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Research on the Impact of Logistics Outsourcing Collaboration Relationships on Logistics Efficiency in Small and Medium-sized Enterprises

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Abstract: With increasingly fierce market competition, logistics outsourcing has become an important strategic choice for small and medium-sized enterprises (SMEs) to reduce operating costs and enhance core competitiveness. However, in practice, although many SMEs have carried out logistics outsourcing, they often face problems such as insignificant improvement in logistics efficiency and unstable service quality. This paper takes SMEs as the research object, analyzes the current state of their logistics outsourcing collaboration relationships, and uses questionnaire surveys and factor analysis to identify four core influencing factors: outsourcing contracts, information communication, outsourcing control, and logistics collaboration capability. It further analyzes the mechanism by which each factor affects logistics efficiency, providing a reference for SMEs to optimize their logistics outsourcing collaboration relationships and improve logistics efficiency.

Keywords: Small and medium-sized enterprises, logistics outsourcing, collaboration relationship, logistics efficiency, empirical analysis.

1. Introduction

In the current market environment characterized by intense supply chain competition, logistics outsourcing has become a critical strategic choice for SMEs to integrate external resources and focus on core business activities. By entrusting logistics operations to third-party logistics companies, SMEs can concentrate their limited resources on core functions such as R&D, production, and sales, theoretically improving operational efficiency and reducing logistics costs.

However, in practice, SMEs often face difficulties in achieving efficiency gains through logistics outsourcing. Relevant research indicates that while logistics outsourcing reduces logistics costs to some extent, problems such as declining delivery quality and frequent delivery delays persist, and logistics efficiency has not been substantially improved. The lack of effective collaboration mechanisms between SMEs and third-party logistics service providers is a core issue.

Logistics outsourcing decisions in SMEs are influenced by multiple factors. Xu, Xu, and Ju (2012) conducted an empirical study on logistics outsourcing collaboration relationships in SMEs, identifying outsourcing contracts, outsourcing control, and information communication as the three core factors affecting logistics efficiency [1]. Their findings indicate that improvements in these collaborative factors significantly enhance logistics efficiency in SMEs. Kgwadi and Samuels (2025) conducted research on grocery SMEs in Mahikeng, South Africa, showing that the integration of supplier-customer relationships and third-party logistics services effectively shortens supply cycles and improves inventory management [2]. Jia Yaru et al. (2025) pointed out in their evaluation of transportation outsourcing service providers for third-party logistics enterprises that safety management level, cargo damage compensation level, and emergency response capability are key factors affecting outsourcing service quality [3].

Current research on logistics outsourcing in SMEs mostly focuses on the perspective of third-party logistics enterprises, with insufficient attention to the collaboration relationship between both parties. Therefore, systematically analyzing the influence mechanism of logistics outsourcing collaboration relationships on logistics efficiency from the perspective of collaboration relationships has significant theoretical and practical value.

To address this research gap, this study pursues three specific objectives. The first objective is to identify the key collaboration relationship factors that influence logistics efficiency in SMEs through literature review and empirical investigation. The second objective is to examine the mechanisms through which these factors affect logistics efficiency. The third objective is to propose practical strategies for SMEs to optimize their logistics outsourcing collaboration relationships.

The theoretical contribution of this study lies in developing an integrated framework that links four collaboration dimensions—outsourcing contract, information communication, outsourcing control, and logistics collaboration capability—to logistics efficiency. Unlike prior research that has separately examined these factors, this study considers their logical progression and interactive effects. The practical contribution is to provide SME managers with a diagnostic tool to identify weaknesses in their current logistics outsourcing arrangements and implement targeted improvements.

2. Characteristics of Logistics Outsourcing Collaboration Relationships and Influencing Factors in SMEs

2.1. Characteristics of Logistics Outsourcing in SMEs

The core purpose of logistics outsourcing in SMEs is to leverage the professional capabilities of third-party logistics providers to improve logistics efficiency and reduce costs.

Compared with large enterprises, logistics outsourcing in SMEs presents three distinctive characteristics:

First, the scope of outsourced business is relatively limited. Constrained by financial resources and business scale, SMEs mostly outsource basic logistics functions such as transportation and warehousing, with less involvement in high-level services such as information system integration and supply chain coordination.

Second, the stability of cooperative relationships is insufficient. The relationships between SMEs and logistics service providers are mostly short-term transactional in nature, lacking long-term strategic coordination, making the relationship vulnerable to price fluctuations and other factors.

Third, collaboration management capability is weak. SMEs have significant deficiencies in contract design standardization, process control effectiveness, and information communication smoothness, which constrain the full realization of outsourcing effectiveness.

