The Impact of Mega-Ships and Carrier Alliances on Ports and Terminals

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Abstract

Over the last decade the capacity of containerships has nearly doubled, as shipping lines compete to reach for maximum economies of scale. Economies of scale, however, is only achieved when a vessel is sailing at full capacity. A weak economy has forced shipping lines to create alliances with other carriers in order to minimize the number of empty slots for each sailing. The emergence of mega-ships and carrier alliances has drastically impacted port and terminal operations. Larger vessels have increased cargo throughput, which has challenged terminal operations, and requires a magnitude of infrastructure improvements. Many ports and terminals are taking the steps necessary to upgrade infrastructure that otherwise inhibits larger vessels from berthing; unfortunately, upgrades are costly and federal funding is not always available in a timely manner. Some ports have created alliances in order to collectively fund projects and increase terminal capacity needed to gain business from mega-ships. While ports and terminals are addressing dimensions and capacity for current vessel sizes in the market, bigger ships are coming: 19,000-20,000 TEU vessels are on order and industry professionals believe 24,000 TEU vessels will join the marketplace by 2020. With even larger ships to hit the market, ports and terminals will need to adapt in order to remain productive in a highly competitive environment.

Keywords: mega-ships, alliances, containerships, benefit, impact, ports, terminals, productivity, operations, technology, infrastructure, increased throughput, cargo, dredging, off-dock container yard, capacity, planning, free time, equipment, collaboration, automation.
The Impact of Mega-Ships and Carrier Alliances on Ports and Terminals

It is easy to get lost in the excitement as news and print media glorify vessels like the *CMA CGM Benjamin Franklin* that are making history for being the largest container vessels to enter ports along the United States West Coast. As fascination ensues, reality sinks in: Shipping lines are creating a trend that is shaping the future of container liner shipping. As ships get larger, shipping lines are searching for creative ways to “fill the ship.” Welcome, the age of carrier alliances. The current carrier alliances, comprised of the 2M, Ocean Three, CKYHE, and the G6, are business relationships between shipping lines for the purpose of consolidating vessel resources in order to meet capacity for a vessel’s sailing. The push towards carrier alliances is a trend caused by the introduction of ultra-large container vessels (ULCV) and mega-ships. To remain competitive, carriers are looking towards lowering costs by building mega-ships to utilize the economies of scale business concept. Considering the unpredictable market conditions, experts say that “mega-ships are vital to compete, and mega-ships are only justifiable when carriers are a part of larger alliances” (Port Technology International, 2015).

While mega-ships and the use of carrier alliances have proven to benefit carriers, this shift in business practices is negatively impacting port and terminal operations. Mega-ships increase pressure on terminals with “lower frequency services and greater throughput peaks for ports and terminals to deal with” (Davidson, 2015). Carrier alliances have caused an increase in container re-handles due to “the ‘extraordinary randomness’ of container discharges” (Mongelluzzo, 2015). Additionally, mega-ships require significant port and terminal infrastructure modification that can be financially challenging to meet. Understanding that 60, 18,000-22,000 TEU ships were ordered during 2015, it is clear that mega-ships are here to stay and the industry will continue to be impacted by carrier alliances (The Loadstar, 2016). This
project will discuss the benefits of mega-ships and carrier alliances to shipping companies, while comparing the impacts on ports and terminals. This project will uncover current issues and discuss solutions to cope with the changes in the container shipping line business.

**Literature Review**

**History of Containerships**

Containerships play a huge role in today’s global commerce, but that wasn’t always the case. In the early days of shipping, cargo was shipped in sacks, or on pallets, and “had to be hoisted aboard ship in small lots then painstakingly stowed in the hold in a manner that would forestall damage during the ocean journey” (Cudahy, 2006, pp. 6). Around 1937, while watching longshoremen load and unload goods, a trucker by the name of Malcom McLean pondered the idea of containerization. Frustrated with how time-consuming port operations were and the increased opportunity for damage, loss, and pilferage due to current shipping methods, McLean focused on change. McLean’s idea forged the way for the modern-day container. The container, a metal box with industry-wide standardized measurements, allows for the seamless movement of containers being transported by ships, trucks, and trains. This standardization increased operational efficiencies, which reduced labor costs and transit time for cargo. The container also helped reduce/eliminate damage, loss, and pilferage, as the cargo was not exposed or easily accessible.

