

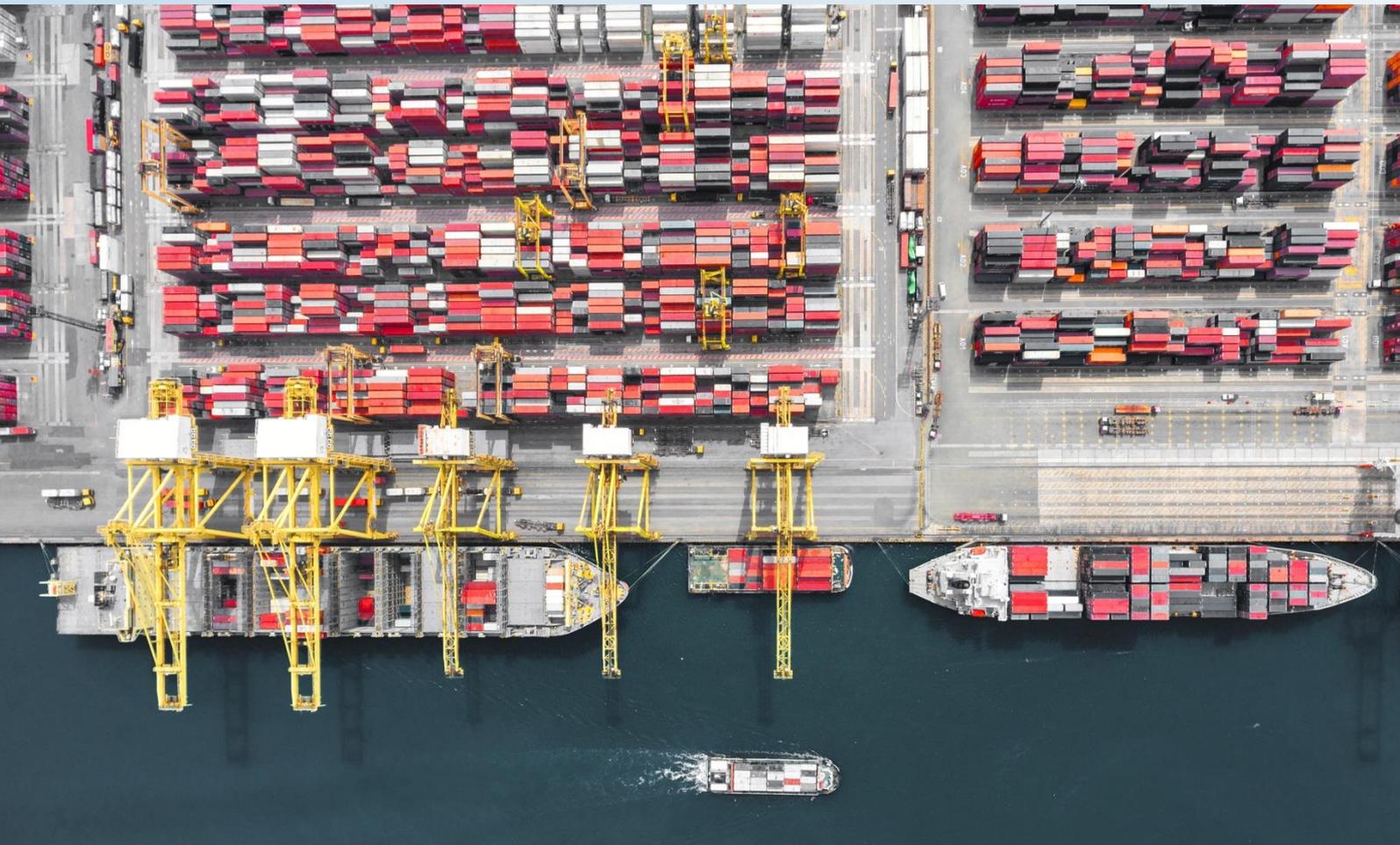


WHITE PAPER

THE IMPACT OF THE DRIVE FOR THE ECONOMIES OF SCALE ON CONTAINER TERMINALS

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1. Introduction

2. A Recent History of Large Vessels

3. Consolidation in the Shipping Industry

4. The Effect on Container Terminal Requirements

5. What Happens Next?

1. INTRODUCTION

It has long been recognized that the container shipping industry is cyclical, with major shipping lines making acceptable operational profits one year and then having substantial losses the next. In an attempt to offset this down cycle, many shipping lines have tried to take advantage of the economies of scale by operating increasingly large vessels, with the aim of reducing the per box costs of each container that they handle.

