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A Study on the Selection of Means of Transportation in International Logistics*

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Abstract

Purpose – This study is a study to investigate the problem of the selection of means of transportation in international logistics by studying the basics of logistics activities, selection factors of transportation methods, and multimodal transportation.

Research design, data, methodology – This study is composed of 5 chapters through literature study. Chapter 1 describes the functions and transportation system of international logistics, Chapter 2 selects transportation, Chapter 3 deals with maritime transportation and multimodal transportation, Chapter 4 describes multimodal transportation in terms of customer service, Chapter 5 addresses the implications and conclusions.

Results – When looking at the problem of selecting a means of transportation, it is important that the parties involved in the transportation choose which means of transportation for their convenience and profit during the transportation process. Here, there will be factors to consider, including transportation cost, when selecting a means of transportation, and each means of transportation may have characteristics or advantages and disadvantages. Considering all these points, the adoption of multimodal transportation from a customer service point of view may be the answer.

Conclusions – This study pays attention to the academic understanding related to the selection of means of transportation and to how usefully this thesis can be used in the selection of transportation related persons, especially shippers, from a practical level.

Keywords : Selection, Means, Transportation, Logistics, Function, Multimodal.

JEL Classifications Code: D23, D30, L91, L92, L93.

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1. Introduction

Conceptually, international logistics refers to carrying out logistics activities across two or more countries. In other words, it means carrying out all activities related to the movement and processing of goods from the place of production to the place of consumption in two or more countries. If we look at the distribution-related parts from one of the management factors, we can see that international physical distribution is an auxiliary and important activity to pursue more efficient and rational management activities through inter-country functions. In the end, systematic and rational international logistics activities will be established through this.

It can be seen from this that international logistics is a part of international trade activities in which the time gap and spatial distance between the two countries are overcome and goods are moved through the process of import and export activities between sellers and buyers in remote international locations. can That is, if the movement of cargo must be done first, it can be seen that it is very important to enable the physical movement of the cargo (Behar, Manners, & Nelson, 2013). In other words, the role of transportation, which can be said to be the basic function of logistics, in the process of transportation, unloading, storage, packaging, and information, should be emphasized the most, especially in relation to the cargo moving from the exporting place to the importing place.

Therefore, it cannot be overlooked that the functional role of transport in the process of international logistics becomes a basic prerequisite for international logistics. It can be confirmed that all other logistical functions are functions that are supported as ancillary or incidental during the physical movement of cargo. In international logistics, the transport function can be understood as the main function, and it can be said that this is a basic requirement of actual international logistics. In addition, it can be recognized that the problem of selecting a means of transportation is a shortcut that leads international logistics activities in a more competitive and efficient direction.

Recognizing the importance of such transportation, this paper intends to examine the problem of how to select a means of transportation in the international goods distribution process. First, I would like to examine the functional aspects of logistics and the components of the international transportation system, and mention the selection and type of transportation means, customer service and multimodal transportation, and implications and conclusions.

2. Understanding International Logistics

2.1 Functions of International Logistics

Changes in the world trade environment and globalization of production have a direct impact on the diversification of physical distribution activities. In a situation where multinational corporations are leading the world's manufacturing, production and other business activities, logistics activities are also taking place. In response to this, the appropriate use and operation of distribution channels in the global market is making business activities of companies more competitive in the market. Therefore, the importance of international logistics is being emphasized in this dimension (Chang, Lu, & Lai, 2021). Although it is such an important international logistics, in its functional dimension, it shares the functions and contents of existing logistics.

International logistics is basically carried out by the functions of transportation, storage, unloading, packaging and information. Since international logistics is carried out across two or more countries, transportation is the main subject, and various activities of storage, unloading, packaging, and information are performed accordingly. The reason why these five major functions of logistics are important is that they are activities that must be basically equipped to reduce logistics costs and improve logistics services. Efficient implementation of these functions can enable more rational and competitive international logistics activities.

2.1.1. Transport Function

Transportation contributes to the creation of space utility by changing the physical location of cargo through spatial movement between remote locations, which can be said to be the premise of physical distribution. In other words, the functional role of transportation from the delivery of the production site to the delivery of the consumption site enables temporal, spatial and physical distribution. At this time, transport is generally divided into transport and delivery, transport is moving from the production area to the distribution center, and delivery is moving cargo from the distribution center to each store.

On the one hand, transportation can be seen to account for the largest share of each functional cost, and the logistics system can be said to be influenced by transportation activities. At this time, the means of transport may be a transport

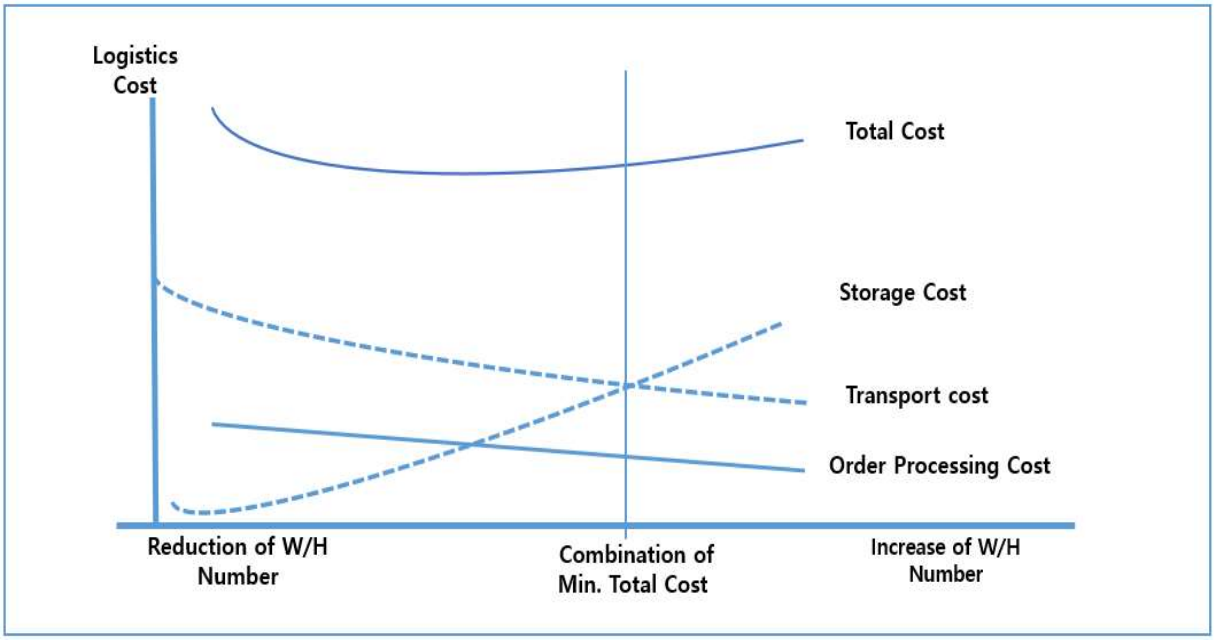
medium used for land, sea, and air transport. In particular, in the reality that multimodal transportation is emphasized in international logistics, door-to-door service by combining each transportation method is recognized as an important part of the international transportation function.

