

# RESEARCH INTO A RISK IDENTIFICATION AND EVALUATION SYSTEM FOR A DYNAMIC ALLIANCE OF LOGISTICS ENTERPRISES

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## ABSTRACT

There are many risks involved in the process of establishing a dynamic alliance of logistics enterprises. This paper analyses risks during the life cycle of the alliance, studies the identification and evaluation process, and sets up a risk identification and evaluation system of dynamic alliance enterprises. Finally, proposes an integration of the risk identification and evaluation systems and risk management countermeasures.

## 1. INTRODUCTION

A dynamic alliance of logistics enterprises refers to stock rights of the enterprises. A certain number of logistics enterprises gain certain market opportunities and commonly provide logistics services and form a multi-enterprise cooperation alliance. This includes an establishing stage, an operating stage and a dismissing stage. Because a dynamic alliance of logistics enterprises exists in a dynamic and loose state, a number of risks largely influence the alliance's implementation. This ultimately results in failure. Thus it is very important to establish a set of efficient risk identification and evaluation systems in order to take precautions against the risks to the alliance and to guarantee its normal operations.

## 2. SUMMARY OF RISK IDENTIFICATION AND EVALUATION OF A DYNAMIC ALLIANCE OF ENTERPRISES

The system consists of the interacting and interrelating sub-systems and elements and their operating principles. It also involves the nature of the working style of the elements. A risk management system of an enterprises' dynamic alliance refers to risk management patterns, rules, methods, procedures and forms in order to realise the alliances' joint goals to protect the alliance from risks during its life cycle and to ensure its normal operation. The risk identification and evaluation system is one type of risk management system of alliances.

There is little in the literature on the study of a risk identification and evaluation system for a dynamic alliance of logistics enterprises. However, there are many documents that discuss the general risk management and monitoring of an enterprises' dynamic alliance, also called virtual enterprises. The research concerned with risk identification focuses mainly on the following.

## 2.1 The knowledge of risk identification

### *2.1.1 Former emphasis*

Research on risk identification focuses on identifying the process, methods and causes, especially methods of risk identification. Usually the identifying methods include the Delphi technique, the brain-storming method, the graphic method, the table checking method, investigation or interviewing, incident tree analysis, job decomposing structure, a flexibility test, and so on.

### *2.1.2 Risk types of a dynamic alliance*

Levels of risk: they can be divided into external risks and internal risks. Stage of risks: they can be divided into establishing stage risks, operating stage risks and dismissing stage risks. Sustained time of risks: they can be divided into stage risks and all-cycle risks. Controllability of risks: they can be divided into controllable and non-controllable risks.

## 2.2 Researches into risk evaluation

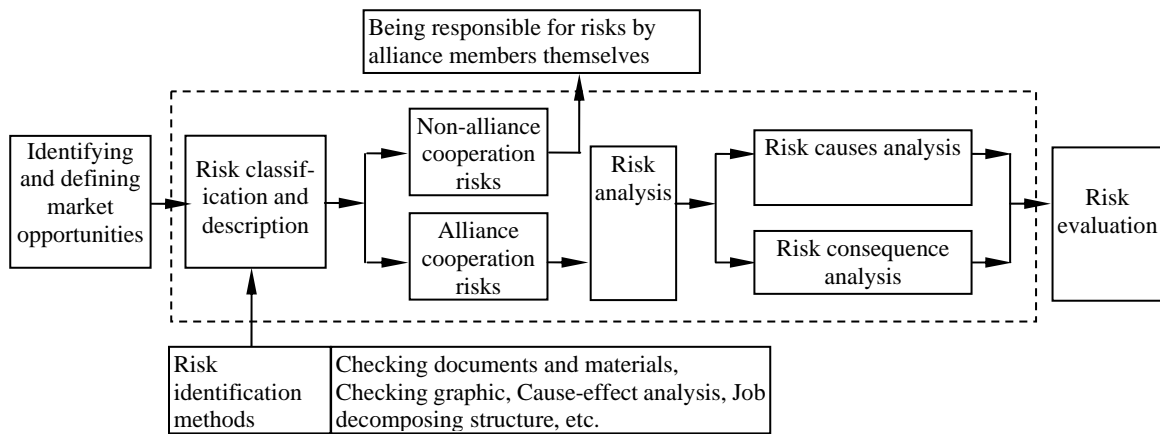
Research into risk evaluation mainly focuses on assessment methods that emphasise single risk and multiple risk evaluation. The former often uses risk consequence and probability to measure risk loss.

