

# Risk assessment on convergence development between logistics and estate industries

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## **Abstract:**

Convergence development between logistics industry and estate industry promotes the emergence of new industry forms: logistics estate industry. Generally speaking, logistics estate is considered to be low-risk and high-return investment project, and favored by investors. But there are still potential risks. Therefore, this paper analyses the risk factors based on the logistics estate value chain, establishes a risk assessment model by entropy method, and makes an empirical research on the basis of case collected in West China. The result shows that the risk index system based on value chain could cover the whole stage of logistics estate development. As a simple and effective method of risk assessment, entropy method could exclude human factors interference of index weight and improve the objectivity of the evaluation results.

**Key words:** *logistics industry; related industry; convergence development; logistics estate industry; risk assessment*

## **1 Introduction**

In recent years, there has been a convergence development trend between logistics industry and related industries<sup>1</sup>, for example, the estate industry, and then producing a new industrial form, logistics estate industry. The convergence development will be helpful to promote industrial upgrading, enhance international competitiveness, and improve the service capabilities of the logistics industry<sup>2</sup>. However, there are also a series of risks in the industry convergence between the logistics industry and the related industries. Take logistics industry as an example, as a typical industrial form converged by logistics industry and estate industry, logistics estate has achieved rapid development in China. A large number of domestic and foreign developers are attracted in this area. For example, Prologis, the global leader in industrial logistics estate across the Americas, Europe and Asia, developing and managing a

world-class portfolio of high-quality logistics and distribution facilities, serving customers and investors as an integral part of the global supply chain, thinks the key to success lies in the risk control of value chain. The logistics estate is considered to be low-risk and high-return investment project, and favored by investors. It could not only contribute to promote regional economic development, but also be conducive to the investor stable returns. But there are great differences in development and operation between logistics estate and common real estate<sup>3</sup>. There are a series of potential risks in all aspects of logistics estate operation and it is necessary to identify and evaluate the risks.

From the dynamic point of view, logistics estate is a process composed of a series of value activities, including the developer integrating resources of government, society, stakeholders and other organizations, constructing logistics infrastructures, delivering it to customers and providing professional services. Based on Michael Porter's value chain theory<sup>4,5</sup>, the logistics estate value chain includes such value-added activities as decision making, planning, programming and designing, project management, investment attracting and sales, property management. In the mean time, it also includes such supporting activities as capital operation, human resources management and so on<sup>6</sup>.

## **2 Analyses of risk factors**

### ***2.1 Feasibility study***

It means a series of activities including feasibility analysis, project negotiations, signing cooperation agreement, land acquisition. Project decision-making is a prerequisite for the successful operation. In reality, the decision result which logistics real estate developers mostly concern about is obtaining a piece of land. However, as a scarce resource, land is irreplaceable, non-renewable, and is the lifeblood of logistics real estate. Because of regional and non-fluidity of logistics real estate, owning land determines the market share of logistics real estate companies<sup>7</sup>. Yet even with advanced mechanism, talent and adequate funding, it is also difficult to develop for developers lacking of land reserves.

### ***2.2 Planning and designing***

In this stage, logistics real estate developers frequently outsource works of project planning part and project designing part to external professional planning and design institutes. Because they taking into account both the planning and designing are very professional activities. Outsourcing can be useful to get external professional resources, enhance the

project's professional standards, streamline internal personnel of project planning and design parts and reduce costs in the mean time.

### ***2.3 Construction***

Project management has restriction on time limit, functional requirements, quality standards, investment income and budget objectives, which requires logistics real estate developers in project management part of the development process to accomplish anticipated task in order to achieve the desired progress, quality and cost control objectives within the given time. As guarantee of development success, project management activities directly determine the project's cost, schedule, quality, safety and brand, etc. Large-scale logistics real estate developers may also have a number of projects running at the same time. In addition to the ability of a single project, this specifically requires the developer to optimize and allocate human resources, financial resources, facilities and equipment between different projects.

### ***2.4 Sales and rent***

The result of investment attracting and sales is also very important to logistics real estate developers. However, the result depends on scientific rational feasibility study and accurate market positioning in the front stage. The sales promotion activities in this part are nothing but implementation process of pre-demonstration and decision-making. It shows the result is determined by not the activities of this phase itself but that of front phase. Strong developers may have their own sales and investment attracting teams, some developers also chose external professional vendors.

### ***2.5 Property administration***

It requires the logistics real estate developer has strong abilities to manage property, which is asset administration capabilities. This needs developers to provide customers with satisfied services through property management, and what is more important is that the developers should administrate these logistics facilities as asset, such as the formulation, assessment and selection of property asset administration plan in the project decision-making stage, the implementation of the plan in the latter stage, the improvement of the plan during implementing process, and so on. There are two basic business modes of logistics properties administration, sales and investment attracting. The developers can once achieve income through sales, or get the long-term stable investment returns through investment attracting.