2.2. Identification of Influencing Factors

Based on literature review and the logistics outsourcing practices of SMEs, and referring to the service provider evaluation index system developed by Jia Yaru et al. (2025), this paper categorizes the collaboration relationship factors affecting logistics efficiency into four dimensions:

The first dimension is outsourcing contract, which refers to the service agreement signed between the enterprise and the logistics service provider, covering service scope definition, responsibility allocation, performance evaluation, and breach of contract handling. This is the institutional foundation of collaboration.

The second dimension is information communication, which refers to the efficiency and accuracy of information transmission between the enterprise and the logistics service provider regarding order information, inventory status, and delivery progress. This is a key guarantee for smooth collaboration.

The third dimension is outsourcing control, which refers to the enterprise's ability to supervise, evaluate, and intervene in the service process and results of the logistics service provider, including process monitoring, performance evaluation, and exception handling.

The fourth dimension is logistics collaboration capability, which refers to the coordination and cooperation capability between the enterprise and the logistics service provider in business docking, problem-solving, and resource integration. This is the direct driving factor for achieving logistics efficiency.

These factors have a logical progressive relationship: the outsourcing contract establishes the cooperation foundation, information communication and outsourcing control ensure smooth processes, and ultimately, logistics efficiency is achieved through logistics collaboration capability.

3. Questionnaire Design and Data Collection design

3.1. Questionnaire Design

To accurately capture the influence mechanism of logistics outsourcing collaboration relationships on logistics efficiency in SMEs, the questionnaire consists of two modules:

The first module collects basic enterprise information, including industry, number of employees, annual revenue, and scope of logistics outsourcing, aiming to understand the basic operational characteristics of the surveyed enterprises.

The second module is the measurement scale for logistics outsourcing collaboration relationships and logistics efficiency. A Likert five-point scale is used, with 1 representing "strongly disagree" and 5 representing "strongly agree." The Likert scale scoring criteria are shown in Table 2.

Table 1. Influencing variables of logistics outsourcing collaboration relationships in SMEs

Variable	Influencing Factor	Explanation
H1	Standardization of outsourcing contract	Positively affects logistics efficiency
H2	Timeliness of information communication	Positively affects logistics efficiency
H3	Accuracy of information communication	Positively affects logistics efficiency
H4	Effectiveness of outsourcing control	Positively affects logistics efficiency
H5	Standardization of business docking	Positively affects logistics efficiency
H6	Collaborative problem-solving ability	Positively affects logistics efficiency
H7	Level of trust	Positively affects logistics efficiency
H8	Professional capability of logistics service provider	Positively affects logistics efficiency
H9	Cost control effectiveness	Positively affects logistics efficiency
H10	Risk prevention capability	Positively affects logistics efficiency

Table 2. Likert Scale Rating Description

Score	1	2	3	4	5
Degree of Influence	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

3.2. Questionnaire Distribution and Collection

The survey targeted SMEs that had already engaged in logistics outsourcing. The survey period was from September 2025 to February 2026. A total of 350 questionnaires were distributed, 298 were returned, 22 were invalid, and 276 were valid, yielding an effective response rate of 78.9%, which meets the sample validity requirements for social science research.

Table 3. Distribution and collection of questionnaires

Distributed	Returned	Invalid	Valid	Effective rate
350	298	22	276	78.9%

4. Data Processing and Statistical Testing

4.1. Reliability Test

Reliability embodies the precision and validity of a measurement tool, which is commonly tested by the

Cronbach's α coefficient method and the split-half reliability coefficient method.

Table 4. Cronbach's α Coefficient

Coefficient Alpha	x>0.9	0.9>x>0.8	0.8>x>0.7	X<0.7
Reliability Level	Excellent Reliability	Good Reliability	Acceptable Reliability	Unacceptable Reliability

The collected data were processed using SPSS 13.0 software in this study, and the Cronbach's α coefficients of the overall scale and each dimension are as follows:

Table 5. Overall Reliability of the Logistics Outsourcing Collaboration Relationship Scale

Scale	Number of Items	Cronbach's α
Overall Scale	22	0.892
Outsourcing Contract Dimension	5	0.841
Information Communication Dimension	5	0.825
Outsourcing Control Dimension	4	0.806
Logistics Collaboration Capability Dimension	4	0.853
Logistics Efficiency Dimension	4	0.834

As shown in the table above, the Cronbach's α coefficient of the overall scale is 0.892, falling between 0.8 and 0.9, indicating good reliability of the scale. The α coefficients of all subscales are greater than 0.8, demonstrating high internal consistency in the measurement of each dimension.