**The first containership.** It wasn’t until 1955 that McLean, then part owner of McLean Trucking, sold his share of the company and bought the Pan Atlantic Shipping Company (Saxon, 2001). The vessel that pioneered McLean’s concept was a converted World War II era T-2 tanker by the name of SS *Ideal X*. This vessel, which carried bulk petroleum, was altered to
accommodate 58, 35-foot containers by means of a “special spar deck- a raised platform or porch- with longitudinal slots” (Cudahy, 2006, pp. 6). The converted SS Ideal X made her first voyage carrying containers on April 26, 1956, paving the way for what became known as the container revolution.

**Evolution of the containership.** The SS Ideal X was far from what the industry today knows as a containership. It wasn’t until 1957 that Pan Atlantic Shipping Company introduced the Gateway City, a ship rebuilt specifically to carry containers. The Gateway City was a “World War II cargo ship identified as a C-2 class vessel, [that] had been thoroughly rebuilt to stack containers one atop another in below-deck racks and to haul additional units staked atop each other as deck cargo” (Cudahy, 2006, pp.6-7). The Gateway City was roughly 450 feet in length and accommodated 226 containers.

**Figure 1.** The SS Ideal X. The first containership. (Journal of Commerce)

Containerships were slow to catch on, as many did not believe they were practical. First and foremost, the acceptance of the containership required the “[reconfiguration] of port facilities around the world to handle inbound and outbound containers” (Cudahy, 2006, pp. 7).
Reconfiguring a port facility to accommodate container vessels would require purchasing container handling equipment and developing a new terminal layout and operations standards, which would take time to implement and utilize a lot of capital. Port workers also discouraged the emergence of containers, as it would drastically reduce jobs for port workers since ships would spend less time in port and require less manpower per shift. It wasn’t until 1972 that the Pan Atlantic Shipping Company, which by then had changed their name to Sea-Land Service, deployed the SL-7 Class vessels. These vessels became the largest containerships at the time, with a record-breaking carrying capacity of over 1,000 containers (Cudahy, 2006). By the mid-1980s, containerships had become the dominant form of liner shipping and ports were adapting to new methods of loading and unloading cargo.

Carriers have competed throughout the years in order to meet trade demand by providing the lowest transport cost. Figure 2 below depicts the evolution of containerships, starting with the above-mentioned vessels from the mid-1950’s and early 1970’s. As noted on the left of the figure, containerships are often compared by their container capacity, whereas capacity is measured by the maximum number of Twenty-foot Equivalent Units (TEUs) that a ship can carry. A TEU is a standardized measurement for an intermodal container with the dimensions 20ft in length by 8ft in height by 8ft in width.

Vessel sizes had a slow growth period from the 1970s through the 1990s; however, vessel sizes gained rapid momentum in the early 2000s. First came the ultra large container vessels (ULCVs), defined as a vessel with a carrying capacity over 10,000 TEUs. Soon after, vessels coined by the term mega-ships began entering the market place: These behemoths are noted for their carrying capacity of more than 18,000 TEUs. At present, the largest containerships on the market are Mediterranean Shipping Company’s “Oscar-class” vessels, which boast a carrying
capacity of 19,224 TEUs. However, it will not be long before until that record is broken, as “vessels with capacity up to 21,100 TEUs have been ordered and will be in service by 2017” (DiBenedetto, 2016).

![Figure 2](image)

**Figure 2.** The evolution of containerships. All dimensions are noted in meters and LOA represents the overall length of the vessel. (Ashar and Rodrigue, 2012)

**Benefits of larger vessels.** In order to meet low transportation costs, shipping companies looked to increase the carrying capacity of vessels. In doing so, companies could achieve economies of scale: larger ships provide cost advantages for shipping lines because the scale of the operation lowers the overall cost per unit. For example, one operation cost is fuel: “ultra large container ships with capacities of more than 10,000 [TEUs] promise higher rates of profitability.
for operators because they offer reduced fuel consumed per freight unit” (Illing, 2015). However, according to experts, in order for economies of scale for these larger vessels to actually work, “shipping lines either need to reduce the number of port calls or they need to get handled faster by increasing berth productivity,” which greatly impacts ports and terminals around the world (Haegaba, 2014, pp. 21).