How to choose between the two is an ability of asset management. In addition, the developers could get operating incomes by providing customer enterprise specialized solutions and value-added services except for rental incomes, which would be the core of asset management capabilities in the future.

## 2.6 Support activities

Support functions mainly include capital operation, human resources management, development approval and other support activities. The most important and prominent Support activities are capital operation and human resources management during logistics real estate project developing. As a capital intensive industry, continued development process of logistics real estate requires substantial funding from early decision, planning and design, project management to property management. Relying solely on its own funds is clearly not enough due to long payback period and substantial capital requirements. It is no exaggeration to say that all the successful logistics real estate projects are a model of capital operation without exception. The competition of logistics property market will eventually be the competition of talent to some extent, so human resource support capacity has become a necessary core capability.

## 2.7 Risk factors

Based on the analysis of the value chain above, the risk factors index system is summarized as follows (Table 1):

Table 1 - Convergence Risk Based on Value Chain

No.	Risk Factors	No.	Risk Factors
<i>k1</i>	preliminary investigation risk	<i>k10</i>	completion acceptance risk
<i>k2</i>	feasibility research risk	<i>k11</i>	sales risk
<i>k3</i>	land acquisition risk	<i>k12</i>	rent risk
<i>k4</i>	marketing planning risk	<i>k13</i>	customer service risk
<i>k5</i>	planning risk	<i>k14</i>	property management risk
<i>k6</i>	program design risk	<i>k15</i>	assets running risk
<i>k7</i>	contract budget risk	<i>k16</i>	development approval risk
<i>k8</i>	bidding risks	<i>k17</i>	capital operational risk
<i>k9</i>	management risk	<i>k18</i>	human resources risk

### 3 Results and discussion

#### 3.1 Risk assessment model

In the information theory, the entropy is a measure of the disorder degree of the system. The higher the order degree of a system, the smaller the entropy, and the greater the amount of information contained in the system. The information entropy theory has great instructive meaning, information grasping degree of the risk assessors is an important determinant to the risk assessment. The larger the amount of information grasped by the assessor, the higher the quality of information, the higher the accuracy and reliability of the risk assessment.

For a particular Risk assessment problem, suppose there are  $m$  risk factors and  $n$  evaluation objects, a multi-index evaluation matrix  $R'$  is set up, and get  $R = (r_{ij})_{m \times n}$  by the standardization of matrix  $R'$ , then the entropy of the  $i$  evaluation index is:

$$H_i = -k \sum_{j=1}^n p_{ij} \ln p_{ij}, \quad i = 1, 2, 3 \dots m \quad (1)$$

Inside the formula,  $k = 1/\ln n$ ,  $p_{ij} = r_{ij} / \sum_{j=1}^n r_{ij}$ , when  $p_{ij} = 0$  时,  $p_{ij} \ln p_{ij} = 0$ , then the entropy weight of the index  $i$  is defined as:

$$\omega_i = (1 - H_i) / (m - \sum_{i=1}^m H_i), \quad 0 \leq \omega_i \leq 1, \sum_{i=1}^m \omega_i = 1 \quad (2)$$

#### 3.2 Empirical research

The form of logistics estate are mainly immovable carriers, such as logistics park, logistics warehouses, distribution centers and so on. Take a logistics estate project in western China for example, the project development body is a comprehensive enterprise group, mainly engaged in construction, estate development, equipment manufacturing, energy development, trade and other fields of material production and business activities. The logistics project is an agricultural products logistics estate project which would include agricultural products logistics (storage) operation area, agricultural products trading area, fruits and vegetables wholesale area, agricultural equipment trading area, etc. The total investment is about 100 million CNY, and the project construction period is about 2 years. The project is expected to have good economic and social benefits.

Set up evaluation of risk factor set  $V = \{\text{small, with less risk, general risk, higher risk, great risk}\}$ , and give value. As can be set  $V = \{1, 3, 5, 7, 9\}$ . According to psychological research, the ability of people to distinguish information was the level of  $7 \pm 2$ . Therefore, we could use 1- 9

scale method to perform risk assessment by inserting {2,4,6,8} between the adjacent two-level in the actual evaluation in order to evaluate more precisely.

Fuzzy comprehensive evaluation results of development risks by the expert group are shown in below (Table 2), where  $k1$  to  $k18$  are representatives of the 18 risk indicator, and  $A1$  to  $A15$  are representatives of 15 evaluation experts.

