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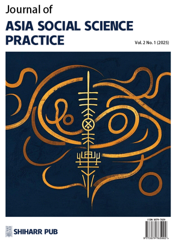

RESEARCH ARTICLE

RESEARCH ON RISK IDENTIFICATION AND PREVENTION STRATEGIES FOR LOGISTICS TRANSIT HUBS: A CASE STUDY OF SF EXPRESS LOGISTICS TRANSIT HUB IN NANNING, GUANGXI

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ABSTRACT

This paper focuses on the risk identification and analysis of the SF Express Logistics Transit Hub in Nanning, Guangxi. It systematically examines the various risks faced during its operations. The paper first defines the concept of logistics transit hubs and their operational modes, and then develops a risk assessment framework encompassing operational risks, internal management risks, and external environmental risks. Using the Analytic Hierarchy Process (AHP) and Fuzzy Comprehensive Evaluation Method, the paper evaluates and assigns weights to the risks. The results show that operational risks, particularly those related to "sorting and packaging," are the most critical. The paper also proposes preventive strategies, including enhanced employee training, improved information systems, optimized facility and equipment management, and the recruitment of specialized logistics talent. The findings provide theoretical support and practical insights for improving risk management and operational efficiency in emerging logistics transit hubs in China.

1. INTRODUCTION

In recent years, the rapid development of e-commerce and the express delivery industry has greatly increased the demand for logistics transit hubs (Lu et al., 2025; Zacharias & Tang, 2010). These hubs, crucial nodes in the logistics network, play a significant role in efficiently managing the sorting, transportation, and delivery of goods across vast networks (Ansari et al., 2018).

However, as the scale of logistics operations expands, the complexity and potential risks inherent in the operation of these transit hubs have also increased (Liu et al., 2022).

The logistics transit hub, specifically in the context of express delivery services, is tasked with gathering, sorting, and transferring parcels from various locations to ensure timely delivery to consumers (Hammad et al., 2021). In the case of SF Express, a leading express delivery company in China, its Nanning logistics transit hub represents a key part of its operational network (Zhao et al., 2022). Despite the company's strong market presence and advanced logistics models, the Nanning transit hub faces a variety of operational challenges. These include risks associated with improper handling, inefficient management practices, technological limitations, and external environmental factors such as adverse weather conditions.

This paper seeks to identify and analyze these operational risks within the context of the Nanning transit hub, providing an in-depth examination of the key factors that affect its efficiency and performance. The study adopts both qualitative and quantitative approaches, including the use of the Analytic Hierarchy Process (AHP) and Fuzzy Comprehensive Evaluation Method, to evaluate these risks and propose targeted strategies for mitigating them. By doing so, this research aims to contribute valuable insights into improving the operation and risk management practices of logistics transit hubs in China and beyond.

2. CONCEPTUAL FRAMEWORK

2.1. Logistics Transit Hub

According to the definition provided by Baidu Baike, an express delivery service network typically consists of three core components: end-point outlets facing customers, express parcel transit centers responsible for sorting and dispatching, and the trunk transportation routes connecting all logistics nodes (Yang et al., 2024). A transit hub, in this context, refers to a centralized facility dedicated to parcel sorting and transfer (Thondoo et al., 2020). In corporate logistics, these facilities are commonly referred to as distribution centers, whereas in consumer logistics, they are known as transit or sorting hubs (Zhou et al., 2021). Apart from minor differences in warehousing and processing functions, their core operational objectives remain largely the same. From a network perspective, the essential role of a transit hub is to aggregate, sort, and re-distribute parcels from across the country, enabling the transformation of logistics flow from dispersed to centralized and back to dispersed again (Basallo-Triana et al., 2021).

2.2. Operational Model of Logistics Transit Hubs

Transit hubs generally follow varying degrees of standardized operating procedures (Crosson, 2017). At the smallest scale are local branches or service offices, which handle collection and dispatch at the point of origin before forwarding parcels to regional or national hubs (Lin & Chen, 2003). These larger hubs then perform centralized sorting and dispatch operations for broader areas, often utilizing trucks or air freight to transfer shipments to other hubs (Lu et al., 2024; Mahéo et al., 2019). Mid-tier nodes are dispersed across different regions and function as key intermediaries within the larger express delivery network (Vassilopoulos, 2004).

