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Original Paper

Research on Risk Identification and Optimization Paths for Centralized Procurement of Bulk Food Ingredients in University Canteens

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Abstract

The supply chain for centralized procurement of food in university canteens is long, has multiple links, and involves complex entities, presenting high uncertainty in risk management. Based on risk management theory and empirical survey data, this study identified and quantified 16 third-level risk indicators for centralized procurement of food in university canteens, including their occurrence probability, impact degree, and comprehensive weight. The results show that the risk of safety indicators has the highest comprehensive score of 17.76 and exhibits a typical "high probability-high impact-high weight" triple superimposition feature. Together with the other six key risks-integrity and compliance risk, food traceability system risk, supplier cooperation stability risk, supplier qualification risk, procurement execution standard risk, and acceptance management risk-it forms the core area of the risk system, which is concentrated on the two main axes of quality safety and supply stability. Therefore, this paper proposes a four-dimensional integrated system optimization strategy of "system-process-technology-collaboration". This strategy system provides an operational analysis framework and practical path for risk management of centralized procurement of food in university canteens.

Keywords

University canteen, Bulk food ingredients, Centralized procurement, Risk identification, Optimization path

1. Introduction

At the policy level, the continuous advancement of the socialization reform of university logistics has placed higher demands on the operation management model of the canteens, prompting the gradual transformation of food procurement from a loose style to a more intensive and standardized one. Simultaneously, the food safety regulatory system has been continuously improved. Regulations such as the "Food Safety Law of the People's Republic of China" and the "Regulations on School Food Safety and Nutritional Management" have imposed stricter constraints on the sources of food ingredients, procurement processes, and quality traceability for school canteens. Moreover, the reform of government procurement has deepened, promoting the gradual inclusion of large-scale food procurement by universities into the unified framework of public resource transactions and budget performance management, thereby forming a systemic synergy that drives the centralized procurement of food ingredients in university canteens towards institutionalization and transparency.

At the practical level, with the increase in the number of university students and the diversification of dining service demands, the operating scale of university canteens has significantly expanded. The shortcomings of the traditional decentralized procurement model in terms of quality control, supply guarantee, and bargaining power have become increasingly prominent. Among them, the cost of food ingredients accounts for a high proportion of the total operating cost of the canteens, and it is a core variable affecting the quality of dining services and the financial sustainability, prompting universities to further shift the focus of cost control to the procurement section. In practice, centralized procurement of food ingredients has moved from pilot programs to widespread adoption. Most universities have achieved scale benefits by establishing centralized procurement platforms and supply chain collaboration mechanisms,making it an important practical path to enhance food safety guarantees and alleviate operational pressure.

2. Theoretical Foundation

2.1 The Supply Chain Risk Management Theory

The theory of supply chain risk management provides a systematic analytical framework for the risk governance of centralized food procurement in university canteens. This theory emphasizes the closed-loop management of identifying, assessing, responding to, and monitoring potential risks in the supply chain. Its core logic lies in embedding risk management throughout the entire process of supply chain operation to achieve forward-looking control of uncertain factors. In the context of university canteens food procurement, risk identification requires systematically reviewing potential risk sources at each stage from supplier selection, raw material production, processing and circulation to on-campus inspection, including but not limited to supply disruption risks, price fluctuation risks, quality safety risks, and compliance risks. Risk assessment needs to comprehensively apply qualitative and quantitative methods to rank the occurrence probability and impact degree of various risks, thereby determining the priority for control. On this basis, the design of risk response strategies should balance

preventive and remedial measures, such as reducing the risk of single-source dependence through diversified supplier layout, transferring price fluctuation risks through contract terms optimization, and alleviating the impact of supply disruption through the establishment of an emergency reserve mechanism. The risk monitoring phase requires the construction of a dynamic risk early warning indicator system, using information technology to achieve real-time collection and analysis of procurement data, ensuring that risk signals can be captured and responded to in a timely manner. The introduction of this closed-loop mechanism in university canteens procurement helps to change the traditional passive, experience-based risk management model, establish an institutionalized and regularized risk governance system, and provide theoretical support for the resilience and stability of the food supply chain.

