

Lessons from the past: what present day disruptors can learn from the containerization of the shipping industry

In terms of innovation in supply chain and logistics, the introduction of the shipping container is perhaps unrivalled as regards its impact upon the industry and the global economy. The reduction in transport costs which it brought about enabled retailers and manufacturers to access low cost products and labour forces in previously remote parts of the world, leading to a revolution in the way that supply chains operated.

The adoption of the new technology was not, as many would expect, quick and without challenge. Companies had experimented with unitizing freight for several decades before but it was not until the 1950s when the containerization trend started to take root.

The way in which shipping containers transformed the industry has many lessons to the disruptors of today and it is therefore useful to analyse this period of systemic change.

The economic case for containerization

Before containerization, one of the greatest areas of time and cost lay in the inefficient handling processes of loading and unloading ships. Typically this could include:

- Unloading of rail freight wagon/truck at the port
- Handling and storage on dock
- Potentially use of a 'lighter' (barge) to move freight to the dock
- The carriage of goods onto the ship (by manual labour)
- Stowage on board

When the ship docked the reverse process was undertaken. Loading and unloading ships took a long time; was labour intensive and the work was often dangerous. In addition to this, most ports had a problem both with corruption and cargo crime. This was endemic across the world.

Governments, shippers, ports, rail companies, trucking lines and shipping lines were not blind to the inefficiencies and the costs involved. Many studies had been undertaken over the years which identified the waste. However, as will be shown, the 'silo mentality' (as it would be called now) was a powerful factor against change. With the exception of shippers, the supply-side of the industry benefited from many of the barriers to change which were in place. This was reinforced by resistance to reform from labour organizations fearing (rightly) that automation would reduce employment in the sector.

Shippers, it might be said, were the victims of these cosy relationships which existed across the logistics sector. However, the high levels of fragmentation which existed in the demand-side prevented any customer pressure for reform. In any case it was unclear that the containerization of shipments would produce savings. Early indications were that unitizing freight without systemic changes to the truck and rail industry, without specialized loading equipment and of course without the specialist container vessels on which to stow the boxes, would be more costly than the existing 'breakbulk' process. Getting every sector to buy in to the case for reform was the real challenge and even then it took many years for the economic value to be released.

In retrospect, it is clear that containerization was the first materialization of 'total supply chain management'. Before this, each logistics sector acted independently without much regard for the opportunities to connect to other modes. Each sector believed its role was to operate its assets in the

most efficient way – not to create efficiency in the supply chain as a whole. The early pioneers of containerization started to change this mind set.

So why did it take so long for a new system to be developed? Looking at the barriers to the adoption of the new technologies and processes involved in containerization provides an indication to present day would-be disruptors.

Social and Political barriers

At the time, national and local politicians were some of the most influential opponents to change in the transport industry. They had an interest in retaining the status quo, largely due to the large labour forces employed in the sector, however inefficiently.

Labour organizations (which had a large influence over the politicians) saw as their role the protection of the jobs and employment rights of their members. In many ports they also benefited from taking kickbacks from shipping lines and they had a monopoly on handling. Even politicians favourable to free markets were frightened of the power of the unions – and rightly so. In the UK a boycott of the new container terminal at Tilbury by unions led to London losing its position as one of the leading ports in the world. Instead, non-unionized Felixstowe was able to grow from a backwater to one of the world's largest terminals within a matter of years.

The resistance to the new, less labour-dependent operating model brought about by containerization has echoes in the antipathy shown to automation and robots which are starting to be deployed in warehouses. Politicians in North America, Europe and Asia are already talking about a tax on robots to slow down the onset of automation. This has echoes of the campaigns (ultimately futile) fought by labour organizations in 1960s and 70s to protect dockworkers' jobs and the income guarantees negotiated by many unions such as the 'Economic Stabilization Program' in the US in the late 1970s.

