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Enhancing Logistics Operations Quality for Improved Business Efficiency: A Structural Equation Modeling Approach in Manufacturing Enterprises in Northern Vietnam

Thi-Trang-Nhung Nguyen[1] and Thị -Minh -Ngọc Luu[2]

Abstract

The research aims to examine the relationship between the quality of logistics activities and business efficiency in manufacturing enterprises in the Northern region of Vietnam. The study selects five component factors of logistics activities including Internal Logistics, Inbound Logistics, Outbound Logistics, Support Logistics, and Logistics Costs to assess the impact of these factors on the Logistics Operation Quality and Business Effective. Primary data is collected from survey results, with 173 valid questionnaires. The study employs a Structural Equation Modeling (SEM) approach, processing data using SPSS 24 and AMOS 24 software. The research findings indicate that factors related to well-organized logistics activities all have a positive influence on the quality of logistics activities. Among these factors, the quality of Inbound Logistics has the greatest impact on the quality of logistics activities. Additionally, the quality of logistics activities positively affects the business efficiency of enterprises. Managerial implications and future research directions are also discussed.

Keywords: *Logistics Operation, Quality of Logistics Operation, Business Effective, Manufacturing Enterprises*

INTRODUCTION

In the current era of strong globalization, competition among nations worldwide is becoming increasingly fierce and intense. Efficient development of logistics services contributes to enhancing the competitive capacity of economies and nations. Logistics efficiently addresses both input and output for enterprises, optimizing the process of transporting raw materials, goods, and services, thus reducing costs and increasing competitiveness for businesses. Logistics plays a crucial role in delivering products to the right place at the right time. Products and services can only satisfy customers and add value when they reach customers on time and at the designated location. Therefore, logistics services have, are, and will continue to impact the business operations of enterprises.

According to the Vietnam Logistics Report 2020 by the Ministry of Industry and Trade, the textile and garment industry ranks second in terms of import-export turnover in Vietnam. Hence, the logistics sector plays a crucial role in the import and export of goods, raw materials, and materials for enterprises in the process of global economic integration. It can be said that transportation costs, warehousing for goods, raw materials, etc., have exerted significant pressure on large-scale textile and garment enterprises participating in the export market and global supply chains. However, the Vietnamese logistics industry still faces many constraints and difficulties. Most Vietnamese logistics enterprises are small-scale domestic firms with fragmented services, lacking integration to create service chains among enterprises, primarily providing basic transportation services, leading to high costs. Additionally, the workforce lacks standardization, technology application remains low, and there is a serious shortage of personnel with managerial skills in the logistics field as well as proficiency in foreign languages.

As supply networks become an integral part of the global business environment, the quality of logistics activities has become a decisive factor for the success of manufacturing enterprises, especially in Northern Vietnam - an area with strong industrial development potential and a large number of industrial parks.

[1] Department of Business administration, Hanoi University of Industry, Bac Tu Liem District, Hanoi, Vietnam. E-mail: nhungntt@haui.edu.vn (Corresponding Author)

[2] International School,Vietnam National University, Hanoi, Vietnam E-mail: ltmngoc@vnu.edu.vn (Corresponding Author)

The quality of logistics activities not only affects the ability to supply and distribute goods efficiently but also directly impacts the costs, time, and customer relationships of enterprises. High-quality logistics services increase customer satisfaction, thereby contributing to sales growth (Baki, 2009). Understanding this relationship can help enterprises enhance competitiveness, improve performance and profitability, while creating sustainable value in an increasingly competitive business environment.

Northern Vietnam has a large number of manufacturing enterprises operating in various fields. This region is evaluated as having economic development potential due to its strategically important geographical location in national production. According to the General Statistics Office, the GDP for the first 9 months of 2022 increased by 8.83% compared to the same period last year, the highest growth rate in a decade; Bac Ninh province ranks third nationwide in terms of total registered capital, with nearly $1.78 billion, accounting for 9.5% of the total (Dang, 2022).

The question arises: how can we determine the relationship between the quality of logistics activities and business efficiency? Many studies have been conducted to explore the relationship between the quality of logistics activities and business efficiency. Research conducted by T. P. T. Lê (2023) aimed to determine the relationship between logistics activities and business efficiency in the textile and garment industry in the Binh Tri Thien region. The study synthesized survey results from 212 textile and garment enterprises in three provinces in the Binh Tri Thien region and analyzed the collected data using the PLS - SEM method. The study by Tùng (2024) focused on solutions to improve the quality of logistics services at DHL Express Vietnam. The research objectives aimed to assess the current state of logistics service quality at DHL Express Vietnam, identify the strengths, weaknesses, and reasons for limitations in improving the service quality of this enterprise. The study by Linh (2024) analyzed theories of resources, logistics service quality, and perceived efficiency, while identifying relationships between factors through a review of related studies.