2.3. Logistics Risk Management

Various unforeseen challenges—such as natural disasters, human errors, improper packaging, address mismatches, and delivery delays—can disrupt the logistics process (Wiendahl et al., 2007). Presently, China's logistics risk management practices are not yet fully equipped to effectively handle such complexities (Su et al., 2024). Logistics risk management, in this study, is defined as the process of identifying potential risks in the logistics workflow from a process-oriented perspective, aiming to prevent the loss or delay of parcels at the lowest possible cost (Yousefi & Tosarkani, 2022). It involves systematic forecasting, identification, and evaluation of risk sources by professional personnel (Schoenherr et al., 2015). Ultimately, logistics risk management represents a coordinated planning approach undertaken by stakeholders to reduce deviations and uncertainties in the logistics system (Rodríguez-Espíndola et al., 2020).

3. RISK IDENTIFICATION AND ANALYSIS OF NANNING LOGISTICS TRANSIT HUB

3.1. Overview of Nanning Logistics Transit Hub

3.1.1. Introduction to the Nanning Logistics Transit Hub

SF Express is one of the most widely used express delivery companies in China (Wu et al., 2022). Although its services are more expensive than those of other companies, SF Express commands a significant market share, particularly in the handling of urgent or high-value items (R. Cui et al., 2020). Nanning, a highly developed economic city and transportation hub in Guangxi, has become a key location for the construction of distribution centers and transit hubs. The Nanning logistics transit hub is a representative example of the "Internet+" model for modern logistics hubs, both facing the challenge of low profitability and dealing with issues of incomplete development. Developing a well-designed risk prevention plan is essential for optimizing organizational structures, improving operational efficiency, and ultimately enhancing the enterprise's profitability and competitive edge. Furthermore, since the Nanning transit hub is newly established, its use of smart technologies and information systems is still in its infancy. However, the hub is constrained by limited facilities and equipment, underdeveloped management systems, incomplete business processes, and inexperienced management, making the identification of potential risks an urgent necessity.

3.1.2. Current Situation of Nanning Logistics Transit Hub

While a small number of express delivery transit hubs have implemented automated operations, the majority of operations remain labor-intensive, which presents substantial risks due to the lack of standardized procedures. The Nanning transit hub, being newly established, faces several operational and technical challenges:

Management Issues: The management structure is still in its developmental phase. Due to the delayed establishment of the Nanning transit hub, it lacks systematic management experience.

During peak periods, such as during Double 11 or New Year holidays, there are frequent disruptions in the onsite operations due to poor management and a lack of coordinated planning.

Employee Qualifications: The education level and professional qualifications of the workforce are relatively low. The labor force is mainly outsourced, and the low salary levels make it difficult to attract professional logistics talent.

Outdated Technology: The hub lacks advanced technological systems and equipment, relying heavily on manual labor. Consequently, there is a high frequency of goods damage and inefficiency in handling operations.

Unclear Operational Processes: The absence of standardized operating procedures leads to inefficiencies. Workers often repeat tasks unnecessarily or fail to follow the correct steps, which increases workload and reduces operational efficiency. Furthermore, unclear responsibilities lead to poor handling of irregular situations, and safety risks are heightened.

Economic and Market Challenges: The express delivery industry is susceptible to fluctuations in economic conditions, transportation regulations, and other external factors. For instance, the COVID-19 pandemic has significantly reduced business volume in the logistics sector, impacting the profitability of transit hubs.

Poor Hygiene: At the end of the year, the large number of parcels results in significant delays. Some workers refuse to work overtime, leading to parcels being left unattended and the overall work environment becoming disorganized. This poor hygiene exacerbates the inefficiency of the entire operation.

In summary, the Nanning logistics transit hub faces a variety of operational risks that need to be identified and assessed. Establishing a risk evaluation framework is crucial to resolving operational issues and bringing the hub’s performance up to par with other transit hubs across China.

3.2. Risk Identification at Nanning Transit Hub

3.2.1. Operational Risks

The operation at Nanning's transit hub follows a standardized procedure that includes unloading, transmission, scanning, sorting, marking, sorting into packages, and loading. However, several issues have been identified during the actual operation:

Non-standard Sorting Operations: Although the Nanning transit hub is a newly built center for SF Express, the volume of parcels during peak times like Double 11 is immense (X. Cui et al., 2025). Sorting personnel face immense pressure and, as a result, often prioritize speed over quality. During busy periods, some employees engage in aggressive sorting practices that can damage parcels, especially fragile items like glassware and model toys.

