	0	0	15	11.3	7.5	11.3	7.5	3.75	0	0	0	0	0	0
13	0	0	0	15	11.3	7.5	11.3	7.5	3.75	0	0	0	0	0	0
14	10	10	7.5	15	11.3	7.5	3.75	2.5	1.25	0	0	0	0	0	0
15	15	15	11.3	10	7.5	5	3.75	2.5	1.25	0	0	0	0	0	0
16	0	0	0	5	3.75	2.5	11.3	7.5	3.75	5	2.5	0	0	0	0
17	1	1	0.75	4	3	2	11.3	7.5	3.75	5	2.5	0	0	0	0
18	10	10	7.5	5	3.75	2.5	7.5	5	2.5	2.5	1.25	0	0	0	0
19	15	15	11.3	3	2.25	1.5	9	6	3	0	0	0	0	0	0
20	20	20	15	5	3.75	2.5	3.75	2.5	1.25	0	0	0	0	0	0
21	7	7	5.25	7	5.25	3.5	12	8	4	0	0	0	0	0	0
22	13	13	9.75	10	7.5	5	5.25	3.5	1.75	0	0	0	0	0	0
23	23	23	17.3	6	4.5	3	0.75	0.5	0.25	0	0	0	0	0	0
24	10	10	7.5	16	12	8	3	2	1	0	0	0	0	0	0
25	12	12	9	15	11.3	7.5	2.25	1.5	0.75	0	0	0	0	0	0
26	17	17	12.8	10	7.5	5	2.25	1.5	0.75	0	0	0	0	0	0
27	6	6	4.5	10	7.5	5	10.5	7	3.5	0	0	0	0	0	0
28	10	10	7.5	3	2.25	1.5	10.5	7	3.5	1.5	0.75	0	0	0	0
29	17	17	12.8	12	9	6	0.75	0.5	0.25	0	0	0	0	0	0
30	0	0	0	18	13.5	9	9	6	3	0	0	0	0	0	0
31	10	10	7.5	8	6	4	9	6	3	0	0	0	0	0	0
32	5	5	3.75	5	3.75	2.5	13.5	9	4.5	1	0.5	0	0	0	0
33	8	8	6	14	10.5	7	6	4	2	0	0	0	0	0	0
34	17	17	12.8	10	7.5	5	2.25	1.5	0.75	0	0	0	0	0	0
35	0	0	0	6	4.5	3	18	12	6	0	0	0	0	0	0
36	0	0	0	0	0	0	15	10	5	5	2.5	0	0	0	0
37	0	0	0	3	2.25	1.5	5.25	3.5	1.75	5	2.5	0	2/5	0	0
38	12	12	9	13	9.75	6.5	3	2	1	0.5	0.25	0	0	0	0

The number of risk	1	1	0.75	1	0.75	0.5	0.75	0.5	0.25	0.5	0.25	0	0.25	0	0
39	0	0	0	14	10.5	7	11.3	7.5	3.75	0.5	0.25	0	0	0	0
40	0	0	0	5	3.75	2.5	15	10	5	2.5	1.25	0	0	0	0

Step 2: Transformation of presence decision making matrix to dimensionless matrix

At first decision matrix should be normalized until its elements will be dimensionless. In this study there is no need to normalize arithmetic mean matrix. The numbers of Table 6 are shown in Table 7.

Equation 2 is used to calculate the arithmetic mean.

$$\tilde{X}_{ij} = \frac{1}{k}\left[\tilde{x}_{ij}^1(+)\tilde{x}_{ij}^2(+)\cdots(+)\tilde{x}_{ij}^k\right]\ldots\ldots\ldots \qquad (2)$$

For example, number 0.375 is calculated as following equation:

$$0.375 = \frac{0 + 0 + 5 + 2.5 + 3.75}{30}$$

Table 7: Arithmetic mean

The number of risk	a	b	c
1	0.375	0.625	0.833333
2	0.291667	0.541667	0.791667
3	0.325	0.575	0.808333
4	0.458333	0.708333	0.958333
5	0.166667	0.416667	0.666667
6	0.375	0.625	0.875
7	0.291667	0.541667	0.791667
8	0.458333	0.708333	0.875
9	0.083333	0.333333	0.583333
10	0.333333	0.583333	0.833333
11	0.458333	0.708333	0.916667
12	0.375	0.625	0.875
13	0.375	0.625	0.875
14	0.541667	0.791667	0.958333
15	0.583333	0.833333	0.958333
16	0.208333	0.458333	0.708333
17	0.216667	0.466667	0.708333
18	0.416667	0.666667	0.833333
19	0.525	0.775	0.9
20	0.625	0.875	0.958333
21	0.425	0.675	0.866667
22	0.55	0.8	0.941667
23	0.683333	0.933333	0.991667
24	0.55	0.8	0.966667
25	0.575	0.825	0.975
26	0.616667	0.866667	0.975