The introduction of Ultra Large Container Ships has led to a substantial reorganization of the shipping industry, from ship builders and shipping companies to port terminal operators and logistics facilitators.

The progressive decrease in unit transport costs to be gained by increasing the size of vessels has been the major driving force in this strategy by container ship operators. However, the potential savings decline as vessel sizes increase.

This White Paper will help explain the forces at play, and the potential consequences for terminal operators.

2. A RECENT HISTORY OF LARGE VESSELS

In the search for scale economies, container ship fleets have undergone repeated revolutions in vessel size. In 2004, the transformation focused on 8,000TEU+ vessels, but since the introduction of Ultra Large Container Ships (ULCSs) greater than 10,000TEU in 2008, there has been a significant increase in the average size of tonnage deployed on services worldwide.

Today, the emphasis is on vessels greater than 18,000TEU.

The very largest vessels have always been deployed on trades between East Asia and Europe and pre-2008, the emphasis in these trades was on the 8,000 to 11,000TEU size range. However, vessels of over 18,000TEU are increasing their share in this market and are now considered the norm.

World Container Fleet Development 1990-2016 ('000TEU+)

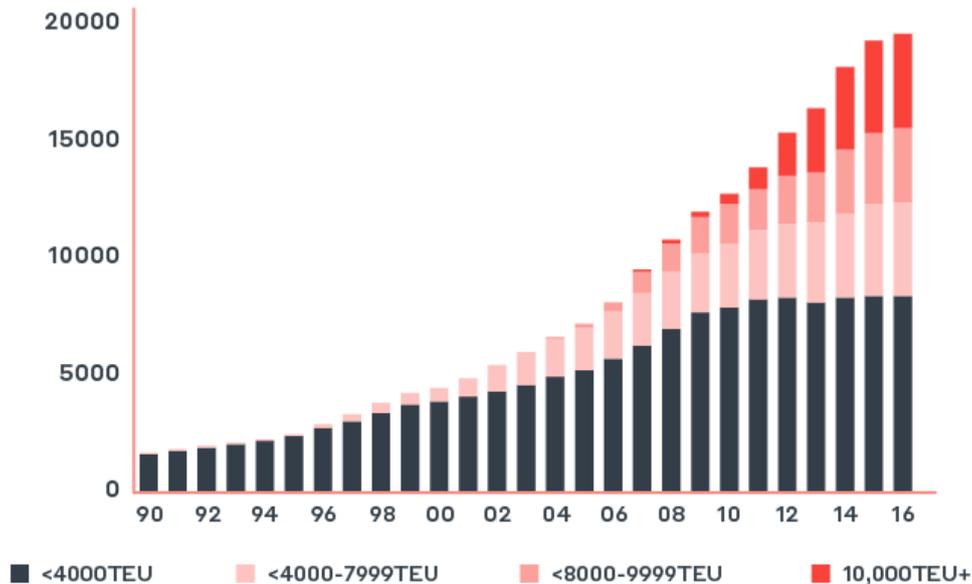
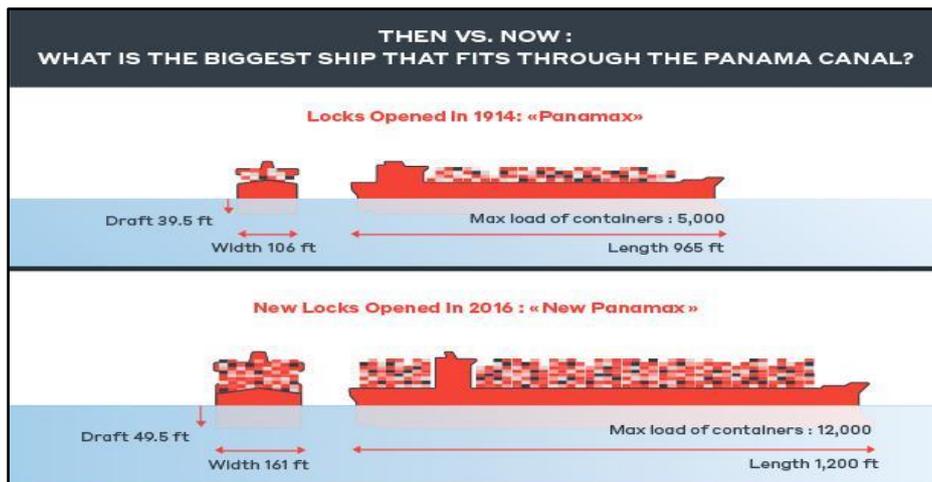