The latter assesses the degree of risks that influences the overall alliance, and uses many evaluation methods, but the composite method is the most practical.

Previous studies in the literature lacked research of the evaluating system, and did not put forward a complete risk identification and evaluation system, which places a limitation on the formulation of prevention countermeasures. Thus, this thesis emphasises research into risk identification and evaluation exclusively, and then expounds an integrated system of the two parts.

## **3. RISK IDENTIFICATION SYSTEM OF A DYNAMIC ALLIANCE OF LOGISTICS ENTERPRISES**

After the dynamic alliance of logistics enterprises has identified and defined market opportunities, it is necessary for it to predict and evaluate risks in the whole process, including the constructing stage, the operating stage and the dismissing stage, so that losses can be prevented. The risk identification system includes risk identification techniques, risk classification and description and analysis. Its goal is to find obvious and potential risks and their causes and effects to so that follow-up risk evaluation and risk prevention countermeasures can be implemented. The operating principle of a risk identification system for a dynamic alliance of logistics enterprises is shown in Figure 1.



**Figure 1. Risk identification system.**

### 3.1 Risk identification methods

All the potential risks cannot be foreseen. It only depends on the single risk identification method. It is necessary to adopt various identification methods to find all the potential risks. Usually it is important to adopt a few techniques to combine risk identification methods to prevent serious risks from being left out.

### 3.2 Risk classification and description

Risks which are found should be classified and described, and should be identified according to which belongs to alliance cooperation risks and which belongs to members themselves. Alliance members should be responsible for non-alliance cooperation risks themselves. As for alliance cooperation risks, they can be classified into stage risks (including establishing stage risks, operating stage risks and dismissing stage risks), transferring risks and whole process risks, and then all these risks should be described. On the basis of the dynamic alliance characteristics of logistics enterprises, alliance risk elements of the risk management system are shown in Table 1.

**Table 1. Risk elements of the dynamic alliance.**

Stages Risk stages	Establishing stage	Operating stage	Dismissing stage
Risks in stage	Identifying risks of market opportunities, partner choice risk, organising and designing risks, contract risks, etc.	Service quality risks, logistics cost risks, logistics technique risks, mid-way withdrawing risks, organising risks, investing risks	Strategy flexibility losing risks, member enterprises' bankruptcy risks, follow-up products production and service issue risks
Transferring risks	Risks of member enterprise breaking contracts, losing risks of member Enterprises, unexpected risks, etc.		
Whole process risks	Natural risks, economic risks, politic risks, social and cultural risks, financial risks, market risks, etc.		

### 3.3 Risk analysis

For identified alliance cooperation risk elements, it is necessary to search for the real causes or the preceding risk elements. It is also important to analyse follow-up consequences or other probable risks. And it is necessary to analyse whether the risk elements may be transferred and their transmitting paths.

## 4. RISK EVALUATION SYSTEM OF A DYNAMIC ALLIANCE OF LOGISTICS ENTERPRISES

A risk evaluation system of a dynamic alliance of logistics enterprises refers to negative influences and loss being maintained and evaluated which result from all kinds of risk elements on the basis of identified risk sources, causes and whole process characteristics. Thus risk management countermeasures can be formulated. The operating procedure is shown in Figure 2.

