

THE E-JOURNAL OF PORTS AND TERMINALS

EDITION HIGHLIGHTS

- Smart ports as lighthouse nodes of supply chain networks
- Optimising automated equipment fleets
- Discussing the need for intelligent centralised systems



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FROM THE EDITOR

Smart technologies, including wireless connectivity, artificial intelligence, automation and digitalisation in general have been hailed as strong solutions to some of the biggest issues of 2020 brought about by the COVID-19 pandemic.

As the pandemic interrupted supply chain flows and forced many to switch to remote working it was these smart solutions that came to the forefront as the answer to minimising disruption.

For those who have not already implemented automation the benefits of such a technology is now abundantly clear and many in the industry have commented that there is a strong shift in the demand for such solutions.

Speaking ahead of PTI's Container Terminal Automation Conference (CTAC) in December 2020, Sun Fei, Automation Architect, ZPMC, said the pandemic had made the industry "better understand" the value of new technologies and that automated terminals had demonstrated their resiliency during 2020.

During CTAC Fei commented that ZPMC has seen its domestic orderbook double as Chinese ports step up their own automation projects amid rising confidence that the worst of the pandemic is over.

All CTAC 2020 News can be found [here](#)

Through this final edition of the Journal for 2020 we explore optimising automated equipment fleets as Kalmar discusses how terminals adapt to a changing business landscape.

With all this automation being implemented we also consider how there will emerge a need for an intelligent centralised system to run and manage the daily operations across various port facilities.

PTI has also received an exclusive article from various authors, including those from the Research Institutes of Sweden (RISE), Hamburg Port Authority, Hapag-Lloyd and Kuhne+Nagel, about the concept of 'lighthouse ports' being digital pioneers and how they will now act as nodes of supply chain networks.

Our PortEconomics partners explain what has been happening regarding throughput at ports throughout the globe during 2020 with an overview and analysis of TEU volumes through the first nine months of what has been a challenging year for many.

Finally, Navis provides insight into why now is the perfect time for terminals to embrace software as a service (SaaS)-based terminal operating systems. The tide is changing and momentum is building for widespread adoption of the SaaS model.

From myself and the entire PTI team we wish you well for 2021.

Beth Maundrill

Editor

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SMART PORTS AS LIGHTHOUSE NODES OF SUPPLY CHAIN NETWORKS

Mikael Lind, Research Institutes of Sweden (RISE); Wolfgang Lehmacher, Anchor Group; Sandra Haraldson, Research Institutes of Sweden (RISE); Xiuju Fu, A*Star/IHPC; Dr. Phanthian Zuesongdham, Hamburg Port Authority; Ralf Huesmann, Hapag-Lloyd; and Simon Fich, Kuehne+Nagel

Ports of the world are crucial nodes in supply chain networks as they manage shipments of goods. Contemporary developments for the ports of tomorrow focus on establishing advanced capabilities for efficient physical handling of goods, not necessarily involving sea transports, as well as looking for opportunities to provide innovative digital services. The latter helps the port to also become an information provider to the participants in supply chain networks as the port develops knowledge about when goods arrive or pass through the port. Such information feeds allow for status and conditions signals, identifying potential risks ahead of the goods, optimising supply chain

buffer zones, generating real-time advice on route options to reach the point of destination in full and on time. The smart port is one source (out of many) for aggregated information serving as the basis for coarse-grained situational awareness enabling well-informed decisions on the transportation of goods of commercial and humanitarian concern. Beyond the role as intelligence provider, lighthouse ports are providing insights to their customers assisting them to make the best moves along the chain.

THE SMART PORT CONCEPT REVISITED

Throughout history, ports have always played an important role as strategic nodes in inter-

national trade and supply chain networks. With the arrival of the Fourth Industrial Revolution and Maritime Informatics, ports now have also the opportunity to establish themselves as logistics information exchange hubs of the digital era serving their local and regional supply chain ecosystem. This idea is grounded in the concept of the smart port.

It is essential to conceive a port as a node of the self-organising ecosystem of goods transports, with some lighthouse ports that are influencing other ports in their developments and decision-making and tightly connect with land and air transports. This all together brings attention to the idea that a smart port is integrated in the ecosystem



“LIGHTHOUSE PORTS ARE DIGITAL PIONEERS. THEY INVESTIGATE EVERY OPERATIONAL AND MANAGERIAL PROCESS AND AREA WITH REGARD TO DIGITISATION.”

which it is part of and feeds its direct and indirect clients with essential information.

Smart ports’ new revenue-generating and cost-saving information services enable carriers, shippers, and other players to significantly improve their operational predictability, efficiency, visibility, and capacity utilisation. Connectivity and increasingly complete port data sets raise situational awareness to reduce inefficiencies, inventories, cash requirements and risks, while descriptive, predictive and prescriptive analytics power timely and fact-based decision making to swiftly and precisely react to disruptions to avoid delays and damage.

Digitally connected cargo handling, combined appointment and notification systems for sea-borne and intermodal traffic as well as container identification and connectivity, improve safety, smoothen operations and increase capacity utilisation as well as its visibility in the supply chain. Productivity gains resulting from a more integrated transportation process equals better resource usage, facilitating the shift to cleaner modes of transportation, and an eco-friendlier operation. Solutions like motion-sensitive lighting systems within terminals and on port roads help reduce energy consumption, and air quality sensors enabling inspectors to receive real-time sulphur dioxide emissions reports from vessels entering or leaving a port support environmental and regulatory compliance monitoring and enforcement efforts.