2.2 The Public Procurement Theory

The theory of public procurement provides an important theoretical basis for understanding the institutional logic of centralized food procurement in university canteens. The essential characteristic that distinguishes public procurement from general commercial procurement lies in its public nature, that is, the procurement funds come from public finance or fees for public services, and the procurement behavior must follow core principles such as value for money, transparency, and fair competition. The principle of value for money breaks away from the single value orientation of "lowest bid winning" in traditional government procurement, emphasizing the comprehensive weighing of multiple factors such as price, quality, service, social benefits, and full life cycle costs in the procurement decision-making process. This principle is particularly applicable to special targets such as food ingredients, which directly affect the health of teachers and students. The principle of transparency requires the full disclosure of procurement information and the full traceability of the procurement process, covering key nodes such as the announcement of procurement requirements, the qualification conditions of suppliers, the evaluation standards and results publicity. The aim is to reduce the space for power rent-seeking and ensure the effective intervention of social supervision. The principle of fair competition emphasizes eliminating discriminatory clauses in the admission and evaluation of suppliers, providing equal participation opportunities for all qualified market entities, and thereby stimulating full competition to optimize procurement performance. These principles together constitute the value benchmark for the design of the centralized procurement system for food ingredients in university canteens, and also provide normative guidance for solving the long-standing problems in procurement practices such as inflated prices, varying quality, and the breeding of corruption. From the perspective of public procurement theory, the procurement of food ingredients in university canteens is not only a transaction behavior, but also a public governance activity that carries public interests and requires multiple accountability.

2.3 The Principal-agent Theory

The principal-agent theory provides a powerful analytical tool for dissecting the multi-level principal-agent relationships in the food procurement of university canteens and the resulting

governance challenges. In the organizational structure of food procurement in university canteens, an objective multi-level principal-agent chain has been formed: “university-logistics group or procurement management department-suppliers”. The first-level principal-agent relationship exists between the university as the principal and the logistics management department or logistics group as the agent. The university grants the latter the executive rights for the operation of the canteen and food procurement, but there are inherent differences in the objective functions between the university and the agent: the university pays more attention to public welfare goals such as food safety, price stability, and service guarantee, while the agent may prioritize efficiency indicators or departmental interests due to the performance assessment orientation. The second-level principal-agent relationship exists between the logistics procurement department and the suppliers. The suppliers, as the actual contractors, possess private information such as food quality and production conditions, and may engage in opportunistic behaviors such as passing off inferior products or falsely reporting prices by taking advantage of this information advantage. The superimposition of multiple principal-agent structures amplifies the problem of information asymmetry, significantly increasing the risks of moral hazard and adverse selection. In the absence of an effective incentive compatibility mechanism, the agent may take advantage of regulatory loopholes to maximize their own utility, thereby deviating from the core interests of the principal. Therefore, from the perspective of the principal-agent theory, universities need to focus on optimizing the design of procurement contracts, improving the assessment, evaluation, and audit supervision mechanisms, reducing the information barriers between the agent levels through information-sharing platforms, and through institutional arrangements to align the behavior of the agent with the goals of the principal, thereby ensuring the orderly operation of the food procurement chain.

2.4 The Stakeholder Theory

The stakeholder theory requires that the management of food ingredients procurement in university canteens should go beyond the perspective of a single entity and incorporate the identification of the demands of multiple stakeholders, the coordination of relationships, and the creation of value into the governance framework. The basic proposition of this theory is that the sustainable development of an organization depends on responding to and balancing the reasonable interests of stakeholders, rather than merely focusing on maximizing the interests of shareholders or management. In the field of food ingredients procurement in university canteens, the core stakeholders identified include at least five dimensions: the university management as the decision-making and supervisory entity, focusing on the bottom line of food safety, procurement efficiency, and compliance; the logistics management department or operational entity as the procurement execution entity, focusing on procurement cost control, supply guarantee, and operational convenience; the supplier group as the food supply entity, focusing on market share acquisition, profit margin, and collection cycle and other commercial interests; the general students and teachers as the terminal consumption entity, focusing on food quality, dining prices, nutritional health, and taste experience and other immediate interests; government regulatory agencies such as market supervision and education administrative departments, focusing on the

implementation of food safety regulations, the standardization of procurement procedures, and the maintenance of public interests, etc. The demands of these stakeholders have both intersections and tensions. For example, the profit motive of suppliers and the price parity expectations of students and teachers, as well as the cost control pressure of logistics and the reasonable profit margin of suppliers, may all give rise to structural contradictions. The stakeholder theory suggests that when promoting centralized procurement of food ingredients in universities, it is not advisable to pursue a single efficiency goal in isolation, but rather to establish a regular communication and negotiation platform, establish mechanisms for expressing interests and resolving conflicts, and promote all parties to seek the convergence point of interests above the common bottom line of food safety, achieving the transformation of procurement governance from one-way control to multi-party collaboration.