Based on this, this study aims to expand and contribute to previous research on the relationship between the quality of logistics activities and business efficiency of manufacturing enterprises in Northern Vietnam. This study aims to analyze the impact of logistics-related factors on the efficient operations of manufacturing enterprises on a Northern scale. The focus of this study is on one of the growing service sectors in Vietnam, which still has considerable potential for exploration. With these reasons and the desire to contribute theoretical and practical significance related to logistics activities and business efficiency. The article is structured into 5 parts:

Part 1: Introduction

Part 2: Theoretical Foundation and Research Model

Part 3: Research Methodology

Part 4: Research Findings

Part 5: Results and Discussion

THEORETICAL FOUNDATION AND RESEARCH MODEL

Theoretical Foundation

Logistics operation

Logistics is described as the activities (services) related to warehousing and transportation, including tasks related to supply, transportation, production monitoring, warehouse management, distribution procedures, customs, etc. Logistics encompasses activities from various industries and stages in a complete process (Đặng Đình Đào, 2012). Thus, logistics can be understood as the management and coordination of activities related to the movement, storage, and handling of goods and information from the source to the end consumer, target, or user. It is an integral part of the supply chain, where goods move from production to the ultimate consumer.

Logistics activities include warehouse management, transportation, packaging, order processing, transportation information, and other support services. The goal of logistics is to ensure that goods are delivered to the right place, at the right time, under safe conditions, and at a reasonable cost. Logistics plays a crucial role in optimizing the efficiency and profitability of businesses, from minimizing transportation costs to improving delivery times and enhancing customer relationships. It also plays a vital role in responding quickly and flexibly to market demands and customer needs. Based on the classification of logistics activities in manufacturing companies, the study identifies the following logistics activities:

Internal Logistics: The term "internal logistics" is often used to refer to the management, coordination, and operation of goods, information, and service activities within the internal scope of an organization or business. In a company, internal logistics typically involves warehouse management, internal supply chain management, project management, and other internal processes to ensure the organization's efficient and flexible operation. Internal logistics is the department responsible for managing and coordinating goods, information, and service activities within the internal scope of an organization or business. The main tasks of internal logistics include warehouse management, internal supply chain coordination, support for internal projects, transportation management within the organization, information management, and process optimization. By organizing and managing these activities efficiently, internal logistics ensures organizational flexibility, efficiency, and effectiveness (Đặng et al., 2011).

Inbound Logistics: Inbound logistics is the process of managing and coordinating activities related to importing, purchasing, and receiving raw materials, finished products, or services from external suppliers. The goal of inbound logistics is to ensure that the organization has sufficient materials and resources to maintain continuous and efficient production and business operations. The main tasks of inbound logistics include order management, order processing, transportation and delivery, quality inspection, storage, and inventory management, as well as ensuring flexibility and efficiency in the import and receipt of goods. By organizing and managing these activities closely, inbound logistics ensures that the organization has sufficient materials and resources to maintain continuous and efficient production and business operations (T. P. T. Lê, 2023).

Outbound Logistics: It involves the transportation and distribution of raw materials, finished products from the factory to end-users. The task of outbound logistics also includes establishing relationships between the company and customers. Besides directly influencing costs and revenues, outbound logistics also directly affects the competitive position of the business (Hoa, 2013, Đặng Đình Đào and Thảo, 2011, Đặng Đình Đào, 2003).

Supporting Logistics: Supporting logistics is the process of supporting transportation activities from production sites to end-users. Supporting logistics involves managing and coordinating services and resources related to processing and converting finished products or services from the production process into final products or services delivered to customers. Specifically, supporting logistics includes activities such as packaging, labeling, quality inspection, preservation, transportation, and distribution of goods. The goal of supporting logistics is to ensure that products or services are delivered to customers on time, at the right place, and in the best condition, thereby enhancing customer satisfaction and strengthening the organization's competitiveness in the market (Vân, 2010, Hoa, 2013, Đặng Đình Đào and Thảo, 2011).

Logistics Costs: Logistics costs are the total amount that an organization or business must spend to perform logistics activities, including warehouse management, transportation, goods storage, order processing, and other activities related to coordinating and managing the flow of goods and information throughout the entire supply chain. Logistics costs may include expenses such as transportation costs, warehousing costs, packaging costs, inventory management costs, order processing costs, transportation and personnel costs, information technology costs, and other costs related to managing and coordinating logistics activities. This can affect product costs, profitability, and the competitiveness of an organization in the market (Vân, 2010, Lê Phúc Hoà, 2007, Hoa, 2013, Đặng Đình Đào and Thảo, 2011).