Port security is enhanced through technologies that enable entrance authorisation, video surveillance and analytics, behaviour analysis and biometric authentication solutions. Customs clearance processes are optimised and accelerated through digital single windows, electronic data exchanges across national borders facilitated by emerging platforms. As a by-

catch of customs clearance, the detailed cargo descriptions of customs manifests can be assessed by advanced analytics systems to reduce the risk of severe damage due to undeclared or mis-declared dangerous goods. All these development trends are surfaced within the new emerging field of maritime informatics.

ENHANCED SITUATIONAL AWARENESS

Data – provided by systems and sensors, distributed through networks, and cleaned and analysed by powerful algorithms – informs about inventories and goods in transit and its conditions. The result is situational awareness about goods, shipments, equipment assets and infrastructure. Situational awareness can be simply defined as “knowing what is going on around us”, or – more technically – as “the perception of the elements in the environment within a volume of time and space, the comprehension of their meaning and the projection of their status in the near future”.

Enhanced situational awareness is in high demand, especially needed in times of turbulence or dynamic circumstances requiring quick and proper reaction. Across the full spectrum of activities in the movement of goods from origin to destination, situational awareness is gluing the actors in the self-organising ecosystem of shipping together. At its core sits digitisation which contributes to enhanced predictability. Once digitised, an industry gains greater insight into its presence and future and can more swiftly and flexibly respond to rapidly changing environments, and quickly establish new collaborative ventures. Tomorrow’s data feeds would also inform about the conditions of the port and ecosystem infrastructure providing foundations for predictive maintenance and repair of logistics and port assets.

DATA SHARING IS ON THE RISE

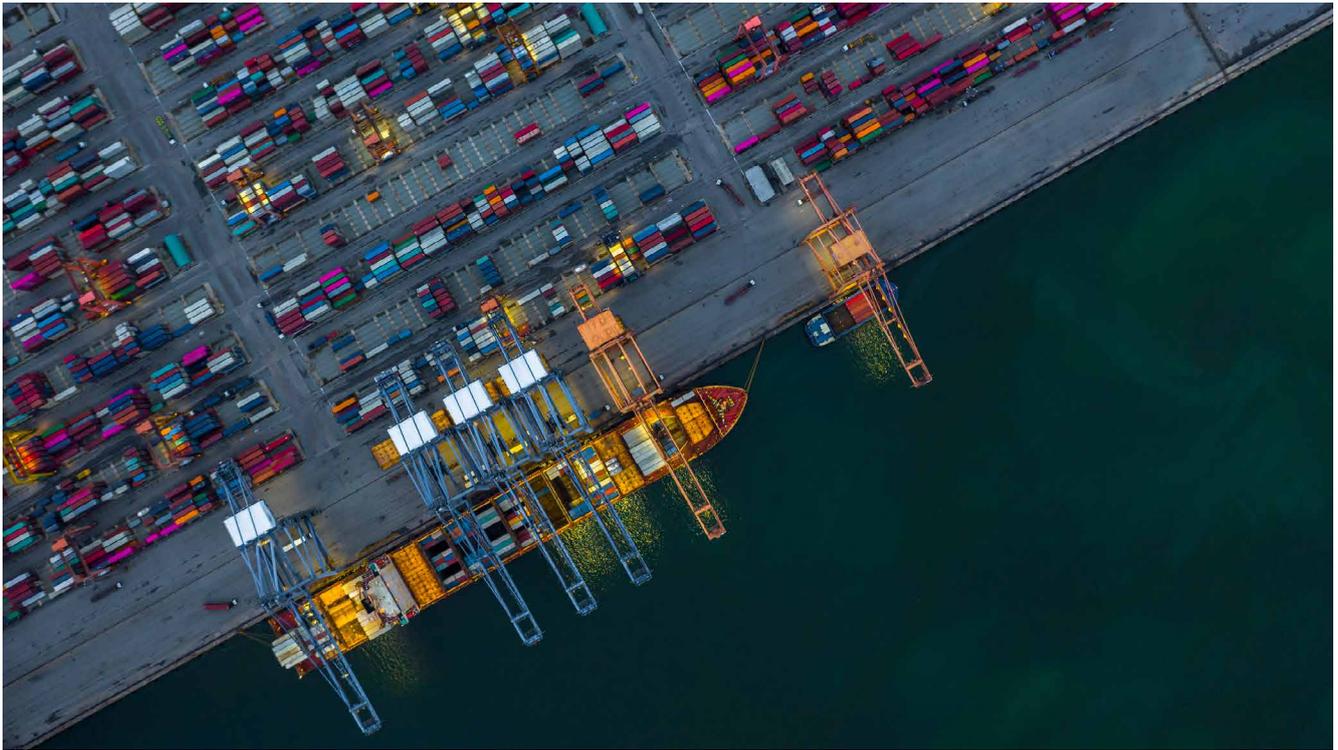
The European Commission forecasts exponential growth of data streams. Substantial investments today are being made in digital technologies allowing for more digital data streams in supply chains. Logistic Service Providers (LSP), carriers, intermodal operators (air, sea, ground), port authorities and terminal operators, regulatory bodies, and Beneficial Cargo Owners (BCO) are all working on this topic for each of their benefits.

Each actor in a port needs to contribute to and access up-to-date situational awareness to achieve a collective and mutually beneficial level of operation efficiency and traffic safety. Numerous initiatives are now building upon the emerging principles of digital collaboration, standardised data sharing, and the use of internet of things (IoT) devices and systems. Their purpose is to improve the speed and predictability of operations by applying just-in-time thinking and door-to-door visibility of the trip execution empowered by digital data sharing.

SMART PORT SYSTEMS

A system of records, combined with relevant internal and external data, can be used in a system of inquiry, such as data analytics, to discover hidden patterns and generate knowledge to enable more efficient use of a port’s capacity. The information produced by a system of inquiry helps to position a port in a modern transportation system. The port’s system will become a microservices data oriented layer invoking different services via standard Application Programming Interfaces (APIs) and exposing a rich set of services to the whole ecosystem, while abiding by global cybersecurity and data sovereignty laws.

