Research on Risk Identification in the Virtual Logistic Strategic Alliance*

Yin Xiangzhou, Zhou Xiaoshuang, Li Guang
School of Management, Wuhan University of Technology, Wuhan, P.R.China, 430070
(E-mail: yxzpl@126.com, clover0207@hotmail.com, jiaren_888@126.com)

Abstract The virtual logistics is a kind of advanced logistics, the logistics enterprises definitely have many competitive advantages. However, the market and legal environment are not perfect at present. There is still inevitable risk at the same time. If we cannot pay more attention to the risk, it will impact the logistics strategic alliance partners, or even lead to failure of the alliance. This article analyzes the risk in the virtual logistics strategic alliance by using Interpretative Structural Modeling Method, and gets the hierarchical structure of various risks, which provide the gist for the further risk management.
Key words Virtual logistics; Strategic alliance; ISM; Risk

1 Introduction

Table 1 The Virtual Logistics Strategy Alliance Risk[3]

Serial Number	Risk	Risk Description
S1	Trust Risk	Due to the information asymmetry, the members suspect and distrust each other, so that make the cost of idle talks.
S2	Communication Risk	Due to improper communication, the instructions can not be implemented effectively.
S3	Profit Distribution Risk	Due to the unfair profit distribution between the members, the positivity is hurted.
S4	Time Risk	Due to the member enterprise couldn't finish the service in time, the market opportunities is missed.
S5	Skill Risk	Due to the difference in the operation and technology between the members, the technology joint is difficult.
S6	Cost Risk	The cost of resource integration is high.
S7	Cooperation Risk	The goal of member enterprise is to maximize its own interests, which exist a gap with the goal of the overall strategic alliance, and unsuccessful coordination could lead to the strategic alliance broken.
S8	Ability Risk	In the virtual logistics organization, each member needs to contribute its own strengths. In the case of the core competence had no way to bring into fully play regularly., the project couldn't be finished smoothly.
S9	Information Risk	The improper handing about the accuracy, timeliness and security of information communication could bring out the risk.
S10	Moral Risk	Due to the information asymmetry, the moral risk is hard to avoid in the virtual logistics, which directly lead to the appearance of false information and deceived behaviors.
S11	Management Risk	Due to the large number of members, which face different organization structure and management ideal，it's easy to bring out the repelling effect.
S12	Strategic Alliance Risk	Due to the uncertainties of the organization and external environment, it has possibility of making the loss to the cooperation union members.

Virtual logistics strategic alliance can make its members share profits and risk in today's market by integrating their resources in a relatively short period of time. So it can make the virtual logistics as a whole be provided with the ability of total logistics service which fits in with the needs of the market [1] . But this does not mean that the risk of virtual logistics are not exist or reduce. On the contrary, because of the complexity of the virtual organization, they often ignore the risk management whole they win the benefits. For example, in the case of the imperfect development of the market and the legal environment, It's prone to appear mistrust and irregular behaviors between the members, which lead to the failure of the virtual logistics management, even the loss of business[2]. Therefore, a further study and discussion on how to manage the risk effectively could provide the virtual logistics

organization partners with operational ways, and at last achieve the higher efficiency of the virtual logistics organization.

Nowadays, the study on the risk management of virtual logistics strategic alliance is abundant. However, the establishment of virtual logistics strategic alliance is a long and complex process, which faces all kinds of risk. At different stages of strategic alliance, the factors influencing the virtual logistics are also at different degrees. In order to prevent and control the strategic alliance risk, we could establish the Interpretative Structural Modelling to identify the major influencing factors and get the hierarchy of the virtual logistics strategic alliance risk.

2 An Example

Step 1: Due to the Delphi Method, we form a panel of experts, including two experts of the logistics, one of management and one of supply chain.

Step 2: Due to the Delphi Method and based on the characteristics of the virtual logistics strategic alliance, we get the main risk.

Step 3: Due to the Delphi Method, depending on their professional knowledge, and after analysis and discussion of these experts, we get the relationship of the main risk.

According to the experts, the relationship is as following.

(1 means Si impact on Sj, 0 means Si haven't impact on Sj)

Table 2   The Relationship Between the Risk Factors of Virtual Logistic Strategic Alliance

$Si \setminus Sj$	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12
S1	0	0	0	0	0	0	1	0	0	0	0	1
S2	0	0	0	0	0	0	1	0	0	0	0	1
S3	0	0	0	0	0	0	1	0	0	0	0	1
S4	0	0	0	0	0	0	0	1	0	0	0	1
S5	0	0	0	0	0	0	0	1	0	0	0	1
S6	0	0	0	0	0	0	0	1	0	0	0	1
S7	0	0	0	0	0	0	0	0	0	0	0	1
S8	0	0	0	0	0	0	0	0	0	0	0	1
S9	0	0	0	0	0	0	0	0	0	0	0	1
S10	0	0	0	0	0	0	0	0	0	0	0	1
S11	0	0	0	0	0	0	0	0	0	0	0	1
S12	0	0	0	0	0	0	0	0	0	0	0	1

3 Date and Methodology

Interpretative Structural Modelling Method(ISM) is an analyzing method which is widely applied in the modern system engineering. The effect of the ISM is to get clear of the given mess relation about the system factors, and to explain the internal structure of the system. The concrete process of ISM is to use the graphics and matrix to describe the given relationship, then do the further operations through the matrix，and at last derive the conclusion to explain the relationship between the system's structure. This model can take the mess ideas and views into an excellent structural relationship[4].