2.1.2. Packaging Function

Packaging can be said to be the starting point of the physical distribution activity in the final state of the production activity. This can be said to be part of the activity to maintain the condition and value of the cargo as it is. In other words, unlike commercial packaging within a factory, packaging activities at the distribution center consist of picking by order and delivering it. On the one hand, packaging is not only convenient for product safety, protection, and classification, but also a major means of reducing logistics costs. At this time, the packaging cost is composed of a component of the logistics management cost, which is different from the one reflected in the cost of commercial packaging. The function of packaging in international logistics has a profound influence on the choice of means of transport and is also related to logistics rationalization.

2.1.3. Storage Function

In the part related to the creation of utility in logistics activities, it is closely related to the time utility. It can be said to overcome the time gap by going through the process of storing goods and managing inventory in a distribution center. This means that the physical storage of the product will bridge the gap between the point of production and the point of consumption. This can be divided into activities that provide a series of storage-related facilities and activities that use them, and these activities include warehousing, location management, inventory movement, and inventory inspection. In the case of international logistics, the function of storing and transporting cargo in bonded areas or other areas is more important than general distribution warehouses. Also, the correlation between the number of warehouses and the storage cost and total logistics cost can be seen in figure 1.



Source: Lee, 2014b

Figure 1: Logistics Cost and warehouse number

2.1.4. Unloading Function

Activities related to the handling of cargo at the interface between storage and transport. That is, it is the function of handling products excluding storage, packaging, and distribution processing. That is, it can be said to mean the

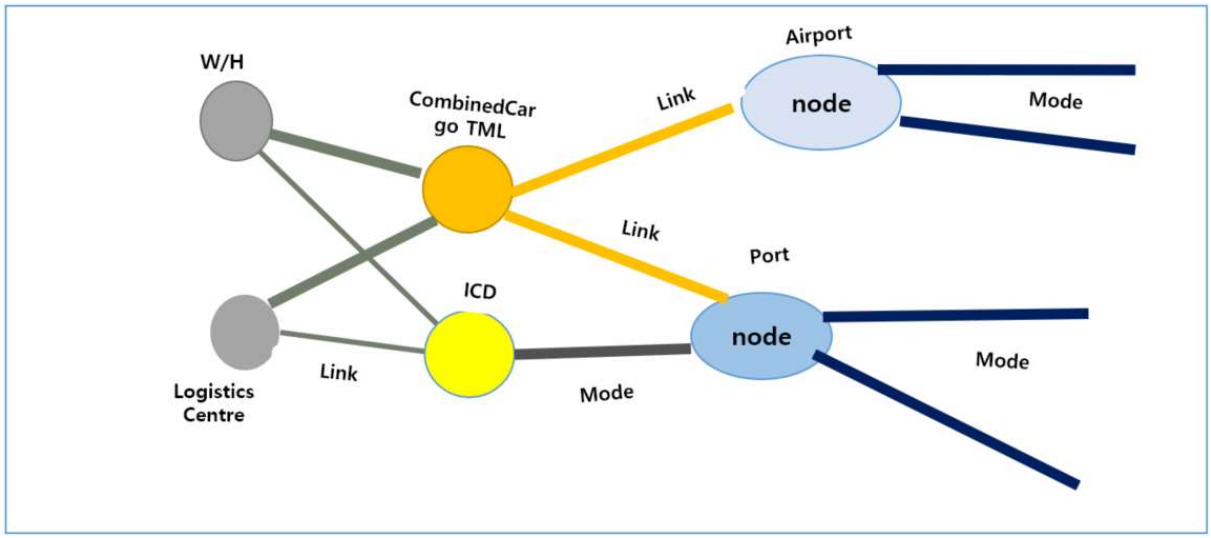
unloading, transport, and loading of goods. It also includes sorting and picking products from the warehouse. This means picking and sorting by manpower in logistics activities. Apart from loading and unloading, which can be said to be a narrow meaning of unloading, it is necessary to view it more broadly. In international logistics, unloading is done from the loading of containers to port facilities for industrial goods, and raw materials are carried out in the warehouses of these facilities.

2.1.5. Information Function

Information processing activities can be said to be the main task of ordering activities. Other than that, it can be said that information processing activities of various data that may occur in the process of performing other logistics functions are included in this category. In the context of increasing importance and necessity of information functions in logistics activities, information functions are being utilized in the direction of maximally improving logistics utility. Logistics automation system was introduced to this, and information-based logistics activities are gradually becoming common. Order information, inventory information, shipment information, logistics management information, etc. are being used (Jin, 1998). In international logistics, the information function is also closely related to logistics rationalization, and in ports, etc., RFID (Radio Frequency Identification) is used to promote efficient logistics management.

2.2. Components of the International Transport System

The international transport system is a physical link that connects customers, raw material suppliers, production plants, storage warehouses and distributors, physically connecting logistics bases where the flow of goods temporarily stops, and supplies goods to the right place at the right time. give. As can be seen in figure 2, the transportation system is largely composed of elements such as transportation route, transportation means, node, operation, and transportation market.



Source: Lee, 2014b

Figure 2: Components of the cargo transportation system

2.2.1. Transportation Route (Link)

Transportation route means a route used for the operation of means of transport loaded with goods, such as road, rail, sea, and air.

2.2.2. Mode of Transport

The means of transport means for transporting goods along a transport route, such as trucks, trains, ships, aircraft,

pipelines, and the like.