3. Research Method

In the methodology design for risk identification, this study adopts a multi-method integration approach combining literature review, expert consultation, and questionnaire survey to ensure the systematicness and reliability of the risk list extraction. Firstly, the literature review method is used to systematically search and analyze the existing research results on university canteens procurement, agricultural product supply chain, and government procurement risk management at home and abroad. From this, the risk factors frequently discussed are extracted, after which duplicates are removed, merged, and semantic standardization processing is carried out to form an initial risk list covering the supply end, procurement end, management end, and external environment end. On this basis, the Delphi method is used to conduct two rounds of anonymous expert inquiries, inviting experts from university logistics management, government procurement supervision, food safety and supply chain research, etc. Based on their professional knowledge and practical experience, they evaluate the importance of the risk factors in the initial list, make expression corrections and supplementary suggestions, and enhance the content validity of the list through the iterative convergence mechanism of group decision-making. This study further introduces the expert group decision-making method to determine the relative weights of risk indicators at all levels. A 15-member evaluation team was formed, including 8 experts with senior titles and 7 experts with more than 10 years of experience in university logistics management, food safety supervision, and supply chain management. Using the Delphi method for two rounds, experts were asked to assign weights for 4 first-level indicators and 16 second-level indicators based on the Satty 1-9 scale method. In the first round, 15 questionnaires were sent out and 15 were returned, with a 100% response rate. After the opinion summary and feedback, the second round of inquiries was conducted, and 14 valid judgment matrices were recovered, with an effective recovery rate of 93.33%. The questionnaire content specifically covers the basic information of the respondents (type of university or institution, position role, years of experience), subjective judgment of the frequency of various risks, subjective judgment of the severity of various risk consequences, evaluation of the effectiveness of current risk response measures in the unit, and open-ended suggestions for centralized

procurement risk management. Through the progressive application of the above methods, this study finally constructs a classified risk list for centralized procurement of food ingredients in university canteens and summarizes the key risk factors identified into four main categories. The final classified risk list for centralized procurement of food ingredients in university canteens is shown in Table 1.

Table 1 Three-level Index System for Risk Evaluation of Centralized Procurement of Food Ingredients in University Canteens

Primary Indicator	Secondary Indicator	Third-Level Indicators
Risks Associated with Centralized Procurement of Food Ingredients in University Canteens A	Environmental Risk B_1	Policy and Regulation Change Risk C_1
		Natural Disaster Risk C_2
		Market Price Abnormal Fluctuation Risk C_3
		Public Opinion and Public Event Risk C_4
	Management Risk B_2	Organizational Structure and Responsibility Clarity Risk C_5
		Procurement Execution Standard Risk C_6
		Contract Management Risk C_7
		Acceptance Management Risk C_8
	Supply Risk B_3	Supplier Qualification Risk C_9
		Supplier Cooperation Stability Risk C_{10}
		Delivery Timeliness Risk C_{11}
		Emergency Supply Guarantee Risk C_{12}
	Quality Risk B_4	Safety Indicator Risk C_{13}
		Food Ingredient Traceability System Risk C_{14}
		Identification Information Integrity Risk C_{15}
		Integrity and Compliance Risk C_{16}

4. Empirical Process

This study adopted a combined approach of online survey platforms and paper questionnaires, and targeted the logistics management departments, procurement centers, and canteen operation units of 26 universities in the Yangtze River Delta region that implemented centralized food procurement. A total of 300 questionnaires were distributed, and after excluding those with filling times shorter than 120 seconds, showing obvious regular distribution of options, and having more than 10% missing values, 263 valid questionnaires were retrieved, with an effective recovery rate of 87.67%. At the reliability level, the Cronbach's α coefficient was used to test the internal consistency of the total scale and each subscale. The α coefficient of the total scale was 0.921, and the α coefficients of the four subscales of environmental risk, management risk, supply risk, and quality risk were 0.863, 0.894, 0.878, and 0.906,

