THE ROLE OF PORT EFFICIENCY IN MARITIME SUPPLY CHAINS

As everyone in the freight forwarding and shipping industry is aware, significant delays can occur to containers between being off-loaded onto the quay and the time they are delivered to the importer's warehouse or factory. There are a range of hard and soft infrastructure factors which determine how efficiently port operators can process cargo, and that's before taking into account the road and rail links which connect them to their hinterlands. These factors often determine whether a forwarder will route freight through these nodes or whether a shipping line will call at a particular port.

Although it is difficult to quantify many of these benchmarks, some, such as container dwell times and numbers of containers processed per hour, can be measured. That is not to say that the results are necessarily made public – many ports see this information as highly sensitive, although a growing number are embracing this level of transparency. The metric can be viewed as a catalyst for customer service improvement and a way of assessing the effectiveness of initiatives. King Abdullah Port, in Saudi Arabia, for example, has implemented a 24-hour container inspection regime which it hopes will help in reducing container dwell times to 3 days from the present 3.8.

Different metrics are used by the various parties involved in the maritime supply chain. For instance, shipping lines are most interested in **Ship Turnaround Times**, so they can maximize the utilisation of their assets and keep to schedules. A study for Maritime Traffic found that the average turnaround time per ship (all types) was 1.37 days (33 hours) with container ships departing in under a day (0.85 days). Japan, South Korea and Singapore are amongst the most efficient countries in processing ships. Over the years, the improvement in servicing ships has been quite marked. Asian ports have seen the best improvements, with time in port reducing from 4.17 days in 1996 to 1.45 in 2011, according to an OECD study[1].

In contrast, shippers and freight forwarders are interested in performance metrics which track the time it takes to process and release containers i.e. **Container Dwell Time (CDT)**. The majority of this paper is dedicated to discussing this benchmark. According to the OECD[2], average performance of a large port is:

- Dwell time of 5-7 days per imported box
- Dwell time of 3-5 days per exported box

Port/terminal operators are, on the other hand, interested in the metrics which reveal the productivity of their own assets such as berths, cranes and yards. Again, the OECD suggests performance benchmarks of 110,000 TEUs per year per crane and 25-40 crane moves per hour.

An over-arching metric which brings together many of these factors is 'port time'. This measurement is the aggregation of several components such as port access time, loading and unloading times of cargo, ship waiting time and time for customs and other administrative procedures.

Obviously, delays which occur outside of the port can be just as important to a shipper. There is no point in having a slick port operation if the shipment is then delayed for hours or days because of poor intermodal or road infrastructure. The World Bank's Logistics Performance Index (LPI) tracks

[1] Ducruet C, Itoh H, Merk O (2014). Time efficiency at world container ports. Discussion Paper. OECD. August.
[2] OECD (2013). The Competitiveness of Global Port-Cities: OECD 2014 Synthesis report. September

the time it takes from port of discharge to reaching an importer's warehouse. (Delivery at Terminal to Delivery Duty Paid).

	Russia	United Kingdom	Germany	Mexico	China	Kenya	United States	Brazil
Import lead time days	5	3	2	5	6	4	2	5

From the small selection of markets above, it can be seen that more developed countries with better infrastructure have shorter lead times, although geographic scale could also be a factor in these measurements.

CONTAINER DWELL TIME

Container Dwell Time can be defined as the length of time it takes for a container to be released from a port's custody after being unloaded from a vessel. This measure can be sub-divided into two further metrics: the time taken from off-load from the ship to availability for pick-up and, secondly, the time taken from off-load to when it exits the terminal.

The Pacific Merchant Shipping Association comments, 'Dwell time is an indicator of how efficient the ports are operating and how quickly the containers are flowing through the terminals. Every time a truck shows up to pick up a container, a stack of containers gets shuffled around to get to the intended one; this is a time-consuming process which hinders the efficiency for both terminals and truckers. With longer dwell times, terminals are storing more containers, and truckers must wait for longer periods as containers must be moved to reach the older containers on the bottom of each stack. With shorter dwell times, terminals are storing fewer containers and able to finish transactions more quickly.'[3]

Delays to the smooth transit of containers through a port can occur on three different bases within the port environment: *physical operations*, *transactional* and *storage*. Whilst the port operators are largely responsible for the first of these categories, and customs and other agencies for the second, delays caused by the third, *storage*, can be attributed to the shipper, as will be discussed.

