



Intermodal Transport as the Main Driver for Improving Logistics Costs - A Study of Viet Nam - Based Logistics Service Users

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Abstract: Intermodality has become a major component of the systems approach to business, which is an integral part of what is commonly called “logistics management”. Another benefit of intermodality has been the cooperation between government and private enterprise in reducing unnecessary documentation, enabling goods in transit to keep pace with demand, enabling an efficient and cost-effective use of the transport system through unbroken chain and customer oriented door-to-door services. The economic basis for intermodal transport is to display favourable economic and operational characteristics individually, can be integrated in a door-to-door transport chain in order to improve the overall efficiency of the transport system. Intermodal transportation is a response to changes of international trade requirements for moving all types of cargo. Logistics costs are among important factors affecting the competitiveness of both companies and nations in the world. Companies can increase their competitiveness by reducing their logistics costs in which the transport costs share the highest proportion, as a result, the total costs of products and services can be reduced. The aim of this article is to evaluate the importance role of intermodal transport as the main factor which will contribute to improve logistics costs in Viet Nam by integrating modes of transport in unbroken chain with the seamless process. Research results are collected from surveys and interviews logistics service providers in Ho Chi Minh City, Vietnam, processed by SPSS software.

Keywords: Intermodal Transport, Logistics Costs, Logistics Service Users (LSUs)

1. Introduction

Transport modalities have been transforming from the simple means of transport to high-tech means of transport, from the steam engine to container ship, from the balloons to jumbo Jet airplanes. During its development history, transport modalities have been gradually perfected to meet customer satisfaction and changes of global trade [1]. Transportation costs also affect international trade by influencing from the location of production and industry, classified as oriented resource, oriented market, footloose [2].

A growth in the logistics services sector could contribute to advancing other objectives such as customs modernization,

single-door initiatives and electronic data interchange - some of the main priorities on the current World Trade Organisation trade facilitation agenda [3] will impact on efficiency of intermodal transportation. Moreover; technical assistance, capacity-building activities, special and differential measures that could be secured in the context of trade facilitation negotiations could contribute to achieving a more balanced and development-oriented set of commitments on transport and logistics services. Intermodality is a quality indicator of the level of the integration between the different modes, more intermodality means more integration and complementary between modes and it will provide scope for more efficient use of the transport system [4].

2. Literature Review

In the choice of transportation mode for a shipment, shippers can consider based on following criteria (Table 1) [5]. In practice, firms may rely on a combination of transportation modes that would best enable them to meet logistics objectives and cost-effective.

Table 1. Ranking and relative operating characteristics of transportation modes (1: the highest, 5: the lowest).

| Modes of transport | Speed (door-to-door) delivery time | Dependability (meeting schedules on time) | Capability (ability to handle various products) | Availability (No. of geographic points) | Cost (per ton-mile) | Frequency |
|--------------------|------------------------------------|---|---|---|---------------------|-----------|
| Rail | 3 | 4 | 2 | 2 | 3 | 4 |
| Water | 4 | 5 | 1 | 4 | 1 | 5 |
| Truck | 2 | 2 | 3 | 1 | 4 | 2 |
| Pipeline | 5 | 1 | 5 | 5 | 2 | 1 |
| Air | 1 | 3 | 4 | 3 | 5 | 3 |

Source: Donald J. Bowersox et al. (2002), p. 346 [5].

Table 2. Structure of transport costs.

| Total costs | | |
|----------------------------------|---------------------|-----------------------|
| External costs | | Internal costs |
| <i>Environmental costs:</i> | | <i>Private costs:</i> |
| Fauna, flora | <i>Congestion</i> | Fuel, maintenance |
| Energy, noise | <i>Accidents</i> | Repairs |
| Pollution of air, water and soil | <i>Use of space</i> | Insurance |
| Landscape, vibration | | Taxes, depreciation |

Source: Quinet E. et al. (2004) [6].