2.2.3. Node

A node refers to a place or facility where the collection and transshipment of cargo, relay between means of transport, etc. are carried out, such as ports, airports, railway stations, cargo terminals, and distribution centers.

3. Choice of Transportation Means

3.1. Characteristic Aspect

3.1.1. Characteristics of Cargo

Selecting a means of transportation is relatively a series of procedures and processes for receiving transportation services, and the decision for this is the user's ability to identify the right characteristics of their cargo and determine the optimal means of transportation based on this, is important (Cema, Zitricky, & Danis, 2017). If we divide the characteristics of cargo, various factors such as the type, weight, volume, nature, value, transportation route and transportation distance, transportation time, and delivery date of the cargo can define the actual cargo characteristics. It will also be necessary to examine the characteristics of the means of transportation in relation to the unique properties and characteristics of the vehicle.

On the other hand, depending on the characteristics of the cargo, the cost of the transportation service may be different, and the change in the freight rate can be tracked. In other words, the cost of transportation services is calculated differently for each item, and in the case of a specific item, when the market demand is high, even if a high fare is paid, a specific transportation method may be selected and used.

Regarding fare calculation, ① it is necessary to consider whether to calculate by weight or volume. This can be calculated in terms of the density of goods. In the case of a light-weight but large-volume cargo, it is common to charge a higher freight rate than a heavy but small-volume cargo. ② In terms of the size and quantity of cargo, although the scale is large, a single product is easy to manage or consigned, so it is economical because the running cost per unit weight is very low. In addition, if a large amount is transported at one time, the terminal cost is reduced and the transport cost is also reduced. ③ Regarding the shape of goods, in the case of finished products that are difficult to be shipped in a dense manner, efficient shipment is difficult and special packaging costs are also required. It can be seen that the special form is less efficient and requires more cost. ④ In the case of loading cost, the cost of loading on the means of transport may vary. As furniture requires special packaging or shipping methods compared to coal, additional terminal costs are incurred. ⑤ It is also necessary to pay attention to perishability and damage risk. In other words, items that are fragile, perishable, or require a certain freshness have a higher freight rate. This is the same as when the freight rate for fruits and vegetables is higher than for sand, gravel and ore.

3.1.2. Characteristics of the Means of Transportation

The means of transportation should have elements corresponding to the characteristics of the cargo. It should be equipped with various types of suitability related to the movement of cargo that the means of transport has as much as the characteristics of the cargo in the matter of selecting a mode of transport. First of all, when transportation demand arises, availability related to whether the means of transportation can be used without delay, and the speed, safety, economy, reliability and convenience of the means of transportation related to the issues of safe delivery of goods by the promised and set time. Gender-related parts can be pointed out as traits (Kim & Bang, 2021).

In the case of selecting a means of transportation, the user will consider various aspects and try to obtain the maximum utility from the selection, which will be used as a reference for selecting a means of transportation by comparing and analyzing the characteristics of each means of transportation. will be Each mode of transport has its own characteristics, which will give users a competitive edge in terms of preferences in the selection process. Its characteristics can be observed in terms of convenience of use, cost, speed, transport volume, and elasticity.

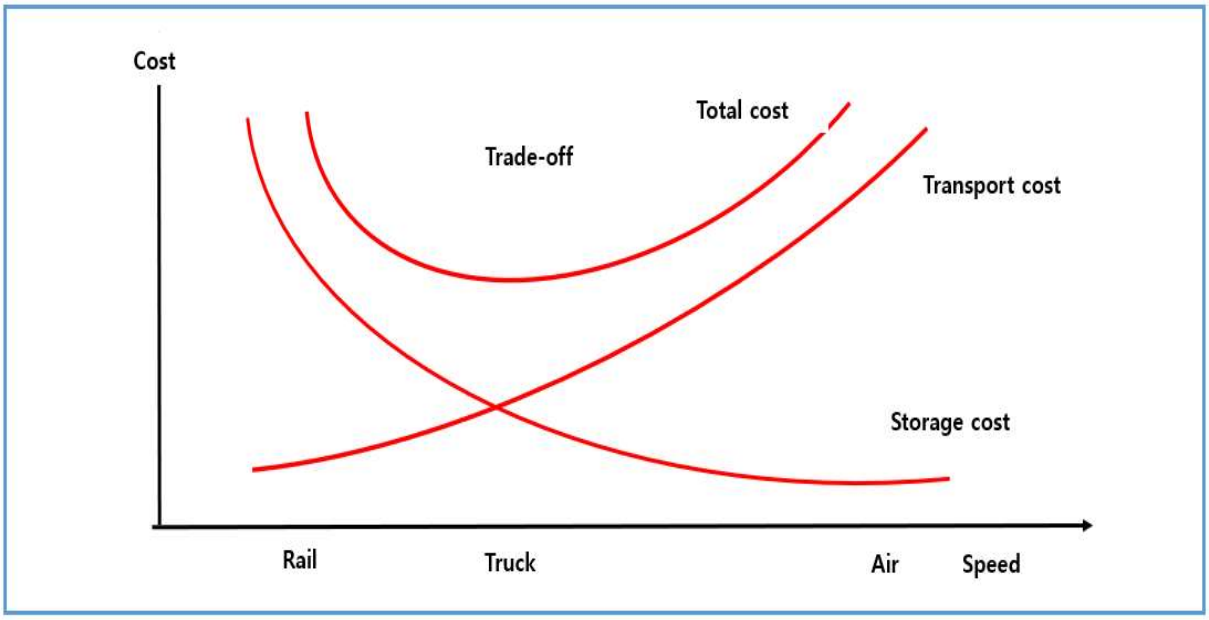
Commonly, the means of transportation that can be classified in the mode of mode may include automobiles, railroads, air, shipping, and pipelines. If you can choose a mode of transport, it will be the right decision (Roberts, 2012).

3.2. Selection of Means of Transportation and Factors to Consider

The choice of means of transport in the process of international goods distribution can be said to be one of the most important factors for the parties involved in trade. From the standpoint of using the transportation service, it is necessary to find the contact point between the characteristics of the cargo and the means of transportation so that the actual transportation contract can be materialized. It is not only directly related to the export and import competitiveness of traders, but it is also judged to be related to the profitability and competitiveness of companies through securing long-term cargo for carriers (Pedersen & Gray, 1998). The choice of means of transport and carrier can be seen to affect service to consumers, transport time, provision of continuous sales service, inventory, packaging, warehousing, energy consumption, and environmental pollution.