Figure: World Container Fleet Development 1990-2016 ('000TEUs)

The impact of the expansion and the widening of the Panama Canal, which opened in June 2016, has also been at the forefront of the minds of the major shipping lines when taking the decision to increase the size of vessels on order, in the sure knowledge that bigger vessels will now be able to enter into the TransPacific services, as well as the main Asia-Europe services.

The new Panama Canal locks now allow the passage of vessels with a breadth of 49m, a LOA of 366m, and a draught of 15m, with a maximum capacity of 170,000dwt or 12,500 to 13,000TEU. This development has seen still further increases in the size of tonnage deployed in this region.



Unfortunately for the shipping lines, many of them began receiving significant new tonnage just at the time when the major world economies went into recession in 2008 and 2009. This has resulted in a more rapid transfer of vessels previously deployed on Asia-Europe services to Transpacific and Transatlantic trades, and the process of “cascading” of larger vessels to secondary deep-sea trades also accelerated.

This has had major implications on international trade and has undoubtedly impacted the strategies of the major lines.

SHIPS ARE GETTING BIGGER AND BIGGER

Still, these shipping companies have continued to order bigger and bigger vessels ahead of actual demand, culminating in the deployment of 18,000 to +19,000TEU vessels on the main arterial trade lanes since 2015. This in turn has caused the cascade of still large tonnage (~8,500TEU) onto secondary trade lanes.

While there are significant scale economies, as ship sizes are increased to around 14,500TEU and even to 18,000TEU, it is difficult to maximize economies of scale on ships of greater size. Even if additional gains can be made beyond this stage, very large increases in capacity have to be incorporated in order to make further savings worthwhile.

Design Development of Large Containerships

	TEUs	Length overall (m)	Beam (m)	Maximum draught* (m)	Noted Required berth depth (m)*
First generation: 1968	1,100				
Second generation: 1970-80	2-3,000	213	27.4	10.8	12.0
Panamax: 1980-90	3-4,500	294	32.0	12.2	12.8-13.0
Post-panamax: 1988-95	4-5,000	280-305	41.1	12.7	13.5-14.0
Fifth generation: 1996-2005	6,400-8,000	300-347	42.9	14.0-14.5	14.8-15.3
Super post-panamax: 1997->	8,000-11,400	320-380	43-47	14.5-15.0	15.3-15.8
Ultra large container ships: 2006->	14,500	380-400	56.4	15.5	16.4
New-panamax: 2010	12,500	366	49.0	15.2	16.1
Triple E-Class	18,270	400	59.0	15.5	16.4
CSCL 18,400 Class	18,400	400	58.6	15.5	16.4
MOL Triumph	20,170	400	58.8	16.0	17.0

Figure: Design Development of Large Container Ships

When the cost of engine power is included in the analysis, the potential savings become marginal. Although the shipping lines want to operate these bigger vessels in order to be able to take advantage of the economies of scale and ship containers at a lower unit cost, the actual total costs are more expensive and any savings therefore require the shipping lines to consistently fill the additional available space.