Poor Scanning and Packaging Procedures: The process of preparing parcels for transfer to other regions is often rushed, and parcel labels are sometimes unclear. This has a direct impact on the efficiency of downstream operations, as misprinted or unclear information delays sorting and transportation.

Loss of Small Parcels: During peak seasons, workers who are tasked with sorting and labeling parcels often make mistakes, especially when handling smaller items like pens or scarves, which are easily overlooked or misplaced.

Unclear Responsibilities: Many operational issues arise due to a lack of clear responsibilities for each process. For instance, when parcels are damaged due to rough handling, no one takes responsibility, and the blame is often placed on the recipient.

3.2.2. External Environmental Risks

External risks such as policy changes, competitive pressures, and adverse environmental conditions can have a significant impact on transit hub operations:

COVID-19: The ongoing pandemic has delayed operations at the transit hub, as many e-commerce businesses delayed opening, and workers were reluctant to return to work due to health concerns. In addition, parcels remained in storage during the New Year, leading to increased customer complaints.

Natural Environment: Adverse weather conditions, including typhoons and heavy rainfall, can disrupt the movement of goods, causing delays in deliveries. The moist climate in Nanning also exacerbates the risk of damaged goods, especially those packed in cardboard or plastic, which are sensitive to humidity.

Industry Competition: The increasing number of distribution centers and transit hubs in the express delivery sector has intensified competition (Ou & Chen, 2025). This impacts profitability, as different transit hubs within the same company can perform at different levels, which affects overall earnings and employee performance.

Customer Expectations: Customer expectations for timely and undamaged delivery are rising, and the regulatory pressure is increasing. New policies from the Ministry of Transport and the State Post Bureau impose stricter requirements on delivery services, adding additional operational stress.

4. DESIGN OF RISK EVALUATION INDICATORS FOR NANNING LOGISTICS TRANSIT HUB OPERATIONS

4.1. Design Process

Based on the detailed analysis of the operational processes, internal management, and external environmental risks at the Nanning transit hub, and drawing from the research of other scholars, the risk evaluation framework has been developed. Operational risks are classified into four categories: scan marking risk, sorting and packaging risk, loading and unloading risk, and equipment malfunction risk. Internal management risks are divided into four subcategories: unprofessional workforce risk, customer complaint risk, low level of informationization risk, and non-standardized operation process risk. External environmental risks are further categorized into natural environment risk, policy and regulatory risk, industry competition risk, and force majeure risk (including social anomalies) (Kumar et al., 2019). The specific meanings of these indicators are outlined in the table1 below:

Table 1: Preliminary Establishment of the Risk Evaluation Index System

Primary Indicators	**Secondary Indicators**	**Specific Explanation**
Operational Risk	Scan marking risk	The unloaded goods are not reasonably arranged and labeled according to their addresses and types.
	Sorting turnkey risk	The process of sorting and package construction is not standardized, such as violent sorting, blurring of the package handwriting and other attitudes.
	Loading and unloading handling risks	In the process of express handling, there is the risk of up and down parallel handling and the risk of violent handling.
	Risk of poor equipment operation	Risk of breakdowns of logistics equipment in transit yards.
Internal management risk	Risk of unprofessional workforce	Risks of unprofessional and low-quality transit yard operations and management personnel who lack a sense of ethics and social responsibility.
	Risk of customer complaints	Risk of returns and complaints caused by customer dissatisfaction due to untimely delivery or damaged goods.
	Risk of low level of informationization	Risk of low level of information in transit yards, high workload and high labor cost of manual operation.
	Risk of unstandardized operation process	Risk of irregular operation due to the lack of standardized process system and operation guidebook.
External environmental risk	Natural Environment Risk	Risk of damage to express shipments and equipment due to natural environments such as typhoons, heavy rains and rainy weather.
	Policies and Regulations Risk	Risk of pressure on transit centers due to legal provisions in express delivery regulations that favor customers.
	Industry Competition Risk	Risks such as lack of profitability due to competition among express delivery companies, distribution centers, and transit yards.
	Risk of social anomalies	Risk of damage to transit centers due to social emergencies such as new coronavirus pneumonia.