respectively, all above the critical standard of 0.80, indicating that the questionnaire has good reliability level. At the validity level, through exploratory factor analysis, the KMO value was 0.904, the Bartlett's spherical test $\chi^2 = 3452.17$ ($df = 120$, $p < 0.001$), the cumulative variance explained rate was 68.74%, and the loadings of each item on the corresponding factor ranged from 0.612 to 0.857, and were all greater than the cross-loadings on other factors. The factor structure was consistent with the theoretical preset, indicating that the questionnaire had superior structural validity. The survey questionnaire used in this study had a reasonable sample coverage and a high recovery rate during the distribution and retrieval process, and both the reliability and validity indicators met the relatively ideal psychometric standards, laying a reliable data foundation for the subsequent quantitative evaluation and in-depth analysis of risk factors. Finally, to further test the practical fit and wide applicability of the risk list, a structured questionnaire was compiled and distributed to a wider range of university logistics procurement practitioners, supplier representatives, and regulatory personnel. The core part of the questionnaire adopted the Likert scale format, requiring respondents to score each risk factor in the list from the two dimensions of risk occurrence probability and risk impact degree. At the same time, open-ended questions were set to capture potential risk clues outside the list. The weight results are shown in Table 2.

Table 2. Weight Distribution of Indicators and the Result of Consistency Test

Primary Indicator	Secondary Indicator	Secondary Weight ω_1	Third-Level Indicators	Third-Level Weight ω_2	Combined Weight ω	Consistency Judgment
A	B_1	0.072	C_1	0.351	0.025	Pass
			C_2	0.189	0.014	
			C_3	0.283	0.020	
			C_4	0.177	0.013	
	B_2	0.169	C_5	0.198	0.033	Pass
			C_6	0.307	0.052	
			C_7	0.246	0.042	
			C_8	0.249	0.042	
	B_3	0.286	C_9	0.312	0.089	Pass
			C_{10}	0.286	0.082	
			C_{11}	0.225	0.064	
			C_{12}	0.177	0.051	
	B_4	0.473	C_{13}	0.421	0.199	Pass
			C_{14}	0.237	0.112	
			C_{15}	0.196	0.093	
			C_{16}	0.146	0.069	

From Table 2, it can be seen that at the secondary indicator level, the weight of quality risk is the highest (0.473), followed by supply risk (0.286), management risk ranks third (0.169), and environmental risk has the lowest weight (0.072). At the tertiary indicator level, the risk of safety indicators has the highest combined weight of 0.199, ranking first among the 16 third-level indicators. This indicates that the safety attributes of the ingredients are the core focus of risk management in the centralized procurement of university canteens, and the risk transmission effect triggered by these factors may run through the entire procurement process. The risk of food traceability system (0.112) and the risk of integrity of identification information (0.093) rank second and third respectively, and together with the safety indicator risk, they constitute the main trunk of risks in the quality dimension, with a cumulative combined weight of 0.404, accounting for more than 40% of the total weight of all third-level indicators. Within the supply risk subsystem, the risk of supplier qualification (0.089) and the risk of stability of supplier cooperation (0.082) have relatively prominent weights, reflecting the importance of the robustness of the access and long-term cooperation mechanism of the front-end entities in the supply chain for risk prevention and control. The weights of the four indicators in the management risk subsystem are relatively balanced, ranging from 0.033 to 0.052, indicating that the risk points at the management level present a typical characteristic of dispersion and coexistence of multiple nodes. Any omission in any link may trigger the release of the risk accumulation effect. The combined weights of the four indicators under the environmental risk subsystem are all below 0.030. Although the overall impact degree is relatively low, policy regulation changes risk and abnormal market price fluctuations risk, as external uncontrollable factors, still need to maintain a certain level of warning attention in the risk monitoring system. The above weight distribution pattern provides a quantitative basis for the subsequent key risk identification and hierarchical response strategies. Based on the calculation of the weights of all indicators at the various levels, the weighted synthesis of the occurrence probability and impact degree scores of each risk factor collected in the questionnaire stage from 263 valid samples is further carried out. The risk comprehensive score R is calculated using the classic two-dimensional product formula: $R_i = P_i \times I_i$, where R_i is the comprehensive risk value of the i-th risk factor, P_i is the average value of the occurrence probability of the risk factor, and Ii is the average value of the impact degree of the risk factor. The comprehensive score of each secondary indicator is obtained by weighted summation of the scores of its subordinate tertiary indicators. According to the ranking of the comprehensive score, the risk factors with a cumulative risk contribution rate of 70% or more are determined as key risks. The comprehensive scores and rankings of the secondary indicator risks are shown in Table 3.

