Relationship Between Information Technology, International Logistics Performance and High-Quality Development of Foreign Trade

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ABSTRACT
In the context of globalization and digitalization, the relationship between information technology, international logistics performance and high-quality development of foreign trade has garnered increasing attention. This study constructs a Structural Equation Model (SEM) to analyse the impact mechanism of information technology on international logistics performance and high-quality development of foreign trade, while exploring the mediating role of international logistics performance between information technology and high-quality development of foreign trade. The findings reveal that information technology has significantly enhanced international logistics performance by optimizing key indicators such as logistics service quality, cargo tracking capability, customs clearance efficiency, timely transportation of goods, logistics infrastructure quality, and international transportation with competitive price, thereby promoting high-quality development of foreign trade. Furthermore, the various dimensions of international logistics performance play a significant mediating role between information technology and high-quality development of foreign trade.

Keywords: *Information technology, International logistics performance, High-quality development of foreign trade, Structural Equation Model, Mediating effect.*

1. INTRODUCTION

Driven by globalization and digitalization, the interrelationship between information technology, international logistics performance and high-quality development of foreign trade has become increasingly intricate. Innovations in information technology, particularly in the realms of the Internet, big data, and artificial intelligence, have fundamentally altered the operational paradigms of international logistics. These advancements have not only enhanced logistics efficiency and reduced operational costs, but also significantly bolstered supply chain transparency and traceability. As a result, they have exerted a profoundly positive influence on logistics enterprises and propelled the high-quality development of foreign trade. Concurrently, the intensification of global economic integration and regional cooperation has led to a substantial increase in both the scale and complexity of international trade, thereby imposing more stringent requirements on international logistics performance. Against this backdrop, an in-depth exploration of the interplay between these three factors holds considerable significance for both theoretical and practical advancements.

Analysing the interplay between information technology, international logistics performance and high-quality development of foreign trade can facilitate the integration of multiple disciplines, including international trade, logistics management, and information technology. This multi-disciplinary approach not only enriches the theoretical framework by offering new perspectives but also provides a scientific basis for policymakers. Additionally, it assists enterprises in enhancing their competitiveness. Against the backdrop of globalization and digitalization, these efforts contribute to strengthening the resilience of foreign trade. Moreover, they hold significant importance for achieving the United Nations Sustainable Development Goals, promoting green development, and balancing economic, environmental, and social responsibilities.

2. RESEARCH ASSUMPTIONS AND MODEL CONSTRUCTION

2.1 Research Assumptions

The foundation of information technology can indirectly enhance international logistics performance by positively influencing infrastructure (Wang Xintian, 2015) [1]. The level of information infrastructure directly affects logistics performance (Closs et al., 1997; Wang Lin and Yang Jianzheng, 2014) [2][3]. Information technology not only has a direct promoting effect on international logistics performance but also indirectly improves logistics performance by optimizing infrastructure and supply chain management.

Therefore, this paper proposes:

- Hypothesis H1: Information technology has a significant positive impact on international logistics performance.

Information technology has significantly promoted the development of international trade by reducing information search costs and communication costs (Freund and Weinhold, 2002) [4]. From the micro perspective of enterprises, the application of information technology can enhance the extensive and intensive margins of enterprise exports, lower export prices, and increase export quantities (Shi Bingzhan, 2016) [5]. Through various mechanisms such as reducing trade costs, improving production efficiency, and promoting technological innovation, information technology has had a significant positive impact on the high-quality development of foreign trade.

Therefore, this paper proposes:

- Hypothesis H2: Information technology has a significant positive impact on the high-quality development of foreign trade.

Good logistics performance means that all links can be closely connected and operate efficiently, reducing the loss and time cost of goods during transit, improving overall logistics efficiency, and promoting import and export trade (Zhu Shiyan, 2021) [6], and it also promotes the high-quality development of foreign trade at a deeper level.

Therefore, this paper proposes:

- Hypothesis H3: International logistics performance has a significant positive impact on the high-quality development of foreign trade.