Ports can provide insights to freight forwarders and other transport capacity and services buyers to guide cargo over the best



available transport modes and efficient routes. Data on the progress to downstream ports allow them to optimally plan and deploy resources. This is especially important in short-sea shipping, enabling optimised capacity utilisation and achieving shorter, reliable transit times. Port data, data sharing governance, big data intelligence and smart port systems are key characteristics of the port of the future. Through increased digitisation efforts during the recent years, leading ports have embarked on the journey from the transshipment hub to also include capabilities of an information hub.

THE CONCEPTION OF A LIGHTHOUSE PORT

Lighthouse ports are digital pioneers. They investigate every operational and

managerial process and area with regard to digitisation. They experiment not only in the digital comfort zone but overcome the fear to fail in order to learn and place themselves ahead of the pack by going beyond the current viable models and operational levels and develop and test completely new ways of operating, positioning themselves as the leaders in the digitisation race.

The interest of the shipper and carriers do not stop at the yard gate and the quay wall. Lighthouse ports are holistically focused, trained and active enabler of supply chain network performance through supporting digital infrastructure, providing digital services and sharing data to help them and the entire system

optimise processes, improve capacity utilisation and avoid disruption through visibility and analytics. They are trusted environments by which carriers, shippers, port communities, customs, and governments, financial, and other actors can securely access the data they need. They set the example, drive innovation through hackathons and support others in their digitisation efforts.

A lighthouse port thus guides other participants in the ecosystem on different decision levels, such as in strategic decisions on investments or more operational real-time decisions to make for transport coordinators and cargo owners for re-planning transport routes and flows. The capabilities of the lighthouse port, as a model for oth-

**“IN TURBULENT
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AND RESILIENCE.”**



ers and having capabilities to inform others outside their own domain, is also one of the drivers for responding to the goals of reducing greenhouse gasses (GHG) resulting from the maritime supply chain being put high on the global agenda.

SMART PORTS AS LIGHTHOUSES IN A NETWORKED WORLD

Improving customer experience

Smart ports function as a probe for deriving status information about shipments and goods, help to optimise buffers, contribute to data pools for optimal routing and is one of many information sources for coarse-grained situational awareness enabling decisions for business, humanitarian and societal concern. Customer relationship management (CRM) systems help to pull all data together and consult customers on their best moves.

Reducing inefficiencies and inventories

Visibility providers like TradeLens, Traxens, Roambee, EVERYTHNG, Scantrust and Fourkites work towards realising the complete end-to-end dataset. Port community systems (PCS) and other platforms and tools, like those provided by startups, connect to other systems and the various stakeholders ranging from shipping lines to customs to road, rail and logistics providers easing the burden of coordination and collaboration. Visibility reduces inventories and frees cash that may be better deployed to drive digitisation efforts and projects.

Mitigating supply chain disruptions

Decision-making is not an isolated process. For ports, they need to be collective and collaborative to mitigate risk propagation when disruptions occur. By sharing information between all relevant stakeholders, a more complete picture can be quickly reached which is of utmost importance in extraordinary situations, like accidents or disasters that cause emergencies and major disruptions.

CONCLUDING REMARKS

Recent trade wars and the COVID-19 pandemic have demonstrated the brittleness of a highly interconnected economy. In turbulent times, responsiveness favours survival through agility and resilience. Agile organisations can quickly decide and redeploy their critical capital and competencies to meet emerging societal needs, such as swiftly delivering bulk healthcare supplies to dozens of countries when needed. Resilient organisations can recover quickly from disruption.

Smart ports, empowered by maritime informatics, with their networks, data, their analytics, platforms and worldwide connectivity are fulcrums of coordination,

supplying the broad range of actors involved in a voyage and port visit with data in near real-time, helping them organise the numerous activities and connectivity to other means of transport. They are architects, drivers of change and vital physical and digital nodes in the next generation supply chain networks. They are important lighthouse-node players in the act of balancing capital productivity and energy efficiency.

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Sandra Haraldson is Senior Researcher at Research Institutes of Sweden (RISE) and has driven several initiatives on digital collaboration, multi-business innovation, and sustainable transport hubs, such as the concept of Collaborative Decision Making (e.g. PortCDM, StationCDM, YardCDM) enabling parties in transport ecosystems to become coordinated and synchronised by digital data sharing.

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SEEING THE BIG PICTURE: OPTIMISING AUTOMATED EQUIPMENT FLEETS

Hannes Myllärniemi, Product Manager, Kalmar One, Kalmar

In one form or another, automation is the future for terminals of all types that are looking to continuously improve the efficiency, safety and sustainability of their operations. This article examines the benefits of fleet-level optimisation for automated container terminals, taking Kalmar's Fleet Management solution as an example.

Until now, container terminal automation projects have often involved a significant amount of customization for each terminal. Automation architectures also differ between system providers, with some focusing more on equipment-level automation and others (e.g. Kalmar) on overarching fleet management systems that enable centralised optimisation of the entire fleet of automated container handling equipment.

Because automation projects have largely been unique initiatives, they have involved a lot of research and product development for each customer and use case. Equipment

control software has varied with each type of machine, making it sometimes challenging to replicate best-of-breed deployments in subsequent projects.

CHANGING THE GAME WITH STANDARDISATION

The open, modular and standardised automation system Kalmar One has been Kalmar's response to these challenges. The system enables the streamlining and automation of operations with proven functionalities and well-established processes. Kalmar One is compatible with all types of equipment irrespective of manufacturer.