Quality of Logistics Activities

The quality of logistics activities refers to the benefits that a logistics service provider offers to customers to meet or exceed their expectations and achieve high efficiency throughout the supply chain (Ngân, 2024). Thus, the quality of logistics activities is the extent to which the activities in the supply chain and logistics management of an organization or enterprise meet the standards, requirements, and expectations for performance, reliability, and customer satisfaction.

Many studies have been conducted on the quality of logistics operations in the past, such as "Logistics Performance Measurement: Issues and Future Directions" by Peck (1995). This study focuses on evaluating and measuring the performance of logistics operations while proposing future development directions. "Measuring the Quality of Logistics Services: A Case Study" McGinnis (2000) conducts an experimental study to measure the quality of logistics services through a case study. "Quality in logistics services—A cross-national comparison" by John Fernie (2004) compares the quality of logistics services in different countries and proposes improvements to enhance quality. "Customer Perceptions of Logistics Service Quality in the E-Commerce Context" by Humphreys (2006) focuses on customer perceptions of logistics service quality in the context of e-commerce. "Assessing the quality of logistics services: An empirical study on the perception of importers in Australia" by Duc Hong Vo and Kim-Phuong L. Vu (Vu, 2017) conducts a study evaluating the quality of logistics services based on the perspectives of importers in Australia. These studies provide important information on how to measure, evaluate, and improve the quality of logistics operations, as well as propose methods and strategies to enhance performance and customer satisfaction in the logistics field.

Business Effective

Business effective is a concept that reflects how a company is utilizing its human resources to achieve its defined business goals and plans effectively (Yuan et al., 2018). It enables companies to compare the difference between output and input results, between investment costs and revenue received. Specifically, only newly established businesses need to evaluate this index because their goal is to maximize profits (Nguyen and Vu, 2023). Business efficiency is the extent to which an organization or business achieves its goals efficiently, by optimizing the use of its resources and capabilities to create the highest possible value (Đinh, 2022). Evaluating business efficiency is not only based on achieving profits but also includes other factors such as increasing sales growth, enhancing competitiveness, improving brand image, enhancing customer satisfaction, and creating value for shareholders and the community. Business efficiency is often measured by various means, including financial indicators such as profit, revenue, profit margin, return on investment (Nguyen et al., 2024), as well as non-financial indicators such as product/service quality, customer satisfaction, employee motivation and development, and social and environmental interactions. An organization or business is considered to be business-efficient when it can create long-term value for all stakeholders, maintain and develop infrastructure, and maintain a balance between financial and non-financial goals.

Hypotheses and Proposed Research Model

Despite numerous studies on logistics, both in theory and practice, little attention has been paid to identifying the factors of logistics services that affect business efficiency. In the process of literature review, many studies have been conducted, including Gillyard (2003), Dang Dinh Dao and Nguyen Minh Son (Đặng Đình Đào, 2012). These authors have pointed out that factors depending on logistics services, such as quality and price, all impact the business efficiency of enterprises. The quality of logistics for manufacturing enterprises is formed from many aspects (Nguyen and Luu, 2019), including transportation services, supply of raw materials, and other factors such as packaging, warehousing, and information services. The quality of logistics services helps improve management, reduce production costs, and enhance competitiveness. It can be concluded that the quality of logistics services has a positive effect on business efficiency (Gillyard, 2003).

For manufacturing enterprises, evaluating logistics service providers in terms of price is very important to ensure minimizing total costs and timely and accurate delivery (Nguyen et al., 2019). The authors classify

factors based on logistics processes, including internal logistics, inbound logistics, outbound logistics, supporting logistics, and logistics costs. These factors all depend on the quality and price of services. From this issue, the research topic will focus on 6 groups of factors: (1) internal logistics quality, (2) inbound logistics quality, (3) outbound logistics quality, (4) supporting logistics quality, (5) logistics costs, and (6) logistics activities.

Based on this, the authors propose the following hypotheses:

H1: Internal logistics quality has a positive relationship with enterprise logistics activities.

H2: Inbound logistics quality has a positive relationship with enterprise logistics activities.

H3: Outbound logistics quality has a positive relationship with enterprise logistics activities.