The improvement of information technology helps to ensure the full exchange of information among upstream and downstream enterprises in the supply chain. This not only enables real-time tracking of goods' trajectories but also guarantees the smooth flow of all logistics links, improving the efficiency and quality of logistics services (Li Yonghui, 2020) [7]. At the same time, the foundation of information technology indirectly affects international logistics performance by influencing infrastructure. Further in-depth analysis shows that international logistics performance indicators have a significant impact on export trade (Xiao Minglu, 2021) [8]. As a key link in international trade, the improvement of international logistics performance can optimize the trade process, enhance the competitiveness of foreign trade products, and thus promote the high-quality development of foreign trade (Sharapiyeva, 2019) [9]. Based on this, information technology is likely to affect the various indicators of international logistics performance and thus act on the high-quality development of foreign trade, with an obvious mediating effect path.

Therefore, this paper proposes:

- Hypothesis H4: International logistics performance has a mediating effect between information technology and the high-quality development of foreign trade.
- Hypothesis H4a: Logistics Competence has a mediating effect between information technology and the high-quality development of foreign trade.
- Hypothesis H4b: Tracking and Tracing has a mediating effect between information technology and the high-quality development of foreign trade.
- Hypothesis H4c: Customs has a mediating effect between information technology and the high-quality development of foreign trade.
- Hypothesis H4d: Timeliness has a mediating effect between information technology and the high-quality development of foreign trade.
- Hypothesis H4e: Infrastructure has a mediating effect between information technology and the high-quality development of foreign trade.
- Hypothesis H4f: International Shipments has a mediating effect between information technology and the high-quality development of foreign trade.

2.2 Model Construction

According to the previously proposed hypotheses, the conceptual model is established, as shown in "Figure 1".

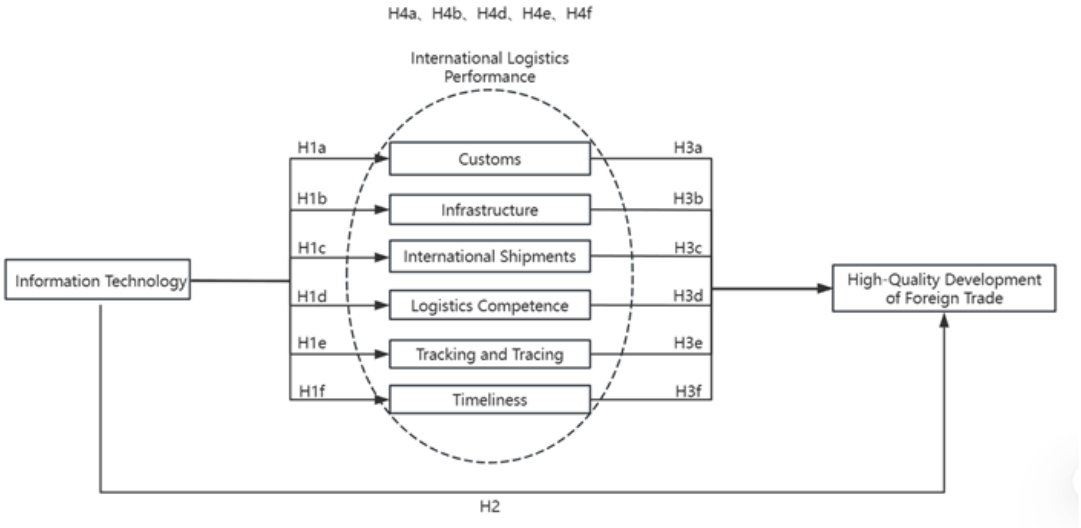

Figure 1 Conceptual model.

3. RESEARCH DESIGN

3.1 Questionnaire Design and Data Collection

This study designs a questionnaire focusing on the interrelationships among information technology, international logistics performance, and high-quality development of foreign trade. The questionnaire is distributed to individuals engaged in logistics, foreign trade, and information technology fields, covering government civil servants, public institution staff, enterprise employees, and research scholars. A total of 260 questionnaires were distributed through the Credamo platform, with 200 valid responses collected, resulting in an effective response rate of 76.92%.

3.2 Research Methodology

This paper utilizes SPSS software for preprocessing the collected questionnaire data and conducting reliability and validity analyses. By constructing a Structural Equation Model (SEM) using AMOS software, this study explores the direct impact of information technology on international logistics performance, as well as the mediating role of various dimensions of international logistics performance between information technology and high-quality development of foreign trade.