Kalmar's view is that Kalmar One is merely the first step towards more open and standardised automation infrastructures. By enabling terminal operators to utilise proven features and systematic approach from one implementation to another, standardisation will reduce the deployment times and en-

able terminal operators to reap the benefits of previously successful solutions.

Kalmar One builds on Kalmar's long experience in automating container terminal operations. The company's earlier equipment control system Kalmar TLS has been an important component when developing Kalmar One. All equipment control functionality that was previously provided by TLS has now been incorporated into Kalmar One, with the addition of some new functionalities.

Compared with the earlier TLS system, Kalmar One includes equipment automation features, yard automation components and integration tools as one standardised system that can be used for automating container handling operations regardless of the equipment type, operation mode or automation level of the terminal. Kalmar One is an open automation system, making it possible to automate equipment from any

manufacturer with Kalmar Key interfaces.

BRIDGING THE TOS AND THE AUTOMATED EQUIPMENT

Kalmar One encompasses intelligent hardware components and sensors installed in container handling equipment and terminal infrastructure, in addition to software running on both the equipment and server levels. At the heart of the solution is Kalmar's Fleet Management product family, which handles all the main functions "under the hood" that enable centralised control, coordination and optimisation of automated equipment fleets. The product family is purely server-based software that serves as an interface between the Terminal Operating System (TOS) and the various automation solutions onboard the equipment or in the yard infrastructure.

Software-based fleet management can be implemented in different system architectures and with several different levels of automation. The Kalmar One Fleet Management solution bridges the TOS and the automated equipment. In addition to interfacing with leading TOS such as Navis N4, it can be used to augment the functionality

of bespoke TOS that have been developed in-house by terminal operators. By adding Kalmar Fleet Management as a middleware layer, the terminal can get the benefits from advanced real-time optimisation without the need to revamp the existing TOS.

From the perspective of equipment control, there are general methodologies for deploying container terminal automation. The solution can be built around the OEM supplier's own equipment control system (ECS) or in some cases with the terminal's own in-house ECS. The third option is to bypass the ECS layer somewhat completely and connect each container handling machine directly with the TOS. Kalmar One represents the first option that provides terminal operators with additional capabilities for centralised fleet-level optimisation through the Fleet Management product family.

The main design principle behind the Kalmar One Fleet Management is to be able to optimise equipment utilisation, routes and container handling tasks on a global level for the entire automated operation. This type of optimisation is not feasible if the majority of the logic of equipment and container moves is handled locally onboard

the equipment. Additionally, centralised fleet management enables more advanced analytics and real-time monitoring for the entire fleet. Concrete benefits include time, fuel and energy savings as well as reduced pavement wear due to automatic shuffling of driving paths and container positions.

The Kalmar One Fleet Management product family consists of four products. Fleet Controller controls the job execution, routing and traffic management of automated equipment fleets. Fleet Optimiser performs holistic optimisation of short-term fleet execution planning. Storage Manager maintains information on all containers in inventory, and Transfer Point Selector manages and optimises the transfer points of container moves.

STEP-BY-STEP DEPLOYMENT

Kalmar One Fleet Management that covers the equipment control system features previously known as Kalmar TLS is currently used worldwide at over 15 container ports and intermodal terminals with widely differing automation environments. Along with other automation solutions, Fleet Management can be deployed in different



KALMAR ONE FLEET MANAGEMENT PRODUCTS AND MODULES

Fleet Controller

Job management:
Job and job queue execution, progress handling, job reporting

Traffic management:
Traffic congestion management, routing, area reservations

Pavement preservation:
Shuffling of lanes and stacks to reduce pavement wear

Fleet Optimiser

Move scheduler:
Move execution planning, validation, queuing, prefetching and scoring

Machine assignment:
Selection, pooling, swapping, overbooking and other management tasks for container handling equipment

Job dispatching:
Job timing and exception handling

Dynamic dispatching:
Dynamic booking and dynamic serving limitations

Fleet size optimiser:
Maintains optimum number of active machines with parking and hibernation as needed

Energy Management:
Automated charging, fuel scheduling

Storage Manager

Container inventory:
Maintains and updates container data including physical inventory location

Housekeeping:
Optimises container stack height

Transfer Point Selector

Transfer point selection:
Lane selection and activation

Twin forming:
Manages twin lifts of containers



ways depending on the operational needs of the terminal. A block-by-block conversion to fully automated operation can be carried out alongside manual operations. This approach helps limit operational risk and enables the terminal to gain valuable experience from automation on an incremental basis.

An alternate method is to introduce progressively additional levels of automation to the entire fleet at the same time, starting with remote crane operation and ending with full equipment and process automation. New greenfield terminals also have the option to start directly at a high automation level. With each new level of au-

tomation, the terminal will be able to gain additional benefits from Kalmar One Fleet Management and other system-wide optimisation tools.

As terminals adapt to the changing business landscape, terminal automation solutions will need to evolve to become more standardized, easier to deploy, and replicable from one installation to another. Kalmar One and the fleet-level optimisation capabilities provided by the Fleet Management product family help customers deliver consistent, measurable performance and reduce operating costs, while simultaneously improving the safety and eco-efficiency of their operations.

ABOUT THE AUTHOR

Hannes Myllärniemi has worked for Kalmar since 2007 in various sales and product management roles, all of which have had a strong automation focus. Nowadays his main task in the company is to look after the commercial product management of Kalmar One automation system.

ABOUT THE ORGANIZATION

Kalmar Global provides cargo handling solutions and services to ports, terminals, distribution centers and heavy industry around the globe. We are the industry forerunner in terminal automation and energy-efficient container handling, with one in four container moves around the globe being handled by a Kalmar solution. We improve the efficiency of your every move through our extensive product portfolio, global service network and solutions for seamless integration of terminal processes.