Legislative barriers

In the post-war era in large parts of the world, the shipping and transport markets were heavily regulated. This was no more the case than in the US where the Interstate Commerce Commission (ICC) controlled most aspects of the freight market. Rates were set (generally on a per commodity basis) and routes allocated to trucking companies by the ICC who saw as its role the maintenance of stability across the US transport market. Huge barriers were placed in the way of companies which wanted to innovate either with new routes or even to start hauling commodities for which they had no permit. This created massive inefficiency.

The ICC was used not only by the government to maintain stability (or stymie innovation depending on your view point) but also by various parts of the industry to prevent competition. For instance, rail companies could challenge trucking companies over the rates they were charging. Likewise shipping lines might challenge rail companies over the routes and services they were providing if they thought it would impact on their profitability.

The regulatory climate is perhaps less proscriptive in the present era than it was in mid-20th century. This, however, has not stopped regulators from taking aim at disruptors such as Uber (licence revoked in London) and AirBnB (banned in various cities in Europe and Asia). As far as the logistics sector is concerned, tax authorities look to be clamping down on employment practices in the 'gig economy' which could limit the operations of many on-demand, last mile delivery companies. With many cities also implementing 'diesel bans' to create clean air zones, the additional traffic caused by on-demand

couriers could come under scrutiny. Implementation of drones has also been held back whilst regulators assess safety, security and privacy issues.

Regulators very unwillingly gave up their control of logistics markets when it finally became evident that even the largest incumbent players could not operate within the sclerotic systems which had been created. The signs are that there is a renewed appetite for re-regulation of many parts of the industry which may well constrain the development of new generation innovators.

Technological barriers

The technological challenges (albeit in the hardware rather than software) involved in the development of containerization should not be underestimated. There was a long period of trial and error before successful designs of the container boxes, the ships, the trucks and the intermodal rail wagons as well as the cranes and handling equipment capable of moving and stowing the containers became adopted. For instance:

- The boxes had to be sturdy enough to be stacked, but not too heavy to make the tare weight uneconomic.
- There had to be a quick way to pick up and load the containers by crane.
- The system had to be standardized so that the boxes could be moved by any truck or by any rail company.
- The system used to stow the boxes on board ships had to be robust enough so that the containers would not shift during the voyage.

Of course, at the outset many companies tried different systems. For example, was it best to deploy shipboard or dock-based cranes? What was the best size for the containers, maximizing economic value of weight and volume? How many containers could be stacked on a ship without it becoming unsafe? It is easy to look back at this period and think that containerization was inevitable, but this was certainly not the thinking at the time.

Likewise, there have been many false starts for other innovations. e-commerce spawned the dot-com bubble of the early 2000s; RFID tags have been around for many decades, although it is only recently that low-cost sensor technology has taken off; excitement over delivery by drones is subsiding; how will 3D Printing develop? Picking the technology which will win out today is just as difficult as it was for the pioneers of containerization 60 years ago.

Resistance from market incumbents

The majority of the incumbent shipping lines of the time were hostile to the prospect of innovation in the form of containerization. The shipping industry had always been focused on moving ships rather than the cargo and there was what might be termed cultural indifference to improving supply chain efficiency. This was perhaps why one of the major innovators in the disruption of the sector, Malcom McLean, came from outside of the sector – trucking rather than shipping. The existing shipping lines had a vested interest in avoiding change, despite acceptance that processes were highly inefficient.

One of the reasons for this was that, from their perspective, there was little economic case for change. Although ships would spend long times in port, this was only partly problematic. Unlike today when it is important for shipping lines to maximize utilization – ships should be generating ROI by steaming at sea and not tied up in harbour – post-war, merchant ships were very numerous and cheap, sold off by navies after the war effort. Shipping pre-containerization was not asset intensive. Stevedoring was

likewise asset-light, using temporary labour rather than investing in materials handling equipment and new technologies.