4.2. Determination of Risk Evaluation Indicator Weights Using Analytic Hierarchy Process (AHP)

4.2.1. Introduction to the Analytic Hierarchy Process (AHP)

The weight assignment for the evaluation index system is determined using the Analytic Hierarchy Process (AHP) (Vaidya & Kumar, 2006). AHP, a qualitative and quantitative decision-making method introduced by the renowned American operations researcher Saaty in the 1970s, is widely used in multi-criteria decision analysis (Kumar et al., 2021). This method optimizes complex multi-objective decision problems by breaking them down into multiple goals or criteria, and then further decomposing them into several levels of indicators. The hierarchical structure is analyzed and ranked using a fuzzy quantitative approach, which calculates the ranking order for individual levels and the overall ranking, providing a systematic method for multi-criteria and multi-scenario optimization decisions.

In the first step, the hierarchical structure is determined based on the logistics risk evaluation system. The factors are divided into three levels: the first level represents the overall goal, which is the evaluation of the logistics operation risk level of the transit hub; the second level includes the three primary risk categories—operational risks, internal management risks, and external environmental risks; the third level consists of the 12 secondary indicators, such as scan marking risk, sorting and packaging risk, etc.

In the second step, a pairwise comparison matrix is constructed. After the hierarchical structure is established, logistics experts are invited to fill out scoring questionnaires. Based on the hierarchical structure of the evaluation index system, each factor is compared pairwise using a scale from 1 to 9, where experts qualitatively assess the relative importance of each factor. The resulting comparison matrix is then constructed, and the reciprocal values are used for inverse comparisons, as shown in the table2 below.

Expert Sample Characteristics. To ensure the scientific validity of the Analytic Hierarchy Process (AHP) evaluation, expert scoring was conducted by a panel of 22 professionals with relevant backgrounds in logistics, risk management, and operations research. Among them, 12 are senior logistics managers or technical directors from leading express enterprises (e.g., SF Express and JD Logistics), and 10 are academic experts from universities and research institutes specializing in logistics systems and industrial engineering. The industry-to-academia ratio is approximately 6:5, which ensures both practical relevance and methodological rigor in the evaluation process. All experts have at least 5 years of experience in logistics planning or risk assessment. The diversity and expertise of the panel contribute to the robustness and reliability of the pairwise comparison matrices used for weight calculation.

where for a criterion layer of n criteria, a two-by-two comparison judgment matrix U = (uij)n × n is obtained. uij denotes the factor i and factor j relative to the target importance values. The same process is performed for the sub-criteria and indicator layers under each criterion layer. This results in a three-level comparison judgment matrix.

Table 2. Pairwise Comparison Scale for Analytic Hierarchy Process (AHP)

scale	αij Meaning
1	i and j are equally important for an attribute
3	Element i is slightly more important than element j
5	element i is more important than element j
7	Element i is significantly more important than element j
9	Element i is definitely more important than element j
2,4,6,8	2,4,6,8 Between two neighboring classes

In the third step, the weights of the content layer, dimension layer and indicator layer are initially calculated based on the judgment matrices (Ha et al., 2023). Calculate the maximum characteristic root λmax of each judgment matrix, and solve the following characteristic equation: (UW) = λmaxW. where W is the eigenvector corresponding to λmax, and the components of W, wi, are the weights corresponding to each criterion (or each indicator), and test the consistency of the matrices.

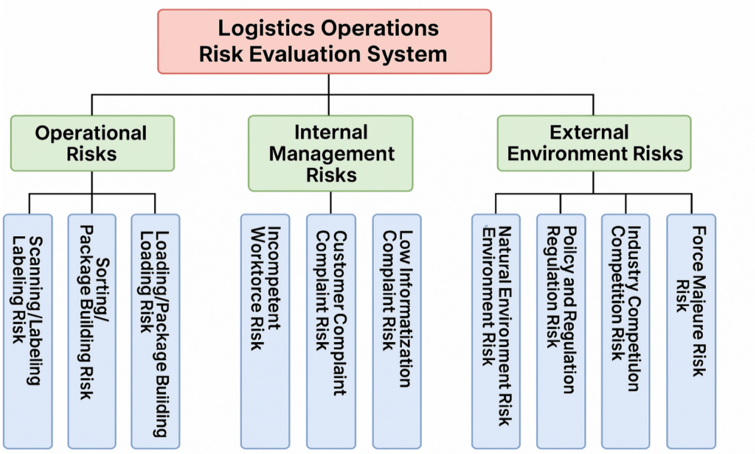

Figure 1: Hierarchical Structure Diagram

In the fourth step, the total weights are calculated. The weights were calculated separately for the dimension level (first-level indicators) and the indicator level (second-level indicators), and the total weights were obtained by multiplying the weights of each criterion level by the weights of each indicator under it.