KUANTAN PORT BEGINNING ITS DIGITAL JOURNEY



Interview with Mazlim Husin, Chief Operating Officer, Kuantan Port

Facing the South China Sea, Kuantan Port is one of the premier deepwater ports of the Malaysian Peninsula's East Coast.

Like many other ports across the globe Kuantan is now embarking on a digital transformation, launched in August 2020.

With the completion of the New Deep-Water Terminal at the port it is positioning itself as the main gateway to China and the Far East as well as acting as a transshipment hub for minor ports in the region.

Speaking exclusively to PTI, Mazlim Husin, Chief Operating Officer, Kuantan Port, described the vision the port has for expansion and digitalization.

A PAPERLESS FUTURE ON THE HORIZON

The port is on a digitisation path which commenced in 2020 with a timeline set out to 2022 and beyond.

“For the digitalisation of Kuantan Port it is not just about the port its also about IJM Group, our parent company, which is a conglomerate in Malaysia as well as port operations we also include construction, prop-

erty development and a toll concession for the highways,” Husin explained.

“What we have been doing for the past few months is enhancing our transformation further as well as integrating with other applications, not just about cargo handling, not just about container handling, but also about safety and palliative services.”

He explained that the aim is to have a centralised location for all the data handled by the port so it can be accessed through one dashboard.

“When we talk about digitisation of the port it’s not a choice. It is something we have to do to transform and to be more competitive amongst other ports in this region,” Husin said.

Discussing the timeline Husin said that 2021 will be a very important milestone year for the port to achieve paperless operations. In 2021 most of the new security features will also be implemented at the port.

In terms of business and cargo Husin said that right now the port’s cargo throughput is around 25 million tonnes but in five years’

time the port aspires to achieve about 35 million tonnes.

Digitalisation is just one part of the entire strategy and the port is also investing heavily in hardware as well as the skills of its people.

Two units of ship-to-shore (STS) cranes were delivered to the Kuantan Port in November. The STS cranes arrived on transporter vessel Zen Hua 29 on 1 November 2020 from one of the largest crane manufacturers in the world, Zhenhua Heavy Industries (ZPMC).

To complement the new cranes, Kuantan Port is expecting four units of rubber-tyred gantry cranes (RTG) due to arrive in December 2020 which have been manufactured by Mitsui E&S.

BELT AND ROAD INITIATIVE

Kuantan Port is set to be a maritime location that is part of China’s Belt and Road global infrastructure initiative.

“If you look back in the history, basically this is the route that has been a trade route between this part of the world for hundreds

of years, culture has travelled this route, religion has travelled this route,” Husin said.

The Belt and Road initiative seeks to enhance this already existing route with the Chinese intention to secure the trade routes around the world, Husin explained.

“It has been very effective, it has helped a lot in the development of Kuantan Port. For Kuantan Port, our advantage lies in our strategic location facing the South China Sea. This strategic location also complements the developments taking place in port’s surrounding hinterlands such as Malaysia-China Kuantan Industrial Park (MCKIP) who has a sister park in Qinzhou, China called China-Malaysia Qinzhou Industrial Park (CMQIP). MCKIP offers global investors opportunities to leverage on its close proximity to Kuantan Port, while Kuantan Port plays a crucial role in making the East Coast of Peninsular Malaysia a gateway to the Far East especially China.” The port has already had close ties with China before this initiative and also has a Chinese partner within its shareholders.

“This enhances our marketing effort and ability to attract more investors from China to be based in Kuantan, to be based in Malaysia.”

Husin said that before COVID-19 and the restrictions to movement he would receive weekly visits from Chinese investors to the port.

“We always received very positive remarks from them when they come to the port...I have also visited Chinese ports many times and always find it inspiring the way they manage their operations and the scale of their operations.

“I am also amazed at the new technology they have over there, all the autonomous



cranes and high-speed railways. And how they dissect their information in such a detailed way so it can be used for planning.”