In the case of a shipper, transportation methods are selected by considering various selection criteria and factors. In particular, since transportation costs account for a high proportion of total logistics costs, it is necessary to first determine the level of demand for transportation costs or service quality (Foster & Strasser, 1990). For example, the choice of international transportation means can be clearly divided into sea or air transportation according to factors such as characteristics of cargo, value, cargo volume, transportation speed and cost. In addition, since the selection criteria for transportation may be different depending on the business strategy and logistics strategy of a company, the selection process of transportation method should be fully considered from a more strategic point of view.

Regarding the cost when selecting a means of transportation, it is necessary to select a means of transportation in a direction that can minimize the total cost after considering the transportation cost and inventory maintenance cost. In figure 3, the higher the speed of transport, the higher the frequency of transport increases, so it can be seen that the transport cost increases. In other words, transportation cost and storage cost are trade-off, so it is necessary to select a transport method from the viewpoint of total cost.



Source: Lee, 2014b

Figure 3: Choice of transportation

On the other hand, since the selection of individual means of transportation has advantages and disadvantages, it is a recent trend to approach the selection of means of transportation in consideration of various factors in terms of total logistics cost. In other words, multimodal transportation would be such a case. At the same time pursuing reduction of the overall logistics cost, it may be an option for logistic rationalization to adopt individual means of transport even if the transport element is expensive (Fulzele, Shankar, & Choudhary, 2019). This would be particularly the case for air transport. Therefore, the grafting of transportation means through the use of multimodal transportation will be a desirable alternative.

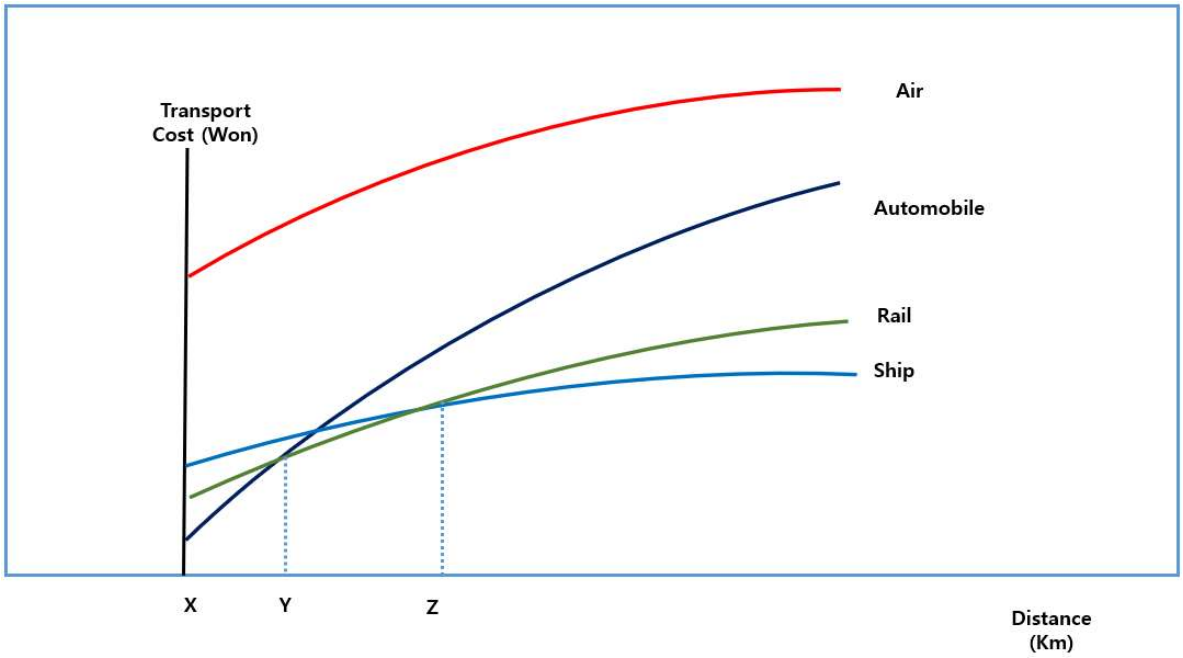
3.2.1. Structure of Transport Cost

Transportation cost is an important factor in transportation (Jeffs & Hills, 1990). This is because this is a matter directly related to product competitiveness in terms of using transportation services, but is closely related to the market share of own company in the transportation market from the viewpoint of carriers who provide transportation services (Viederyte, 2016). Therefore, the choice of transportation means the best new housing and careful consideration for reducing transportation costs in terms of using it.

First of all, looking at the structure of the transportation cost, it is the sum of the end point cost and the transportation distance cost. In the case of long-distance transport, the end point cost is high and the transport distance cost is low. Looking at this in detail, the end point cost is also called the destination cost or the terminal cost. This is constant regardless of the distance, but it varies depending on the size of transportation or the conditions of the terminal (Stock & La Londe, 1977). This can be said to include the cost of loading and unloading, insurance, and terminal maintenance. In relation to the cost of transport distance, it is also referred to as driving cost. This can be said to be a transportation cost that increases with the distance, and it can be seen that the transportation cost decreases as the distance increases.

3.2.2. Means of Transportation and Transportation Costs

Transportation means and transportation costs are closely related to each other. Terminal costs and mileage per unit distance are calculated differently for each mode of transport. The cost curve is determined by the terminal cost and travel cost of each mode of transport (Grunda & Zemaitis, 2011) . Terminal costs increase in the order of road, rail and ship. In particular, ship or air transport costs a lot of money for the installation of infrastructure facilities, that is, ports and airport facilities, which are considered basic sunk costs, and the terminal cost is high because there is a problem of maintenance thereafter.



Source: Lee, 2014a

Figure 4: The relationship between transportation means and transportation costs

* Note : - It is advantageous to choose the mode of transport that shows the lowest transport cost per section
- Short distance (X-Y section): automobile
- Intermediate distance (Y-Z section): railway
- Long-distance (sections over Z): Ship

The driving cost per unit distance increases in the order of ships, railroads, and roads. For long-distance travel, road transportation appears to be the most expensive to travel. For short-distance transportation, road transportation such

as automobiles and trucks, which has a low terminal cost and relatively high running cost, is considered advantageous. Although long-distance transport requires a lot of terminal cost, sea transport with the right driving cost is advantageous, and depending on the distance, the advantageous transport method may be different.