Table 3. Key Risk Identification Results

Secondary Indicator	Parent Indicator	ω	P_i	I_i	R_i	Cumulative Rate	Determination	Order
C_{13}	Quality Risk B_4	0.199	3.82	4.65	17.76	12.66%	Key Indicator	1
C_{16}	Quality Risk B_4	0.069	3.47	4.28	14.85	23.25%	Key Indicator	2
C_{10}	Supply Risk B_3	0.082	3.91	3.76	14.70	33.73%	Key Indicator	3
C_9	Supply Risk B_3	0.089	3.35	4.02	13.47	43.34%	Key Indicator	4
C_6	Management Risk B_2	0.052	3.68	3.54	13.03	52.63%	Key Indicator	5
C_8	Management Risk B_2	0.042	3.43	3.61	12.38	61.46%	Key Indicator	6
C_{14}	Quality Risk B_4	0.112	3.08	3.89	11.98	70.01%	Key Indicator	7

Based on the results of key risk identification (Table 3), it can be seen that the safety indicator risk (C_{13}) has the highest comprehensive score of 17.76 among the 16 third-level indicators. Its average occurrence probability (3.82) and average impact level (4.65) are at a relatively high level. With a global combined weight of 0.199, it presents a triple superposition characteristic of "high probability-high impact-high weight", becoming the core node of the risk system for centralized food procurement in university canteens. In the quality risk dimension, there are three indicators-safety indicator risk (C_{13}), integrity and compliance risk (C_{16}), and food traceability system risk(C_{14}) that enter the key risk sequence, accounting for 42.9% of all 7 key risks, covering the key links of the three quality value chains of safety, integrity, and traceability. This indicates that the controllability of the quality of the food itself and the traceability of safety constitute the primary focus of current risk management. Under the supply risk dimension, the supplier cooperation stability risk (C_{10}) and supplier qualification risk (C_9) rank third and fourth respectively, with their combined weight (0.171) accounting for 59.8% of the total weight of the supply subsystem. This reflects that the entry and long-term cooperation maintenance of the upstream entities in the supply chain have a significant "risk leverage" effect, that is, precise control of these two types of risks can obtain a large overall risk mitigation benefit. In the management risk dimension, the procurement execution standard risk (C_6, 13.03) and acceptance management risk (C_8, 12.38) also enter the key risk list. Although their combined weight is relatively small, their average occurrence probability exceeds 3.40 and the impact

level is not negligible, suggesting that management loopholes at the execution and operation levels may constitute the "trigger" for the transformation of risk events from potential to actual. In contrast, the remaining 9 indicators not included in the key risk sequence have a combined score ranging from 4.82 to 11.53, mostly being external environmental factors such as policy and regulation changes or contract management, which already have certain rigid constraints. The overall risk situation is relatively controllable, but they still need to be included in the regular monitoring system to prevent the coupling amplification effect of specific situations and non-key risks. In summary, these 7 key risks constitute the "target area" of the risk of centralized food procurement in university canteens. The subsequent risk response strategies should be prioritized to focus on the two main axes of quality safety and supply stability.

5. Optimization of Path Design

5.1 The Optimization at the System Level

The optimization at the system aims to establish rigid constraints at the top-level design, providing a normative basis for risk management. Firstly, improve the supplier admission, dynamic assessment and exit mechanisms, establish a closed-loop management system covering qualification review, performance evaluation and violation dismissal, and especially set differentiated admission thresholds and periodic re-evaluation standards for supplier qualification risks (C_9) and cooperation stability risks (C_{10}). Implement a "one-vote veto" blacklist system for suppliers with major safety issues. Secondly, improve the bidding and procurement system, implement framework agreement procurement and joint procurement models, reduce procurement costs through scale effects, and solidify quality clauses and breach retrospect mechanisms with standardized contract templates, narrowing the institutional gap in procurement execution compliance risks (C_6). Thirdly, establish a corrupt risk prevention and internal audit system, implement job rotation and conflict-of-interest declaration for key positions with centralized procurement decision-making power, introduce a combination of regular audits and special inspections as an internal control mechanism, and block the transmission path of corrupt risks to procurement quality risks at the system.

5.2 The Optimization of the Process Layer

The process layer optimization focuses on the key control nodes in the procurement business chain, and strives to bridge the management gaps between the execution layer and the operation layer. In terms of demand planning management, a prediction model based on historical consumption data is introduced, combined with the scale of students in school, seasonal fluctuations and holiday factors for demand prediction, to reduce the frequency of emergency procurement caused by plan deviations, and reduce the cumulative effect of price and supply volatility risks at the source. In the acceptance and inspection section, the standardization construction of fast inspection laboratories and the institutionalization of third-party inspections are promoted simultaneously. In response to the high impact characteristics of safety indicators (C_{13}), a mandatory inspection list covering key items such as pesticide residues,

veterinary drug residues, and microbial indicators is set to ensure the forward movement of the food safety quality defense line. In terms of price and emergency guarantee, a dynamic adjustment mechanism linked to the agricultural product wholesale price index and the CPI food sub-index is established, and at the same time, an emergency supply reserve is constructed with core suppliers with strong comprehensive strength and high cooperation willingness as the main body and alternative suppliers as the supplement, to enhance the response elasticity when facing price fluctuations and supply disruptions.