The number of risk	a	b	c
27	0.433333	0.683333	0.883333
28	0.416667	0.666667	0.833333
29	0.633333	0.883333	0.991667
30	0.4	0.65	0.9
31	0.483333	0.733333	0.9
32	0.358333	0.608333	0.816667
33	0.5	0.75	0.933333
34	0.616667	0.866667	0.975
35	0.3	0.55	0.8
36	0.166667	0.416667	0.666667
37	0.108333	0.275	0.525
38	0.55	0.8	0.95
39	0.358333	0.608333	0.858333
40	0.25	0.5	0.75

Step 3: For normalizing the number of above table according to equation 3, all the number of table 7 is divided on the largest number of column C that is shown in Table 8.

$$\tilde{r}_{ij} = \left(\frac{a_{ij}}{c_j^*}, \frac{b_{ij}}{c_j^*}, \frac{c_{ij}}{c_j^*} \right)$$

For example, number 0.3781512610 is calculated as following equation:

$$0.3781512610 = \frac{0.375}{0.991667}$$

Table 8: The process of normalizing

The number of risk	a	b	c
1	0.378151261	0.630252101	0.840336134
2	0.294117647	0.546218487	0.798319328
3	0.327731092	0.579831933	0.81512605
4	0.462184874	0.714285714	0.966386555
5	0.168067227	0.420168067	0.672268908
6	0.378151261	0.630252101	0.882352941
7	0.294117647	0.546218487	0.798319328
8	0.462184874	0.714285714	0.882352941
9	0.084033613	0.336134454	0.588235294
10	0.336134454	0.588235294	0.840336134
11	0.462184874	0.714285714	0.924369748
12	0.378151261	0.630252101	0.882352941
13	0.378151261	0.630252101	0.882352941
14	0.546218487	0.798319328	0.966386555
15	0.588235294	0.840336134	0.966386555
16	0.210084034	0.462184874	0.714285714
17	0.218487395	0.470588235	0.714285714
18	0.420168067	0.672268908	0.840336134

The number of risk	a	b	c
19	0.529411765	0.781512605	0.907563025
20	0.630252101	0.882352941	0.966386555
21	0.428571429	0.680672269	0.87394958
22	0.554621849	0.806722689	0.949579832
23	0.68907563	0.941176471	1
24	0.554621849	0.806722689	0.974789916
25	0.579831933	0.831932773	0.983193277
26	0.621848739	0.87394958	0.983193277
27	0.43697479	0.68907563	0.890756303
28	0.420168067	0.672268908	0.840336134
29	0.630252101	0.882352941	0.991596639
30	0.403361345	0.655462185	0.907563025
31	0.487394958	0.739495798	0.907563025
32	0.361344538	0.613445378	0.823529412
33	0.504201681	0.756302521	0.941176471
34	0.621848739	0.87394958	0.983193277
35	0.302521008	0.554621849	0.806722689
36	0.168067227	0.420168067	0.672268908
37	0.109243697	0.277310924	0.529411765
38	0.554621849	0.806722689	0.957983193
39	0.361344538	0.613445378	0.865546218
40	0.25210084	0.504201681	0.756302521

Obtaining dimensionless weighted fuzzy matrix

Creating "dimensionless" weighted matrix vector W (As inputs to the algorithm). The elements of normalized weighted matrix calculated using equation 4. The results are shown in Table 9.

$$v_{ij} = r_{ij} \cdot w_j$$

Table 9: Dimensionless weighted fuzzy matrix

The number of risk	a	b	c
1	0.008976885	0.014961474	0.019948632
2	0.007854774	0.014587437	0.021320101
3	0.009724958	0.017205695	0.024187717
4	0.009600279	0.014836795	0.020073311
5	0.003989726	0.009974316	0.015958906
6	0.010098995	0.016831658	0.023564322
7	0.006982021	0.012966611	0.018951201
8	0.012343216	0.01907588	0.023564322
9	0.002493579	0.009974316	0.017455053
10	0.006982021	0.012218537	0.017455053
11	0.010971748	0.016956337	0.021943495
12	0.007854774	0.01309129	0.018327806
13	0.008976885	0.014961474	0.020946064
14	0.014587437	0.021320101	0.025808543
15	0.015709548	0.022442211	0.025808543