**History of Carrier Alliances**

Carrier alliances are bonds between companies who make vessel sharing agreements (VSA). “A [VSA] is usually reached between various partners within a shipping consortium who agree to operate a liner service along a specified route using a specified number of vessels” (World Maritime News, 2014). Before containerization became the dominant form of liner transportation, most cargo was moved in the form of breakbulk. VSAs presented challenges for breakbulk shippers “in terms of reserving an appropriate amount of space for the cargo, keeping the cargo of different carriers segregated, and dealing with liability issues” (Lawrence and Rhode, 2014). Additionally, carriers interested in a VSA “in the U.S. trades had to persuade the [Federal Maritime Commission (FMC)] to find the agreement was in the public interest, a process that could and often did take years” (Lawrence and Rhode, 2014).

In 1984, the United States President signed The Shipping Act of 1984, which aimed to simplify the process of carrier agreements becoming effective. The act states that:

> Agreements filed with the FMC would become effective 45 days after filing unless the FMC went to court and obtained an injunction against an agreement on the grounds that the agreement was likely, through a reduction in competition, to result in an unreasonable
reduction in transportation service or an unreasonable increase in transportation cost. (Lawrence and Rhode, 2014)

Around the same time period, containerization was becoming more predominant, allowing for the stowage and liability challenges once faced by carriers to subside. VSAs “increased throughout the late 1980s and early 1990s, although the vast majority of these agreements were often focused on a single trade lane” (Lawrence and Rhode, 2014). Eventually, globalization and world trade encouraged the creation of “global alliances” as carriers sought to geographically broaden cooperation.

**Benefits of carrier alliances.** The 2008 global financial crisis hit the shipping industry hard, which created “tough business conditions [that] forced operators to look for ways to become more efficient” (Reuters, 2016). Shipping companies decided to work together; by doing this, “carriers are better able to keep their rates stable in an environment where supply outstrips demand” (Global Express Services, 2014). Carrier alliances allow members to share resources on specific trade routes, giving members the ability to offer and “sell weekly services while owning fewer vessels” (Wang). Sharing vessels also reduces costs for members by consolidating cargo, “making better use of the [vessel’s] capacity” (Klettner, 2015, pp. 72). Lastly, carrier alliances create more bargaining power for members when negotiating terminal handling costs with terminals and port dues when negotiating with port authorities (Klettner, 2015, pp.72).

**Current carrier alliances.** At present, there are four major carrier alliances. 2M consists of Maersk Line and Mediterranean Shipping Company (MSC). Together these carriers make up “about 28% of the overall market share in container capacity” (Wang). The G6 is made up of Nippon Yusen Kaisha (NYK), Hapag-Lloyd, Orient Overseas Container Line (OOCL),
American President Lines (APL), Hyundai Merchant Marine (HMM) and Mitsui O.S.K. Line (MOL) and share a combined 17% of the industry. CKYHE consists of five Asian-based carriers and represents 16.4% of the market. These carriers are COSCO, K Line, Yang Ming, Hanjin, and Evergreen. The last alliance is the Ocean 3, made up of CMA CGM Group, United Arab Shipping Company, and China Shipping Container Lines (CSCL), which dominates 14.7% of the market share of container capacity. Figure 3 below shows the current market share of the major alliances across four major trade lanes. Although VSAs are not a new concept, it is clear that “the size, reach and market concentration of recent alliances are” changing the way carriers once did business (Hacegaba, 2014, pp. 17).

The new norm. The industry has seen an increased popularity in vessel sharing as a result of the mega-ship trend. Larger ships give companies the ability to lower costs through the
principle of economies of scale; however, “economies of scale can only be maximized when the vessels are at full capacity.” (Hacegaba, 2014). Ultimately, the carrier’s goal to fill to capacity is “driving the string of newly-created or recently-strengthened vessel-sharing alliances” (Hacegaba, 2014, pp. 17). With the constant pressure for lowering costs, mega-ships are necessary for any carrier to remain competitive. With that being said, the size and costs of these behemoths may make it difficult for carriers to succeed outside of an alliance. Carriers are now becoming more dependent on one another, which eliminates the possibility that this trend will ever diminish.