4.2. Validity Test

Validity testing is used to assess the structural validity of a measurement tool. This study adopted the KMO test and Bartlett's test of sphericity to judge the suitability of the data for factor analysis. The criteria were set as a KMO value greater than 0.7 and a significant Bartlett's test.

Table 6. Results of KMO and Bartlett's Test of Sphericity

Kaiser-Meyer-Olkin (KMO)Test	Approx. Chi-Square	Degrees of Freedom	Significance
0.784	2537.426	231	0.000

The KMO measure was 0.784, exceeding the threshold of 0.7, indicating strong correlations among variables and suitability for factor analysis. The approximate chi-square value of Bartlett's test of sphericity was 2537.426, with a significance probability of Sig.=0.000 < 0.001, reaching a highly significant level, which further verified that the data was suitable for factor analysis. This result is consistent with the factor structure identified in previous research on SME logistics outsourcing collaboration relationships.

4.3. Exploratory Factor Analysis

Principal component analysis was used to extract common factors with eigenvalues greater than 1, and the varimax method was adopted for factor rotation. A total of 5 common factors with eigenvalues greater than 1 were extracted, with a total variance explanation rate of 74.62%.

Table 7. Total Variance Explained

Component	Initial Eigenvalues	Extraction Sums of Squared Loadings	Rotation Sums of Squared Loadings
	Total	% of Variance	Cumulative %
1	4.97	22.59	22.59
2	3.62	16.45	39.04
3	2.89	13.14	52.18
4	2.04	9.27	61.45
5	1.78	8.09	69.54
6	1.12	5.09	74.62

The cumulative variance explanation rate of the five common factors after rotation was 66.46%, which is comparable to the variance explanation rate in the study by Zaato et al. (2024) and falls within the acceptable range for social science research. The naming of each factor is as follows:

Table 8. Naming of the Five Common Factors

Common Factor	Name	Corresponding Original Dimension
Factor 1	Outsourcing Contract Factor	Outsourcing Contract
Factor 2	Logistics Collaboration Capability Factor	Logistics Collaboration Capability
Factor 3	Information Communication Factor	Information Communication
Factor 4	Outsourcing Control Factor	Outsourcing Control
Factor 5	Logistics Efficiency Factor	Logistics Efficiency

The results of factor analysis verified that the dimensional division of the questionnaire design has good structural validity. All items had factor loadings greater than 0.5 on their corresponding common factors, indicating that the measurement model has good convergent validity.

5. Analysis of Causes of Low Logistics Efficiency from the Perspective of Collaboration Relationships

Based on the factor analysis results and the practices of SMEs in logistics outsourcing, the causes of low logistics efficiency are analyzed from four dimensions.

5.1. Outsourcing Contract Dimension

The outsourcing contract is the institutional foundation of logistics outsourcing collaboration. Several problems exist in current contract design: lack of clarity in contract terms, incompleteness in coverage (e.g., exception handling, information interface requirements, process monitoring authority), and weak contract management abilities (lack of dynamic tracking and evaluation mechanisms).

Specifically, many contracts lack specificity in defining

key performance indicators such as on-time delivery rates, acceptable damage ratios, and information update frequencies. Without quantified standards, SMEs have no objective basis to evaluate logistics provider performance. Furthermore, most contracts do not include provisions for information sharing requirements, such as real-time tracking data or automated inventory updates, which are essential for effective collaboration. Another common deficiency is the absence of dynamic adjustment clauses that would allow contract terms to be modified as business volumes or service requirements change over time.

5.2. Information Communication Dimension

Information communication is a key guarantee for smooth collaboration. Common problems include insufficient timeliness of information transmission, limited depth of information sharing (e.g., lack of production planning and demand forecasting information), and dispersed and inefficient communication channels, leading to distortion and delay.

The consequences of poor information communication are multifaceted. When order information is not transmitted in a timely manner, logistics providers may fail to allocate appropriate transportation capacity, resulting in shipment delays. When inventory status updates are inaccurate or delayed, SMEs may face stockouts or excess inventory simultaneously. When delivery progress information is unavailable, customer service representatives cannot provide accurate delivery estimates to end customers, leading to dissatisfaction and increased inquiry handling costs. Moreover, the absence of automated information exchange mechanisms forces both parties to rely on manual data entry and phone communications, which are both time-consuming and error-prone.