		S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12
	S1	1	0	0	0	0	0	1	0	0	0	0	1
	S2	0	1	0	0	0	0	1	0	0	0	0	1
	S3	0	0	1	0	0	0	1	0	0	0	0	1
	S4	0	0	0	1	0	0	0	1	0	0	0	1
	S5	0	0	0	0	1	0	0	1	0	0	0	1
$A + I =$	S6	0	0	0	0	0	1	0	1	0	0	0	1
	S7	0	0	0	0	0	0	1	0	0	0	0	1
	S8	0	0	0	0	0	0	0	1	0	0	0	1
	S9	0	0	0	0	0	0	0	0	1	0	0	1
	S10	0	0	0	0	0	0	0	0	0	1	0	1
	S11	0	0	0	0	0	0	0	0	0	0	1	1
	S12	0	0	0	0	0	0	0	0	0	0	0	1

Step 1:Receive the Reachability Matricx

Based on the rule of Boolean Algebra and Matrix Theory, we should calculate (A+I) × (A+I) until $(A+I)^n=(A+I)^{n-1}$. There are logical addition operation and logical multiplication operation in the

Booleann Algebraandd Matrix Theory. The specific denotation is as 0+0=0, 0+1=0, 1+1=1, 1×0=0, 0×1=0, 1×1=1

By the calculation, we get $(A+I)^3=(A+I)^2$,and the Reachability Matricx is as the following:

$$R= (A +I)^3 = \begin{array}{c|cccccccccccc} & S1 & S2 & S3 & S4 & S5 & S6 & S7 & S8 & S9 & S10 & S11 & S12 \\ \hline S1 & 1 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 1 \\ S2 & 0 & 1 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 1 \\ S3 & 0 & 0 & 1 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 1 \\ S4 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 1 \\ S5 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 0 & 1 \\ S6 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 1 & 0 & 0 & 0 & 1 \\ S7 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 1 \\ S8 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 1 \\ S9 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 1 \\ S10 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 1 \\ S11 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 1 \\ S12 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 \end{array}$$

According to the Reachability Matricx, we can get the reachable set $R(Si)$ and the antecedent set $Q(Si)$ as Table 3.

Table 3   The Reachable Set and Antecedent Set

Si	$R(Si)$	$Q(Si)$	$R(Si) \cap Q(Si)$
1	1,7,12	1	1
2	2,7,12	2	2
3	3,7,12	3	3
4	4,8,12	4	4
5	5,8,12	5	5
6	6,8,12	6	6
7	7,12	1,2,3,7	7
8	8,12	4,5,6,8	8
9	9,12	9	9
10	10,12	10	10
11	11,12	11	11
12	12	1,2,3,4,5,6,7,8,9,10,11,12	12

Step 2: Etom

The purpose of etom is to understand the hierarchy relationship among the system factors. The top level represents the ultimate objective of the system, the next underlayer is the cause of the upper storey. By using this method，we can establish the relationship between the various factors scientifically.

The method of etom is based on the condition $R(Si) \cap Q(Si)= R(Si)$ to extract. In the table 3, Si=12 meets the condition, and is the ultimate goal. Extracting Si=12, we can get the result as Table 4.

Table 4   The Reachable Set and Antecedent Set

Si	$R(Si)$	$Q(Si)$	$R(Si) \cap Q(Si)$
1	1,7	1	1
2	2,7	2	2
3	3,7	3	3
4	4,8	4	4
5	5,8	5	5
6	6,8	6	6
7	7	1,2,3,7	7
8	8	4,5,6,8	8
9	9	9	9
10	10	10	10
11	11	11	11

From the Table4, we can found Si=7, 8, 9, 10, 11 meet the requirement, and extract them. These mean Si=7, 8, 9, 10, 11 be the second level and be the cause of S12.

Extracting Si=7、8、9、10、11,we can get the result as Table 5.

Table 5   The Reachable Set and Antecedent Set

Si	R(Si)	Q(Si)	R(Si)∩Q(Si)
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6

4 Results

From the Table5,we can found all them meet the requirement, and Si=1、2、3 are the causes of S7 as well as Si=4、5、6 are the causes of S8.

In accordance with the above model, we can set up the interpretive structural model of influencing risk factors in the virtual logistics strategic alliance.

Figure 1   The Interpretive Structural Model of Influencing Risk Factors in the Virtual Logistics Strategic Alliance

5 Conclusion

The strategic alliance risk is the most critical factor for the virtual logistics organization's success. The research of risk identification in the virtual logistic strategic alliance is the first step of the risk management, and it's also the foundation for the subsequent stages. If we cannot confirm the source and origin of the risk exactly, we are impossible to predict and analysis the organization crisis, and we also cannot institute countermeasure of preventing risk. Therefore, whether the analysis of the risk be comprehensive and profound or not could impact on the value of risk management about the virtual logistics strategic alliance, and the risk identification is also the foundation of improving the organizational operating efficiency. However, there are still certain flaws with the ISM. The ISM only can receive the interpretive structural model of the risk factors in the virtual logistics strategic alliance, which is lack of the risk ranking and so on. So in the future research of the virtual logistics strategic alliance risk, we should present the way and strategy about risk avoidance by some other models and develop the operative tools to do the risk management.

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