Nonetheless, vessels of greater than 20,000TEU have been ordered for 2017 and designs for 22,000 to 24,000TEU vessels are under consideration.

IN SUMMARY

Even though ships are getting bigger, it is unlikely that the limited further economies to be gained will be sufficient enough to offset the lack of flexibility and the operational difficulties of trading and handling these much larger vessels. It remains to be seen whether this limits the further growth in size of container ships.

3. CONSOLIDATION IN THE SHIPPING INDUSTRY

The current global demand suggests that there is not yet the necessary demand required for individual lines to be able to fully utilize the new bigger vessels cost-effectively, and so shipping lines have looked to develop formal alliance agreements, Vessel Share Agreements, and less formal 'slot swap' arrangements. These are designed by the shipping lines to allow like-minded lines to have access to space on their vessels, in order to increase the level of utilization on these vessels, thereby reducing the slot costs. This obsession with the economies of scale has led to further attempts at consolidation and to the creation of the Mega-Alliances that will be able to fill these vessels.

Hapag-Lloyd's merger with UASC was concluded in May 2017, and liner consolidations in 2016 include CMA-CGM's acquisition of NOL/APL, Maersk Line's acquisition of Hamburg Sud, and the merger of COSCO and China Shipping. These follow earlier rounds of consolidation:

- **1997:** Merger of P&O Containers with Nedlloyd
- **1997:** NOL's take-over of APL
- **1999:** Maersk Line's take-over of Sealand
- **2005:** Take-over of P&O Nedlloyd by Maersk Line
- **2005:** Take-over of CP Ships by Hapag Lloyd's

At present, there are persistent rumours of the merger of the three Japanese lines – KLine, MOL and NYK Line – as well as the possible purchase of OOCL by COSCO.

This consolidation in the container shipping sector is a means of pooling vessel capacity by two or more carriers and is done by either exchanging slot capacity or by sharing vessels. Consortia have vessels sharing agreements on certain trade lanes and usually also jointly procure port and terminal services. Consortia serve to maximize the efficiency of resources and optimize service levels, such as frequency and transit times.

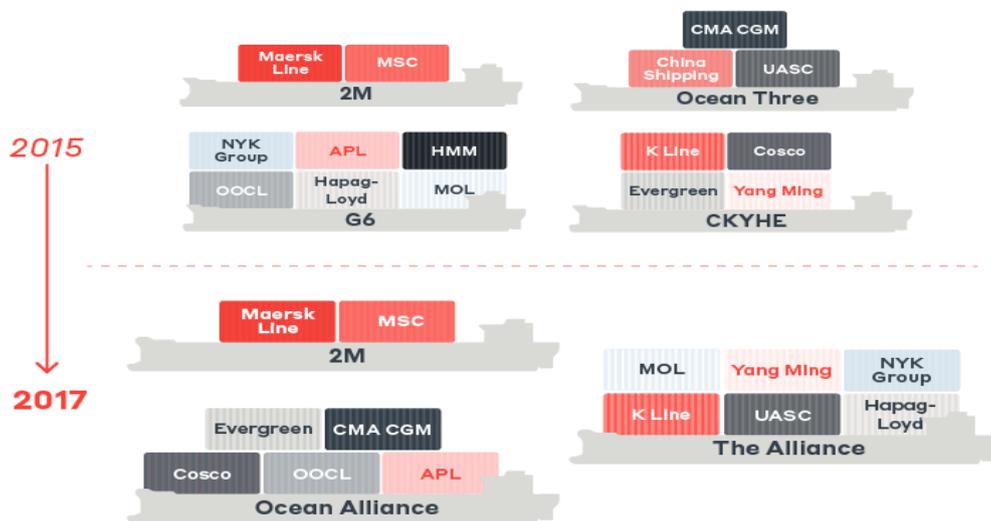


Figure: The Rearranging of Alliances between 2015 and 2017

Due to strategic or commercial changes, as well as mergers and acquisitions, consortia have tended to change on a regular basis. In 2014, the proposed P3 Alliance (Maersk, MSC, and CMA-CGM) was ultimately unable to ratify, but in 2015 two other Mega-Alliances were spawned as a result, both with the aim of ensuring that ever bigger vessels can be fully utilized. These were the 2M Alliance between MSC and Maersk Line and the O3 (Ocean Three) Alliance between CMA-CGM, UASC, and CSCL.

