



BUILDING WITH BOXES

The Containership Market Explosion

by Marc Levinson, New York

The modern shipping container, introduced in 1956 and first used internationally in 1951, has brought about breathtaking changes in the world economy. Before the container, transporting goods was expensive - so expensive that it did not pay to ship many things halfway across the country, much less halfway around the world. Containerization changed all that. By making freight transportation cheap, it turned transport cost from a key factor in economic decisions into an afterthought.

This dramatic change in cost structures had implications far beyond the maritime industry. Manufacturers no longer needed to cluster near ports or customers in order to minimize their freight bills. Sprawling industrial complexes where armies of thousands manufactured products from start to finish gave way to smaller, more specialized plants that shipped components and half-finished goods to one another in ever lengthening supply chains. Australian wines, Brazilian shoes, Turkish suits, and luggage made in China, became routine merchandise in retail stores around the world, exposing consumers to an unprecedented variety of products at unimaginably low prices.

Before containerization, goods moved across the ocean in breakbulk ships, vessels with several levels of open space beneath the top deck. Many of the vessels in use in the 1950s and 1960s were World War II-era Liberty Ships and Victory Ships, which had intentionally been built small to minimize the loss of cargo in submarine attacks. These war-surplus vessels were sold off at bargain prices after the war, creating a low-cost merchant fleet. Because ship lines had paid almost nothing for their vessels, and had built almost no new vessels since the 1920s, most of the cost of transporting goods internationally was incurred in the loading and unloading of ships.

This was a complicated business. At the shipper's factory or warehouse, the freight would be loaded piece by piece on a truck or rail car. The truck or train would deliver hundreds or thousands of such items to the waterfront. Each had to be unloaded separately, recorded on a tally sheet, and carried to storage in a transit shed, a warehouse stretching alongside the dock. When a ship was ready to load, each item was removed from the transit shed, counted once more, and hauled or dragged to shipside. The dock would be covered with a jumble of paperboard cartons and wooden crates and casks.

Getting all of this loaded was the job of the dock workers, variously known around the world as longshoremen, stevedores, wharfies, or dockers. These men would assemble various boxes and barrels into a "draft" of cargo atop a wooden pallet, which was then lowered by a shipboard winch into the hold. There,

another gang of dockers would remove each item from the sling board and find a place to stow it, maneuvering it into position with a four-wheeled cart, a fork lift, or brute force. An average trans-Atlantic ship in the 1950s might carry 200,000 separate items, so loading and unloading it could easily take a week or more.

The path to containerization was forged by a man who knew nothing at all about ships. Malcom McLean started in business driving a single truck in 1933, and by the early 1950s had built one of America's largest and most profitable road-hauling companies. Changing the world was far from McLean's mind. Rather, his original goal was simply to make a buck: congested highways were making truck traffic along the East Coast much slower and less punctual in that pre-expressway age, and McLean figured he could gain a competitive advantage by putting his trucks on board ships and sending them down the coast by water rather than by road. Government regulators wouldn't permit a truck line to own ships, and rudimentary investigation showed that putting wheeled truck trailers aboard vessels would lead to a hugely inefficient waste of space. McLean sold off his truck line in 1956 and bet everything on his specially designed containers, which would ride in special frames built aboard remodeled ships.

McLean's fundamental insight, commonplace today but quite radical in the 1950s, was that the shipping industry's business was moving cargo, not sailing ships.

Malcom McLean was by no means the "inventor" of the shipping container. Metal cargo boxes of various shapes and sizes had been in use for decades, and numerous reports and studies supported the idea of containerized freight before the *Ideal-X* set sail. None of these efforts had been profitable, McLean's was, because he approached containerization quite unlike the shipowners and railroad men who had tried it before. McLean's fundamental insight, commonplace today but quite radical in the 1950s, was that the shipping industry's business was moving cargo, not sailing ships.

NOT FOR REPRODUCTION

That insight led him to a concept of containerization different from any that had come before. McLean understood that reducing the cost of shipping goods required not just a metal box, but an entire new way of handling freight. Every part of the system - ports, ships, cranes, storage facilities, trucks, trains, and the operations of the shippers themselves - would have to change. In that understanding, he was years ahead of almost everyone else in the transportation industry.

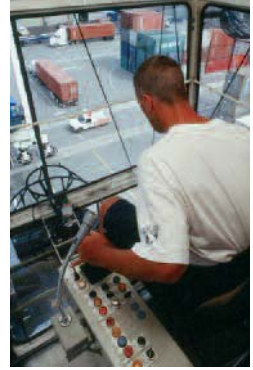
Ships are the most costly part of containerization, but containerization isn't really about ships. Rather, it is a highly automated system for moving goods with a minimum of cost and complication. A modern containerport is more like a factory than like the docks of the pre-container era. At each berth - the world's biggest ports have dozens - rides a mammoth oceangoing vessel carrying nothing but metal containers, stacked 15 or 20 abreast and six or seven high both on the deck and in the hold below. The structure that holds the crew quarters, topped by the navigation bridge, is toward the stern, barely visible above the stacks of boxes. The crew accommodations are small, as is the crew. A ship carrying 3,000 40-foot containers may cross the Pacific with only 20 people on board.