**Creative Project**

Mega-ships and carrier alliances have become an unstoppable trend. Many ports and terminals cannot accommodate these larger vessels, or if they can, port visits cause a disruption to their normal operations. At this point, ports and terminals need to identify major issues and find innovative solutions in order to “harness and enjoy the benefits of increased throughput rather than being hamstrung by it” (Hepworth and Lefler, 2015, pp.116). This next section will focus on the issues ports and terminals face and discuss solutions for port and terminals to cope with the changes in the container shipping line business to remain competitive.

**Port and Terminal Infrastructure**

Larger vessels and carrier alliances can create many problems for ports and terminals. Many ports are designed to service smaller vessels and have not adapted to the changing trends; however, “the rise of the mega-ships is forcing ports to invest heavily to attract and handle the new megacarriers” (DiBenedetto, 2016).
**Water depth in port areas.** All ships have a known draft: the draft of a vessel is defined as the vertical measurement from the water’s surface to absolute lowest point of the vessel. The draft of a vessel changes depending on the vessel’s size, which is depicted below in Figure 4. In order for a ship to dock in port, the shipping channel must accommodate the draft of the vessel, which can be up to 51 feet, plus approximately 10% (although this measurement can vary port to port). In order to accommodate mega-ships, ports must invest in dredging so that the depth of their berths and approach channels allow for larger vessels.

![Figure 4. Comparison of vessel draft by container capacity. (Port of Seattle)](image)

The Port of Oakland conducts annual dredging maintenance in order to maintain 50-foot depths to allow for larger container vessels. In 2015, the Port of Oakland spent $3.7 million on a project to “scoop 185,000 cubic yards of sediment from 17 deep-water shipping berths”
(Burnson, 2015). Unlike the Port of Oakland, other ports are struggling to keep up with changing trends. After nearly two decades, Port Everglades received federal funding to begin a $381 million dredging project. This project will not only “deepen the port’s main navigational channel from 42 feet to 48 feet, [but also] deepen and widen the entrance channel and parts of the Intracoastal Waterway” (Owers, 2016).

Accessibility is key for ships; “if the channels and berths are not deep enough, [mega-ships] may not serve a port at all, or they will have to use smaller ships than they would like” (Armbruster, 2010, pp. 18). A shipping line’s decision to use smaller vessels will reduce productivity associated with economies of scale and impact their profit margins, making shipping lines more likely to choose a different port that can accommodate their larger vessels. If ports and terminals do not invest in creating or maintaining deep-water berths and approach channels, they reduce their competitive edge and long-term success.

**Size and number of container cranes.** As seen in Figure 2, as a vessel gets larger, the carrying capacity of a ship expands by increasing the number of containers that fit below deck, stacked vertically above deck, and aligned horizontally across the ship. Said adjustments make mega-ships taller and wider than ever before, which means the cranes used to load and unload them need to be able to stack as higher and wider to accommodate vessel requirements.
Container cranes, often called ship-to-shore (STS) cranes or quay cranes, are utilized at container terminals to load and unload container ships. As ship sizes have evolved, so have container cranes: “The largest ones now have an outreach up to [approximately 230 feet] with enables to grab containers up to 25 rows. Their height can reach [approximately 262 feet]...” (International Transport Forum, 2015, pp. 59). In order to not only service mega-ships, but also service them when they are fully loaded, terminals can either buy new cranes, or consider raising existing cranes. Both methods are costly, but a necessity to ensure mega-ships can load and unload at a terminal.

In January of 2014, the three biggest container cranes were delivered to the Khalifa Port in Abu Dhabi. These cranes, costing $28 million, have a height of approximately 415 feet. The addition of these new cranes to their terminal will allow them to continue servicing the 14,000 TEU vessels that are currently calling the Khalifa Port (Standfield, 2014). The Port of Oakland, on the other hand, will start a $13.95 million project in April 2016 to raise four of container cranes at their Oakland International Container Terminal (OICT). The port plans to replace the
crane legs completely, which will add 26 feet to the crane’s height. Ultimately, these cranes will “be able to reach three rows of containers higher on a ship… [giving them the] height [needed] to load and unload ships with capacity up to 14,000 [TEUs]” (Burnson, 2015). Of the 33 cranes located at the Port of Oakland, eight of them are already tall enough to accommodate the largest ships that call the port. By lifting four additional cranes, it gives the Port the ability to handle multiple mega-ships at one time. The Port of Oakland is taking a proactive approach to changing trends and the future of global trade.

