History and Impact of the Intermodal Shipping Container

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The intermodal shipping container, a large steel box built in a small number of standard sizes to allow transportation of goods by ship, truck, train and, rarely, airplane, is a simple technology whose use has had a profound social and economic impact. That impact was initially felt by actors in the shipping industry, particular port workers and shipping companies. But, as with many extremely effective technologies, the container's impact became much wider – affecting not only the shipping industry, but local development and the global economy.

The Need and the Technology

Into the 1950s, most goods transported on water over long distances were shipped by what is called break bulk shipping, in which goods were transported loose or packaged in boxes, bags, barrels, or other relatively small containers that varied depending on the type of good. A major cost in break bulk shipping is time and labor spent loading and unloading ships at portside in ways that avoid damage to the goods. One analysis in the late 1950s concluded that 60-75% of the cost of transporting cargo by sea was made up of portside costs, while another study of a specific ship voyage found cargo handling made up about 37% of total costs (Levinson 21, 33-34). These costs included not only labor, but losses of time and damage (including theft) to cargo waiting to be loaded onto a ship while other material was unloaded. Cudahy (*Container Revolution* 5-6) reports that a "cargo ship typically would spend as much time in port being loaded and unloaded as it did sailing."

The exception was in shipping to carry a single type of good, such as oil. For such goods, both ships and port facilities had been specialized to allow more rapid loading/unloading, at lower costs. This specialized bulk shipping had become industrialized, in contrast to break bulk

shipping of more diverse or finished goods, the loading/unloading of which had changed little in decades (Broeze 9-11).

The high costs of ocean shipping inhibited international trade. In 1961 ocean freight costs made up 12% and 10% of the value of U.S. exports and imports respectively, and were so high for some goods that international sales were impossible. These costs contributed to the remarkable situation of international trade in 1960 making up a smaller proportion of the U.S. economy than in it did in 1930 (Levinson 8-9).

Some attempts had been made to overcome these challenges. For example, the U.S. Military had begun using 8'6"x6'3"x6"10" metal shipping containers during World War II and continued to do so into the 1950s ("History & Development").

Commercial attempts, which were to have far greater impact, were made by shipping companies in the United States, particularly those led by a former trucking company magnate, Malcolm McLean. The concept was simple: by using metal shipping containers similar to those used by the U.S. Military but in sizes that were larger yet still capable of being transported by truck or train (thus "intermodal"), the loading of goods onto ships could take place in two locations – one closer to the point of manufacture or assembly (possibly hundreds or thousands of miles away), in which the goods are put into containers, and the second at dockside, where the containers are loaded onto ships. Unloading is similar, with goods removed from containers at a point of distribution or even sale, far removed from the docks. McLean's companies and another firm, the Matson Navigation Company, successfully used this technology along a number of shipping routes in the late 1950s and early 1960s (Levinson 54-68). The container revolution had begun.

Standardization and Popularization

The intermodal shipping container became the preferred way of shipping most ocean freight in the 1960s for two reasons. One was the success of particular companies, such as McLean's (which had been renamed Sea-Land Service, emphasizing the intermodal nature of its business). Sea-Land's growth benefited from being able to demonstrate it's cost efficiency servicing the U.S. Military during the Vietnam War, where dockside break bulk unloading bottlenecks were a major problem that the container helped overcome (Levinson 176-188).

The other was standardization of container sizes across the shipping industry, which allowed for more aggressive investment in ships and container-handling equipment. In the first few years of use, different companies had used containers suited to their particular industry or circumstances, with factors affecting container size including the ships they owned, the type of goods being transported, legal limits on the length or weight of loads carried on roads in markets they served, and similar limits for rail travel. However, industry-wide and international agreements on principal container sizes were reached rapidly in the early 1960s. Agreements were also reached on container strength, to allow containers to be stacked and also to allow transportation not only by ship and truck, but also by train. (The ends of containers must be strong enough to withstand the forces produced when train cars bump, which are much higher than typical forces on ships and trucks.) Standards for fixtures to allow containers to be lifted and connected were also specified (Levinson 127-149; Broeze 12-16). The compromises developed at that time are among the most common sizes today.