Operational Processes

Some of the reasons for inefficiency of port operational processes can be blamed on various bottlenecks in the physical movement of containers to and from the terminal. These can be *demand driven* or *service driven*.

Demand driven challenges include the trend towards larger ships which can create a surge of container volumes within a short period of time overwhelming operational capabilities. Other problems range from the tactical e.g. ships arriving off-schedule, to the macro, for instance the soaring number of containers imported to the US in 2018 to avoid upcoming tariffs imposed on Chinese goods (see case study below).

Service driven problems include:

[3] https://www.scmr.com/article/pmsa_targets_ports_of_la_long_beach_for_container_dwell_time

- Insufficient cranes and/or poor berth/crane productivity
- Insufficient space in yard leading to congestion and sub-optimal stacking
- Inadequate labour or labour diverted to other berths to maximize productivity
- Unreliability of power supplies (particularly in emerging markets)
- Opening hours of port
- Industrial unrest
- Intermodal equipment (e.g. chassis) shortages
- Truck driver shortages
- Weather conditions (such as iced yards)

The case studies below demonstrate the different challenges faced by two highly sophisticated ports for diverse reasons. The problems detailed in the first study, involving UK port Felixstowe, relate to the implementation of a new IT system whilst those in the second, involving the Port of Long Beach in the USA, relate to the surge in container volumes prompted by Trump's sanctions on China.

Case Study: Felixstowe IT System Implementation

In 2018, what appeared to be a passing problem around the implementation of a new IT system gradually became a major threat to the Port of Felixstowe's business. In June of that year, container operations slowed dramatically, making the loading and unloading of vessels very difficult. Despite assurances that its problems were being solved, the UK's largest container port continued to lose traffic. Shipping lines became impatient and many diverted to other ports including London Gateway. These included CMA CGM, MSC, Maersk, OOCL and Hapag-Lloyd.

The issue was over the introduction of a new Terminal Operating System called 'Next Generation Terminal Management System' or nGen. Hutchison Port Holdings (HPH) had introduced this system to its terminals around the world for over a decade so it is unclear why Felixstowe should have encountered such problems. Customers of Felixstowe have long complained of the difficulty of communication with the port, contrasting it with the open approach of other ports, such as Southampton. In particular, lack of visibility on the status of containers has been a frequently cited issue.

This is all the worse for the port as customers now have options for moving containers in and out of the UK. Notably, Felixstowe has been in a fierce competition with London Gateway, the new terminal owned by DP World. It has a location within the Hamburg-Le Havre range and so is a serious long-term rival.

Case Study: West Coast Ports Hit by Container Surge

Reports of congestion in January 2019 at LA/Long Beach highlighted a number of frailties in US inbound supply chains. The usual reason for the rush at that time is Chinese New Year. Although ports are only closed for a few days, the holiday period sees Chinese manufacturing shutdown for up to a few weeks. US importers, therefore, have to secure space on ships well in advance to avoid disruption.

However, this time around, congestion at ports appeared to be particularly bad. Port of Long Beach Executive Director Mario Cordero stated: "We're seeing unprecedented levels of cargo at the Port of Long Beach. Marine terminal operators, the International Longshore and Warehouse Union, shipping lines, truckers and other stakeholders are working hard to manage resources."

Similar issues were reported at neighbouring Los Angeles. Between them, these ports handle around one third of US inbound containers.

The main problem was that in addition to Chinese New Year, tariffs (or perhaps more accurately the threats of tariffs) had prompted importers to rush to beat the January 1 deadline. On December 1, the US and China called a truce on new tariffs which would have hit $200bn of Chinese products. However, even before this extension was agreed, importers were planning ahead, piling up inventory in anticipation for their implementation. This in effect meant that stock-piling had been taking place for several months. Going back further in the year, prior tariffs have also caused similar issues. This situation has resulted in a boom-and -bust scenario, making it hard for port operators to manage the flows of containers in a cost effective way whilst meeting the needs of shipping lines and freight forwarders.