Additionally, increasing the number of container cranes can be vital to maintaining productivity with mega-ships. Experts suggest that additional cranes, working in closer proximity, are necessary to “turn bigger ships in about the same amount of time [terminals] have been working smaller vessels” (Mongelluzzo, 2016). In November 2015, Total Terminals International in Long Beach deployed nine cranes for the loading/unloading of a 10,000 TEU vessel: although it is typical for a terminal to only deploy five or six cranes to a vessel of that size, the terminal increased crane density “in order to cut down on the number of work shifts required to turn the vessel” (Mongelluzzo, 2016).

**Terminal Operating Systems.** Experts believe that the shipping industry is “in the midst of a critical transformation, [as] mega-vessels… are pressuring terminals to move to more modern and optimized operations” (Navis, 2014). Despite the increase in vessel size and cargo throughput, shipping lines are insisting terminal operators maintain productivity. Planning terminal operations is an absolute necessity to remain productive and to do so, terminals will need IT systems and Terminal Operating Systems (TOS) that will allow a terminal to manage “increasing call sizes, demanding customer expectations, congestion, constraints in terms of berthing space and crane availability” (Klettner, 2013, pp. 72).
Berth planning is getting more complicated as ships get larger. Berth space is limited at terminals; as ship size increases, the amount of ships that can berth at a terminal decreases. Figure 2 shows that ships’ length has drastically increased over time, creating a situation where “a 5000-ft berth that once handled five ships now handles three” (Mongelluzzo, 2016). Terminals operating systems can support berth planning by automating the function, giving terminal management a tool to “automatically assign and optimize berth and crane planning at the beginning of an operation” (Nguyen, 2015, pp. 94). Terminal operating systems can analyze and optimize real-time data to automatically calculate the optimum travel distance for containers being loaded/discharged, assign a vessel to the optimum berth location, assign the most optimal number of cranes per vessel at berth, forecasting costs and operational time, and much more. A terminal operating system can help terminal operators handle larger vessels, and as such, terminals should consider upgrading their terminal operating systems to adapt to the trends in the industry so that operations can remain productive and efficient.

**Increased Cargo Volumes**

On trade lanes that utilize mega-ships, the industry has seen an increase in cargo volumes during fewer peak periods, as mega-ships can carry more cargo. This results in a decline of weekly call services. Terminals then “have to cope with a much higher variability in delivery volumes… which creates demand for sufficient intermediate storage space, not only space for containers but also plug-ins for cooling and refrigerated containers, and tank storage for liquid bulk or dry storage” (Illing, 2015). Increased cargo volumes can put extreme pressure on ports and terminals to maintain productivity and service for their customers. Ports and terminals have looked into off-dock container storage, automating yard planning, decreasing free time, increasing yard equipment, adjusting operating hours, and forming port alliances to help combat
issues associated with increased throughput. A terminal that is unprepared to handle increased cargo throughput will not be able to compete in the long run. It is important that terminals do not lose efficiency because of increased cargo flow and find solutions to organize and distribute cargo within the same timeframe as before.

**Off-dock container yard.** Some terminals have looked to the concept of off-dock container yard to combat congestion and over capacity issues. An off-dock container yard is a storage area for containers located away from or outside of the marine terminal. Because mega-ships require the “expansion of infrastructure to cater to the higher peaks related to [increased cargo throughput]… more physical yard and berth capacity is needed” (International Transport Forum, 2015, pp. 9). Having additional space to store containers has allowed terminals to adopt a free flow model: in a free flow model, containers are discharged from the vessel and immediately hauled by truck to the off-dock container yard, where the containers are stored for pick up by the customers. The free flow model helps a terminal move containers off-site quickly, as to “open space at the yard for additional volume” (Hacegaba, 2016, pp. 31). Currently, two terminals in the Ports of Long Beach have been successful at operating the free-flow model: Pacific Container Terminal, operated by SSA Marine, utilizes the free flow model, which has allowed the terminal operator to handle increased volumes of containers by capitalizing on additional space to organize containers and deliver to customers faster. The Port of Long Beach is also in discussions about a rail system directly from the terminals to and inland location where containers could be distributed. Increased use of “rail, on-dock as well as short-haul, would help the ports to increase the use of rail to relieve terminal and gate congestion” (Mongelluzzo, 2015).