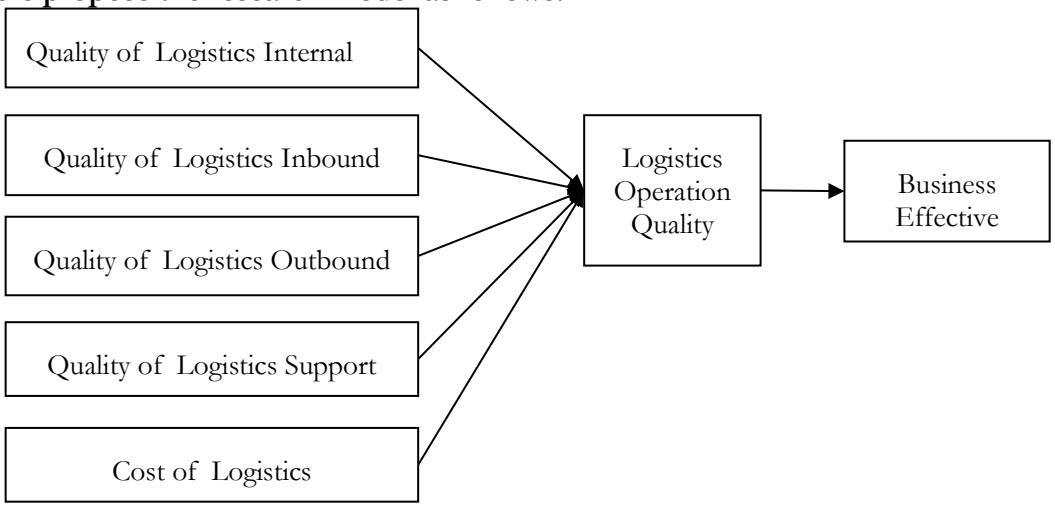
H4: Supporting logistics quality has a positive relationship with enterprise logistics activities.

H5: Logistics costs have a positive relationship with enterprise logistics activities.

H6: Logistics activities have a positive relationship with enterprise business efficiency.

Regarding the proposed research model, in addition to factors related to logistics activities and business efficiency referenced from previous studies such as Gillyard (2003) and Yuan et al. (2018), Đặng Đình Đào (2012), the authors propose to omit the impacts of the Covid variable since it was researched in 2023 and 2024, a time when the Covid-19 pandemic had been controlled and did not significantly affect the economy at that time.

Finally, the authors propose the research model as follows:



(Source: The Authors)

Picture 1 Proposed Research Model

RESEARCH METHODOLOGY

Research Design

The study was conducted using both secondary and primary data to analyze the impact of logistics activities on the business efficiency of manufacturing enterprises in the Northern region of Vietnam. Data were collected through questionnaire distribution and processed using SPSS 24 and AMOS 24 software.

In terms of measurement scales, based on in-depth research by authors, such as Gillyard (2003), Đặng Đình Đào (2012), Vân (2010), Hảo (2015) regarding the impact of logistics activities on business production, the study synthesized the factors affecting the efficiency of business production.

The measurement model comprises 7 observed variables, including Quality of Logistics Internal scale (Log_Inter) with 4 observed variables, Quality of Logistics Inbound scale (Log_InB) with 5 observed variables, Quality of Logistics Outbound scale (Log_OutB) with 5 observed variables, Quality of Logistics Support scale (Log_Sup) with 6 observed variables, Cost of Logistics (Log_Cost) with 6 observed variables, Logistics Operation Quality scale (Log_Qual) with 4 observed variables, and Business Effective scale (Bus_Eff) with 4 observed variables.

Data Collection

200 questionnaires were sent to manufacturing businesses across the entire Northern region of Vietnam. However, only 182 responses were received, with 9 respondents failing to provide sufficient answers or marking the same choice repeatedly. Thus, only 173 valid survey responses were collected from employees, which also represent the official sample size of this study.

Table 1. Descriptive statistics

Element	Ingredient	Quantity	%
Type of Enterprise	State – owned enterprises	33	19.1
	100% privately-owned enterprises	84	48.6
	Foreign-invested enterprises	56	32.4
Target Market	Domestic market	67	38.7
	International market	54	31.2
	Both domestic and international market	52	30.1
Business Setor	Electronics	25	14.5
	Wood processing and furniture	32	18.5
	Textile and garment	31	17.9
	Metalworking	26	15.0
	Processing agricultural products, food	25	14.5
	Leather and footwear	9	5.2
	Auto part	11	6.4
	Other industries	14	8.1
Revenue in 2023 (Unit: VND)	Less than 3 billion	20	11.6
	3 billion to 10 billion	67	38.7
	10 billion to 50 billion	51	29.5
	50 billion to 100 billion	28	16.2
	Over 100 billion	7	4.0
Number of Employees (Unit: persons)	Less than 10	27	15.6
	From 10 to 50	68	39.3
	From 50 to 100	42	24.3
	From 100 to 200	27	15.6
	Over 200	9	5.2

(Source: The Authors)

RESEARCH FINDINGS

Evaluation of Measurement Reliability

The reliability of a scale is assessed through two main indices, Cronbach's Alpha and Composite Reliability. Composite Reliability (CR) is often preferred over Cronbach's Alpha because Cronbach's Alpha tends to underestimate reliability compared to CR (Hair, 2017). Chin (1998) suggested that in exploratory research, CR should be at least 0.6. For confirmatory studies, a threshold of 0.7 is considered appropriate for CR (Henseler, 2013). Many researchers agree that a threshold of 0.7 is suitable for the majority of cases, as noted by Hair (2017) and Bagozzi (1988).