In the fifth step, the weights of the indicator system are assigned. In the specific calculation process of the system, Yaahp software was used for computerized solution.For details, refer to Figure 1: Hierarchical Structure Diagram.

4.2.2. Calculation of Indicator Weights Using AHP

Using the Yaahp software, a hierarchical structure diagram of the logistics operation risk evaluation system was first constructed (Pamucar & Cirovic, 2015). Based on the results of expert questionnaires, pairwise comparison matrices were generated and entered into the software. Consistency tests were then conducted for each matrix. The results showed that the consistency ratios for the matrices corresponding to logistics operation risk, operational risk, internal management risk, and external environmental risk were all below 0.10, indicating acceptable consistency. The maximum eigenvaluesλmax for the matrices were 3.0291, 4.0211, 4.0042, and 4.0566, respectively.

Table 3: Weights and Rankings of Logistics Operation Risk Indicators

Ranking of Primary Indicators for Logistics Operation Risk	**Primary Indicator**	**Weight**
	Operational Risk	0.6586
	External Environmental Risk	0.1852
	Internal Management Risk	0.1562
Ranking of Secondary Indicators for Logistics Operation Risk	**Secondary Indicator**	**Weight**
	Sorting and Packaging Risk	0.3363
	Scan Marking Risk	0.1985
	Natural Environment Risk	0.092
	Unprofessional Workforce Risk	0.0831
	Equipment Malfunction Risk	0.064
	Loading and Unloading Risk	0.0599
	Industry Competition Risk	0.0538
	Non-standardized Operation Process Risk	0.029
	Customer Complaint Risk	0.029
	Policy and Regulatory Risk	0.0237
	Social Anomaly Risk	0.0158
	Low Informationization Level Risk	0.0152

Table 4: Logistics Operation Risk

Logistics Operation Risk	**Operational Risk**	**Internal Management Risk**	**External Environmental Risk**	**Wi**
Operational Risk	1	5	3	0.6586
Internal Management Risk	0.2	1	1	0.1562
External Environmental Risk	0.3333	1	1	0.1852

Table 5: Operational Risk

Operational Risk	**Scan Marking Risk**	**Sorting and Packaging Risk**	**Loading and Unloading Risk**	**Equipment Malfunction Risk**	**Wi**
Scan Marking Risk	1	0.5	4	3	0.3013
Sorting and Packaging Risk	2	1	5	5	0.5107
Loading and Unloading Risk	0.25	0.2	1	1	0.0909
Equipment Malfunction Risk	0.3333	0.2	1	1	0.0971

Table 6: Internal Management Risk

Internal Management Risk	**Unprofessional Workforce Risk**	**Customer Complaint Risk**	**Low Informationization Risk**	**Non-standardized Operation Process Risk**	**Wi**
Unprofessional Workforce Risk	1	3	5	3	0.532
Customer Complaint Risk	0.3333	1	2	1	0.1854
Low Informationization Risk	0.2	0.5	1	0.5	0.0971
Non-standardized Operation Process Risk	0.3333	1	2	1	0.1854

Table 7. External Environmental Risk

External Environmental Risk	Natural Environment Risk	Policy and Regulatory Risk	Industry Competition Risk	Social Anomaly Risk	Wi
Natural Environment Risk	1	4	2	5	0.4966
Policy and Regulatory Risk	0.25	1	0.3333	2	0.128
Industry Competition Risk	0.5	3	1	3	0.2903
Social Anomaly Risk	0.2	0.5	0.3333	1	0.0851

According to the AHP calculations, the weights and ranking of each level of indicators were determined as follows: among the first-level indicators, operational risk ranks highest, followed by external environmental risk, and then internal management risk. At the second level, the top three indicators are sorting and packaging risk, scan marking risk, and natural environmental risk, which together account for more than half of the total weight.The calculation of the evaluation indicator weights can be found in Table 3: Weights and Rankings of Logistics Operation Risk Indicators, Table 4: Logistics Operation Risks, Table 5: Operational Risks, Table 6: Internal Management Risks, and Table 7: External Environmental Risks.