Table 3. Conditions affecting transport costs.

| Condition | Factors | Example |
|----------------------------|---|---|
| Geography | Distance, physiography, accessibility | Shipping between France and England vs. shipping between France and the Netherlands |
| Type of product | Packaging, weight, perishable | Shipping coal Shipping flowers or wine |
| Economies of scale | Shipment size | A Boeing 747 compared to Boeing 737 A ULCC (Ultra Large Crude Carrier) compared to a VLCC (Very Large Crude Carrier) |
| Trade imbalance | Empty movement | Trade between China and the United States |
| Infrastructure | Capacity, limitations, operational conditions | Regional, international, pan-nation |
| Mode | Capacity, limitations, operational conditions | A bus compared to a car |
| Competition and regulation | Tariffs, safety, ownership | The European Union, The Jones Act |

Source: Rodrige et al. (2004): The geography of transport system. USA: University of Hofstra, (concepts of chapter 2). [7].

Benefits of intermodal transportation on global trade can be described as follows:

1. Fostering international trade and economic growth: because of satisfying the requirements for sustainable development such as those of economic, social, environmental and with suitable telecommunications [8].
2. Reducing logistics cost and just-in-time delivery [9]. Furthermore, Blackburn (1991) [10] argues that just-in-time has become increasingly important factor in doing business globally. Just-in-time delivery reduces the inventory holding costs, which account for a large share of the total production costs of business. Therefore, reduction in inventory costs directly improves the productivity of an economic system; output can be produced at the lower costs.
3. Expanding transportation network and economies of scale: intermodal transportation is a system of interconnected networks so it could add new service

Table 2 based on Quinet E. et al. [6], provides a specific outline of the different types of cost involved in transport, according to who bears them, who causes them, and also according to whether they are tradable or not, internally or externally.

Transport costs are formulated not only from external and internal costs but also derived from the set of conditions described in the Table 3 [7].

points.

4. Developing new economy: intermodal transportation makes competition on price, quality and diversification.
5. Being accessibility of input, output markets: as a result of expanding transportation network, companies can sell inventories earlier and approach quickly markets.
6. Being the cooperation between government and private enterprise in reducing unnecessary documentation, enabling goods in transit to keep pace with demand, enabling an efficient and cost-effective use of the transport system through unbroken chain and customer oriented door-to-door services.

3. Research Methodology

Initially, we develop five stages to conduct the research in this paper as follows:

Stage 1: Research question identification;

Stage 2: Design the questionnaire; start collecting data for the survey;

Stage 3: Data input, checking the fitness of the questionnaire;

Stage 4: Running SPSS software application;

Stage 5: Analysis of findings.

For the framework study, we identify six critical factors which determine the logistics costs in Vietnam including warehousing & inventory cost, transport cost, customer service, distribution, macro-environment and other. Our hypothesis is that transport cost shares the highest proportion in total logistics cost.

A questionnaire was designed to collect primary data from Vietnam logistics service providers (LSPs) in terms of significant issues related to their suggested location of logistics centre in Ho Chi Minh City, Vietnam. Collected data are processed and analysed by SPSS software. The details of questionnaire survey and data analysis are presented in Table 4.

Table 4. The Detail of Questionnaire Survey and Data Analysis.

| No | Items | Contents |
|----|------------------------------------|---|
| 1 | Survey method | Questionnaire survey |
| 2 | Sampling method | Non-random sampling (snowball) |
| 3 | Assessment method | Quantitative, qualitative Yes/No |
| 4 | Types of response format | Multiple choice Open-ended |
| 5 | Survey time | June-August, 2019 |
| 6 | Targeted respondents | Logistics service users |
| 7 | Data processing and analysis tools | SPSS (Statistic Package for Social Science) Cronbach Alpha factor (α): |
| 8 | Reliability analysis | $0.6 \leq \alpha < 0.7$: Acceptable $0.7 \leq \alpha < 0.8$: Good $0.8 \leq \alpha \leq 1.0, \alpha \geq 0.8$: Very good |

Source: Ho Thi Thu Hoa (2019): Research project DT194006 "A research on solutions for reducing Vietnam Logistics costs". [14]

Logistics costs are driven or created by the activities that support the logistics process. The major cost categories-customer service, transportation, warehousing, order processing and information, lot quantity and inventory carrying formulate the total logistics cost. Logistics costs are driven or created by the activities that support the logistics process. The major cost categories-customer service, transportation, warehousing, order processing and information, lot quantity and inventory carrying formulate the total logistics cost. Generally, the costs of transportation activities and inventory constitute the majority of logistics costs. However, if modern logistics costs or invisible costs of new economy mentioned such as costs derived from the external activities (traffic congestion, noise, environment pollution & climate change, etc.). The formulae to calculate total logistics cost including traditional & modern can be described as following:

$$TLC=TPC+ICC+LQC+OIC+WHC+CSC+ISC \quad (1)$$

Legend:

TLC: total logistics costs;

TPC: Transportation costs;

ICC: Inventory carrying costs;

LQC: Lot quantity costs;

OIC: Order processing and information costs;

WHC: Warehousing costs;

CSC: Place/customer service costs;

ISC: Invisible costs, this cost may indirectly impact on the society. For example: Cost derived from the traffic congestion; Cost derived from the noise by activities of transport; Cost derived from the environment pollution; Cost derived from climate change.

The impact of high logistics costs is to increase the goods prices and reduce competitive capability of the economy [11]. This could be explained as follows:

$$P=BIC+DTC+SRC+QLC+LOC \quad (2)$$

In which:

BIC: basic input cost;

DTC: direct transaction costs;

SRC: Supplier relationship costs; QLC: Quality control costs;

LOC: Logistics costs.

4. Research Results

The targeted respondents in this paper is emphasizing all main groups of industries of logistics service users (Figure 1). The questionnaires were sent out and collected during July and August of 2019, and were validated for the dataset of SPSS software:

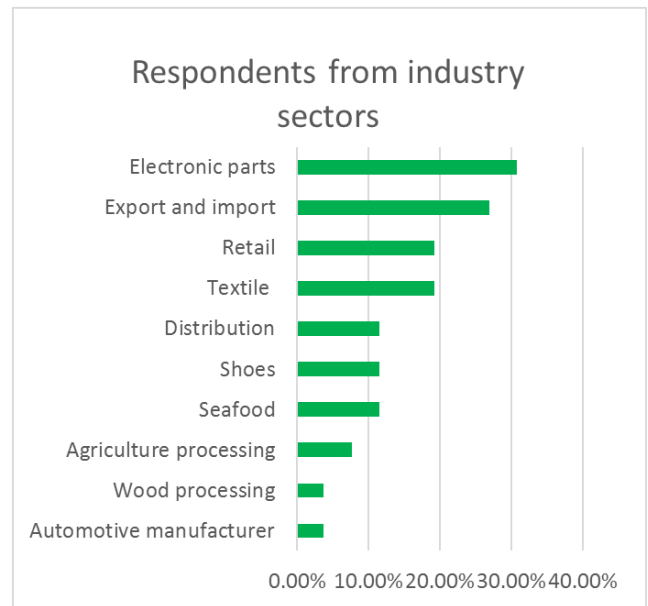


Figure 1. Respondents from industry sectors.

The market of logistics services users covers international and domestic scale. For each kind of goods, there will be different characteristics of the market, but in general, most of the cargo owners in Vietnam often import the main raw materials from abroad, accounting for over 80% of the proportion of materials, then produce and distribute in foreign

markets entirely, or partly in domestic and the remain for export.

Regarding import activities, the largest import market is China, accounting for over 80% of export and import goods of businesses surveyed and interviewed. Next is Japan, Southeast Asia, USA, South Korea and other markets. For the import market, cargo owners in Vietnam mainly import main raw materials for production activities and a few import finished goods. After finishing production, these enterprises will re-export finished or processed goods back to the same country where they import raw materials.

Typical industries for outsourcing in Vietnam and exporting to foreign countries and not for domestic consumption can be mentioned as garments, leather shoes and electronic components, machinery and equipment of enterprises interviewed.

For the study framework, there are some significant findings related to logistics costs evaluation from the side of logistics service users (LSUs). Generally, there are only 5.4% LSUs evaluated that low logistics costs in their production and operation, while 56.8% LSUs identified hat logistics costs are still high for their operation (Figure 2).

