The Coming Modularisation of the Global Supply Chains

Vivek Sood

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The field of international goods transportation has witnessed several great advances over the last 100 years. Of these, perhaps, none had more far reaching impact than the advent of containerisation. Before 1965, all packaged goods were packed into boxes of different sizes and shapes to be loaded on ships. General cargo ships themselves were small in size – no bigger than 20,000 tonnes or so – and stayed anywhere between 1 week and 4 weeks in any single port. About 70% of ship's time was spent in non-value producing activities such as planning and loading boxes and crates of diverse sizes and shapes into the ships holds.

Containerisation changed all that. Ships are now built to carry standard containers of 20' (or 40'). Containers are packed and unpacked in container yards far from ports – reducing the need for holding the ships in port, and costly warehousing space close to port. Size of container ships has increased greatly – the latest ones will carry nearly 10,000 TEUs (twenty equivalent units) or about 100,000 tonnes. These ships utilise more than 80% of their time on value-producing activities. No wonder the cost of shipping one meter cube of packaged cargo has gone down by nearly 75% to 85% in real terms over the last 40 years. This has made it possible to reconfigure the global supply chain in such a way that most activities are now carried out in the best place to do so. Manufacturing boom in China, super large container shipping companies, hub and spoke model of shipping, emergence of 6-10 global container terminals, are all partially a result of containerisation.

So what precisely is the magic in using standard shipping containers instead of boxes and crates? The answer is simple – modularisation. We believe that a similar move towards modularisation of global supply chains is emerging and it will have a far reaching impact on the organisations, nations and businesses. Before looking at its impact, let us examine what modularisation means in a wider context of global supply chains.

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Imagine a supply chain which is able to instantly flex itself to the changes in your business structure and dynamics. Every time your company bought a division, you could seamlessly integrate its supply chain with your overall supply chain. Every time you divested a business, you could unravel the integrated supply chain without too much pain (and/or expense). Moreover, every time a trucking, freight forwarding, warehousing or shipping company proved itself incapable of meeting commitments made during the sales process – you could easily take your business to another one. Every time you reconfigure your manufacturing footprint, or alter your sourcing strategy, your supply chain follows closely. In other words, your business is not beholden to any one supply chain service provider or systems provider - because they are all interchangeable. The physical infrastructure, processes, systems and services involved in configuration of global supply chains are slowly but inevitably moving towards modularisation that will make this possible.

Modularisation, in this context, means breaking up of a greater whole into interchangeable parts that fit together seamlessly; and, together, in many different combinations and permutations, make many different wholes. The gradual evolution towards modularisation of supply chains is being spearheaded by the customers who demand control and flexibility in their supply chains coupled with low cost. Modularisation is preceded by Standardisation – achieving commonality in terminology, in measurements, and in activities. Standardisation is essential to modularisation because it helps simplify the complexity and bring uniformity. Imagine, if shipping containers were of many different sizes – rather than a standard container of 20'x8'x8'. Efforts to modularise general cargo shipping would have been seriously hampered.

Why is modularisation attractive? Because it helps us achieve homogeneity – a condition where products and services start looking more and more similar. Homogeneity, in turn, encourages substitution and/or switching between suppliers and hence commoditisation of the relevant market. This essentially leads to falling prices, and growing volumes – implications which we will analyse further after examining the causes of modularisation of global supply chains.