To assess the measurement scales, the study uses the criterion of Cronbach's Alpha (Ca) with Ca > 0.7 and the inter-item correlation coefficient > 0.3. The values of Ca range from 0.859 to 0.931, all of which are greater than 0.7. However, after removing scale LS6, the reliability of the Logistics Support scale increased. Therefore, scale LS6 was excluded from the group. The reliability results of the measurement scales after removing LS6 are presented in the tables below:

Table 2 Cronbach's alpha reliability statistics

Measurement Items	Cronbach's Alpha (Ca)
Logistics Internal	0.832
Logistics Inbound	0.843
Logistics Outbound	0.878
Logistics Support	0.826
Logistics Cost	0.921
Logistics Quality	0.860
Business Effective	0.916

(Source: The Authors)

Results of Scale Testing for Factor Groups. Based on the analysis, all Cronbach's alpha values are greater than 0.8. This indicates that the 7 factor groups meet the conditions for further analysis steps (Hair, 2017).

Factor Analysis Exploration (EFA) Results

After assessing that the measurement scales meet the standards, all 7 factor groups are suitable for conducting EFA. The results of the EFA are as follows:

Table 3 EFA Results

Measurement Items	Inspection Value
KMO value	0.916
Bartlett's Test of Sphericity	0.000
Total Variance Explained	63.999
Eigenvalues	1.918

(Source: The Authors)

KMO Value: 0.916 ($0.5 \leq KMO \leq 1$); Bartlett's Test Significance (Sig): 0.000 (<1%). These results indicate that the variables are correlated with each other in the overall dataset, and applying factor analysis is appropriate.

Seven factors are extracted based on the criterion of Eigenvalue = 1.918 > 1, and these 7 factors summarize the information of the 33 observed variables entered into the EFA most effectively. The total variance explained by these 7 factors is 63.999% > 50%, indicating that the 7 factors explain 63.999% of the variance in the data of the 33 observed variables included in the EFA. The results of the factor rotation matrix Pattern Matrix are shown in the table below:

Table 4 Pattern Matrix

Observed Variables	Factor							Factor's Name
	1	2	3	4	5	6	7	
LI1	.754							Logistics Internal
LI2	.649							
LI3	.753							
LI4	.765							
LIB1		.714						Logistics Inbound
LIB2		.626						
LIB3		.656						
LIB4		.723						
LIB5		.673						
LOB1			.606					Logistics Outbound
LOB2			.766					
LOB3			.669					
LOB4			.687					
LOB5			.726					
LS1				.753				Logistics Support
LS2				.668				
LS3				.893				
LS4				.879				
LS5				.729				
LC1					.813			Logistics Cost
LC2					.774			
LC3					.815			
LC4					.839			

LC5					.730			
LC6					.854			
LQ1						.913		Logistics Quality
LQ2						.741		
LQ3						.771		
LQ4						.665		
BE1							.760	Business Effective
BE2							.710	
BE3							.982	
BE4							.949	

(Source: The Authors)

In summary, after testing with a sample size of 173 using SPSS software, all measurement scales in the theoretical research model met the standards, with no need to remove any scale components. Therefore, the proposed factors in the model remained unchanged, preserving the integrity of the concepts. The official research model did not differ from the proposed model. Based on these results, Confirmatory Factor Analysis (CFA) is conducted next.