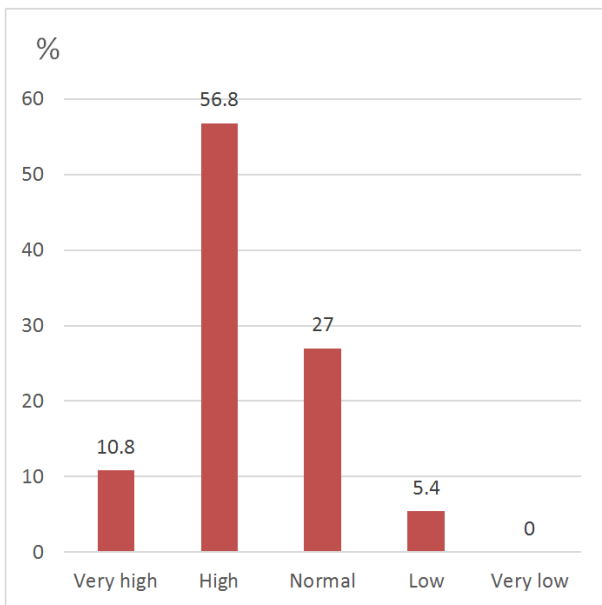


Figure 2. Evaluation on logistics costs paid by logistics service users.

Logistics costs of logistics service users participating in the survey and interview accounted for less than 5% of the

total cost with 28% of enterprises, from 5-10% with 32% of companies surveyed and interviewed, from 16 -20% which 12% of companies and from 26-30% and over 30% had 4% of companies surveyed (Figure 3).

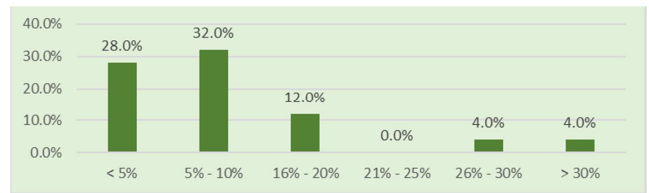


Figure 3. Proportion of logistics costs in total costs.

The proportion of logistics costs is also different based on the characteristics of each industry. Logistics costs in total costs is identified at 25-30% in seafood industry, 4-5% in electronic parts and equipment industry (Table 4).

Based on the initial results, we can find that transport costs play the highest proportion (within 30%-75%) in total logistics costs. As a result, improving logistics costs to increase the competitiveness of Viet Nam products in national and international scope is very necessary with the role of transport and intermodal transport as the main driver. With the capability of integration and combination of all modes of transport in unbroken transport chain from the point of origin to the point of destination of goods flows of movement, intermodal transport can play an important role to optimize transport cost to utilize the advantages of all modes of transport. The LSUs highly appreciate the connecting ability of logistics services centers to transport infrastructure network to reduce transport costs and logistics costs (Table 5).

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Table 5. Logistics costs in total costs in some majority industries.

| Industries | Logistics costs | | | Logistics costs/total costs |
|-----------------------------------|-----------------|-----------------|-----------------------|-----------------------------|
| | Transport costs | Warehouse costs | Other logistics costs | |
| 1. Agriculture | 30-50% | 3-5% | 10% | 10% |
| 2. Sea food | 30-50% | 10% | 30% | 25-30% |
| 3. Milk | not available | not available | not available | <5% |
| 4. Garment | 60% | not available | not available | not available |
| 5. Electronic parts and equipment | 70-75% | 5-15% | 2% | 4-5% |
| 6. Wood | 60% | 10-15% | < 2% | 2% |

Source: Ho Thi Thu Hoa (2019): Research project DT194006 “A research on solutions for reducing Vietnam Logistics costs”. [14]

Table 6. Evaluation of connecting capability of logistics services centers to transport infrastructure network.

| No | Connecting capability to logistics service centers | Evaluation (Likert scale: 1 (lowest)-5 (highest)) |
|----|---|---|
| 1 | Connecting to sea port | 4.47 |
| 2 | Connecting to air port | 4.19 |
| 3 | Connecting to rail way | 3.86 |
| 4 | Connecting to inland water way | 3.89 |
| 5 | Connecting to highway and linking roads | 4.17 |
| 6 | Connecting to residential area, to ensure not to influence residential activities | 3.81 |
| 7 | Connecting to the market, customer | 4.25 |

Source: Ho Thi Thu Hoa (2019): Research project DT194006 "A research on solutions for reducing Vietnam Logistics costs". [14]