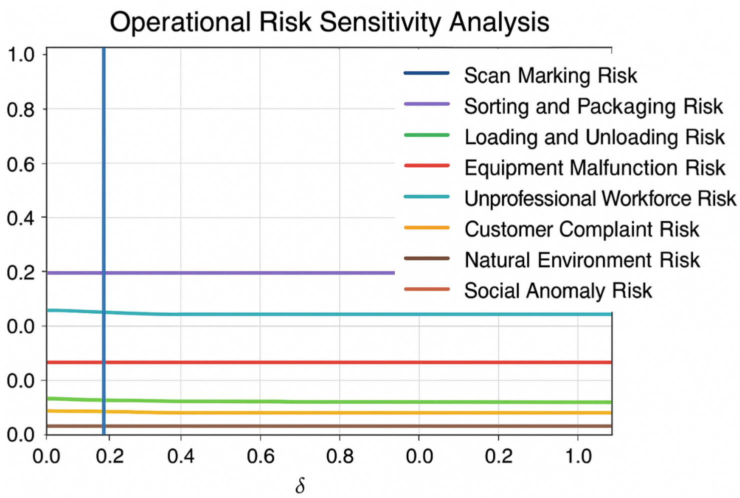

Figure 2: Operational Risk Sensitivity Analysis

This study conducted a sensitivity analysis of the logistics operation risk indicator system. The results indicate that, except for scan marking risk, sorting and packaging risk, loading and unloading risk, and equipment malfunction risk, which increase as operational risk rises, all other indicators decrease with an increase in operational risk. The same pattern applies to other situations. This suggests that the logistics operation indicator system exhibits good sensitivity. The specific ranges of variation can be observed in Figure 2: Operational Risk Sensitivity Analysis, Figure 3: Internal Management Risk Sensitivity Analysis, and Figure 4: External Environmental Risk Sensitivity Analysis.