Transactional Processes

A proportion of the overall dwell time is caused by transactional processes such as the lodging of customs clearance paperwork following the arrival and off-loading of a ship. Similarly, after clearance, there may be a delay in the payment of customs dues.

In parts of the world where significant revenues are raised by the duties imposed on imports, considerable efforts are made in ensuring that shipments are consistent with declarations[4]. In such markets, rates of physical examinations are high with clearance times ranging in Mombasa, for example, between 2-4 days depending on the risk classification.

In many ports, clearance documents can be lodged electronically rather than in paper form which can make parts of the process more efficient. However, in many parts of the developing world hard copies of documents will usually be required at some stage of the process. Inttra estimates that currently only around half of the ocean freight sector's transactions are digitized.

As identified in the paper, "Maritime Transport in Africa", Port of Lomé, despite signing up to UNCTAD's ASYCUDA++ electronic system[5], still requires many manual interventions:

- Registration of the ship manifest by the consignee on ASYCUDA++ after vessel arrival
- Cargo delivery bill handed over by the consignee to the shipper during exchange of the bill of lading
- Cargo clearance bill given by customs after receipt of the customs declaration and the payment of fees
- Cargo exit bill given by the port authority after the payment of port fees
- Bill reissued by the Port Operations Department to confirm the payment of fees and register the exit date
- Delivery note issued by the Port Operations Department to confirm in writing the exit from port or transfer to a container freight station
- Order of execution issued by the Customs Brigade to confirm and verify liquidation of the customs declaration

[4] In Kenya, import tariffs account for 40% of all taxation revenues

[5] ASYCUDA is a computerised customs management system which covers most foreign trade procedures. The system handles manifests and customs declarations, accounting procedures, transit and suspense procedures.

Source: Why Does Cargo Spend Weeks in Sub-Saharan African Ports? Lessons from Six Countries[6]

The authors of the World Bank LPI report say, 'Although the time to clear goods through customs is a small fraction of total import time … it rises sharply if goods are physically inspected, even in high-performing countries.'[7] This is evident from the performance of a selection of countries in the LPI:

	Russia	United Kingdom	Germany	Mexico	China	Kenya	United States	Brazil
Clearance Time (days) without Physical Inspection	2	1	1	1	1	3	2	2
Clearance Time (days) with Physical Inspection	4	2	1	2	2	4	3	5

Source: World Bank

One way of reducing the time spent on clearance is to increase the number of bonded warehouses which exist outside of the port. Indonesia has increased the number of bonded warehouses in the country from 22 to 50 in 2016. "By diluting the accumulation at the major ports and switching it into the spokes at the (bonded logistics centers), we hope to cut the dwell time," said Director General of Customs and Excise Heru Pambudi quoted in a Journal of Commerce article[8].

Storage

Delays are not always due to port inefficiency. In some cases, an importer may take the view that it is cheaper to store their goods in the port rather than an off-site warehouse. Therefore, this is a conscious decision to leave the goods in the yard, rather than clear them. To reduce the use of this tactic, many ports have increased so-called 'demurrage' charges, a tactic which is often encouraged by customs authorities who want to encourage the payment of dues as soon as possible. According to the World Bank, taking Douala as an example, storage in the port is the cheapest option for an importer for up to 22 days (11 days beyond the container terminal's free i.e non-charged time)[9].

[6] https://unctad.org/meetings/en/Contribution/dtltlbts-AhEM2018d3_WorldBank_en.pdf
[7] https://openknowledge.worldbank.org/bitstream/handle/10986/29971/LPI2018.pdf
[8] https://www.joc.com/port-news/asian-ports/port-tanjung-priok/indonesia-seeks-further-cut-container-dwell-times_20160921.html
[9] http://www.freightintoafrica.com/article/why_high_dwell_times_in_african_ports

PORT DATA

Although, as mentioned, many ports do not routinely publish CDTs, below is a selection of data from those which do.