The number of risk	a	b	c
16	0.005610553	0.012343216	0.01907588
17	0.006483305	0.013964043	0.021195422
18	0.009974316	0.015958906	0.019948632
19	0.010996684	0.0162332	0.018851457
20	0.016831658	0.023564322	0.025808543
21	0.010173802	0.016158392	0.020746578
22	0.011520335	0.016756851	0.01972421
23	0.018402613	0.025135277	0.026706231
24	0.013166097	0.019150687	0.023140413
25	0.013764556	0.019749146	0.0233399
26	0.012916739	0.018153255	0.020422412
27	0.010373289	0.016357878	0.02114555
28	0.009974316	0.015958906	0.019948632
29	0.014961474	0.020946064	0.023539386
30	0.010772261	0.017504925	0.024237588
31	0.011570207	0.017554796	0.021544523
32	0.008577912	0.014562502	0.01954966
33	0.013465327	0.02019799	0.025135277
34	0.016607236	0.0233399	0.026257387
35	0.008079196	0.014811859	0.021544523
36	0.004488442	0.011221106	0.017953769
37	0.002593322	0.006583049	0.012567638
38	0.014811859	0.021544523	0.025584121
39	0.009650151	0.016382814	0.023115478
40	0.007480737	0.014961474	0.022442211

Step 4: Positive and negative ideal solution is obtained by equation

$$A^+ = [v_1^+, \ldots, v_j^+, \ldots, v_n^+]; \qquad v_j^+ = \max_i \{v_{ij}\}$$

$$A^- = [v_1^-, \ldots, v_j^-, \ldots, v_n^-]; \qquad v_j^- = \max_i \{v_{ij}\}$$

Step 5: Calculation of distance from positive and negative ideal.

There are two methods for calculation of distance between each option and positive and negative ideal: Euclidean method and block method. Euclidean method is showed by equation 6.

$$S_i^+ = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_{s_j^+})^2}$$

$$S_i^- = \sqrt{\sum_{j=1}^{n} (v_{ij} - v_{s_j^-})^2}$$

Step 6: Calculation of the relative closeness of options to the ideal solution options.

We define this criterion for the combination of the values of S_i^-, S_i^+ and thus comparing the options to one another that it is calculated with Equation 7. The calculations are shown in Table 10.

$$C_i^+ = \frac{S_i^-}{S_i^+ + S_i^-}$$

Table 10: Calculation of distance and weight of criterion

Row of risk	Si+	Si-	ci
1	0.985381212	0.015301177	0.015290743
2	0.985427896	0.015588858	0.015573024
3	0.982978283	0.018033824	0.01801559
4	0.985172483	0.015440571	0.015431111
5	0.990037743	0.011106928	0.011094229
6	0.98318371	0.017706606	0.017690856
7	0.987045484	0.013856763	0.013844272
8	0.981683025	0.018899043	0.018888048
9	0.990044525	0.011695922	0.011675602
10	0.987790716	0.012945014	0.012935497
11	0.983386369	0.017218339	0.017207933
12	0.986917972	0.013771805	0.013762312
13	0.985050645	0.015739205	0.015726784
14	0.979438829	0.021082543	0.021071557
15	0.978688905	0.021729578	0.021720488
16	0.987672082	0.013512	0.01349602
17	0.986137369	0.015124744	0.015105679
18	0.98471458	0.015833736	0.015825059
19	0.984644968	0.015703728	0.015698255
20	0.977939265	0.022395408	0.022387915
21	0.984316595	0.016279029	0.016269339
22	0.98400538	0.016355984	0.016350076
23	0.976591934	0.02369009	0.023683411
24	0.981522827	0.018934745	0.018926085
25	0.98105675	0.019358398	0.019350365
26	0.98284089	0.017449525	0.017444459
27	0.984050962	0.016556163	0.016546117
28	0.98471458	0.015833736	0.015825059
29	0.98019094	0.02013857	0.020131936
30	0.982510454	0.018347795	0.018332061
31	0.983118703	0.017380133	0.017371467
32	0.98578018	0.01492019	0.014909748
33	0.980412136	0.020174703	0.020162871
34	0.977940175	0.022435103	0.022426687
35	0.985203477	0.015799062	0.015783238
36	0.988794175	0.012495294	0.012479203
37	0.992760459	0.008326812	0.008317768

Row of risk	Si+	Si-	ci
38	0.979363245	0.02111954	0.021109349
39	0.983632547	0.017280503	0.017264739
40	0.985057463	0.016160239	0.016140585

Step 7: Ranking of options according to their relative closeness to the ideal solutions.