4. DATA ANALYSIS AND HYPOTHESIS TESTING

4.1 Reliability and Validity Analysis

4.1.1 Reliability Analysis

Cronbach's Alpha coefficient was used for reliability assessment. The results for each variable are presented in “Table 1”.

Table 1. Reliability test results

Variable	Cronbach's Alpha	Cronbach's Alpha (Standardized Items)	Number of Items
Information Technology	0.88	0.88	6
Logistics Competence	0.792	0.796	2
Tracking and Tracing	0.714	0.718	2
Customs	0.762	0.765	2
Timeliness	0.782	0.783	2
Infrastructure	0.758	0.759	2
International Shipments	0.837	0.839	2
High-Quality Development of Foreign Trade	0.862	0.868	5

As shown in “Table 1”, all variables exhibit Cronbach's Alpha coefficients greater than 0.7, indicating that the data obtained from the questionnaire demonstrate good reliability.

4.1.2 Validity Analysis

This study conducts validity analysis through KMO test and Bartlett's test of sphericity. The results of the exploratory factor analysis are presented in “Table 2”.

Table 2. Exploratory factor analysis results

Kaiser-Meyer-Olkin and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.883
Bartlett's Test of Sphericity	Approx. Chi-Square	2247.083
	df	253
	Sig.	0

The KMO value of 0.883 indicates strong correlations among variables, making factor analysis appropriate. Additionally, the significance level of Bartlett's test of sphericity approaching 0 further confirms the suitability of the data for factor analysis. These results indicate that the questionnaire has good construct validity.

4.2 Hypothesis Testing

4.2.1 Model Fit Test

The overall model fit results are as shown in “Table 3”.

As can be seen from “Table 3”, the CMIN/DF is 1.525, meeting the standard below 3; the values of the three indicators CFI, IFI, and TLI all exceed 0.9, meeting the research standards; and the RMSEA value is 0.040, less than 0.05. These fitting indicators indicate that the overall fitting degree of the model is good.

Table 3. Hypothesis testing

Index	Reference Standard	Measuring result
CMIN/DF	1~3 is Excellent, 3~5 is Good	1.525
RMSEA	<0.05 is Excellent, <0.08 is Good	0.040
IFI	>0.9 is Excellent, >0.8 is Good	0.947
TLI	>0.9 is Excellent, >0.8 is Good	0.937
CFI	>0.9 is Excellent, >0.8 is Good	0.946

4.2.2 Path Relationship Hypothesis Testing

The results of the model path relationship test are shown in "Table 4".

As can be seen from the test results in "Table 4", information technology has a significant positive impact on all indicators of international logistics performance, so Hypothesis H1 holds. Information technology has a significant positive impact on the high-quality development of foreign trade, so Hypothesis H2 holds. All indicators of international logistics performance have a significant positive impact on the high-quality development of foreign trade, so Hypothesis H3 holds.

Table 4. SEM model path relationship test results

Path			Estimate	S.E.	C.R.	P	Impact Direction	Hypothesis No.	Result
M1	<---	xx	0.48	0.15	5.202	***	Positive	H1	Yes
M2	<---	xx	0.564	0.158	5.68	***	Positive	H1	Yes
M3	<---	xx	0.421	0.187	4.532	***	Positive	H1	Yes
M4	<---	xx	0.646	0.171	6.264	***	Positive	H1	Yes
M5	<---	xx	0.525	0.153	4.604	***	Positive	H1	Yes
M6	<---	xx	0.443	0.138	4.856	***	Positive	H1	Yes
wm	<---	xx	0.268	0.188	2.147	0.032	Positive	H2	Yes
wm	<---	M1	0.159	0.064	2.285	0.022	Positive	H3	Yes
wm	<---	M2	0.165	0.077	2.034	0.042	Positive	H3	Yes
wm	<---	M3	0.162	0.052	2.346	0.019	Positive	H3	Yes
wm	<---	M4	0.179	0.076	2.153	0.031	Positive	H3	Yes
wm	<---	M5	0.141	0.076	2.093	0.036	Positive	H3	Yes
wm	<---	M6	0.146	0.064	2.259	0.024	Positive	H3	Yes

4.2.3 Mediation Relationship Test

Mediation effect test results of international logistics performance are show in "Table 5".

