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# The shift of containerisation influence: 50-year logistics innovation in international business

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## Keywords

containerisation, supply chain management, logistics innovation, international business

## Abstract

*The purpose of this paper is to analyse the oldest logistics innovation in international business, containerisation. Furthermore, an evaluation of containerisation's influence in the peak of its 50-year presence. The first invention of containerisation is in 1956. Since then containerised shipping has transformed economic geography. Containerisation brings results for modern supply chains in vertical integration, especially reefer containerisation. The method of research used in the paper is qualitative research of literature review on previous studies. Two significant roles of containership found are regarding transportation cost and loading time. This paper contributes to the debate of the containership influence, as the oldest logistics innovation, in international business.*

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## 1. Introduction

The innovation of logistics plays a predominant role in the emergence and development of international business. Innovation is an idea, practice, or object which is described as new by an individual or another unit of adoption (Rogers, 1995). Meanwhile the term logistics, in the earliest year, was limited to military purpose. Nowadays, the concept of logistics relates to physical activities, such as transport and storage as well as non-physical activities. One of the oldest logistics innovations in international business is containerisation. International business consists of economic transactions across national borders to satisfy the needs of individuals and organisations. I choose containerisation as a focus of this research because of its existence has brought a tremendous impact in the business world and reached 50 years since the initial establishment. Business is changing and developing over the year; customer demand becomes higher and more diversified, and the need to have quick door-to-door delivery on the right time increasing. Therefore, containerisation is the right fit to supply the current market. In addition, reefer containerisation, 16.4% of world's containership, answers the major challenge in cold supply chain to guarantee the prime condition of the goods received (Rodrigue and Notteboom, 2001; Drewry, 2011).

This paper begins with an overview of various innovations in logistics since the emergence and development of international business. The next section introduces containerisation as one example of logistics' innovation and the massive development of containers in reefer market. This chapter will elaborate the primary role of containerisation, along with its evaluation, followed by conclusions to be drawn from the research.

## 2. Literature Review

Before getting into deeper analysis about the containerisation and its role, I would like to evaluate the shift of transportation system. Current transport has immense influence to the existing containerised shipping. Tseng et al. (2005) explained that a transportation system is the largest component in a logistics chain. Advancements in a transportation system, for example, ship design and navigation, triggered the transport technologies discovery in the early 1800s' industrial revolution. Hence in 1776, Adam Smith highlighted the need to find a better way of moving products.

In regards to Chang's study (1998, as cited in Tseng et al., 2005), logistics development can be divided into four periods, which are shown in Figure 1.

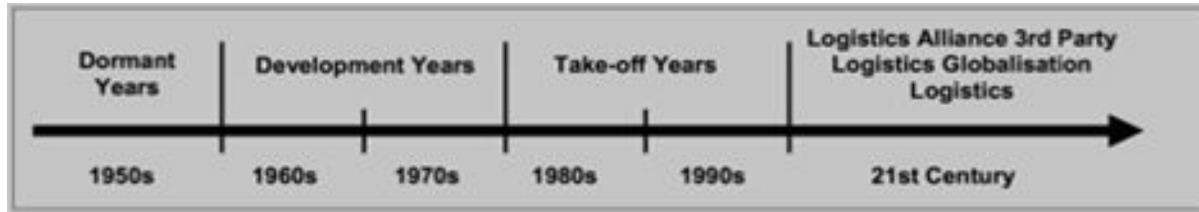


FIGURE 1.

Figure 1. Historical development of logistics

During the dormant years of rebuilding after the World War II, the early 1950s marked by the use of oil tankers and steamships. In 1956, an opening of the Suez Canal created a significant leap in trans-oceanic shipping between Europe and Asia through African coast. The second generation of cargo ships, which were refrigerated, in the second half of the century, contributed to many product diversifications. At this point, countries managed international transaction due to the awareness of factor endowment difference.

In 1960, Hymer's theory introduced foreign direct investment (FDI). This second stage of international business analysis emphasised on the necessity to acquire liability of foreignness while operating business abroad. Edith Penrose in 1959 also noted the need to understand company's behaviour, a resource-based view, to competing and interacting internationally. In their paper, Hirst and Thompson (2002) claimed the beginning of international business was in 1960 when there were the needs of the multinational company enterprise (MNE) activities. The trends in international trade began to rise at over 9 percent per annum from 1950 to 1973. The growing diversity of the international labour market influenced by massive migration since the mid-1970s. In 1990, Penrose identified that some firm's distinctive characteristics benefited from their cross-border market integration. Although these movements caused a massive expansion in volumes traded, distances covered, and products involved, there were still significant barriers for international shipments.