In terms of the present market incumbents there is also resistance to change, albeit for different reasons. Many large logistics companies have invested heavily in technology systems over the past 30 years and these systems are in place today. Even though there is no doubt that at some levels all companies have committed to embracing the opportunities which innovation can bring, making changes to these legacy systems is easier said than done. This has sown the seeds for disruptors such as freight forwarder Flexport to enter the market. With the benefits of working off a blank sheet of paper, the company has been able to develop systems from scratch rather than add on components to 1980s' architecture. Management claims that 70% of its employees come from outside of the freight forwarding sector, providing an alternative perspective on many of the challenges faced.

Unpacking the economic benefits

Although there was a good economic case for unitizing shipping volumes in the 1950s due to the reduction of handling costs and time, the benefits were certainly not clear cut. Many shippers exported or imported small consignments not large enough to fill a container (these days this is called less-than-containerloads or LCL). Therefore, there was a large amount of consolidation to be undertaken which, of course, involved extra handling. Whereas these days the container market is dominated by large importers, such as Wal-mart, filling many thousands of full containers, this was not the case in the 1950s when the market was far more fragmented. What to do with empty containers was (and still is) also a problem. Trade imbalances around the world have led to a pile up of containers in major import markets (i.e. North America and Europe) and their restitution is only possible due to the overall economic value created elsewhere in the system.

There was also the view (at least at the outset) that containerization would be unnecessary for international shipping as the time spent loading and unloading was a much small proportion of the overall travel time. When a journey might take 4-5 weeks, a few days extra in port was less critical than in a short sea shipping operation.

However, this was a very limited view of the potential of containerization. Very quickly it was evident that shipping volumes could (and would) consolidate around a few, very large terminals serving large containerships. Feeder services would move containers to these hubs from smaller ports where they would be transhipped. The huge levels of efficiency and the economies of scale which this new system created meant that rates fell significantly leading to industry transformation.

Today's innovators are trying to address inefficiencies in other transport sectors. For instance, as with shipping before it, road freight is highly inefficient, some estimates suggesting that close to a quarter of trucks are empty at any one time¹. In theory, a technological solution which better matches capacity with demand should release this economic potential and for precisely this reason many road freight platforms have developed over the years. Unlike containerization, however, there has been no revolution. Why is this?

There are many reasons, but perhaps the most important is that whilst shippers can benefit from lower road freight rates using such a platform, the asset providing road freight operators don't do so well. The 'reverse auction' nature of such platforms can lead to a race to the bottom in terms of rates. Whilst rate

¹ European Commission, <https://ec.europa.eu/transport/sites/transport/files/mobility-package-overview-of-the-eu-road-transport-market-in-2015.pdf>



reductions also occurred in the shipping industry, of course, the leading shipping lines were able to consolidate, build bigger ships to provide lower costs, maximizing economies of scale, and call at fewer, larger, faster ports to improve asset utilization. The potential for the road freight sector is very much more limited in these respects. For example, delivery frequencies and just-in-time or on-demand delivery have driven the need for smaller, less-efficient commercial vehicles not larger.

Conclusion

Containerization was not a solution to a shipping problem. Rather it addressed inefficiencies within the entire supply chain. The fact that it impacted on so many parties – shippers, shipping lines, rail operators, truckers, port authorities, stevedores, labour organizations, governments to name a few – created major barriers to its wholesale adoption. Eventually these barriers were overcome by the sheer weight of the economic case and the power of free markets.

The lesson for today's innovators is that it is not enough to design a solution which addresses the symptoms of a problem – a deep understanding of the underlying issues and the needs of all the stakeholders concerned is required. Just because something becomes technologically possible, doesn't mean that it will be successful. Social, political, cultural and regulatory factors have to be taken into account as well as the basic economic case. There have to be benefits for all (or at least most) stakeholders, not just a few.

Further Reading

For readers wanting to find out more about the transformative nature of containerization, I recommend reading *The Box: How the Shipping Container Made the World Smaller and the World Economy Bigger* by Marc Levinson. <https://press.princeton.edu/titles/10724.html>



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