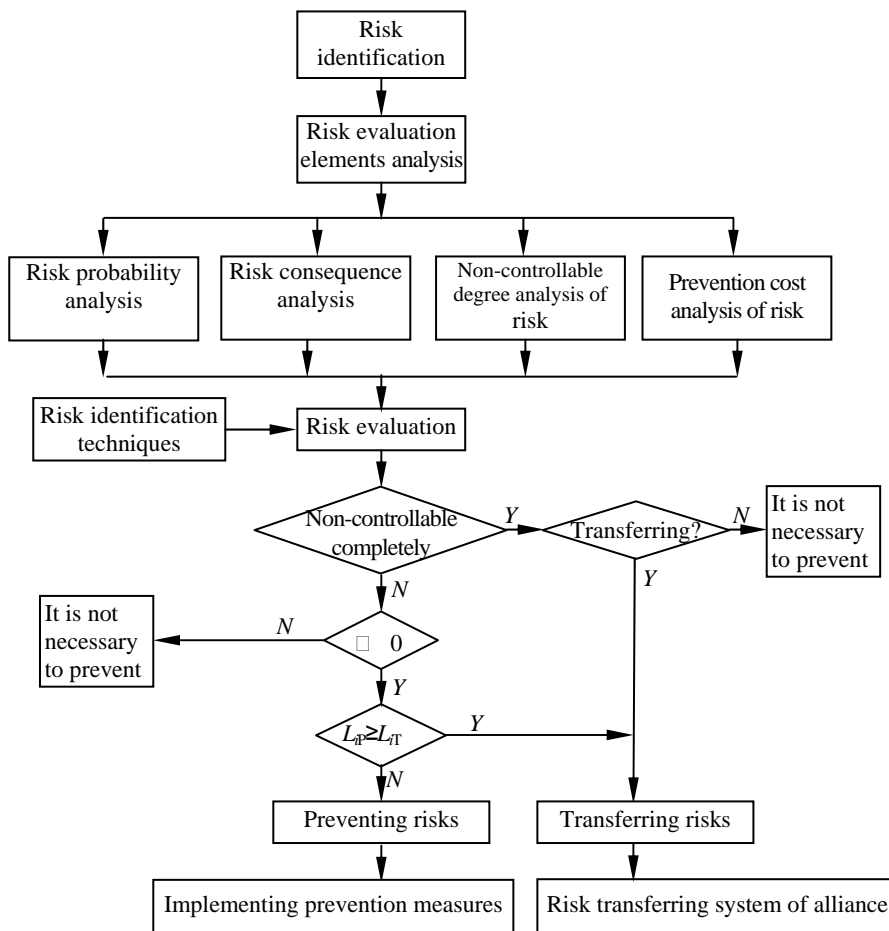


Figure 2. Risk evaluation system.

### 4.1 Risk evaluation elements analysis

Risk evaluation elements analysis mainly analyses the risk probability, risk consequences, non-controllable degree of risks and risk prevention costs.

#### 4.1.1 Risk probability analysis

Risk probability ( $P_i$ ,  $0 \leq P_i \leq 1$ ) can be defined by two methods. One is where risk managers or specialists define the probability value, and the other is where probability can be described by ranks according to risk incident frequencies, and then the risk probability scales are defined.

#### 4.1.2 Risk consequence analysis

Risk consequence refers to the biggest loss once risks have occurred. When the alliance estimates risk consequences ( $S_i$ ), it should comprehensively predict according to the nature, scale, severity and time of risk loss. Risk consequences not only include direct loss consequences, but also indirect loss consequences and financial influences.

#### 4.1.3 Non-controllable degree analysis of risks

Non-controllable degree of every risk can be expressed as  $C_i$ , and  $0 \leq C_i \leq 1$ . When  $C_i$  is equal to zero, the alliance risks are completely controllable; when  $C_i$  is equal to 1, the alliance risks are completely non-controllable. Correspondingly, a controllable degree of alliance risks can be expressed as  $C_i' = 1 - C_i$ . Controllable or non-controllable degrees of alliance risks maybe include the following: First, the dynamic alliance cannot control some risks even if members try their best, but no way can be found, such as political risks and natural disaster risks. The non-controllable degree of these risks cannot be expounded with  $C_i = 1$ . Second, the dynamic alliance can reduce the probability of some risks, such as opportunity identified risks. The non-controllable degree of these kinds of risks can be defined with  $C_i$ , and  $0 < C_i < 1$ . Third, the dynamic alliance can take effective measures to avoid some risks, such as asset assignment risks. The non-controllable degree of these risks can be expressed as  $C_i = 0$ .