Several issues appeared while handling shipped cargo. Due to the large quantity needed to be moved at the port, each freight was treated separately, and lack of monitoring; as a result, a company faced several lost and damaged items. These restrictions created extended periods and increasing numbers of labourers needed to load and unload crates from one port to another. Such a system resulted in delays at ports, and companies had to hold quite a significant amount of stocks to ensure the success of their production processes (Frost, 2010). To meet the challenge containerisation was imagined and then developed.

### 3. Containerisation and Its Role

Containerisation is a great innovative example in logistics (Grawe, 2009, p. 371). Levinson (as cited in Notteboom and Rodrigue, 2008, p. 153) in 2006 noted that containerisation as a logistics innovation had an astounding impact on production and distribution for 50 years. The first generation of containerisation was invented in 1956 by Malcom MacLean for shipping 58 aluminium truck bodies on a refitted oil tanker from New York to Houston. A similar concept was also used on the east coast of Canada in 1953 and the west coast in 1955. Since then, there have been three generations of containerisation, which differed by size and speed (Pearson and Fossey, 1983, p. 248).

Containerisation's second generation was born during the re-opening of the Suez Canal in 1976, with greater speed but being more costly to operate. The third phase was typically the same as the second generation but more fuel efficient, which then reduced the operating costs. Technological advancements influenced the types of the container carrying ships; such as container/bulk carriers, container/ro-ro, and fully cellular containership (Pearson and Fossey, 1983, p. 1). Containerisation improves a ship's productivity, which makes handling cargo less time-consuming at the port, reduces the number of lifts, and inventory costs (Frost, 2010), reduces transportation costs and the containers themselves are easily moved (Grawe, 2009, p. 360-361).

In 1966, containerisation became a worldwide system of transportation, used by 83% of Europe-East Asia, and 99% of Europe-Japan trade. By mid-1980s, containerisation had become a routine for not only manufacturers but also business functioning and retailers. In hand with the spread of containerisation use in trans-oceanic shipping, containerisation also employed in railways and air transportation. In 1967, trans-Siberian railways provided a well-developed container service across Eurasia which made an alternative way of transporting goods faster compared to trans-oceanic shipping. Later on, in the late 1970s, Federal Express started to make a rapid expansion in its use of cargo aircraft. Although there were several containerised transports by railways and air, only limited amount of literature found.

Containerisation brings results for modern supply chains in vertical integration, especially reefer containerisation. Six contributions of changes brought in reefer containers are the presence of controlled atmosphere systems, electrical plugs, lower cost compared to a specialised reefer, a shipment in smaller quantities with specific temperature and humidity requirements for certain products which are cheaper than air freight transportation, punctual delivery time, and lower risk of cargo damage and deterioration (Arduino *et al.*, 2013). Containerised shipping has transformed economic geography (Levinson, 2008); as well as changing delivery handling from labour-intensive to a capital and time-intensive operation. The presence of containerisation in 50 years, as I mentioned earlier, changes in size and growth over the year. Using the theory of Edith Penrose, I suggest on acknowledging more its competitive advantages to make containerisation a sustainable platform for delivering cargos. There are two most potential benefits of containerisation, such as transportation cost and loading time.

#### a) Transportation Cost

Containerisation arguably has had a significant reduction effect on transportation costs. Macmillan and Westfall (1970) mentioned that selling prices internationally were high in 1959 before the use of the shipping container. Freight might cost 25 percent of the product cost, which meant international trading was not beneficial; also packaging would make up 20 percent of the final retail price (Smyrlis, 2006). The biggest expense of the process occurred at the port of departure, while moving the cargo from land transportation to the ship, and then delivering it back to truck or train before reaching the customer. The cost of shipping before containerisation was unpredictable, with no precision linking manufacturer and importer. Levinson (2008) noted that containerisation has brought about a massive cut in transportation costs around the world.