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Supply Chain Element	STANDARDISATION (emergence of common parameters – terminology, measurements, activities)	MODULARISATION (breaking up into smaller more manageable units)	HOMOGENISATION (creation of similarity between modules in order to facilitate switching)	COMMODITISATION (multiple buyers competing on a level field to supply modules at best price)	IMPLICATIONS
Physical Infra-structure	Use of standard shipping containers, pallets, warehouse designs, ships etc.	Containers, pallets, ships, tanks etc. become interchangeable modules	TEUs, pallets etc. are standard unit of carriage. Most business is carried out on these terms.	All buyers and sellers in the market become price takers. Massive growth in volume and ship size.	Massive growth in world trade as businesses carry out manufacturing where it is most cost effective.
Systems	Standard supply chain systems emerge with recognised functionalities and capabilities.	Systems are increasingly configured as modules which work together with other modules from same or different vendors.	Similar modules of different vendors become interchangeable. System modules become homogenised units of trade.	Systems become increasingly a commodity – conferring no particular competitive advantage. Prices start drifting lower.	•CIOs' role in mixing and matching a best-of-breed solution becomes paramount. •Easier to configure systems that match business needs. •Systems aid rather than hinder process and service outsourcing, offshoring and switching
Processes	Standard supply chain processes with well articulated inputs, outputs and intermediary steps.	Sub-processes are configured as modules which work seamlessly with other sub-processes.	Sub-process modules are increasingly homogenised to effectively create a market in these.	No special profits to the business process outsourcing companies or the companies that outsource processes.	•With minimal switching cost sub-process will be carried out where they can be most effectively and efficiently done. •BPO will become a norm rather than exception. •Large process factories will emerge that allow the same economies of scale and scope that are the norm in physical factories.
Services (transportation and storage)	Standardisation of supply chain services with standard contracts, measurements, management mechanisms and prices.	Service components are broken up into geographical, asset based and activity based components to discover and engage best service provider for each module.	Service modules are homogenised in order to create and manage interactions with several service providers at same time.	Company mixes and matches service modules from a variety of service providers	•Each transportation and warehousing task carried out by the company with the best location, asset and scale advantage. •The customer manages multiple interactions with several service providers simultaneously, based on clearly agreed service parameters.

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To further explore modularisation of supply chains let us examine each of the four components of the supply chains – physical infrastructure, systems, processes and services.

Supply Chain Physical Infrastructure:
Perhaps the most visible part of the global supply chain is its physical infrastructure. Shipping containers, air cargo containers, pallets, racking, forklifts, warehouses, ships, trucks, trains, ports, terminals – these are all gradually moving towards modularisation and standardisation. Many of these are already well advanced along the path towards modularisation and standardization. However, large amount of work still needs to be done to make sure modules all fit each other seamlessly. For example the pallets currently most used throughout Australia – CHEP pallets - are not sized suitably for loading into shipping containers. Their size does not allow for two of these loaded together, side by side, inside a container. However, because most of the trucks and warehouses are set up to accommodate these pallets it is not easy to switch standards, thus requiring costly double handling. Similarly, railway tracks in the various states of Australia are still in the process of being standardised after a long time spent double handling of cargo at state borders. Around the world, there are numerous examples of such inefficiencies in supply chains emanating from lack of standardisation and/or modularisation of physical equipment.

Case Study 1 – 1980s - Modularisation in the PC industry
Perhaps the clearest example of modularisation is the evolution of the Personal Computer industry in the last 25-30 years. 1981 saw the launch of the IBM Personal Computer. The IBM PC brought together all of the most desirable features of a computer into one small machine. It offered 16 kilobytes of user memory (expandable to 256 kilobytes), one or two floppy disks and an optional color monitor. When designing the PC, IBM for the first time contracted the production of its components to outside companies. The processor chip was from Intel and the operating system from Microsoft. IBM's decision to outsource the two key components eventually led to the modularisation of the computer industry.

Dell utilised the emerging trend of modularisation in the PC industry to create a unique business advantage. While, it offers highly customized computers to its customers, the whole production chain and final assembly are highly standardized. This is because of the way a computer is built. All the components and sub components such as the motherboard, hard disk, graphics cards, memory etc. are available in a huge variety (e.g. for processors there are Intel Pentium, Intel Celeron, AMD Athlon, AMD Duron etc) and are essentially interchangeable modules performing essentially similar tasks. This makes it easy to offer the technical specifications that the customer wants. This and the fact that the computer chassis is easy to manufacture in different forms and colours and with the help of plastic "appearance parts" give it a wide variety of looks makes it very easy to offer a completely customized computer to the customers.

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Case Study 2 – 1960s - Modularisation of the Ship building industry

During the 1960s, the shipbuilding industry reduced the cycle time for building a large ocean going merchant vessel from 3 years to 6 months by modularisation. The whole ship's structure was divided and sub-divided into smaller and smaller modules that were produced simultaneously by a number of satellite suppliers just-in-time to brought together and joined together into a final assembly. The whole system is still one of the finest examples of a well-orchestrated supply chain in motion. Tremendous benefits in terms cost and production time reduction, increased throughput, flexibility and customisation ability accrued to the shipping industry as a result.