Ranking was obtained according to the weight of risks in the above table. Table 11 shows which risks should be considered more in compare of others.

Table 11: Ranking of risks

Weight	Risk	The number of risk	Rank
0.023683411	Exchanging Predictable information of organization with other member of supply chain	23	1
0.022426687	The organization's ability to build multiple cooperative with its strategic suppliers	34	2
0.022387915	Distribution of benefits and harms equally between the organization and other members of supply chain	20	3
0.021720488	Presence of planning groups of supply chain along with other members of supply chain	15	4
0.021109349	Evaluating of suppliers at the time of the adoption in organization	38	5
0.021071557	Presence of agreements on bilateral objectives with other members of supply chain	14	6
0.020162871	The ability of organization in Concentrating of key accounts in marketing development programs	33	7
0.020131936	The ability of organization to adapt the type of service according to customer demand	29	8
0.019350365	The similarity of collective culture of organization with the supply chain	25	9
0.018926085	Exchange of developmental information of project-based of organization with other members of supply chain	24	10
0.018888048	\Staff training to help supply chain projects	8	11
0.018332061	The ability of organization to inform customers about the current status of service project development	30	12
0.01801559	Support of senior directors of organization from the supply chain issues	3	13
0.017690856	Presence of systems that have the ability to process information from the other members of supply chain	6	14
0.017444459	Similarity of collective decision-making of organization with other members of supply chain	26	15
0.017371467	The ability of organization to concentrating its suppliers with future development process in organization	31	16
0.017264739	Evaluation of quality control of suppliers during work	39	17
0.017207933	Willing of organization to coordinate with other members of the supply chain	11	18
0.016546117	Processing ability of future customer demands in terms of quantity and quality in accordance with the agreement with the customer	27	19
0.016350076	Exchange of organization information regarding to the stock levels with other members of the supply chain	22	20
0.016269339	Presence of mutual dependence between organization and other members of the supply chain	21	21
0.016140585	Presence of project management in organization for evaluation of supply chain processes	40	22
0.015825059	Presence of long-term relationships with other members of the supply chain	18	23
0.015825059	Presence of long-term relationships with other members of the supply chain	18	24
0.015783238	Presence of concentrated source of logistics and the market for suppliers of organization	35	25
0.015726784	Presence of bilateral agreements in evaluation of supply chain processes with other members of the supply chain	13	26
0.015698255	Presence of equal distribution of power among all members of the supply	19	27

Weight	Risk	The number of risk	Rank
	chain		
0.015573024	**Availability of financial resources**	**2**	**28**
0.015431111	**Presence of internal objectives before the start of the supply chain projects**	**4**	**29**
0.015290743	**Access to personnel / human resources**	**1**	**30**
0.015105679	**Willing of organization to trust the other members of the supply chain**	**17**	**31**
0.014909748	**The ability of organization to the causes of potential customer dissatisfaction**	**32**	**32**
0.013844272	**Agreement on the exchange of information about policies with other organizations in the supply chain**	**7**	**33**
0.013762312	**Access to human / personnel resources in the supply chain**	**12**	**34**
0.01349602	**Awareness of organization about the impact of its decisions on other members of the supply chain**	**16**	**35**
0.012935497	**Presence of necessary experience to start and maintain relationships of supply chain**	**10**	**36**
0.012479203	**Presence of centralized source of information with potential customers in organization**	**36**	**37**
0.011675602	**Presence of groups of individuals within the organization and project included from the various working area**	**9**	**38**
0.011094229	**The ability of staffs to utilize information technology systems for the supply chain issues**	**5**	**39**
0.008317768	**Presence of concentrated source of logistics, market, and other area**	**37**	**40**

CONCLUSION

In this paper, using a standard and tested model was tried to review the basic concepts and displayed a practical model with the appropriate tools in supply chain risk. In the above-mentioned method, after breaking and categorizing risks based on RBC and classifying risks using fuzzy TOPSIS method organizational risks were categorized. To improve the quality of the performance of organization, project-based organization that was studied should analysis the aforementioned risks based on the priority and implement the necessary corrective actions. Even after controlling risks, the mentioned project-based organizations should persistently monitor and control referred risks periodically (PMBOK 5TH Edition)

Apart from the good results obtained by the proposed method, the main objective of this study is introducing applied various techniques in supply chain risk management based on PMBOK 5TH Edition, Fuzzy TOPSIS decision-making model and development of this topic in management academic literature as well as scientific and systematic application of it in industries, companies and projects. It is hoped that this study present different tools in supply chain management can take a step towards academic and professional management.

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