**Yard planning.** Some ports and terminals do not have the ability to store containers off-dock and must look to technology to find solutions. Yard organization is a key factor for
handling increased cargo. Automating yard planning could help provide a “detailed strategy concerning the storing and stacking of containers in the optimum yard slot to increase a terminal’s throughput and decrease a ship’s turn around time” (Nguyen, 2015). There is technology available to terminals that can provide yard planners the tools to “build a unique yard strategy using a smart algorithm” (Nguyen, 2015). Said technology will help management minimize container re-handling, avoid congestion and bottlenecks in the yard, effectively utilize container-handling equipment, and overall increase operations organization.

**Free time.** Free time is the amount of time a container, once discharged from the vessel, can remain on the terminal before the importer must pay to store the container, which are known as demurrage fees. In the Port of Long Beach, demurrage fees occur after a container has been sitting on the terminal for four days. In fact, importers will often leave their import container at the terminal until “the free time allowed for storage expires before they move the boxes” (Mogelluzzo, 2016). The Port of Long Beach has recently announced a proposal to reduce free time from four days to six shifts, although they are seeing some resistance from the community due to the Port’s current congestion issues. The concept of reducing free time, in ports that are not facing congestion issues, could be advantageous for terminals as a means to create additional space in the yard to better handle the increased container throughput by working a mega-ship.

**Yard equipment.** Experts say that the “immediate impact of the big ships will be on yard operations, where the cargo surges will directly impact container inventory and delivery of loaded import containers to truckers” (Mogelluzzo, 2016). Big ships amplify the equipment, space and manpower needed to handle increase cargo volumes and terminals must consider investing in additional cargo handling equipment for their yard operations. Some operators have been able to make “some gain in productivity by using different (or simply more) cranes,
different or more yard machinery, and/or faster or more terminal tractors” (van den Heuvel, 2004, pp. 20).

Increasing other yard equipment, such as tractors and rubber-tire gantry cranes, will aid in the movement of discharged containers around the terminal. At some terminals, mega-ships will only generate about 2,000 container moves per vessel call, whereas terminals in Southern California are expected to handle between 13,000 and 14,000 container moves per vessel call: “this requires a massive mobilization of yard tractors, rubber-tire gantry cranes serving the stacks and an increased number of longshore work gangs” (Mongelluzzo, 2016). If a terminal is unable to secure and allocate enough resources week after week, “the terminal operator will not be able to clean up the surge from the vessel before the next big ship arrives” (Mongelluzzo, 2016). Experts believe that investing in container handling equipment in the yard will be a necessity for terminal operators to remain productive and retain customer satisfaction and loyalty.

**Operating hours.** Ports and terminals all around the world have different operating hours. U.S. ports typically operate a day, and possibly, a night shift, while most foreign ports work 24 hours a day, the difference between the two being labor costs: “longshore labor [in the U.S.]… are the most expensive in the world, so most terminals cannot afford to maintain 24/7 operations under current operating conditions” (Mongelluzzo, 2015). Because of the collective bargaining agreements with the two longshore unions, terminals in the U.S. must pay a premium to work night and weekend shifts. Despite the cost, experts say that extended gate hours can aid with congestion issues caused by increased cargo volumes. Extended gate hours would allow importers more time to pick up their containers, and would ultimately reduce congestion during normal working shifts. If terminals cannot move containers and free space in the yard by the time the next ships calls, they run the risk of over-capacity, congestion and loss of productivity. While
extending operating hours may come at a price, it may be the only option terminals to maintain productivity.

**Port alliances.** Now that mega-ships are becoming the new norm, it is important that ports adjust business models to handle increased throughput and less frequent visits from larger vessels. The industry has adapted in such a manner that “the new nature of demand is for less fragmented terminal capacity (fewer, bigger terminals needed in each port) which requires consolidation of terminal, both physically and in terms of ownership” (Port Technology International, 2016). In some cases, smaller ports may look to create strategic alliances in order “to achieve the scale needed to meet the demands of mega-ships” (Illing, 2015). A strategic alliance is not a merger of two consenting ports, but allows ports to combine certain resources and utilize them jointly in an effort to maintain a competitive edge.