Other lines formed their own Alliances in an attempt to compete. The New Alliance and the Global Alliance, which merged to form the so-called G6 Alliance, including NYK Line, Hapag-Lloyd, APL, HMM, OOCL, and MOL. Evergreen joining the CKYH Alliance to form the CKYHE Alliance, including Cosco, K-Line, Yang Ming, and Hanjin (which recently declared bankruptcy).

Since then, more recent developments have resulted in the formation of three Mega Alliances, which have been operational as of April 2017: 2M, Ocean Alliance, and The Alliance.

FEWER OPTIONS FOR SHIPPING

This new Alliance structure effectively reduces the booking options for shippers down to only these three alternatives. While granted there is more than one mainline service operated by each Alliance on each of the main trade lanes and that some of these lines now provide additional landside services in order to differentiate themselves from their partner lines, effectively a shippers' choices are now seriously reduced compared with even just two years ago.

This should, in theory, give shipping lines more power and the ability to increase sea freight and become more profitable.

However, this assumes that the vessels deployed can be fully utilized and that the current Alliance structures will last. History tells us that shipping lines are still looking to increase vessel sizes further – making full utilization an even harder task – and Alliance structures will only remain intact as long as it suits the majority of lines. As soon as one of the major lines – Maersk, MSC, CMA-CGM, etc. – is able to fill its largest deployable vessel just with their own cargo, then the Alliances will become surplus to their requirements.

This is still many years off, however, so in the meantime cyclical profits and losses are set to remain the norm.

IN SUMMARY

The search for economies of scale and the transformation of the industry has led to consolidation and the creation ever changing alliances. This means fewer options in the industry.

4. THE EFFECT ON CONTAINER TERMINAL REQUIREMENTS

While the shipping lines seek to improve their profitability by deploying bigger and bigger vessels on the main trade lanes, the impact that this has on the ports and terminals that these vessels call at is immense.

And it's not only the biggest terminals that have to adjust. As a result of the increase in the size of vessels being deployed on all trade routes because of the cascading of larger tonnage from the main arterial trades, the number of ports that are capable of handling the larger size of the vessel will be fewer than those currently handling cargo vessels.

If terminals want to continue to handle their share of mainline services, they will have to invest heavily in order to provide the necessary means to make their facility capable of handling ULCSs (or bigger ships that have been “displaced” by ULCS).

For ports and terminals, the increase in container ship sizes will result in further pressure on their performance levels. The ports that do not make these improvements will lose market share, unless they are able to make better use of the facilities at their disposal or expand their existing facilities in order to ensure that they are better placed to handle these bigger vessels.

Not all ports will have the necessary depth of water, length of quay, or number of gantry cranes to be able to handle vessels of this size. Couple this with the increased total costs of calling at ports with larger tonnage and the result will be shipping lines maximizing the efficiencies of their deployed assets by reducing the time spent in port as well as the actual number of direct calls (therefore increasing transshipment).



Figure: As ships get bigger, these cranes need to get taller and their reach needs to get longer.