On the other hand, as can be seen in figure 4, there is a difference in transport time and cargo transport volume depending on the means of transport. In addition, a specific means of transport is required for the transport of a specific cargo, which leads to specialization of the means of transport. The transport means of this exclusive line concept also show differences in the quality of transport services such as delivery speed, dispatch interval time, unloading time, risk of damage, and reliability.

4. Types of Means of Transportation

4.1 Sea Transport

Sea transportation has a relatively low freight rate as it transports large quantities over long distances compared to other transportation methods. For countries with an export-oriented industrial structure, maritime transport plays an important national function in the transport of export cargo and import of raw materials. Marine transportation is also an area with effects from other related industries. This is considered to have a ripple effect on related industries such as the shipbuilding industry, the steel industry, the port industry, and the marine insurance industry. On the one hand, it has the effect of macroscopic job creation and foreign exchange gain.

As a form of maritime transportation, there is a liner that regularly operates to a specified port on a set schedule according to a set route (Brouer, Karsten, & Pisinger, 2018), the shipping company individually concludes a shipping contract with a large number of unspecified shippers, the shipping company has the nature of a public transporter or general transporter, and the contract form is a non-negotiable contract, and the bill of lading serves as the contract. In the case of a tramper, the port of call or route is irregular, and the fare is determined according to the supply and demand of cargo and ships, so it fluctuates flexibly, and handles a large amount of bulk cargo such as grain, minerals, and wood. can do. A contract of charter party to borrow all or part of the shipping space from the ship owner must be concluded.

4.2 Types of Land Transport

There are three ways to send export cargo containers from inland areas to ports. The most used method is land transportation by road, followed by rail and coastal sea transportation. In particular, container land transportation charges account for the largest burden after sea freight among logistics charges that must be borne during import and export.

4.2.1. Road Transportation

In accordance with the expansion of the land network and the development and enlargement of transport vehicles, air transport not only plays a key role in the comprehensive transport system, but also takes charge of final transport from batch transport or international multimodal transport to doorstep.

Advantages of air transportation include small initial investment, flexibility in transportation capacity such as departure and arrival times, fast speed and relatively low terminal cost for short-distance transportation, easy door-to-door service, and very easy to use. Convenience points, etc. are mentioned.

On the other hand, disadvantages include low utilization when transporting heavy cargo such as bulk cargo, high cost for long-distance transport, high probability of transportation disruption due to climate and vehicle breakdown, and low energy efficiency. can be heard

4.2.2. Rail Transport

Rail transport (carriage by rail) mainly plays a bridge role between sea and land by a piggy-back method, and is used as a rail car service that limits the scope of transport on the railway line (Vashist & Dey, 2016).

Advantages of rail transport include low cost per unit during long-distance transport, 24/7 service function, and high safety, making it a convenient transport method for low-priced goods. Rail transport has an advantage in mass transport over medium to long distances, and anthracite and ash account for more than 60% of the items currently

mainly used in Korea. Rail transport has recently been emerging as an alternative means of container land transport due to road congestion and the strengthening of overburdening controls on import and export cargo.

On the other hand, disadvantages of rail transportation include large investment, slow speed for short-distance transportation, high investment costs for terminal facilities, high transshipment costs, and low possibility of door-to-door service. Currently, container rail transportation is most actively carried out between the Uiwang inland container depot (ICD) in the metropolitan area and Busanjin Station.

4.3. Coastal Shipping

Coastal shipping is being done as an alternative to rail and road transportation between the metropolitan area and Busan. However, it cannot be said that coastal shipping has superior price competitiveness compared to road transportation because it goes through a complex distribution process such as maritime transportation, unloading, and shuttle transportation, so the overall transportation time is excessive.

However, if coastal shipping is actively used to transport export cargo that is not in a hurry to ship or import cargo that has time to supply and demand raw materials, it has the advantage of being able to transport cargo at a slightly cheaper rate than road transport.

4.4. Air Transport

Carriage by air refers to the transportation of passengers and cargo in the plane's space. Air freight transport is an act of production as a method of transport, and the product is an immediate good called transport service and is an intangible good. Air cargo transportation is produced according to the movement of aircraft, which is a production facility, and as the transportation service is consumed, goods are moved from place to place, thereby creating new utility. Advantages of this include meeting urgent freight transportation needs, enabling rapid transportation of products that are easily perishable due to their inherent nature, and reducing costs. The disadvantages are that there are restrictions on weight and service, and the freight is expensive. In addition, transportation is possible only in large cities with airport facilities, and transportation costs are high due to high energy consumption. In addition, the characteristics of air transport can be said to be speedy, safety, nocturnal, one-way, and non-seasonal (excluding seasonal products) (Lee, Kim, &Yoon, 2017).

4.5. Characteristics of International Small Parcel Express

International express service refers to a service industry in which parcels are transported internationally by globalized companies and consumers. In the case of air transportation in the past, high-priced valuables were mainly transported, but the international express service system is oriented toward transporting small quantities of various types of cargo that consumers want. The characteristics of the international small parcel express service for the purpose of fast and accurate delivery service are as follows.

- The use of information technology (IT) is essential
- Establishment of comprehensive logistics service: In addition to prompt delivery, payment of national taxes and customs duties, various reporting documents, customs clearance services, etc.
- Provision of solutions for the integration of e-commerce
- Diversification of service products and expansion of service areas