Confirmatory Factor Analysis (CFA)

To ensure the unidimensionality of the observed variables, the study used the following criteria:

CMIN/df: 1.483 (CMIN/df ≤ 2)

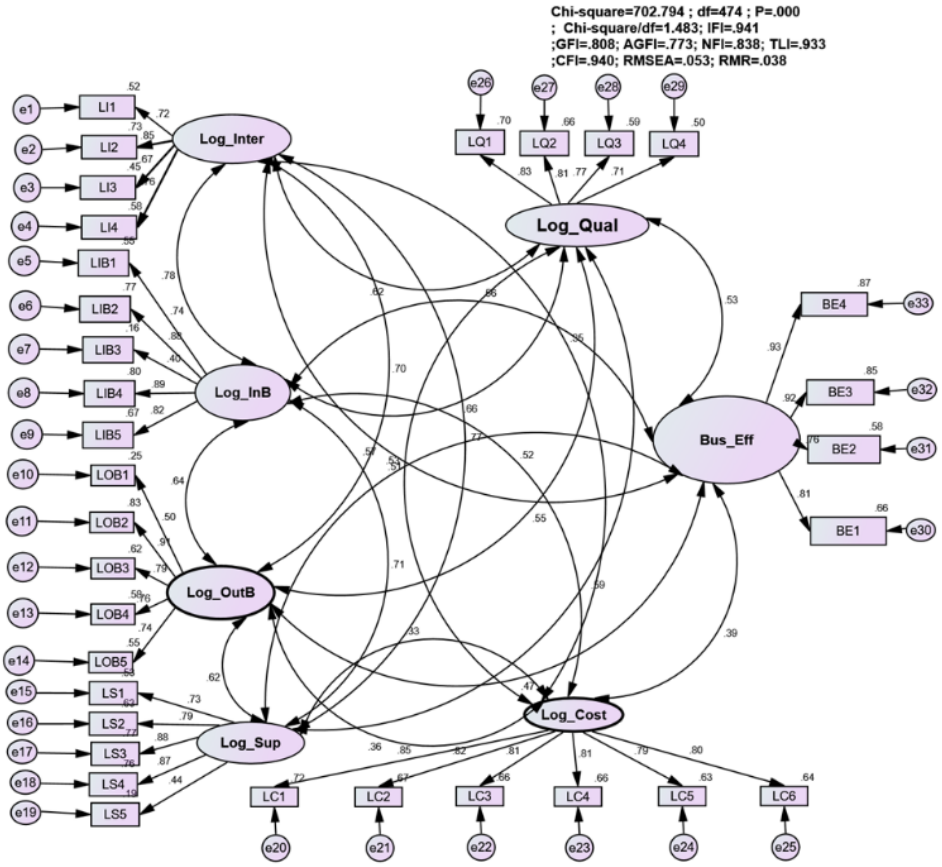
GFI (Goodness of Fit Index): 0.808 (8 < GFI < 9)

CFI (Comparative Fit Index): 0.940 (CFI ≥ 0.9)

TLI (Tucker-Lewis Index): 0.933 (TLI ≥ 0.9)

RMSEA (Root Mean Square Error of Approximation): 0.053 (RMSEA ≤ 0.6)

Due to sample size limitations, the GFI value of 0.808 remains acceptable according to Baumgartner and Homburg (1996) and Doll et al. (1994).



(Source: The Authors)
Picture 2 CFA Model

The results of the CFA analysis indicate that the measurement model fits the real data well. To continue the study, we examine the reliability, convergence, and discriminant validity of the measurement scales.

Firstly, to assess reliability, the study evaluates the standardized factor loadings (≥ 0.5) and composite reliability (CR ≥ 0.7).

Then, for convergent validity, the convergence of a scale is assessed based on the Average Variance Extracted (AVE) index (Hair, 2017). Hock & Ringle suggest that a scale achieves convergence if the AVE reaches 0.5 or above. This threshold of 0.5 (50%) implies that, on average, the latent variable explains at least 50% of the variance in each observed variable (Hock, 2010). The statistical results in the table below indicate that all AVE values are above 0.5, ensuring the scale's convergence.

Lastly, to achieve discriminant validity, the Maximum Shared Variance (MSV) indices must be smaller than the corresponding AVE indices; simultaneously, the Square Root of AVE (SQRTAVE) must be larger than the inter-construct correlation indices.

The results of these tests all meet the requirements and are presented in the following tables:

Table 5. Standardized Regression Weights

Count				Estimate	Count				Estimate
1	LIB5	<---	Log_Inter	.816	17	LS1	<---	Log_Sup	.728
2	LIB4	<---	Log_Inter	.893	18	DR5	<---	Log_OutB	.743
3	BE1	<---	Bus_Eff	.813	19	DR4	<---	Log_OutB	.762
4	LIB1	<---	Log_Inter	.743	20	DR3	<---	Log_OutB	.790
5	LIB2	<---	Log_Inter	.879	21	DR2	<---	Log_OutB	.908
6	LIB3	<---	Log_Inter	.399	22	DR1	<---	Log_OutB	.500
7	LI2	<---	Log_InB	.854	23	LS1	<---	Log_Cost	.847
8	LI3	<---	Log_InB	.674	24	LS2	<---	Log_Cost	.820
9	LI4	<---	Log_InB	.759	25	LS3	<---	Log_Cost	.810
10	BE2	<---	Bus_Eff	.759	26	LS4	<---	Log_Cost	.810
11	BE3	<---	Bus_Eff	.920	27	LS5	<---	Log_Cost	.791
12	BE4	<---	Bus_Eff	.933	28	LI1	<---	Log_InB	.720
13	LS3	<---	Log_Sup	.876	29	LQ4	<---	Log_Qual	.706
14	LS4	<---	Log_Sup	.872	30	LQ3	<---	Log_Qual	.766
15	LS5	<---	Log_Sup	.439	31	LQ2	<---	Log_Qual	.811
16	LS2	<---	Log_Sup	.795	32	LQ1	<---	Log_Qual	.834
					33	LS6	<---	Log_Cost	.800

(Source: The Authors)

Table 6. CR, AVE, and SQRTAVE evaluation results

	CR	AVE	Log_ Inter	Log_ InB	Log_Ou tB	Log_Sup	Log_Cos t	Log_Qu al	Bus_Eff
Log_Inter	0.821	0.535	**0.731**						
Log_InB	0.810	0.462	0.783***	**0.680**					
Log_OutB	0.821	0.480	0.643***	0.700***	**0.693**				
Log_Sup	0.891	0.623	0.709***	0.772***	0.623***	**0.789**			
Log_Cost	0.917	0.648	0.517***	0.353***	0.356***	0.335***	**0.805**		
Log_Qual	0.858	0.606	0.662***	0.622***	0.546***	0.591***	0.507***	**0.778**	
Bus_Eff	0.917	0.737	0.559***	0.568***	0.474***	0.533***	0.393***	0.533***	**0.858**

(Source: The Authors)

Testing the Model and Research Hypotheses

The results of the model testing indicate that all analysis criteria meet the necessary standards, confirming that the research model is appropriate for the collected data.

Specifically:

CMIN/df = 2.253 (CMIN/df ≤ 3)

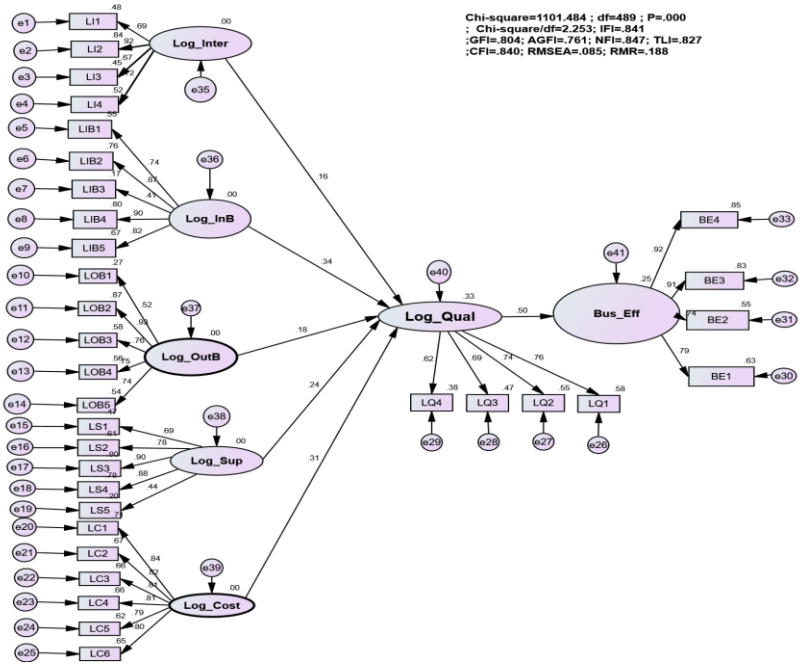
GFI (Goodness of Fit Index) = 0.804 (8 < GFI < 9)

CFI (Comparative Fit Index) = 0.840 (CFI ≥ 0.8)

TLI (Tucker-Lewis Index) = 0.827 (TLI ≥ 0.8)

RMSEA (Root Mean Square Error of Approximation) = 0.085 (RMSEA ≤ 0.6)

Due to the sample size limitation, the GFI value of 0.804 is still acceptable according to Baumgartner and Homburg (1996) and Doll et al. (1994).



(Source: The Authors)

Picture 3 SEM linear structural model

Through statistical indicators, the author tested the proposed research hypotheses. The results of Structural Equation Modeling (SEM) analysis indicate that all relationships are statistically significant at a 95% confidence level ($p < 0.05$). Furthermore, the relationships have positive effects on each other, as evidenced by positive parameter estimates.