#### 4.1.4 Risk prevention cost analysis

Human, material and financial aspects are necessary to predict and prevent any risk, and this involves costs and expenses. Risk prevention cost ( $L_i$ ) analysis measures and estimates cost and expenses needed to reduce losses and is thus the basis which guides risks to be controlled and decides whether risks will be controllable. Measuring and estimating costs mainly involve the following: Human expenses and organising costs; cost of materials and goods; funds; information and communication costs; etc. When risks are transferred,  $L_i$  is a risk transferring cost.

### 4.2 Risk evaluation methods

These are different from general risk evaluation. This paper considers not only the non-controllable degree of risks, but also risk prevention cost (transferring cost). Absolute risk and relative risk are used in the process of assessing alliance risk losses. The methods are described below:

#### 4.2.1 Calculating absolute risk ( $Z_i^1$ )

Absolute risk is the absolute loss when the risks are not prevented. That is the risk result. The calculation method of absolute risk is:

$$Z_i^1 = P_i S_i, \quad i=1, 2, \dots, n: \quad (2.1)$$

#### 4.2.2 Calculating relative risk ( $Z_i^2$ )

Relative risk is the relative loss when risks are controlled and prevented. It is necessary to consider risk probability ( $P_i$ ), risk consequence ( $S_i$ ), non-controllable degree of risks ( $C_i$ ) and risk prevention cost ( $L_i$ ) when relative risk is calculated. When we calculate transferring cost,  $L_i$  is a risk transferring cost.

$$Z_i^2 = P_i S_i C_i + L_i, \quad i=1, 2, \dots, n: \quad (2.2)$$

#### 4.2.3 Calculating the difference between absolute risk and relative risk

This is expressed as  $\Delta$ :

$$\begin{aligned} \Delta &= Z_i^1 - Z_i^2 = P_i S_i - (P_i S_i C_i + L_i) = P_i S_i (1 - C_i) - L_i \\ &= P_i S_i C_i' - L_i = Z_i^1 C_i' - L_i \end{aligned} \quad (2.3)$$

When  $\Delta$  is more than zero, it indicates that prevented risk loss is less than non-controllable risk loss. At this time it is beneficial to control and prevent risks. When  $\Delta$  is less than or equal to 0, it is shown that controlled risk loss is more than or equal to non-controllable risk loss, and it may be because  $L_i$  is too large or  $C_i'$  is too small. In that case, controlling risks may not correspond to the performance priority principle. It is rational not to take any prevention countermeasure. Thus  $\Delta$  provides a quantities basis on which to choose risk management strategies, and makes risk management more scientific and rational.

#### 4.3 Choosing risk management countermeasures

Risk management countermeasures are used to choose an exclusive management and prevention method aimed at the nature and evaluation consequences of every risk. The procedures are as follows:

4.3.1 *According to the evaluation of the results of risks*, alliance risks can be divided into non-controllable risks and controllable risks.