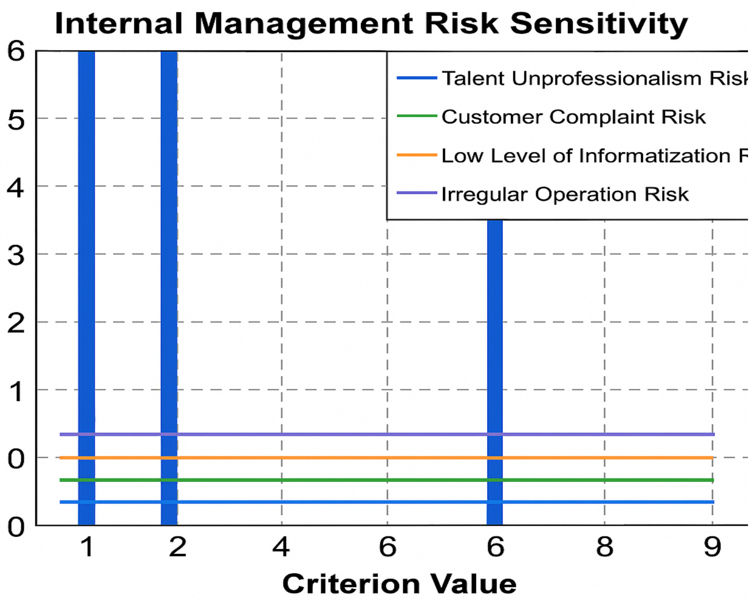

Figure 3: Internal Management Risk Sensitivity Analysis

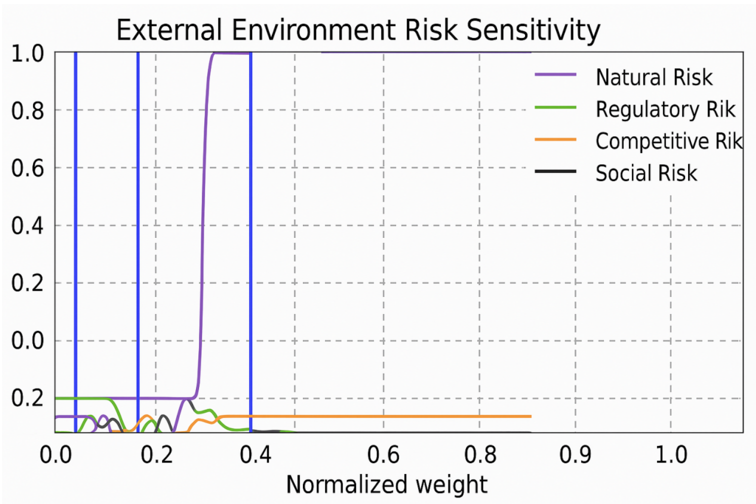

Figure 4: External Environmental Risk Sensitivity Analysis

4.3. Fuzzy Comprehensive Evaluation Model for Risk Assessment

4.3.1. Introduction to the Principles of Fuzzy Comprehensive Evaluation

Fuzzy Comprehensive Evaluation (FCE) is one of the widely used methods for validating indicator systems in the field of fuzzy mathematics (Althuwaynee et al., 2014). In practical applications, the evaluation of an object often involves multiple factors. The evaluation of such an object is determined by a combination of these factors, meaning that all the factors involved must be evaluated. After evaluating each sub-factor individually, the challenge is to determine the overall evaluation of the object. This is a typical problem addressed by FCE, where the core idea is to evaluate each factor by assigning it a rank or level, and then combine these individual evaluations to derive the overall evaluation score.

First, let the object of judgment be P: its factor set$U = \{u_1, u_2, \cdots, u_m\}$,judgment rating set$V = \{v_1, v_2, \cdots, v_m\}$. Then each factor in U is fuzzy judged according to the rating index in the judging set, and the judging matrix is obtained:

$$R = \begin{bmatrix} r_{11}, r_{12}, \cdots, r_{1m} \\ r_{21}, r_{22}, \cdots, r_{2m} \\ r_{n1}, r_{n2}, \cdots, r_{nm} \end{bmatrix}$$

(1) where rij denotes the degree of affiliation of ui with respect to vj. (U,V,R) then constitutes a fuzzy comprehensive judgment model. After determining the importance index of each factor (also known as weights), it is noted as $\overline{B} = A \cdot R = \left(\overline{b_1}, \overline{b_2}, \cdots, \overline{b_m}\right)$

(2) After normalization, get$B = \{b_1, b_2, \cdots, b_m\}$,can determine the final judgment level of the object P.

4.3.2. Risk Evaluation Process Using Fuzzy Comprehensive Evaluation

This study conducts a fuzzy comprehensive evaluation based on hierarchical regression analysis (Behzadian et al., 2012). First, a logistics operation risk assessment table was exported from Yaahp software, followed by the following steps:

The first step is to define the alternative object set, which in this case refers to the logistics operation risk at the Nanning Express Hub in Guangxi.

The second step is to define the indicator set, which consists of the secondary indicators of operational risk, internal management risk, and external environmental risk.

The third step is to establish the weight set: Since each indicator in the set has a different level of importance, weights are assigned to both first-level and second-level indicators. The first-level weight set and second-level weight set were computed using Yaahp software.

The fourth step is to define the evaluation set: Based on the characteristics of logistics operation risks, the evaluation set is defined as v={High, Medium, Low}, corresponding to the scores of 3, 2, and 1. These ratings are input into Yaahp software to generate a risk assessment table.

The fifth step is to construct the judgment matrix: The assessment table was imported into Excel, where relevant experts from the Shanghai Xikui Express Hub were invited to rate each secondary indicator. The average ratings for each factor were then calculated and imported into Yaahp, ultimately yielding a comprehensive evaluation score for the logistics operation risks.

4.3.3. Fuzzy Comprehensive Evaluation Results

The logistics operation risk evaluation table was generated using Yaahp software (Sharma et al., 2024). The relevant leaders from the Nanning transit hub in Guangxi, who have years of logistics operation experience, were invited to assign ratings to each secondary indicator, selecting High, Medium, or Low. The final weights were calculated by combining the opinions of several experts, and the data was then imported into Yaahp software. The overall score for the logistics operation risk model was 3.3875, falling between 2 and 3, indicating that the Nanning transit hub faces significant risks in its logistics operations. Among these, operational risk, particularly sorting and packaging risk, is the most prominent.

Table 8: Expert Evaluation Results

Number	Evaluation Indicator	Evaluation
1	Scanning Test Risk	Medium
2	Sorting and Packaging Risk	High
3	Assembly and Transportation Risk	Medium
4	Equipment Malfunction Risk	Low
5	Unprofessional Labor Input Risk	High
6	Customer Complaint Risk	Medium
7	Low Information Technology Level Risk	Low
8	Media Communication Irregularities Risk	Low
9	Natural Environment Risk	High
10	Policy and Legal Risk	Medium
11	Industry Competition Risk	Medium
12	Social Abnormal Risk	Low

4.3.4. Summary

This section validates the logistics operation risk evaluation system for the Nanning transit hub using Yaahp software. The weights and rankings for both the first-level and second-level indicators were calculated. The results show that operational risk is the most critical factor in the overall logistics operation risk, with sorting and packaging operations having the greatest impact on logistics performance. Based on hierarchical analysis, the logistics operation risk measurement table was generated by setting evaluation levels. Through the input of relevant experts, the comprehensive evaluation score of the entire model was derived.