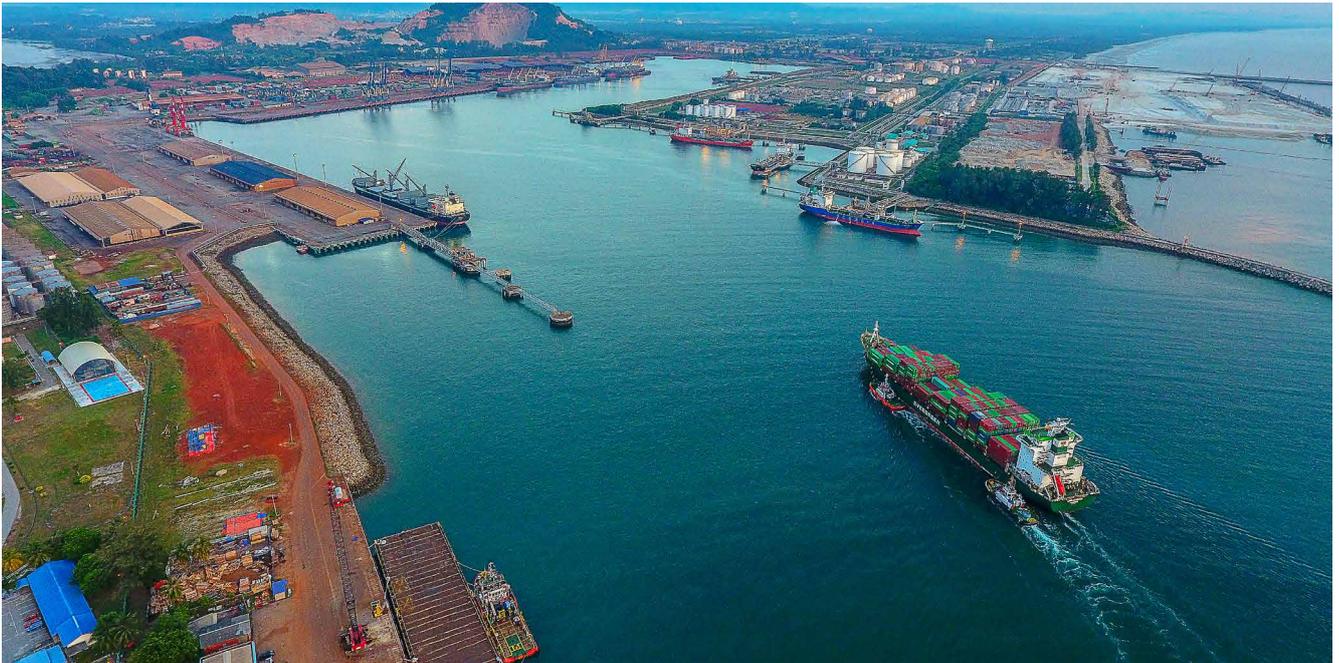
INFORMATION AND COVID

Husin explained that the port has coped well with the events of 2020 and the COVID-19 pandemic which has typically disrupted much of the supply chain.

The port had faced some positive cases earlier in 2020 but Husin said these were related to a foreign vessel crew who visited the port. None of the workers at the port were affected and the crew were quarantined and all the appropriate measures taken.

“It was a reminder to us and to the port user that we cannot take this situation for granted,” he said.





Husin emphasised how important it is to provide the correct information in the most efficient way and not allow the spread of information via social media to take away from the core messages.

“What we learned from this incident is that you really have to manage the information. What we have done is formed our own emergency committee for the port which also includes some government parties and from there we manage the information and make sure that the information that is dispersed to the public is credible,” he explained.

“Even when there are no cases, we issue a statement which I personally signed, not just internally but to the community also, so I think in that sense we have been managing it pretty well.”

Husin added, “The outside community is very important to us because our workers are from that community and we do interact with that community and the partners within it.”

Husin acknowledged that no government or president could have predicted the effects of COVID-19.

Operationally this has meant to port has looked to continue to cooperate collaboratively with its partners over the period to ensure that customers requirements are met.

One problem the port had faced, like many others, was container space because they

could not be taken out of the port, but he said this is not what he considers major disruption.

“The government has also given us a lot of exceptions so we can handle these sorts of challenges through the MCO [movement control order].” This means certain companies, based on special approval given by the government, can bring out the cargo through.

He concluded by saying, “I can say that really the effect of COVID-19 [on cargo and operations] at Kuantan Port has been quite minimum.”

Overall, the port continues to be on its path to digitalisation and the COVID-19 pandemic has not hampered this effort.

“We have a vision in the sense that to us Kuantan Port is a very important development. This is the only container port on the East Coast of Malaysia, and we have been supporting the oil and gas industry as well as the heavy industry for decades now. With our existing infrastructure and our ongoing expansion, as well as the government mega infrastructures project such as the East Coast Railway Link (ECRL) that connects Kuantan Port and Port Klang on the west coast, the future is very bright for Kuantan Port,” Husin concluded.

The future vision is for Kuantan Port and the surrounding area to be a logistics hub.

Written by Beth Maundrill

ABOUT THE AUTHOR

Mazlim Husin carries with him over 25 years of corporate experience. His career with Kuantan Port Consortium began in mid-2016 when he successfully spearheaded its rebranding exercise. In a short span of time with Kuantan Port, Mazlim has quickly developed a keen sense of acute understanding of the business and promoted to General Manager of Operations in early 2017 and again gained the trust of the executives of the company with another promotion in mid-2018 as its Chief Operating Officer.

ABOUT THE ORGANIZATION

Strategically located on the eastern seaboard of Peninsular Malaysia and in the heartland of petrochemical industries, Kuantan Port has developed into a major petrochemical, bulk, and container terminal in the east coast region. Supported with excellent port facilities and services, a vast market outreach, and a strong network of global shipping connections, Kuantan Port will be a catalyst for the rapid expansion of the industrial and manufacturing activities in the East Coast Industrial Corridor.

With the completion of its New Deep Water Terminal, Kuantan port is envisaged to be the main gateway to China and the Far East and shall act as a transshipment hub for minor ports in the region.

“WHEN WE TALK ABOUT DIGITISATION OF THE PORT IT’S NOT A CHOICE. IT IS SOMETHING WE HAVE TO DO IN ORDER TO TRANSFORM.”



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MOVING TOWARDS A GLOBAL NETWORK OF PORTS



Jan Gardeitchik, Business Development Manager Digital, Port of Rotterdam

Digitization is a significant contemporary trend, and all ports and maritime companies are aware of the need for change. The question is: how and where to start? This paper outlines a model for digital maturity that shows how we, as ports, need to develop and exchange data in order to keep up with the developments taking place around us. We strongly believe in a step-by-step approach that keeps the process manageable and encourages the port community to get on board; within our Digital Maturity Model, four 'maturity levels' have been defined.

LEVEL 1: DIGITIZATION OF INDIVIDUAL PARTIES

Many different parties operate at a port, including the port authority, nautical service providers and terminals, and by digitizing their processes all of these players can work more efficiently. Every organization does this for itself and largely keeps the development of such processes under their own control. In order to achieve this digital goal, port companies implement

what is known as a Port Management System (PMS), which supports the administrative and financial processing of calls and facilitates the digitization of the departure and arrival of ships, dock planning and cargo handling.

Another option could be to combine data science with – as an example – Automatic Identification System (AIS) technology on board ships. This, as well as the use of sensors within a port, can result in more efficient asset management. The Port of Rotterdam itself achieves savings of 5-10% in dredging costs by bundling the routes sailed with information on silt deposits in the port basins.