In July 2015, the ports of Seattle and Tacoma were approved by the Federal Maritime Commission to create the Northwest Seaport Alliance. Historically, these ports have always competed for business, but eventually realized that their competition “was actually self-destructive, and they would both prosper if they worked together as a gateway to ward off the real competition in the trans-Pacific trades” (Mongelluzzo, 2015). The Ports of Seattle and Tacoma will now be able to leverage their combined volume, which is important to compete against Canada’s Port Metro Vancouver and Prince Rupert, as well other U.S. West Coast ports. Additional competition will likely arise from U.S. East Coast ports with the completion of the Panama Canal Expansion in early 2016. Through the Northwest Seaport Alliance, the Ports of Seattle and Tacoma “will act as a single gateway in marine terminal planning, development and marketing in order to build modern, competitive terminals capable of efficiently handling mega-ships of today and tomorrow, while avoiding duplication of facilities” (Mongelluzzo, 2015).
Using restructuring and consolidation, the Northwest Seaport Alliance aims to create four to five modern mega-terminals out of the existing nine smaller container terminals.

As the demand for fewer, larger terminals increases, so does the pressure for ports to find solutions. Although this concept is complex, expensive, and likely to take a lot of time, it is likely that the industry will see other ports within a close geographic region form strategic alliances or consolidate terminals in order to meet the demands of mega-ships. Experts say, “leverage matters, especially in today’s highly competitive shipping environment in which mega-carriers operate big ships of 8,000- to 14,000-TEU capacity that by necessity must call at fewer ports to be profitable” (Mongelluzzo, 2015). Strategic alliances can help ports increase leverage with shipping lines and carrier alliances, which is crucial to not only remaining competitive, but remaining profitable.

**Collaboration Between Terminals and Carrier Alliances**

Collaboration between the terminals and carrier alliances is key to the efficiency of terminal operations. Experts say “there is a need for more operational collaboration between terminals and shipping lines to help deal with issues such as peaking and productivity” (Davidson, 2015, pp. 66). Collaboration has previously been overlooked by carriers and terminal operators; however, as carriers create alliances the needs of the industry are shifting, making collaboration a necessity in the industry.

**Stowage Planning.** Stowage planning is a crucial aspect to terminal operations. A stowage plan is simply the arrangement of cargo on a containership. A good stowage plan will allow for the maximum utilization of stowage space on board the containership and organize the cargo in a manner that is efficient for on and off loading containers at each port of call. The
introduction of carrier alliances has created a situation where containers from five or more shipping lines are arriving to port on one vessel, causing an ‘extraordinary randomness’ of container discharges and increasing congestion on the terminals (Mongelluzzo, 2015). It is important that “ports and terminals... work with the carriers to develop better stowage plans... so that vessel unloading and the delivering of containers to trucks occurs in a more logical sequence” (Mongelluzzo, 2015). A successful system is needed to create transparency for shippers and terminal operators to increase terminal organization and productivity when ships are being unloaded.

Hapag-Lloyd is the first shipping line to attempt a “collaborative, cloud-based stowage planning system that makes stowage plans and cargo data available to vessels in port and to terminal operators” (Mooney, 2016). This type of software will aim to “reduce incidents of unexpected changes issued at short notice and waiting times for the shipping line and terminal. It provides visibility into the progress of berth operations and ultimately allows a more efficient deployment of vessels” (Mooney, 2016). This is exactly the type of collaborative system needed to reduce issues of congestion and disorganization.

**Summary**

**Difficulties in Development**

Mega-ships are here, now, and the unfortunate reality is that many ports and terminals are not ready for them. While over the course of a decade, “the average capacity of a containership has doubled,” ports and terminals have failed to maintain a similar pace (International Transportation Forum, 2015, pp.7). Ports and terminals must catch up, but upgrading ports and terminals to meet the needs of these mega-ships is not going to be cheap or easy:
“[The] increasing pace at which new generations of container ships are conceived and constructed has consequences for the rest of the transport chain: investments and infrastructure and port superstructure are in many cases not amortized, which increases capital costs and reduces profit margins for port operators and port authorities” (International Transport Forum, 2015, pp. 14).

As ports and terminals look to make improvements to attract mega-ship business, concerns over cost weigh in.