4.2.3.1 Mediation Effect Test of International Logistics Performance

Table 5. Mediation effect test results of international logistics performance

Model	Model 1		Model 2		Model 3	
Dependent Variable	high-quality development of foreign trade		International Logistics Performance		high-quality development of foreign trade	
Index	β	t	β	t	β	t
information technology	0.603	10.625***	0.558	10.215***	0.336	4.849***
International Logistics Performance					0.671	9.203***
R-squared	0.363		0.345		0.555	
Adjusted R-Squared	0.36		0.342		0.55	
F	112.891***		104.351***		122.655***	

a Note: *** represents P<0.001

From "Table 5", it can be seen that, in the first step (Model 1) test, there is a significant influence relationship between the level of information technology and the high-quality development of foreign trade ($\beta = 0.603$, $p < 0.001$), indicating that the total effect holds. In the second step (Model 2)

test, there is a significant influence relationship between the level of information technology and international logistics performance ($\beta = 0.558$, $p < 0.001$). At the same time, in the third step (Model 3) test, the influence of the level of information technology on the high-quality development of foreign trade is significant ($\beta = 0.336$, $p < 0.001$), and the influence of international logistics performance on the high-quality development of foreign trade is significant ($\beta = 0.671$, $p < 0.001$). Therefore, the mediating role of international logistics performance in the model holds.

Table 6. Decomposition table of total effect, direct effect and mediation effect

	Effect Value	Se	LLCI	ULCI	Effect Size
total effect	0.711	0.067	0.579	0.843	
direct effect	0.336	0.069	0.200	0.473	0.48
mediating effect	0.375	0.062	0.259	0.504	0.52

According to the results in "Table 6", the upper and lower limits of the bootstrap 95% confidence interval of the mediating effect of the information technology level on the high-quality development of foreign trade and international logistics performance do not contain 0, indicating that the information technology level can not only have a direct effect on the high-quality development of foreign trade, but also have a mediating effect on the high-quality development of foreign trade through the variable of international logistics performance. The direct effect (0.34) and the mediating effect (0.37) account for 48% and 52% of the total effect (0.71) respectively. Therefore, Hypothesis H4 holds.

4.2.3.2 Mediation Effect Test of Six Dimensions of International Logistics Performance

The test results indicate that: (a) Information technology has a significant positive impact on the high-quality development of international trade; (b) Information technology has a significant positive effect on the six dimensions of international logistics performance; (c) The six dimensions of international logistics performance have a significant promoting effect on the high-quality development of international trade; (d) Considering the impact of six dimensions of international logistics performance on the high-quality development of international trade, the role of information technology in the high-quality development of international trade has significantly declined. This indicates that the six dimensions of international logistics performance play a partial mediating role between information technology and high-quality development of international trade, which means that Hypotheses H3a-H3f receive corresponding support.

5. CONCLUSION

This article explores the relationship between information technology, international logistics performance, and high-quality development of foreign trade by constructing a structural equation model. Additionally, a mediating effect model is developed to verify the mediating role of international logistics performance. The following conclusions are drawn:

- Information technology has a significantly positive impact on international logistics performance. Through automation and digitalization, information technology enhances the quality of logistics services, reduces logistics costs, and increases supply chain transparency, thereby promoting a comprehensive improvement in international logistics performance.
- International logistics performance has a significantly positive impact on the high-quality development of foreign trade. The improvement of international logistics performance not only optimizes trade processes but also enhances the timeliness and reliability of foreign trade, thereby promoting high-quality development in foreign trade.
- Information technology has a significantly positive direct impact on the high-quality development of foreign trade. The application of information technology optimizes the supply chain and improves trade efficiency, which greatly promotes the high-quality development of foreign trade.

- International logistics performance plays an important mediating role between information technology and the high-quality development of foreign trade. Information technology can indirectly exert a significantly positive impact on the high-quality development of foreign trade. Specifically, six indicators of international logistics performance — Customs, Infrastructure, International Shipments, Logistics Quality and Competence, Tracking and Tracing, and Timeliness — each play a mediating role between information technology and the high-quality development of foreign trade.

AUTHORS' CONTRIBUTIONS

Dan Liu provided professional guidance. Xinlan Sun and Pingfan An conducted the data analysis. Hanyu Shi and Hangxiao Jin were responsible for model construction. Xinlan Sun consolidated and summarized the findings.

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