### 3.3 Calculation result

Table 2-Expert Evaluation Data

	$A1$	$A2$	$A3$	$A4$	$A5$	$A6$	$A7$	$A8$	$A9$	$A10$	$A11$	$A12$	$A13$	$A14$	$A15$
$k1$	5	7	5	5	7	4	6	6	5	4	4	7	5	7	6
$k2$	2	3	5	2	2	5	4	5	3	2	2	4	3	6	5
$k3$	6	9	5	5	6	7	8	8	8	7	8	4	8	6	9
$k4$	6	5	8	9	4	7	7	7	5	5	9	8	5	9	9
$k5$	4	4	7	6	9	3	3	3	4	4	3	7	7	5	7
$k6$	6	8	9	9	6	9	7	3	7	7	6	8	5	5	6
$k7$	3	2	5	3	5	3	6	2	3	3	1	4	2	3	3
$k8$	3	2	3	7	4	1	5	6	5	3	4	3	5	3	5
$k9$	1	4	1	3	5	2	5	3	2	1	4	5	2	5	1
$k10$	3	1	2	3	2	3	4	3	5	2	4	8	1	2	2
$k11$	5	6	3	6	3	1	5	5	2	3	7	6	2	3	5
$k12$	9	9	8	8	6	6	6	7	8	8	5	6	8	8	5
$k13$	7	7	8	6	5	7	6	5	7	7	8	9	9	7	8
$k14$	4	2	3	3	8	8	4	3	1	4	1	4	1	3	2
$k15$	6	6	8	9	6	6	8	8	5	6	9	7	6	6	8
$k16$	1	1	3	1	4	2	3	2	4	4	2	1	2	6	6
$k17$	9	7	4	4	5	6	6	6	8	7	8	8	8	8	6
$k18$	4	8	5	2	6	7	6	5	5	7	4	7	4	6	6

Suppose  $R'$  is a fuzzy relation collection of set  $U$  to set  $V$ , element  $r'_{ij}$  in Matrix

$R'$  represents the results of the risk  $i$  evaluated by the expert  $j(j=1,2,\dots,n)$ . Standardization

of  $R'$  can take the appropriate calculation methods in accordance with the nature of

indicators to form standardization matrix  $R = (r_{ij})_{m \times n}$ . Data standardization and calculation

was completed by MATLABr2012a in this paper. Firstly, calculate the entropy value  $H_i$  and entropy weight  $\omega_i$  of each risk factor respectively using the formula above (Table 3).

And then calculate the total risk of the logistics estate by the formula  $E = \sum \omega_i H_i$ , the total development risk size is 0.8982.

Table 3-Calculation Results of Entropy Value and Entropy Weight

Risk Factors	$H_i$	$\omega_i$	Risk Factors	$H_i$	$\omega_i$
$k1$	0.8591	0.0881	$k10$	0.9662	0.0211
$k2$	0.9303	0.0436	$k11$	0.9203	0.0499
$k3$	0.8893	0.0693	$k12$	0.8921	0.0675
$k4$	0.8449	0.0970	$k13$	0.9124	0.0548
$k5$	0.9451	0.0344	$k14$	0.9388	0.0383
$k6$	0.8766	0.0772	$k15$	0.9107	0.0559
$k7$	0.9482	0.0324	$k16$	0.9285	0.0447
$k8$	0.9429	0.0357	$k17$	0.9162	0.0524
$k9$	0.8530	0.0919	$k18$	0.9272	0.0456

### 3.4 Risk level discussion

International criterion commonly adopted in project risk decision is ALARP principle (As Low As Reasonably Practically), which could be used as the basis of risk decision-making (Table 4).

The total risk  $E = 0.8982$ , according to ALARP evaluation criteria,  $0.64 < E = 0.8982 < 1.00$ , the logistics estate project should be denied because of its great risk.

Table 4-ALARP Criteria

Risk Level	Risk Size	Standard Values	Risk Decision Criteria
1	1~4	0~0.16	Acceptable, no review required
2	5~8	0.16~0.32	Acceptable, need management review
3	9~12	0.32~0.48	Undesirable high-level decision
4	13~16	0.48~0.64	Unacceptable
5	17~25	0.64~1.00	Denied

#### 4 Conclusions

Relatively speaking, logistics estate could bring reasonable income and stable returns, but a huge potential risk hides behind the booming. In order to minimize the risk, developers should establish a full risk control mechanism based on logistics real estate business processes. The domestic developers should build its core capabilities based on fully understanding the uniqueness of the logistics real estate business process. Only in this way can the domestic logistics real estate developers establish its long-term competitive advantage and avoid convergence risks.

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