THE VANCOUVER PORT AUTHORITY

On the wharf, the container cranes go into action almost as soon as the ship ties up. The cranes are huge steel structures, rising 200 feet into the air and weighing more than two million pounds. Their legs stretch 50 feet apart, easily wide enough for several truck lanes or even train tracks to pass beneath. The cranes rest on rails running parallel to the ship's side, so that they can move forward or aft as required.

High up in each crane, an operator controls a trolley able to travel the width of the vessel along a boom. From each trolley hangs a spreader, a steel frame designed to lock on to all four top corners of a 30-ton box. The operator moves his trolley out the boom to a precise location above the ship, lowers the spreader to engage a container, raises the container up towards the trolley, and pulls trolley and container quickly toward the wharf. The trolley stops above a rubber-tired transporter waiting between the crane's legs, the container is lowered on to the transporter, and the spreader releases its grip. The transporter then moves the container to the adjacent storage yard, while the trolley moves back out over the ship to pick up another box. The process is repeated every two minutes, or even every 90 seconds, each crane moving 30 or 40 boxes an hour from ship to transporter, each time picking up an outbound container from another transporter to reload the ship.

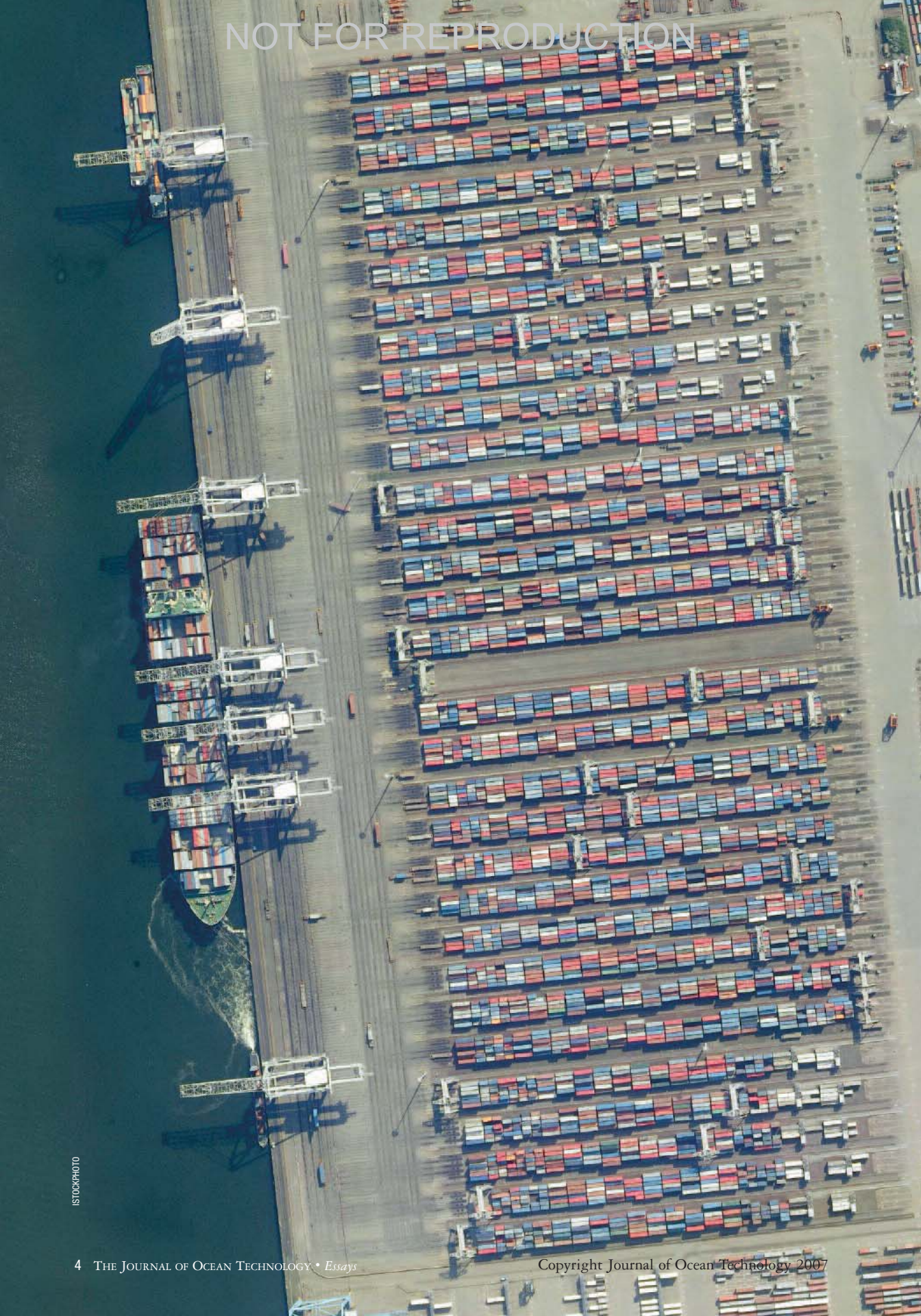


THE VANCOUVER PORT AUTHORITY

In the yard, a vast asphalt lot, (see photo next page) the incoming container is driven beneath a stacking crane. The stacker has rubber-tired wheels 50 feet apart, wide enough to span a truck lane and four adjacent stacks of containers. The wheels are linked by a metal structure 70 feet in the air, so that the entire machine can move back and forth above the rows of containers stacked six high. The crane engages the container, lifts it from the transporter, and moves it across the stacks of other containers to its storage location. A few hours later, the process will be reversed, as the stacking crane lifts the container on to a steel chassis pulled by an over-the-road truck. In the most advanced ports, the entire process of moving containers on the dock and in the yard is performed by automated vehicles without human operators, leaving the waterfront busy with activity but almost devoid of workers.

The equipment needed to move containers, and the technology to keep track of them, have reshaped the economics of the shipping industry. Before the container,

NOT FOR RETRODUCTION



ISTOCKPHOTO



ISTOCKPHOTO

ocean shipping was highly labor intensive, with most of the cost incurred in loading and unloading. Investment needs were minimal. Shipowners had little incentive to build large ships, as big ships were no cheaper to load than small ships, so they made do with old vessels that carried little debt. Capital equipment on the docks was limited to the occasional forklift truck. In this environment, in which most costs were variable, shipowners rarely lost much money: if no cargo was to be had, a ship could simply be tied up at the dock and most of the costs would go away.

Containerization transformed ocean shipping into a highly capital-intensive business. And in container shipping, quite unlike breakbulk shipping, scale matters. New containerships are expensive, costing more than \$100 million per vessel, but they keep getting larger nonetheless. The reason is simple: the larger the ship, the lower the cost of carrying each container.