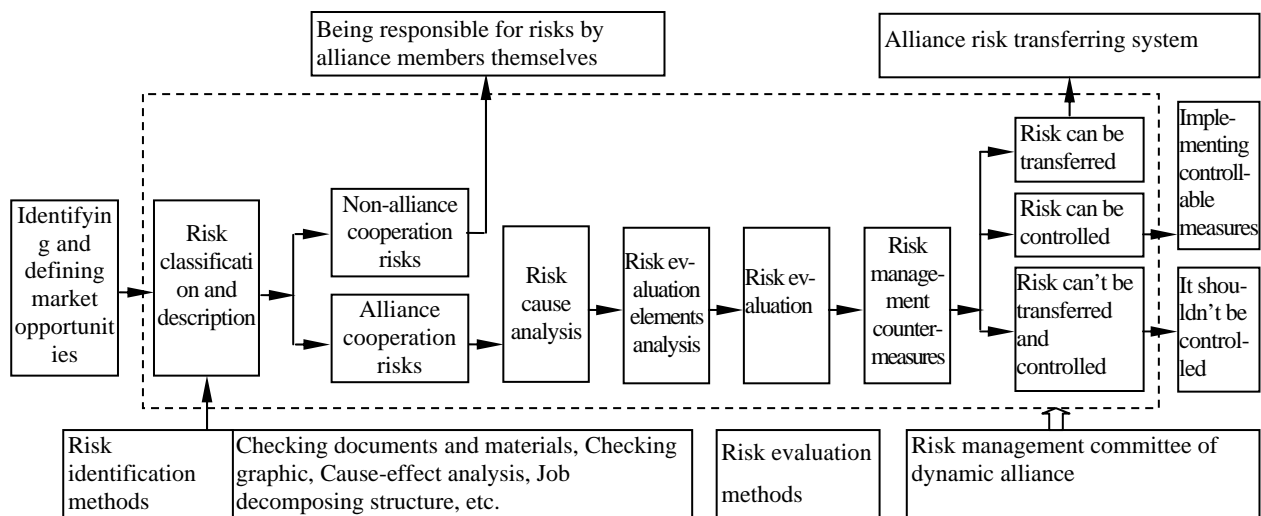
4.3.2 *Completely non-controllable risks*: first consider risk transferring, and through risk transferring the system of the alliance. When some risks cannot be transferred, the alliance should just accept them, and no controlled measure is taken. These risks should be shared by alliance members.

4.3.3 *Controllable risks*: every  $\Delta$  should be calculated. When  $\Delta$  is less than or equal to 0, these kinds of risks have higher prevention costs which is more than risk loss. In this case, it is rational not to take any prevention measure, and the alliance enterprises are responsible for the risks. When  $\Delta$  is more than zero, these kinds of risks can be controlled by countermeasures or by transferring risks.

4.3.4 *When  $\Delta$  is more than zero*: if risks can be transferred, the alliance should take transferring measures. If risks cannot be transferred, the alliance should take prevention measures. If risks can not only be transferred but also prevented, the prevented cost (LiP) should be compared with the transfer cost. When LiP is more than or equal to LiT, the alliance should choose risks transferred, and use the risk transferring system. When LiP is less than LiT, the alliance should control and prevent risks, and lay down and implement prevention measures.

## 5. INTEGRATION OF A RISK IDENTIFICATION SYSTEM AND RISK EVALUATION SYSTEM OF A DYNAMIC ALLIANCE OF LOGISTICS ENTERPRISES

A risk identification system of a dynamic alliance of logistics enterprises must be integrated with an evaluation system so that the whole risk management system can have a higher controllable function and more efficient managing tools. Its integrated system is expressed in Figure 3. The following should be noted: First, the alliance should establish a risk management committee exclusively responsible for risk identification, evaluation and monitoring during the alliance's life cycle. In the risk management committee, the leading enterprise is the head unit and member enterprises are committee member units. Second, in view of the consequences of risk evaluation and management, risks can be divided into transferring risks, controllable risks and non-controllable risks. The alliance should take different countermeasure to deal with the different kinds risks.



**Figure 3. Integration of risk identification system and risk evaluation system.**

## 6. CONCLUSIONS

A risk identification and evaluation system of a dynamic alliance of logistics enterprises is the principal risk management system of the alliance. It determines whether the alliance can be established successfully and operate normally. It also decides the quality of follow-up risk management. This paper has established a risk identification and evaluation system, which can not only fully identify alliance risks but also proposes efficient evaluation methods. Finally, risk management countermeasures can be laid down and implemented. The system not only complements incomplete research on risk evaluation and identification, but also develops innovative risk evaluation methods and risk management strategies. These methods and strategies are easy to use.

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