THE ROAD FORWARD FOR PORT OPERATORS

The implications for terminals are clear in this highly competitive market, but what should be done about it at times is less easy to determine. Here are some elements that port owners and operators need to consider implementing:

- Deeper and wider approach channels for the bigger vessels;
- Deeper berths and turning circles to handle the big vessels alongside;
- Clear planning for all terminal developments. Depth of water alongside is critical to “future proofing” terminals and channels; approach dredging can usually follow at a later date;
- Longer vessels require longer berths;
- Larger consignments, which will be the inevitable consequence of fewer direct port calls and an increase in the transshipment volumes, require larger terminal area/yard space;
- Higher transshipment volumes lead to increased gate pressure;
- More, larger, and heavier gantry cranes are needed to handle the bigger vessels and to provide a longer reach, taller clearance, and a more efficient way of lifting, with twin/tandem/triple lifts to increase efficiency;
- Strengthened quays to handle more containers and bigger cranes;
- The increase in crane size will result in an increase in the electrical loads/infrastructure which will also require improvements;
- Training for crane drivers and other shore side staff in order to increase efficiencies.

Furthermore, it is important for terminals to develop additional ‘value-added’ services, like warehouses, storage facilities, reefer plugs, Free Trade Zones, etc., in order to add to their attractiveness as a package for the major shipping lines.

In the North Continent, Mediterranean, and Caribbean, for example, this is likely to result in transshipment business that focuses on terminals that can meet the requirements of their shipping line. This has always been the case, but the economics of introducing these much larger vessels will accelerate the trend.

The development of the transshipment sector is, therefore, expected to be a compound effect of economic growth-induced demand and the policies of major operators in converting direct flows into transshipped flows.

Factors of the development of transshipment demand

1

The continuing increase in vessel size and further moves to reduce the number of direct calls on deepsea vessels.

4

Future development of built-up costs of direct calls V feeder alternative.

2

Related terminal accessibility for largest vessels.

5

The availability of overall capacity for transshipment operations, as determined by the balance of supply/demand in the regional port markets.

3

Adequacy of existing ports for direct calls.

6

Degree of shipping line investment in terminal developments in dedicated terminals - effectively fixing a shipping line at a particular port.

IN SUMMARY

As a result of the cascading effect, the increase in the size of vessels on all trade routes will impact all facilities. If terminals want to continue to be relevant, they will have to invest and adjust to this new environment.



5. WHAT HAPPENS NEXT

Time will tell how long these new mega alliances will operate, but as long as individual lines are unable to maximize their own assets with their own shipments, without relying on other shipping line's volumes, there is a necessity for alliances. This means that these "marriages of convenience" are here for some time yet.

The continued increase in vessel sizes, which will probably increase to still greater tonnages, will further delay any dismantling of the alliance structure.

It is only when one of the bigger lines – Maersk, MSC, or CMA/CGM – is able to fill the largest vessels that they deploy with their own shipments (and based on the largest possible vessel size that does not suffer from diminishing returns as far as the economies of scale are concerned) that the requirement for co-operation will become superfluous. Even then, it is likely that the smaller lines will still require some form of alliance structure to be able to compete.

ABOUT THE AUTHOR

Steve Wray has been Associate Director - Maritime at WSP in the UK since July 2016, responsible for maritime consultancy on a global basis. He has extensive experience in shipping, port and development projects, primarily gained whilst working at Ocean Shipping Consultants, a premier name in the consultancy field. Since joining the firm in 2007, he has produced numerous containerisation and other studies, particularly in the African, Caribbean, Central America, Mediterranean, Black Sea and Baltic regions.

He is also a regular contributor on the conference circuit having given papers at conferences held in Accra, Odessa, Bilbao, Gdansk, Szczecin, Rostock, Tallinn, Riga, St. Petersburg, Klaipeda, Istanbul, Barcelona, Amsterdam, London, Bremerhaven, Doha, Maputo, Durban and Antananarivo on a variety of topics related to changes within the shipping industry and forecast predictions for the future developments.

Before being recruited by OSC, he worked for more than 19 years with liner shipping companies P&O Containers, P&O Nedlloyd and Maersk Line. He has an intimate understanding of the perspective of the port users to analyses in this sector and first-hand experience of the North European and Mediterranean/Black Sea container feeder markets, as well as Transatlantic, Transpacific and African deep sea trades.