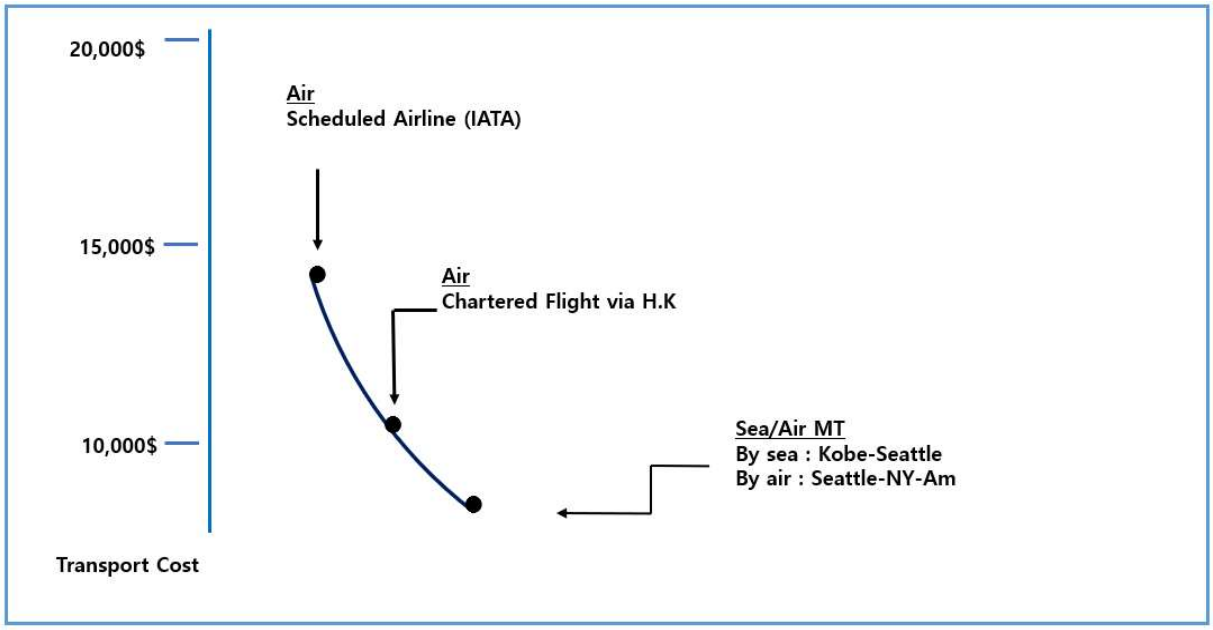
4.6. Multimodal Transport

The definition of multimodal transport is well defined by the Rules on Multimodal Transport Documents (ICC, 1992). In other words, multimodal transport is described as transport of goods under a single contract for transporting goods by at least two different means of transport. In addition, according to the United Nations Convention on International Multimodal Transport of Goods (UNCTAD, 1981), international multimodal transport is transport by at least two or more transport methods based on a multimodal transport contract. It is stipulated as transportation between two countries with different destinations and destinations for goods. It refers to the consistent transportation of the transportation section to the destination.

4.6.1. Requirements for Multimodal Transportation

Based on a comprehensive understanding of the concept of multimodal transportation, it will be possible to generalize the requirements for multimodal transportation.

- A single contract of carriage and uniform liability in which all responsibilities for carriage are concentrated on the multimodal carrier.
- The first carrier assumes the through carriage.
- Different modes of transport are used.
- The carrier has the right to claim the through rate for the entire transportation section.
- A multimodal transport document (MTD) must be issued.



Source: Banomyong & Beresford, 2001.

Figure 5: Multimodal transportation and transportation costs

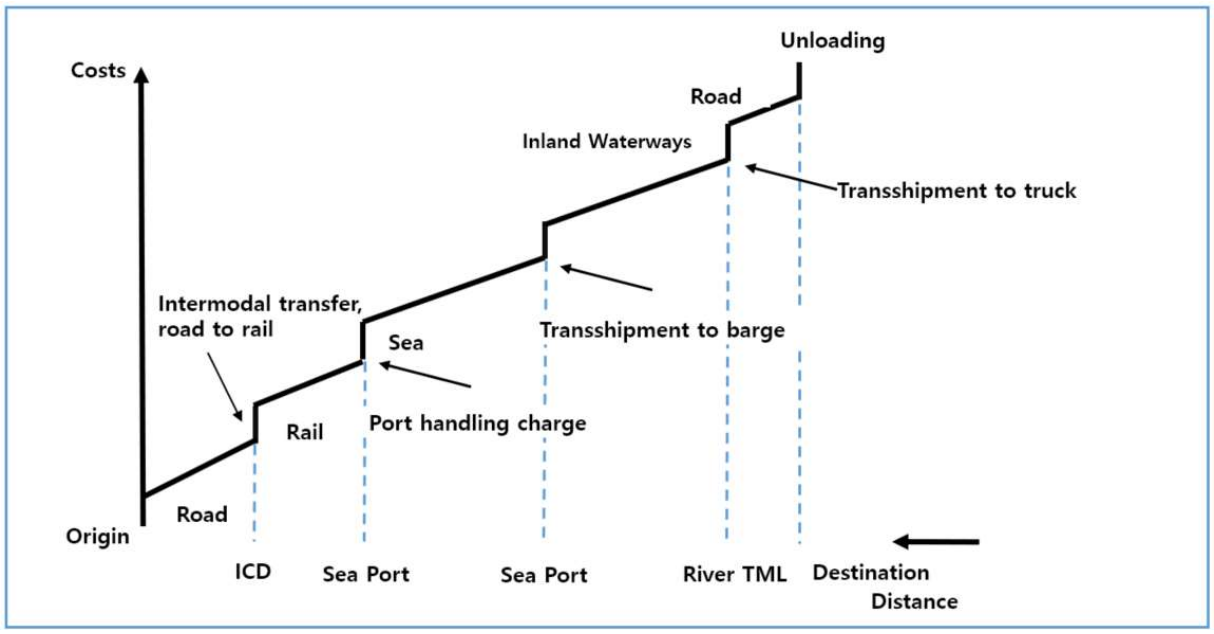
4.6.2. Land Bridge

The general forms of international multimodal transport include sea-land multimodal transport and sea-air multimodal transport. For sea-land multimodal transport, the Land Bridge method, which serves as a bridge between the continent and the sea, is used. This Land Bridge Service is intended to reduce transportation costs and shorten transportation time (figure 6). Sea-air combined transportation (sea-air) is a transportation method that effectively combines the low fare of sea transportation and the speed of air transportation. In addition, air transportation is used in the interior of the United States and between the United States and Europe, and is transported to the eastern part of the United States and various parts of Europe.