5. Conclusion

Decision number 200/QD-TTg, approving the "Master Plan for national logistics sector development in Vietnam to 2020 with a long term vision until 2025", issued on February 14, 2017, has identified the viewpoint that "Logistics is an important services industry in the national economy, playing a supporting role, connecting and promoting socio-economic development of the country as well as each locality, contributing to improve competitiveness of the economy; Developing high added value logistics services, linking logistics services with goods production, import and export and domestic trade, transport infrastructure development and information technology; Maximizing the advantages of strategic geographic location, strengthen connectivity to make Vietnam will be became an important logistics hub in the region; The State plays a supporting role, creating a favorable environment for improving competitiveness and developing logistics services in Vietnam". With these perspectives, 6 main groups of tasks have been proposed, including: "Completing logistics policies and laws; Completing logistics infrastructure; Improving logistics business capacity and logistics quality; Developing logistics services market; Training and raising awareness of logistics human resources and other task groups" [12].

Intermodal transportation, with the options of integrating multiple modes, provides a flexible response to the changes of supply chain management's requirements in global markets and distribution systems. The integration of modes requires a process or systems approach for execution and "a higher degree of skill and broader knowledge of the transportation/supply chain processes, information, equipment, and infrastructure" [13].

The Vietnam Logistics Report also points out that the development of the freight market is to promote the advantages of each mode of transport. The second point is to rearrange transport mode by reducing the market share of road transport and increasing the market share of rail, inland water way and sea transport. The last point is to strongly develop multimodal transport in order to improving logistics services quality [15].

Intermodal transportation, as it moves from a focus on infrastructure components to that of process or system, will have more viability and applicability in international trade of Viet Nam. With the integration of all modes of transport into

an unbroken chain, intermodal transport plays an important role to improving logistics costs by utilizing the main advantages of modes of transport.

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Biography



Ho Thi Thu Hoa: In 2007, she received PhD in World Economy specialized in Transport and Logistics at University of Economics in Bratislava (scholarship from Slovak Republic). She got scholarships for international short courses of logistics and multimodal transport in The Netherlands, Japan and Australia. Funded by GIZ (Germany); British Council for international researches; the logistics expert in World Bank project about Vietnam. Research interests focus on logistics costs, logistics service quality, logistics centers, intermodal transport network and global supply chain. The head of project “Developing logistics industry in Ho Chi Minh City until 2025, orientation to 2030“ for Ho Chi Minh City People’s committee, and Research project DT194006 “A research on solutions for reducing Vietnam logistics costs” (financed and granted by Vietnam Ministry of Transport) and a main member of project “Enhance the level of skills and expertise of ASEAN transport officials in implementing effective, simplified ASEAN transport facilitation procedures -TF-6” funded by ASEAN.



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Vietnam Logistics Research and Development Institute (VLI) – a subsidiary of Vietnam Logistics Business Association (VLA) in teaching FIATA Diploma in Freight Forwarding (2017, 2018); 10 years of research in seaport, transport and logistics; participated in logistics development projects as Nghi Son port development (2016), “Enhance the level of skills and expertise of ASEAN

transport officials in implementing effective, simplified ASEAN transport facilitation procedures -TF-6” (2018), and logistics development projects in Ho Chi Minh City (2019).



Le Van Thanh (Engineer of Port Construction, MSc. on Maritime Management): He has more than 25 years experienced in transport construction, port construction engineering and port project management. He has been Director of many port construction projects in Vietnam such as Con Dao, Phu Quoc, Phan Thiet and Phu Yen. Currently, he works as project manager at Joint Stock Company Sai Gon – Hiep Phuoc Port in Ho Chi Minh City, Vietnam. He is the co-authors of many articles about intermodal transport, logistics center and logistics cost. Currently, he is the member of research project DT194005 “A research on modeling logistics center connecting to multimodal transport network – case applied for Southeast of Vietnam (Ho Chi Minh City and neighboring provinces)” (financed and granted by Vietnam Ministry of Transport) and project “Developing logistics industry in Ho Chi Minh City until 2025, orientation to 2030”.



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Bui Van Hung: Bachelor in Sea Transport Economic and MSc. on Shipping Operation and Management - Ho Chi Minh City University of Transport. He has been in the dynamic shipping and freight industry for a decades and worked in several sectors of the industry like freight forwarding & custom clearance, logistics, warehousing, sales and marketing. He regularly attends national

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