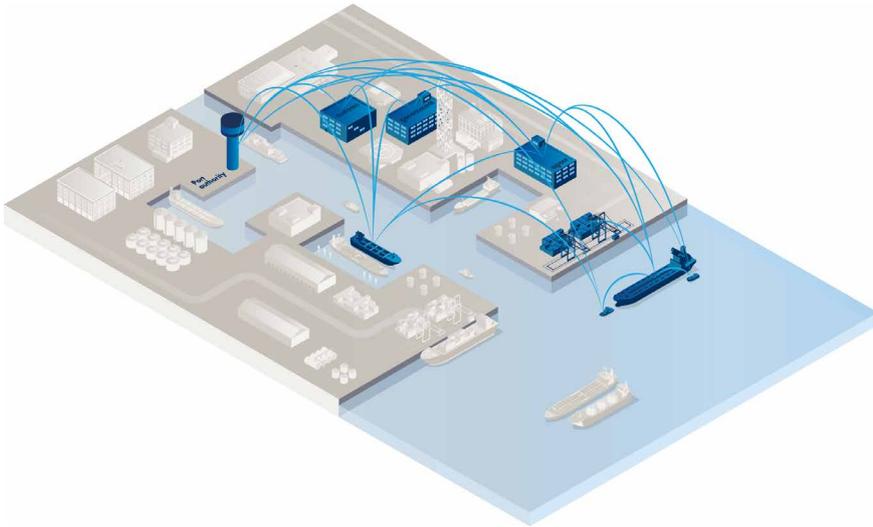
Automating the individual parties in the port enables data collection, which can be used to make the port run more cost-effectively, more safely and more sustainably. The implementation of the PMS in Rotterdam has shortened the turnaround time for ships by 30 minutes and, assuming a vessel costs €10,000 (\$11,200 USD) per hour, this means around €150 million (\$167.9 million) in annual savings [1].

LEVEL 2: INTEGRATED SYSTEMS IN A PORT COMMUNITY

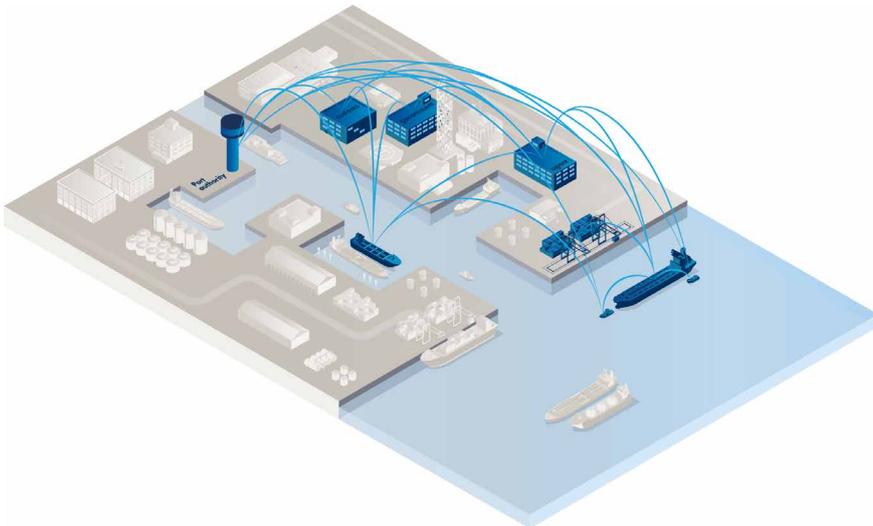
The digitization of individual processes heralds the digital exchange of information within the port community. Given that the number of players in a port can grow rapidly it is best to link all individual systems to one central platform, enabling the port to operate as a single entity. For this reason, systems in the Port of Rotterdam have been developed using the principles of security by design. Due to the fact that human activity also determines the level of data security, cyber security and cyber resilience need to be properly aligned to one another.

A Port Community System (PCS) forms a neutral, reliable basis for the digital exchange of information within the port community. This applies both to business-to-government (B2G) communication and to communication between companies (B2B). Data ownership and control of who may use which data needs to be arranged in such a way that it is always clear who data belongs to and who it may be shared with. This may not get in the way of exchanging new data. A port author-

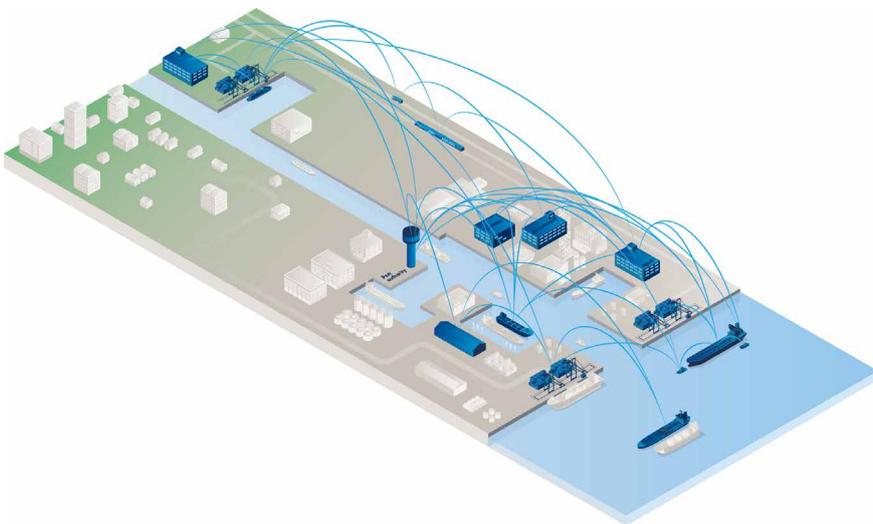
Level 1



Level 2



Level 3



ity can play a neutral part in this and so offer added value to the port community.