5.3. Outsourcing Control Dimension

Outsourcing control reflects the enterprise's ability to supervise and manage the logistics service process. Weaknesses include inadequate process monitoring systems, lack of performance evaluation mechanisms, and insufficient capacity for handling abnormal situations.

The lack of effective outsourcing control mechanisms manifests in several ways. First, without real-time process monitoring, SMEs cannot detect service failures as they occur; problems are only discovered after customers complain or orders are delayed beyond acceptable windows. Second, in the absence of structured performance evaluation systems, logistics providers receive no regular feedback on their service quality, removing any incentive for continuous improvement. Third, when abnormal situations such as transportation accidents, customs delays, or system outages occur, the absence of pre-established emergency response procedures leads to ad hoc and often ineffective reactions, prolonging disruption durations and magnifying negative impacts on logistics efficiency.

5.4. Logistics Collaboration Capability Dimension

Logistics collaboration capability is the direct driver of logistics efficiency. Current shortcomings include low standardization of business docking, lack of collaborative problem-solving mechanisms, and insufficient depth of resource integration.

Weak logistics collaboration capability typically exhibits three symptoms. The first symptom is low standardization of business docking, meaning that order placement procedures, data exchange formats, and exception reporting protocols vary from transaction to transaction, increasing coordination complexity and error rates. The second symptom is the absence of collaborative problem-solving mechanisms; when issues arise, the tendency is to assign blame rather than jointly investigate root causes and develop preventive solutions. The third symptom is shallow resource integration—SMEs and their logistics providers operate as separate entities rather than as an integrated supply chain, missing opportunities for shared warehousing, consolidated transportation, or joint demand forecasting that could reduce costs and improve service levels for both parties.

6. Countermeasures and Suggestions for Improving Logistics Outsourcing Efficiency

6.1. Optimizing Outsourcing Contract Design and Management

Contracts should clearly define the scope of services, performance standards, responsibility allocation, information interface requirements, process monitoring authority, and breach of contract handling. A dynamic contract management mechanism should be established to evaluate and update contracts regularly.

6.2. Establishing an Efficient Information Communication Mechanism

A unified information sharing platform should be built for order management, inventory inquiries, and delivery tracking. Information interface procedures should be standardized, and the depth of information sharing should be expanded to include production planning and demand forecasting.

6.3. Strengthening Process Control in Outsourcing

A process monitoring system and a performance evaluation system covering key indicators such as on-time delivery rate, accuracy rate, cargo damage rate, and safety management level should be established. Standardized emergency response procedures should be developed for common exceptions.

6.4. Enhancing Logistics Collaboration Capability

Business processes should be standardized, and collaborative problem-solving mechanisms should be established to replace mutual blame with cooperative improvement. When conditions permit, deeper cooperation models involving resource sharing and information system integration should be explored.

7. Conclusion and Future Research

This paper takes SMEs as the research object and uses questionnaire surveys and factor analysis to identify four core influencing factors: outsourcing contract, information communication, outsourcing control, and logistics collaboration capability. The analysis shows that the outsourcing contract provides the institutional foundation, information communication and outsourcing control ensure

process smoothness, and logistics efficiency is ultimately achieved through logistics collaboration capability.

Corresponding optimization strategies are proposed for each dimension. Future research can further explore the mediating and moderating effects among the influencing factors and expand the sample scope to conduct cross-industry comparative analyses.

Several limitations of this study should be acknowledged. First, the data were collected through self-reported questionnaires from SME managers, which may introduce common method bias. Although the factor analysis results indicated that this bias is not severe, future research could incorporate objective performance data from logistics providers or customer satisfaction surveys as complementary measures. Second, this study employed a cross-sectional design, capturing the collaboration relationship at a single point in time. The dynamic evolution of these relationships over extended cooperation periods remains unexplored. Third, the sample was confined to SMEs in a specific geographic region, which may limit the generalizability of findings to other regions with different logistics infrastructures or business cultures. Future research could extend this study in several promising directions. Longitudinal studies tracking the same enterprises over multiple years could reveal how logistics outsourcing collaboration relationships evolve and how changes in contract design, information sharing, or control mechanisms affect efficiency trajectories. Comparative studies across different industry sectors could identify whether the relative importance of the four influencing factors varies between retail, manufacturing, and service-oriented SMEs. Additionally, the potential moderating effects of contextual variables such as enterprise size, outsourcing duration, and technological sophistication warrant further investigation. Finally, emerging digital technologies including cloud-based logistics platforms, Internet of Things sensors, and blockchain-based smart contracts may fundamentally transform collaboration mechanisms in logistics outsourcing, presenting an important avenue for future inquiry.

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