**Cost.** Investing in terminal infrastructure can be very costly; in fact, “the American Association of Port Authorities has reported that U.S. ports plan to spend $46 billion by 2017” (Hacegaba, 2014, pp. 30). Some infrastructure improvements around the U.S. include:

- The Port of Miami “spent $2 billion on improvements, including four new mega-crane to handle the expected increase in container traffic, and it is spending another $1 billion to build a tunnel for truck traffic between the harbor and U.S. I-95” (Hacegaba, 2014, pp. 30).
- Dredging projects to deepen the harbors within the Ports of Savannah and Charleston will cost roughly $1 billion (Hacegaba, 2014, pp. 30).
- The Port Authority of New York/New Jersey has plans to “raise the Bayonne Bridge by 60 feet so that larger ships can enter the Ports of Newark and Elizabeth,” a project that will cost $1.2 billion (Hacegaba, 2014, pp. 30).
- The Port of Long Beach has “invested US$1.3 billion on a new middle harbor terminal that has taller bridges, wider channels and deeper berths to accommodate mega-ships” (Port Technology International, 2015).
• The Port of Los Angeles has spent $510 million in expanding the TraPac Terminal, as well as $155 million on a rail yard project (Port Technology International, 2015).

Some terminals have found partial or full terminal automation a means to combat several issues relating to handling megaships, including increased productivity and safety on terminals, as well as lower variable costs. Although beneficial, “upgrading to automated systems is extremely expensive: new, fully automated terminals cost over a half a billion dollars to implement” (Priceonomics, 2015). Cost can be a major challenge for ports and terminals looking to attract mega-ship business. Like many business owners, ports and terminals must find a balance between investment and return that works.

**Bigger Ships are Coming**

Mediterranean Shipping Company (MSC) currently has the largest vessels joining the world’s fleet: Known as the ‘Oscar class,’ these vessels have a capacity of over 19,000 TEUs. Under their current new build program, MSC is expected to welcome a total of 19, 19,000+ TEU vessels to their fleet (Schuler, 2015). However noteworthy 19,000+ TEU vessels sound, industry professionals believe mega-ships with a 24,000 TEU capacity will make an appearance by 2020.

With ports and terminals in process of upgrading their facilities to accommodate larger vessels, it will be hard to decide how large they want to accommodate for. Shipping lines, and their “pursuit of scale, has excited a debate about how far and how fast the continued growth of ships can go on, and about how much upgrading work is needed for container shipping companies’ management systems to cope with a once-unimaginable scale of operations” (Wright, 2011). A concern for ports and terminals focuses on the lack of information provided to them regarding increases in vessel sizes: “shipping lines, for their own commercial reasons,
don’t share their plans with terminal operators” (Wright, 2015). Being unable to know the progression of container ship size, ports and terminals must decide if they want to preemptively upgrade their facilities to account for future vessel sizes. The Port of Flexistowe is one that has taken the mega-ship trend into consideration, whereas they have “built [a] new facility with the potential to deepen the water to [59 feet], in case of the arrival of yet another new class of containerships” (Wright, 2011). Some industry professionals believe ports and terminals need to be ahead of the game when it comes to mega-ships; however, for many ports and terminals, addressing this issue may be challenging, as planning for potentially larger vessels could come at even higher costs, increase the amount of time projects will take, or not even be viable.

**National Freight Policy**

Many industry professionals believe that a national policy can be vital to “upgrading [a country] in terms of competitiveness in productivity and the ability to service this and future generations of vessels” (Ferrulli, 2015). It is important for countries to have a strategy in place to help ports plan strategically. By looking at the transportation equation from a national level, “a national plan could focus attention on the entire supply chain and help prioritize projects of national significance and reduce the number of redundant projects at individual ports” (Hacegaba, 2014, pp. 31). Additionally, a national plan can aid in the allocation of federal funding, which can help cut costs and make improvements more realistic. In the U.S., for example, federal funding has been dismal, and four ports in Florida, Georgia, and Texas have been forced to pay roughly a half a billion dollars to deepen federal waterways because securing federal funding, if granted at all, will take years (Etter, 2015).
Success with national plans can be seen with how successful ports in China and Canada are. Experts support development of a national policy and believe it will help a “nation’s supply chain better prepare for industry changes such as the larger vessels and the alliances” (Hacegaba, 2014, pp. 31). For large nations with many ports, it is imperative that governments look into national policies in order to make the country, as a whole, competitive.
References


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