Impact on Port Labor

The impact of expanded use of containers was immediately felt by port workers, with the speed efficiencies in loading/unloading meaning fewer workers were required. Studies found that the amount of goods per worker that could be loaded or unloaded with containers, as compared to break bulk, was so much higher as to "make nineteen in every twenty men redundant," as Broeze (235-236) puts it.

These changes were naturally met with misgivings by workers and their unions, resulting in major struggles between labor and shipping companies that lasted into the 1980s. The ultimate result was tremendous drops in the number of dock workers – with examples being the number of registered longshoremen on the U.S. East Coast falling by over two-thirds from 1952 to 1972, and the number of dock workers in the United Kingdom falling from over 70,000 to under 10,000 between the early 1960s and the late 1980s (Broeze 237-238). These changes occurred in spite of worldwide shipping increasing more than 600% from 1950 to 1973 (Brookfield 63).

Impact on Other Technology and Business Practices

The nature of dockside labor changed as well, with container operations demanding more technical skills in operating heavy machinery. Standardization of container size and handling attachments meant that the same cargo handling equipment could be used for a huge variety of goods. Moreover, ships could be designed from the start to carry containers. Uncertainty in shipping was also reduced – it was easier for a shipping company to calculate the speed of loading or unloading containers than for a similar quantity of mixed goods.

These advances resulted in further increased investment in ships and shipping companies in the 1970s (Broeze 72-76) and the of creation ever-larger container ships as efficiencies of scale

of big ships, which would be loaded and unloaded rapidly, became evident. As the scale of operations of shipping companies grew, they pursued further integration with land transportation. A key example is Sea-Land. It had started as a trucking company, and agreed to a friendly takeover by the railway company CSX in 1986 (Cudahy, *Box Boats* 160-166).

Impact on Ports and Cities

Advances in lowered costs of labor, faster loading/unloading, and increased ship size occurred in parallel with changes in ports themselves. Larger ships required deeper water. But more importantly, containerized trade required more space. Containers are their own storage, so warehouses were not needed at portside. Instead space was needed for the containers themselves and also for the additional volume of trade that lowered shipping costs allowed. In many places, this resulted in shifting of port operations from near city centers to less developed locations. Example are the rise of Tilbury as the main container port for London (Brown 132-144) and the movement of cargo operations from New York City's piers to Elizabeth and other locations in New Jersey. In some cases, the growth of ports has taken the form not only of direct expansion, but also of consolidation of several facilities in nearby towns or cities (McCalla 129-131).

In many cases, the scale of container shipping led to, or at least highlighted, the value of regional cooperation. In California, competition between the ports of Los Angeles and Long Beach for container traffic gave way to more coordination between them in the 1980s (Erie 88-93). In the greater New York City area, the Port Authority of New York and New Jersey has played a key role in such regional coordination.

Containerization has contributed to changes in the location of industry and labor within regions as well. The advantage of export manufacturing taking place dockside disappeared as low-

cost intermodal transportation became available. Instead, manufacturing could spread out regionally into the facilities designed to allow easy access for trucks carrying containers, rather than built up along the waterfront. Such changes were dramatic in New York City, for example, with manufacturing in the city dropping precipitously while container shipping to and from inland locations was booming in New Jersey (Starr 48-55; Levinson 98-100).

Global Impact and Future Directions

But the most profound impact of the container is on the global economy as a whole. Worldwide, by the early 2000s, 300 million 20-foot containers were moved by sea each year, with over a quarter of those shipments coming from China (Levinson 277). As Slack (25) puts it:

> Globalisation and container shipping enjoy a reciprocal relationship. There is little doubt that the expansion of international commerce and the expansion of global manufacturing systems would have been impossible without the efficiencies and economies that containerisation has brought. Container shipping is a facilitator of globalisation.

Globalization is rightfully the subject of much debate. We have seen how containers have reduced employment at individual ports. Beyond that, globalization has resulted in shifting of employment among cities, regions and countries. It has also lowered costs to consumers and enabled delivery of a much wider varieties of goods to many markets. Globalization has affected not only economies but the environment, politics, and culture. The shipping container, a simple technology intended to speed the loading/unloading of goods, has played an important part in those changes.

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