The costs affected by the rise of containerisation involve the elimination of handling the expense of longshore labour, insurance, and pier rental. This shipping cost reduction allowed industry to locate factories far from their customers, and carry a variety of low-cost commodities from around the globe. "The container made shipping cheap and changed the shape of the world economy," as explained by Levinson (2016, p. 2). The cost of delivering raw materials in, and distributing finished goods out, had decreased dramatically (Erie, 2004). The low transportation cost enhanced more affordable prices for customers thereby increasing living standards around the world (Broda, 2004). In cold supply chain, Arduino *et al* (2013) illustrated the difference of transportation costs between reefer containers and bulk reefer is approximately 10€ per pallet of banana which makes using containers are cheaper than the traditional transportation even in reefer market. On the other hand, Slijper (1976) confronted that the handling cost at the port was likely to be higher since the introduction of containerisation. Even allowing for the fact that containerisation may have created higher handling charges, a company will still prefer to have this type of transportation in spite the fragmentation of shipping beforehand.

Containerisation has created more reliable and efficient distribution channels with customers abroad. The growing figure of established MNEs and company's concern on FDI, influence this distribution channels efficiency. Therefore, further innovation of packaging reduction for containers or truck operations decreased cubic size and weight, resulting in lower freight costs. Despite several

debates about the deployment of transportation cost reduction by using containerisation, I believe that the initiative brings more advantages compared to the earlier vessels/models. The justification of six studies, which agreed on the decrease of transportation costs since the creation of containerisation, informed my thoughts and judgements.

#### **b) Loading Time**

The time needed to load goods and raw materials has been significantly diminished by the operation of containerisation. Before the presence of containerisation, sending freight was interrupted by delays, cancellations, and other unpredictable issues such as lack of water in the river. Being able to handle freight quickly concluded faster shipment cycles from producer to the customer, which then decreased inventory costs (Levinson, 2006). In hand with this statement, Pearson (as cited in Pearson and Fossey, 1983, p. 93) in 1980 stated that the similar proportion of time at the port for a containership is one-quarter, whereas a conventional general cargo ship is two-thirds. Whittaker (1975, p. 2) also suggested that the ability to load and unload cargo at once in standardised containers, thereby avoiding the handling of small packages, benefited all parties from the dock and point of origin or consumption. Vessels spending less time in port is the result of containerisation usage. Time for unloading the bulk vessel, the traditional transportation before containership, takes up to three to four days while containers can take less than 24 hours (Wild, 1996; Drewry, 2011).

The containership's first generation was eight or ten times more utilised. Companies could reduce the long-consuming waiting, creating inventory unproductively for goods 'trapped' on the train or waiting for shipment in the harbour. A shipment operated with precise timetables of departures and arrivals encourages the operator to have the confidence to claim the reliability of shipping time. The continuous benefit gathered from containerisation facilitated just-in-time manufacturing. The 'just-in-time' model was established by companies like Toyota in Japan in the early 1970s. The new production system could result in producing and shipping products as customers needed them, which led to a substantial amount of cost savings and reduced manufacturers' inventories. The rapidity of cargo movement created increased sales (Slijper, 1976). When actual sales improved, revenue of the company will follow, because the company could conveniently provide the quantity needed by the customer. Moreover, the increase in sales was strengthened by the smaller volumes of cargo 'lost' during shipment, as happened before the invention of the shipping container.

#### **4. Conclusions**

This paper covers broadly the logistics relating to the establishment of international business, with particular reference to the role of its innovation through an extensive review. Delivery from manufacturers to the final consumers is required for the whole production procedure, which only if properly coordinated in each component would result in the ultimate benefit. Since the first international use of containerisation in 1966, the volume of international trade has doubled global manufacturing production's capacity. The dramatic decrease in transport costs and loading times, due to the increase of containerisation operations, has contributed a significant role in enhancing the integration of the global economy, especially in the field of international business. Efficient logistics' operations increase customer value and add value to a firm's output, resulting from the ability to reduce costs and give delivery solutions according to customers' needs. The containerisation model has shown itself to be the best way of cost saving and the most efficient logistics innovation for both exporters and importers.

#### **5. Research Limitations and Direction for Further Research**

The author describes a comprehensive analysis of containerisation performance for 50 years in this research. However, the influence of containerisation does not stop in the harbour yet continues to the on-road transportation, such as trucks and trains until finally reach the final

destination, customers. As a result, the availability of these transportation modes in the containership chain should be discovered to get the complete insight of supply chain management. Future research should focus on the analysis of post-harbour containerisation chain and not limited to the presence of trains and trucks.

### Acknowledgement

The research of this study is sponsored and funded by Indonesia Endowment Fund for Education (LPDP).

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