Table 7 Regression weight

Hypothesis	Correlation			Estimate	S.E	C.R	P
H1	Log_Qual	<---	Log_InB	.137	.066	2.062	**.039**
H2	Log_Qual	<---	Log_Inter	.308	.075	4.115	***
H3	Log_Qual	<---	Log_OutB	.187	.086	2.186	**.029**
H4	Log_Qual	<---	Log_Sup	.243	.083	2.926	**.003**
H5	Log_Qual	<---	Log_Cost	.220	.057	3.876	***
H6	Bus_Eff	<---	Log_Qual	.565	.103	5.497	***

(Source: The Authors)

Through statistical indicators, the author tested the proposed research hypotheses. The official research model includes 7 factors: Log_Inter, Log_InB, Log_OutB, Log-Sup, Log_Cost, and Log_Qual. Based on the results of SEM analysis, all hypotheses from H1 to H6 proposed were accepted, except for H1 and H3, which were not accepted because $p > 0.05$.

Table 8 Standardized regression coefficient

Count	Correlation			Estimate
1	Log_Qual	<---	Log_InB	.164
2	Log_Qual	<---	Log_Inter	.343
3	Log_Qual	<---	Log_OutB	.177

4	Log_Qual	<---	Log_Sup	.236
5	Log_Qual	<---	Log_Cost	.311
6	Bus_Eff	<---	Log_Qual	.500

(Source: The Authors)

For factors influencing the quality of logistics operations, internal logistics quality emerges as the stronger influencing factor. This is evidenced by the standardized coefficient estimates between internal logistics quality and overall logistics quality, with an absolute value of 0.343. In contrast, the absolute values of the standardized coefficients of the influences of Log_InB, Log_OutB, Log-Sup, and Log_Cost on this factor are only 0.164, 0.177, 0.236, and 0.311, respectively. Therefore, enhancing the quality of logistics operations can prioritize improving internal logistics quality to achieve higher efficiency.

RESULTS AND DISCUSSION

The results indicate a positive relationship between Logistics Operations Quality and the Business Effective of manufacturing enterprises in the Northern region of Vietnam, with a standardized coefficient of 0.500.

The findings of this study are also consistent with several research results from both domestic and international authors regarding the relationship between logistics activities and business performance. Authors such as Lai (2002) have highlighted the impact of outsourcing logistics activities on the efficiency of business logistics. Specifically, they noted that low-quality logistics services, weak management, and a lack of management mechanisms would affect the efficiency of logistics operations. Hugos (2006) has also focused on analyzing the impact of logistics management, including transportation, warehousing, packaging, inventory management, and information management, which are crucial for a company's success.

The proposed research model encompasses 7 research concepts, with a total of 6 research hypotheses to be tested using a structural equation modeling (SEM) approach. Specifically, the study integrates quantitative techniques such as Cronbach's Alpha reliability testing, exploratory factor analysis (EFA), and confirmatory factor analysis (CFA). With all 6 research hypotheses proposed, the results of the hypothesis testing at a 95% confidence level indicate that all hypotheses are accepted.

Among the factors influencing the Logistics Operations Quality, Quality of Logistics Internal, Quality of Logistics Inbound, Quality of Logistics Outbound, Quality of Logistics Support, and Cost of Logistics were identified. Additionally, was found to have a significant positive impact on Business Effective within organizations. Notably, Logistics Operations Quality exhibited the strongest influence on Business Effective (β= 0.500).

Regarding factors affecting Logistics Operations Quality, Quality of Logistics Internal emerged as the stronger influencing factor. This is supported by the standardized coefficient estimates, where the absolute value of the standardized coefficient between internal logistics quality and overall logistics quality was 0.343, compared to 0.164, 0.177, 0.236, and 0.311 for Log_InB, Log_OutB, Log-Sup, and Log_Cost, respectively. Therefore, enhancing internal logistics quality should be prioritized for achieving higher efficiency in logistics operations.

The study conducted at manufacturing enterprises in Northern Vietnam explores the relationship between Logistics Operations Quality and Business Effective. While the research contributes academically and practically, it has identified several limitations: Firstly, the sampling method employed convenience sampling, which may not represent the entire population. Future research should use larger and more diverse samples across various provinces and industries. Secondly, the research model explains only a portion of the variance of the dependent variable, and there may be additional factors beyond the independent and mediating variables in the model. Moreover, the study is limited in synthesizing theoretical bases due to the emerging nature of the research field, lacking established theories from both domestic and international research markets. Lastly, the study only examines the relationship between organizational justice and knowledge

sharing through job satisfaction without considering direct relationships. Future research should diversify the model to accurately assess the research significance.

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