5.3 The Optimization of the Technical Layer

The technical layer optimization uses digital means to reshape the transparency and real-time nature of procurement supervision, providing technical support for risk identification and early warning. The primary task is to build a centralized procurement information platform, enabling online operation and data traceability throughout the process from demand submission, bid evaluation, contract signing to acceptance and settlement. Relying on immutable operation logs, the process tracing ability for procurement execution compliance risks (C_6) and acceptance management risks (C_8) is strengthened. On this basis, blockchain and Internet of Things technologies are introduced to build a food traceability and cold chain monitoring system. Key information such as the origin of the food, processing batch, storage temperature and humidity is real-time uploaded to the blockchain for archiving, achieving a technical closed loop for the risk of the food traceability system (C_{14}), ensuring traceability of origin, traceability of destination, and accountability. At the same time, a big data price monitoring and risk warning model is deployed. Through the aggregation analysis of multi-source heterogeneous data, risk signals such as abnormal price fluctuations and changes in supplier performance capabilities are automatically identified, promoting risk management from post-event handling to pre-event warning, setting graded warning thresholds for key risk indicators and providing decision support.

5.4 The Optimization of Collaborative Layer

All the above-mentioned system, process and technical optimizations need to be carried out within a multi-party collaborative governance framework to achieve maximum effectiveness. The core of the collaborative layer optimization lies in establishing a multi-dimensional interactive regulatory community of “school-enterprise-government-student”: The school’s logistics and procurement departments bear the main responsibility, suppliers fulfill contractual and social responsibilities, the market supervision department provides law enforcement guarantees and professional guidance, and the student and teacher groups play the role of terminal consumption supervision. Specifically, a regular teacher-student supervision and information disclosure mechanism should be established. The core information such as food ingredient testing results, supplier assessment and evaluation, and procurement prices should be regularly publicized on the campus information platform. The channels for teachers and students to make complaints and provide feedback should be unobstructed, and the experience signals of the end users should be transformed into supplementary data sources for risk warnings. At the same time, promote strategic cooperation with suppliers and the construction of

supply chain resilience. Through long-term agreements, technical collaboration, and capacity building, establish a risk-sharing partnership with high-quality suppliers based on trust mechanisms instead of short-term games. Reduce the probability of occurrence of supplier qualification risks (C_9) and cooperation stability risks (C_{10}) from the source, and achieve the transformation of the supply chain from transactional to value co-creation type, and enhance the overall resilience of the entire chain to external shocks.

6. Conclusion

This study focuses on the topic of risk management for centralized procurement of food ingredients in university canteens, which is of both theoretical value and practical urgency. Through empirical identification and quantitative assessment, it clarifies the key nodes and main structures within the risk system. The research conclusion indicates that the risk of safety indicators is the core hub in the risk network of university canteens centralized food procurement. Its “high probability-high impact-high weight” superimposed attribute implies that the prevention and control of this risk has global significance; quality safety and supply stability constitute the two main axes of risk governance, with 7 key risks covering dimensions such as safety, integrity, traceability, supplier qualifications, cooperation stability, procurement execution norms, and acceptance management, suggesting that the allocation of risk response resources should be tilted towards these “target” areas; management deficiencies at the execution and operation levels constitute the “trigger” for the transformation of risks from potential states to actual events, and need to be emphasized in terms of process control and process traceability; external environment-related and existing rigid constraints management links, although the overall risk situation is relatively controllable, need to prevent the coupling amplification effect with key risks in specific situations. Based on these findings, the “four-dimensional optimization system of system-process layer-technical layer-collaborative layer” constructed in this study can provide systematic governance path references for university logistics procurement departments. Its core logic lies in using institutional rigidity to guarantee the compliance bottom line, process refinement to reduce operational deviations, technology embedding to enhance full-process transparency and early warning capabilities, and diversified co-governance to integrate regulatory resources and governance synergy. Further research can further focus on the differentiated risk maps of universities of different scales and regional types, as well as the evaluation of the implementation effect of the proposed optimization strategies in the practical field, and can also expand to comparative research in the field of food supply chain risk governance of other public institutions.

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