North America

One of the problems faced by West Coast of the USA ports has been the surge of containers at the end of 2018 as importers sought to beat the Trump tariffs. Throughout most of 2018 dwell times were between 2.5 to 3 days, but by November this had risen to 3.51 days. According to the Pacific Merchant Shipping Association (PMSA). “Anything over three days creates a barrier to improving efficiency.”

Europe

Very few CDTs are published by European ports. Dublin Port has recently gone on record as saying that it intends to reduce its dwell time to 2 days from 3 by 2021, as a result of pressure on space (caused by Brexit). This would seem to be a good estimate for most of the larger ports in the region.

Sub-Saharan Africa

Durban and Mombasa are the best performing ports in sub-Saharan Africa against this metric. Their performance is comparable in many cases to some ports in Europe and far better than others in the continent.

Durban(South Africa)	4 days
Mombasa (Kenya)	3.4 days (2018)
Tema (Ghana)	20 days
Lomé (Togo)	18 days
Douala (Cameroon)	19 days
Dar Es Salaam (Tanzania)	18 days (imports)

Source: Maritime Transport in Africa (UNCTAD) n.b. unless otherwise indicated data relates to 2011 and there may have been improvements since.

Middle East

King Abdullah Port (Saudi Arabia)	3.7 days

Whilst King Abdullah Port claims highly competitive CDTs, other ports in the country are not as efficient with some estimates putting delays at between 10 to 20 days as a result of customs controls and inspections. Jebel Ali port in neighbouring UAE is globally competitive and consequently many importers prefer to route their shipments through Dubai, despite the extra distance involved.

Asia

Although few ports in the region publish data, it has been estimated in the World Bank Study that the average CDT in East Asian ports is 4 days.

India

India CDTs compare well against ports in parts of the developing world. In 2017 across major ports which represent 70% of the throughput of Indian container traffic, average dwell times were 2.9 days for imports and 3.8 days for exports.

Cochin	5.2 days
Chennai	2.01 days
Jawaharlal Nehru Port Trust (JNPT)	2.79 days

Other ports in Asia which release their CDTs include:

Tanjung Priok (Indonesia)	3.7-4.2 days
Belawan (Indonesia)	8 days

Although Container Dwell Times are not routinely published by ports or terminal operators, technology company Inttra provides what it calls a Dwell Time Dashboard to its customers (this data is not publicly available). It claims that the data included in the product helps shippers avoid unexpected invoices with analytics on turnaround time for various phases of the shipping lifecycle. In particular it measures individual port dwell activity between empty pickup, gate in / out, vessel load / unload, and returned; analyzes potential cost impact and allows the shipper to avoid high-risk ports with historically lengthy dwell periods. It is able to do this by calculating the time between specific status events triggered by the container's transit of the port after unloading.

CONCLUSION

The time spent by containers in ports is hugely significant to supply chains and economies for several reasons.

- Every day that inventory spends in transit or stored represents an inventory cost to the shipper which has to be financed and paid for.
- Delays are inconsistent with modern supply chain practice, such as Fast Fashion, which relies on swift movement of goods to retailers.
- Supply networks are closely integrated and a delay to one shipment can result in severe consequences at other parts of the supply chain.
- Those agencies and ports which fail to provide predictable and expedited clearance and transit times will become marginalized by global shippers. This will have implications for economic growth.

Ports and governments have a major role to play in making operational and transactional processes more efficient. Using private sector capabilities (where they don't already exist) will be key to this. There will also be gains through technological innovation. For example:

- Smart Gate systems allow the process of cargo entry and exit automatically, in addition to pre-booking services for delivering and receiving goods.

- Container Dwell Time Management Systems (Cdtms) are being developed to provide more visibility for all supply chain partners.
- Container stacking solutions allow better and more timely access to containers as well as the colocation of full and empty boxes, improving the utilization of yard space.

However, it would be wrong to expect technology to provide a ‘silver-bullet’ to the problems many shippers, freight forwarders and, indeed, port operators face. Results will only be achieved by a coordinated response from all the parties involved, not least of all governments.