1) Significance of Land Bridge

Land Bridge refers to a land transport section, which is an intermediate section among transport sections connecting sea-land-sea as the integrated sea-land transport is realized. The development of the Land Bridge is a form of multimodal transportation through the Sea-Land-Sea method by using a railway or road that crosses the continent as a bridge. The purpose of the Land Bridge is to reduce the transportation cost and the overall required time. The possibility of such cost reduction is excellent for major inland transportation networks in order to enable marine transportation companies to pursue economy of scale in inland transportation. The cargo volume was concentrated in a small number of ports with accessibility. The Land Bridge puts all journeys under the control and responsibility of

a single mode of transport. Another feature is that the entire transport process is covered by a single bill of lading issued by the shipping company or Non Vessel Operation Common Carrier (NVOCC). was able to do.



Source: Banomyong & Beresford, 2001.

Figure 6: Process of Land Bridge

2) The main route of the land bridge

(a) SLB

SLB (Siberian Land Bridge) refers to a multimodal transport type that connects Korea, Japan, the Far East, Southeast Asia, Australia, continental Europe, and the Scandinavian Peninsula with Siberia as a land bridge.

(b) ALB

ALB (American Land Bridge), developed by Seatrain in 1972, was developed as a cargo route to Europe/North America rather than a route to the Far East/Europe, and started to transport cargo from the Far East and Japan to Europe. After that, Sea-Land in 1978, APL in 1980, and Lykes Lines in 1982 participated. Moreover, Sea-Land and APL participated in the Intermodal System by Double Stack Train (DST) in the United States. It is fully serviced.

(c) CLB

As a transportation route developed by a Japanese forwarder in 1979, ALB via the continental United States is ship-driven, whereas CLB (Canadian Land Bridge) is a forwarder-driven service. Because it is outside the jurisdiction of the European Freight Union, such as SLB and ALB, and outside the application of tariffs for sea freight on Pacific and Atlantic routes, a significant number of European Freight Union contract subcontractors have also been used at one time. On the other hand, sea freight rates have fallen due to rapid advances, but CLB has been experiencing a decline in utilization recently as transportation costs have increased due to multiple transshipments.

(d) MLB

In 1972, the US shipping company Seatrain started transporting the Mini Land Bridge (MLB) from Europe to California via Charleston. Using the return route of this transport to transport cargo from the Far East to the East Coast of the United States was the beginning of MLB transportation, which opened the curtain for multimodal transportation between the United States and the Far East.

(e) IPI

While the Mini Land Bridge is port-to-port transportation, IPI (Interior Point Intermodal), that is, Micro Bridge, refers to a consistent multimodal transportation service using at least two modes of transportation from (or to) inland locations in the United States.

4.7 Advantages and Disadvantages of Each Mode of Transport

Pros and cons can be identified within the categories of each mode of use, transportation distance, and cost. You can examine freight car and rail transport on land, sea transport and air transport, and pipeline transport. While each means of transportation has its own unique advantages, the disadvantages cannot be overlooked as well, but in general, the advantages and disadvantages of the means of transportation can be confirmed by looking at the size, distance, and cost of the means of transportation (table 1). For example, when examining the degree of acceptance of the volume or weight of cargo of a specific means of transport, the unit price per unit can be calculated by measuring in the dimension of space, which can be regarded as a product provided by the means of transport. In other words, it is possible to calculate the fare, and this can be understood in terms of the rate competitiveness of transportation means.

On the one hand, it can be understood that these rates are directly related to the transportation of bulk cargo and have a deep relationship with the transportation distance. In addition, the problem of packaging and the problem of speed may be mentioned additionally. However, the recent trend is that transportation is provided from the existing market superiority of transportation service providers, and now the market is formed from the perspective of transportation consumers, which indicates that customer-oriented services are widely applied to transportation and logistics. Therefore, it is also a trend that multimodal transportation or consistency of transportation is being emphasized. This means that the existing concept of single transportation is changing to a pattern of complex transportation, which should be understood as an important change in the selection of transportation means of the times (Meixell & Norbis, 2008). In other words, it may be that the consistent or standardized form of transport containerization in the container market becomes a decisive opportunity for multimodal transport.

Therefore, when examining the advantages and disadvantages of transportation means, transportation must understand the unique form of each transportation method and its applicability in the transportation market, and calculate which one is more competitive in terms of transportation cost and in a timely manner. It can also be seen that this is an issue that needs to be decided (Cullinane & Toy, 2000)).

Table 1: Advantages and disadvantages of each mode of transport

Category	Advantage	Disadvantage
Truck	- door to door - safe carriage of cargo - good for short distance and small quantity - through transport	- high rate in long distance - inadequate of lager cargo - possiblity to make accident
Railway	- adequate for medium, long distance - lower rate in medium, long distance - networking nationwide	- difficult for transport demand by users - subsquent transport mode needed for door to door service - relatively high rate for short distance
Ocean-going	- proper for larger, weight cargo - good for long distance - cheaper rates	- slower speed -affected by weather conditions port facilities and unloading costs are expensive -cargo damage accidents occur a lot -packing costs are high
Airway	-good for transporting expensive and small products -less damage to the product -low packaging cost -fast transportation speed -suitable for products sensitive to the trend of emergency cargo	-difficult to transport large quantities of cargo -fare is expensive -a weight limit existed -the influence of weather conditions is significant -Insufficient transport integrity

	-reduces inventory maintenance costs for shippers	
Pipeline	-low maintenance cost -continuous mass transportation is possible -good for securing paper -eco-friendly transportation method	- limited products (oil, gas) -limited to specific locations (only available in oil pipeline installation areas) -high initial facility investment

Source: composed of own materials

5. Customer Service and Multimodal Transportation

5.1. Customer Service

The modern management process places more weight on consumption than on production. This means entering an era in which consumers occupy a dominant position in the process of supply and demand in the market. In other words, it is to establish a customer-oriented management system for consumers. Along with the sales process of product distribution including the manufacturing industry, it is considered essential to provide customer-oriented services to users in the service area of the distribution process. This trend is also seen in transportation (Matei, Erdei, & Pintea, 2021). It is to expand the scope of transportation services to the door of the buyer.