Until 1988, the largest containerships afloat held no more than 2,500 40-foot boxes-in shipping lingo, 5,000 twenty-foot equivalent units, or TEUs-because vessels with larger capacity cannot fit the locks of the Panama Canal. Since then, dozens of post-Panamax ships have joined the world's container fleet. These vessels are too large to traverse the canal, so ship lines employ them on routes for which size is no obstacle. Vessels traveling from Asia to Vancouver or Los Angeles routinely carry 4,000 40-foot containers and in a few cases more than 5,000. Smaller, older vessels are employed on routes between East Asia and the Atlantic ports of North America.

The canal's size constraints raise the relative cost of shipping between East Asia and both East and Gulf Coast ports and Europe. More important for shipowners and their customers, the canal's size limitations reduce flexibility and redundancy. When Pacific ports are closed by a labor dispute, as occurred in 2002, or when land transport tie-ups leave incoming vessels spending days at anchorage, as happened at Los Angeles and Long Beach in 2005, ships cannot simply be diverted to eastern ports. The enthusiasm of shipowners and major shippers for expanding the canal is easily understood.

Vessels traveling from Asia to Vancouver or Los Angeles routinely carry 4,000 40-foot containers and in a few cases more than 5,000.

Yet the canal project is a risky financial bet. Shippers, the companies that pay the bill for shipping, generally are indifferent to the routing; if Wal-Mart asks Maersk Line to move a container of apparel from Hong Kong to Kentucky, Maersk can choose among dozens of possible ways of doing so. It could ship the container to Long Beach and put it on a train to Memphis, or send it via Vancouver with rail to Chicago. It could take it through the Panama Canal to New Orleans and then send it to Kentucky by truck, or it might use a routing through the Suez Canal and across the Atlantic to Norfolk. The canal, the North American ports, and the land transportation companies are all competitors for the business, Maersk's choice is likely to depend upon which combination of ocean shipping costs, port costs, and land transport costs is cheapest at the time.

Therein lies the challenge for the Panama Canal Authority. Today, ship operators have every reason to favor an expanded canal. Once the money has been spent and the canal widened, however, vessels will avoid the canal if it is not the lowest-cost alternative. Recovering construction costs through higher tolls may prove difficult, because the anticipated customers can literally sail away. The Canal Authority must find a way to collect as much of the money as possible before construction starts, at a time when demand for shipping is quite robust. Should slower world economic growth weaken demand for shipping or should the expansion end up costing more than projected, shipowners will do their best to avoid paying the bill after the fact. ~

Marc Levinson is an economist in New York and author of [The Box: How the Shipping Container Made the World Smaller and the World Economy Bigger](#). (Princeton University Press, 2006). Marc can be reached at mrlevinson@comcast.net.