Table 9: Comprehensive Evaluation Report

Evaluation Objective	**Comprehensive Evaluation Score**
Logistics Operation Risk	2.3875

Appendix 1: Evaluation Domains

Evaluation Level	**Score**
High	3
Medium	2
Low	1

Appendix2: Weight Vector

Indicator	**Weight**
Scanning Test Risk	0.1985
Sorting and Packaging Risk	0.3363
Assembly and Transportation Risk	0.0599
Equipment Malfunction Risk	0.064
Unprofessional Labor Input Risk	0.0831
Customer Complaint Risk	0.029
Low Information Technology Level Risk	0.0152
Media Communication Irregularities Risk	0.029
Natural Environment Risk	0.092
Policy and Legal Risk	0.0237
Industry Competition Risk	0.0538
Social Abnormal Risk	0.0158

5. RISK PREVENTION STRATEGIES FOR THE NANNING TRANSIT HUB LOGISTICS OPERATIONS

Based on the results above, it is evident that the logistics operation risks at the Nanning transit hub are relatively high. To effectively mitigate these risks and enhance the overall operational efficiency of the hub, and to catch up with other transit hubs and distribution centers, several preventive measures must be implemented:

5.1. Strengthening the Training of Internal Operations Staff

During sorting and packaging, some operators often engage in violent sorting, improper unloading, inaccurate package labeling, and other issues in an effort to improve efficiency. These practices create significant problems for subsequent processes, such as damaging customers' shipments, incorrect delivery addresses, and loss of small parcels. To address these problems, management should assess operators based on their proficiency and implement ranking systems. Inexperienced staff should receive additional training before being assigned tasks, and the mastery of skills should be directly linked to performance-based wages. This shift in focus from "efficiency over quality" will be a key strategy. Furthermore, the installation of comprehensive surveillance systems, such as cameras, can monitor operators' actions. The Lean Management Board should not only display metrics like the number of shipments or the status of vehicles but also track employee performance, thus transitioning management from focusing on tasks to focusing on personnel.

5.2. Addressing the Impact of Natural Environmental Factors

The research results indicate that unpredictable natural environments have a significant impact on logistics operations at the transit hub. Extreme weather events, such as typhoons and heavy rains, affect delivery speed, which can result in packages being delayed at the hub. The floor at the Nanning transit hub is damp, and due to limited sunlight, dirt and oil stains from conveyors can accumulate. When there is excessive inventory, packages may be "contaminated." Therefore, cleaning and organizing operations must be prioritized. Observations during routine inspections of the hub often reveal poor hygiene in work areas, operational equipment, and transport vehicles. For example, conveyors accumulate debris, and to address this, the staff should be assigned specific responsibilities and held accountable. Equipment malfunctions, such as oil leaks from conveyors, should be resolved by implementing maintenance protocols and hiring repair staff to inspect and address issues regularly. Additionally, transport vehicles often accumulate dust, and in rainy seasons, unpleasant odors can arise. Truck drivers should regularly clean their vehicles and ensure proper ventilation after rainy days.

5.3. Addressing Talent Development and Industry Competition Risks

The Nanning transit hub is also facing significant challenges in talent development and industry competition. The current workforce consists of many temporary employees with lower education levels, and many have no prior logistics experience. This negatively affects both work attitudes and service quality. Moreover, the shortage of high-level management staff means the hub lacks a proper management system and standard operating procedures. Without clear systems and guidelines, it is difficult to define employee roles and effectively assess their performance. Therefore, recruiting more highly qualified logistics professionals is essential for improving management. Regarding industry competition, some experts believe that the Nanning transit hub, being newly established, lags behind other transit hubs in cities like Shanghai, which affects the overall operational quality and consequently impacts employee wages. To address this, the hub could benefit from hiring experienced staff from other transit hubs. Management could also organize training sessions using PowerPoint presentations or video case studies to help staff learn from the successful experiences of other logistics centers.

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CONFLICT STATEMENT

The author declare no conflict of interest.

COOPERATION STATEMENT

The author affirms that this research was conducted independently and that no other individuals contributed to its authorship.

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