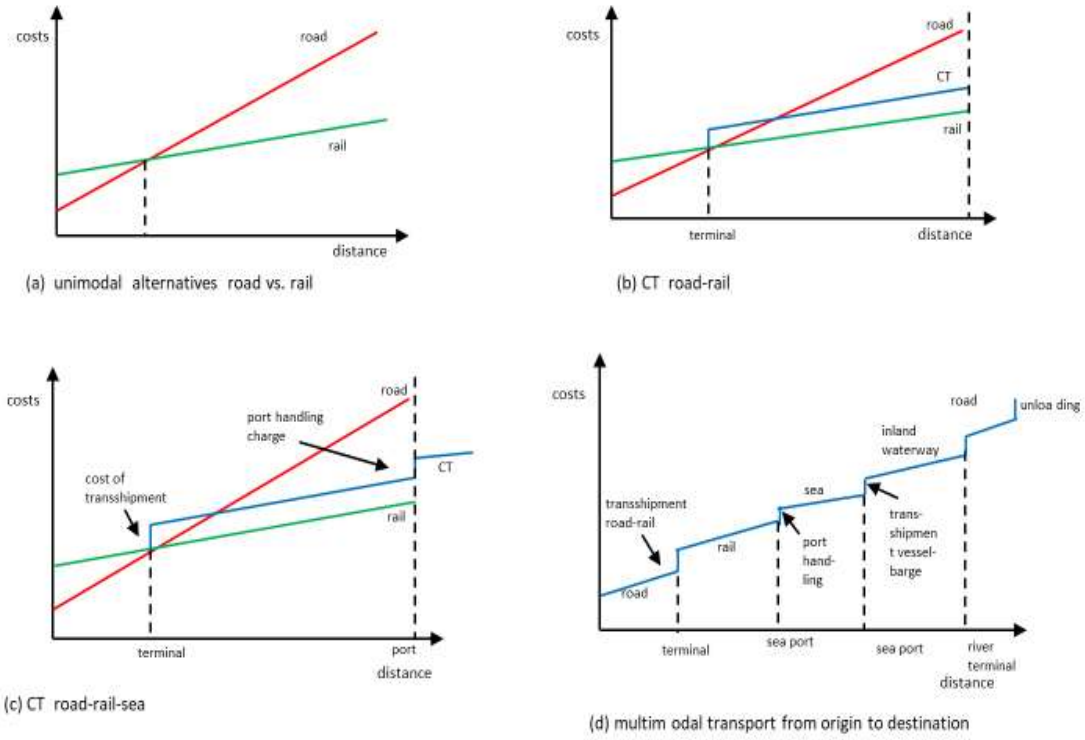
That is, door-to-door service is utilized. This is also impossible in the form of single transportation of means of transportation. Therefore, in order to provide such an integrated and customer-oriented transportation service, a consistent type of multimodal transportation service is provided through the combination of two or more transportation means. It can be said that this is to provide a value-added transportation service as well as a customer-oriented transportation service. In other words, being able to provide customer-oriented, customer-friendly transportation services is also an advantage that multimodal carriers can do. Therefore, in the light of the times when the level of customer-oriented service is getting higher and higher in the process of selecting a means of transport, the development of single transport is inevitable and possible.

5.2 Multimodal Transportation Service

When container transport is compared to single land transport, the additional processing, cooperation and planning activities make it costly (Olteanu & Stinga, 2015). In particular, the transshipment cost can be called a step fix. In the table below, Figure.7 schematically explains the cost problem at the conceptual level for different multimodal transportation compared to single land transportation and rail transportation. Figure (a) shows the steep slope of the land transport curve compared to the rail transport curve. In this case, the fixed cost level of land transportation is lower than that of rail transportation. Therefore, theoretically, when the rail transport cost is lower than the land transport cost, there is a certain transport distance. All figures except figure (a) show additional cost curves for the multimodal transport concept. An additional subsidy fee will be added to each transshipment process. In particular, rail carriers, tow trucks and terminal operators must invest in cost-intensive vehicles and handling equipment. Therefore, it can be said that the standby cost of container transportation is much higher than that of single land transportation.

As shown in the figure above, it is understood that the cost inferiority or disadvantage of inputting the initial sale cost of container transportation has its own reasons. This is not irrelevant to the principle that container transportation has reciprocity that should be achieved through linkage with auxiliary parts in the transportation process. The handling process at the port proves this in particular, and it will be closely related to the computer work following automation and modernization of the port. However, such containers play a role as a central transport for multimodal transport, and the consistent nature of containers in the transshipment process between each means of transport is also a premise for multimodal transport.

The modern age is the era of demand for transportation that provides customer-oriented transportation services. How well carriers meet the transport needs and requirements of consumers is also a matter directly related to the carrier's market competitiveness. Here, the functional role of multimodal transport is well-lit. In other words, each means of transport is connected and delivered and delivered in a consistent and timely manner, thereby maximally satisfying the needs of transport consumers. In other words, it is to enhance customer satisfaction service through door-to-door transportation.



Source : Bendul (2014).

Figure 7: Costs for Multimodal Road Transport

6. Implications and Conclusions

In international transportation, it is important to select an appropriate transportation method and to use it in practice. Also, from the perspective of logistics, it can be seen that each functional element plays an important role in pursuing the rationalization of logistics. At this time, from the shipper's point of view, if the cargo can be transported at a reasonable rate for transporting his or her cargo, logistics costs can be reduced. When choosing a means of transportation, it is necessary to consider several factors. In particular, it would be good to compare the relationship between transportation means and transportation cost to refer to the selection of transportation means by comparing various means of transportation.

In addition to the shipper's choice of transportation, we must not forget to treat the shipper as a customer service from the point of view of the carrier. In a situation where it is becoming common to provide high-quality services to customers day by day, the awareness and understanding of the carrier's service needs to be emphasized more. In other words, each carrier needs to satisfy the interest and access to the cost and service of the shipper.

As a result, it is seen that the choice of transportation means results in a problem of high-quality service and transportation cost. This is also the realm of the simultaneous carrier, which is the problem of the shipper. In that sense, multimodal transportation is judged to be an alternative to meet their needs and demands. Multimodal transportation is being established as the most customer-oriented transportation service in terms of supply and demand in the current transportation market. It is shown as a result of the agreement of Multimodal transportation is, therefore, the best combination transportation service that can be achieved through appropriate and rational selection of transportation agencies, and its good use is a win-win dimension that requires mutual cooperation.

In other words, providing an integrated and optimized service throughout the entire process is also important in the selection of transportation methods, and multimodal transportation will be the answer. In particular, the customer-oriented service form of door-to-door service of multimodal transportation and comprehensive logistics approach with added value are considered to be very important in the selection process of transportation means. Therefore, it is judged that multimodal transportation will be an alternative in the selection of transportation means.

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