The Japanese ship building companies utilised this emerging trend to their great advantage. With their Kieretsu type structure, lean manufacturing processes (and government assistance) they rapidly built substantial cost advantage and market share that lasted till the Korean Shipyards (and now Chinese shipyards) copied them. A typical Japanese shipyard was surrounded by ancillary businesses that supplied modules and sub-modules to the shipyard, and were totally dependent for their business on the parent company. Close co-ordination eliminated waste, reduced cycle times substantially and led to significantly lower turnaround times.

Supply Chain Systems:

The term modularisation originally emerged from supply chain systems. Most supply chain systems started off as trying to solve one single supply chain problem – which they did very well. As they expanded their reach through acquisition or product development, more modules were attached. While modules of systems from same company generally work together quite well, real flexibility emanates when the systems from different companies work together seamlessly. Whether it is demand forecasting system that needs to work closely with a inventory planning system, or a production scheduling system that needs to work with transportation route optimiser – the systems need to work with each other irrespective of the vendors. This is now becoming more and more easier. Use of XML and other open languages, web-based interfaces and standardised processes are leading to modularisation in supply chain systems to an extent where companies can choose variety of functionalities from a diverse range of vendors to form a customised best-of-the-breed solution that precisely meets their needs. Good CIOs are already saving their companies significant amounts of money by mixing and matching the right solutions. However, though they are willing to be a part of a best-of-breed solution, each of the major vendors of supply chain systems is still trying to sell itself as the best end-to-end system provider. This push, coupled with some of the disingenuous practices of the systems industry, leads to the conclusion that the level of modularisation in supply chain systems still has a long way to go before it becomes a standard accepted industry practice.

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Supply Chain Processes:

Most business processes are increasingly being commoditized. (please see article "The Coming Commoditization of Processes" by Thomas H. Davenport in Harvard Business Review June 2005 for more discussion on this topic). Supply chain processes, in particular, have an increasingly propensity for standardisation, modularisation and homogenisation. As supply chains, even for the smallest of businesses, are turning global in nature, standardisation is becoming necessary to reduce complexity. This in turn is leading to modularisation and an ability to outsource and offshore some of the low value-added processes. Finally, this modularisation is leading to homogenisation and thus commoditisation of the processes. That is because while, in their totality the standard processes of two companies may be sufficiently different from each other, but when broken up into smaller sub-processes or modules they are homogeneous enough to be carried out by many possible vendors – including internal incumbents.

Supply chain Services:

Supply chain services such as trucking, shipping, warehousing, third party logistics, railways etc. are always fairly homogeneous in nature. Control of supply chain assets does give temporary cost advantage in some locations, however, this advantage is neither universal not permanent. Supply chain service providers' efforts to build barriers to switching by proprietary systems linkages have not proven very successful due to modularisation in the supply chain systems. Similarly, while size may provide some economies of scale and scope, and hence cost advantage, to the larger players in these industries – their claims to be uniquely qualified to carry out the supply chain task of a company rarely stack up. Moreover, it is self evident that none of the service providers have the physical capability to carry out all the supply chain tasks at all locations of a large multi-national organisation. More often than not they themselves use sub-contractors where it is expedient. While resisting modularisation by their customers, they tend towards it in their own operation. It will be fair to say that the supply chain services are fairly standardized and modularized. The customers only need to recognize and treat them as such while configuring their supply chain strategy.

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Implications of Supply Chain Modularisation:
What will be the impact of this coming modularisation of global supply chains?

Firstly, Supply chain strategies will become increasingly important – something which could never be outsourced to your third party logistics (3PL) service provider in whichever *avatar* they present themselves. Customers will be able to unravel the packaged bundles of services presented to them, pick and choose the components that suit them the best, and put together a best of breed customised bundle for themselves.

Secondly, modularisation makes it easier to homogenise and hence commoditise a market. Hence, whether it is the market for supply chain systems, or for processes, or for physical infrastructure or for services – these will be increasingly commoditised going forward. Companies will do well to prepare for this coming commoditisation and stay on the leading edge of the curve rather than grudgingly follow their competitors half-heartedly.

Thirdly, this modularisation will change the face of global supply chains. All tasks will be carried out where it is most cost effective to do so. You can expect service factories to be the norm, working in unison with physical factories in different locations.

Finally, this coming modularisation will consolidate supply chains' position as one of the key drivers of the organisations' competitive advantage. Supply chain strategists' role will be viewed as much more than the 'dispatcher of trucks' or the 'storekeepers' – which have been the traditional forte of the logistics departments in many companies.