While a PCS has traditionally focused on administrative data, the exchange of event data is now becoming increasingly important. People can use it to better predict how the logistics process will evolve. The exchange of event data and adding “brain” function makes a PCS more valuable. The annual added value of the PCA PortBase in the Port of Rotterdam amounted to €245 million [2], and savings include €30 million by reducing the number of phone calls, €100 million by reducing email traffic, and €10 million by reducing the volume of road freight mileage.

LEVEL 3: LOGISTICS CHAIN INTEGRATED WITH HINTERLAND

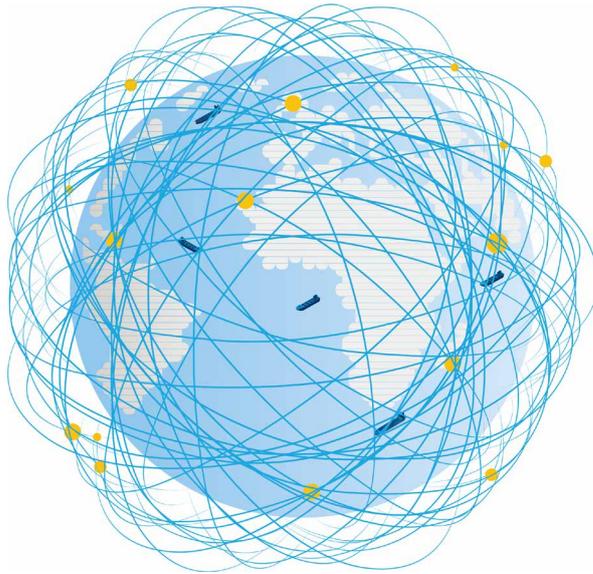
At this level, hinterland players are also involved in the digital communications taking place within the port community. Information from the PCS about ETA/ATA and ETD/ATD are shared with inland terminals, empty depots, carriers and other stakeholders. Consequently, parties in the hinterland have a real-time insight into cargo and ship visits, which makes better planning possible. Shippers are better able to guide their cargo over the available transport modes and transshipment hubs, as they can select the most efficient route for their cargo and have insight into the expected transit time. If they wish, they can contact carriers and/or transshipment hubs in the logistics chain. With tracking and tracing, all logistics chain players have insight into the status and location of cargo batches.

For ports and their hinterland, the digital sharing of information yields competitive advantages: shorter transit times, reliable hinterland transport and lower costs. For potential clients, this can be what prompts them to consider a port shift. In addition, ports and hinterland players can get to know each other’s needs, as well as those of their clients, which reinforces their joint clout. However, digital communications with the hinterland chain will only run smoothly if clear standards and definitions related to the contractual agreements between chain parties are set.

LEVEL 4: CONNECTED PORTS IN THE LOGISTICS CHAIN

At this level, an integrated door-to-door digital logistics chain is created on a global scale, making optimum use of different transport modes and creating benefits for all players along the logistics chain. Shippers and shipping companies are able to plan with greater accuracy and follow their cargo/ships in real time. Warehouses can maintain their stocks with small margins. Ports and terminals can forecast the ETAs and ETDs of ships more and more accurately and use their dock space and resources

Level 4



more effectively. This is not a luxury, given that currently around 30% of sea-going vessels still arrive more than 24 hours late [3].

The environment also benefits. The fulfilment of contract agreements by bulk carriers often leads to unnecessary emissions and high costs because the ships arrive at the port at the time arranged only to find themselves anchored outside the port because they are not yet allowed in. The fulfilment of contract arrangements on the basis of real-time information offers the opportunity of sailing more slowly, and therefore greener. Ships reach the

port just in time and at the moment there is space available.

The linking of technologies, such as artificial intelligence, IoT and AIS, means everyone can access the information they need about sea-going vessels: location, cargo, crew data, port calls, and speed. A new era is dawning in shipping, one in which the entire logistics process will become transparent and predictable. We are convinced that this will result in a considerable improvement in global port calls, with several international shipping companies anticipating a potential saving of between €25 and €150 billion across the maritime industry [4]. In addition to this, studies have shown that emissions in international shipping could fall by 35% due to Just-in-Time (JIT) shipping [5].

CONCLUSION

Working towards this - the highest level of digital maturity - is a challenge for everyone involved. For example, ports will have to enter into talks about sharing information with their rivals. In addition, global standards will have to be developed in order to make it possible to follow the logistics process from manufacture to the finished product on the shelf.

Based on the digital maturity model, ports can grow step by step into 'Smart Ports'. Although innovative technology plays a key role, it is not an objective in and of itself: the focus is on sharing data. The level at which this happens will have an impact on the digital maturity of a port, and on the associated benefits. We are happy to share our knowledge and experience in this area with all parties, as only together will we be able to work towards JIT operations and facilitate a seamless flow of cargo.

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ABOUT THE AUTHOR

Jan Gardeitchik originally studied Chemistry and Information Technology and he joined the Port of Rotterdam authority 35 years ago as a safety & environmental specialist.

Within the Port authority he worked on various positions and was a senior manager for more than 20 years, leading both operational and staff departments. He was also trained as Incident Commander and has a broad experience in dealing with port emergencies.

He followed "leadership and executive development" programs at the Erasmus University and became head of the Policy and Innovation department of the Harbour Master Division.

He worked on the introduction of clean fuels for shipping, like LNG, Port Call Optimization programs and Cyber security resilience.

After working for some time in the Middle East he now is Business Development Manager Digital at Port of Rotterdam International. The digital product portfolio, bearing the name PortForward, is growing steadily. Port of Rotterdam develops digital tools and solutions not only for the Port of Rotterdam community but also offers them to other ports in the world.

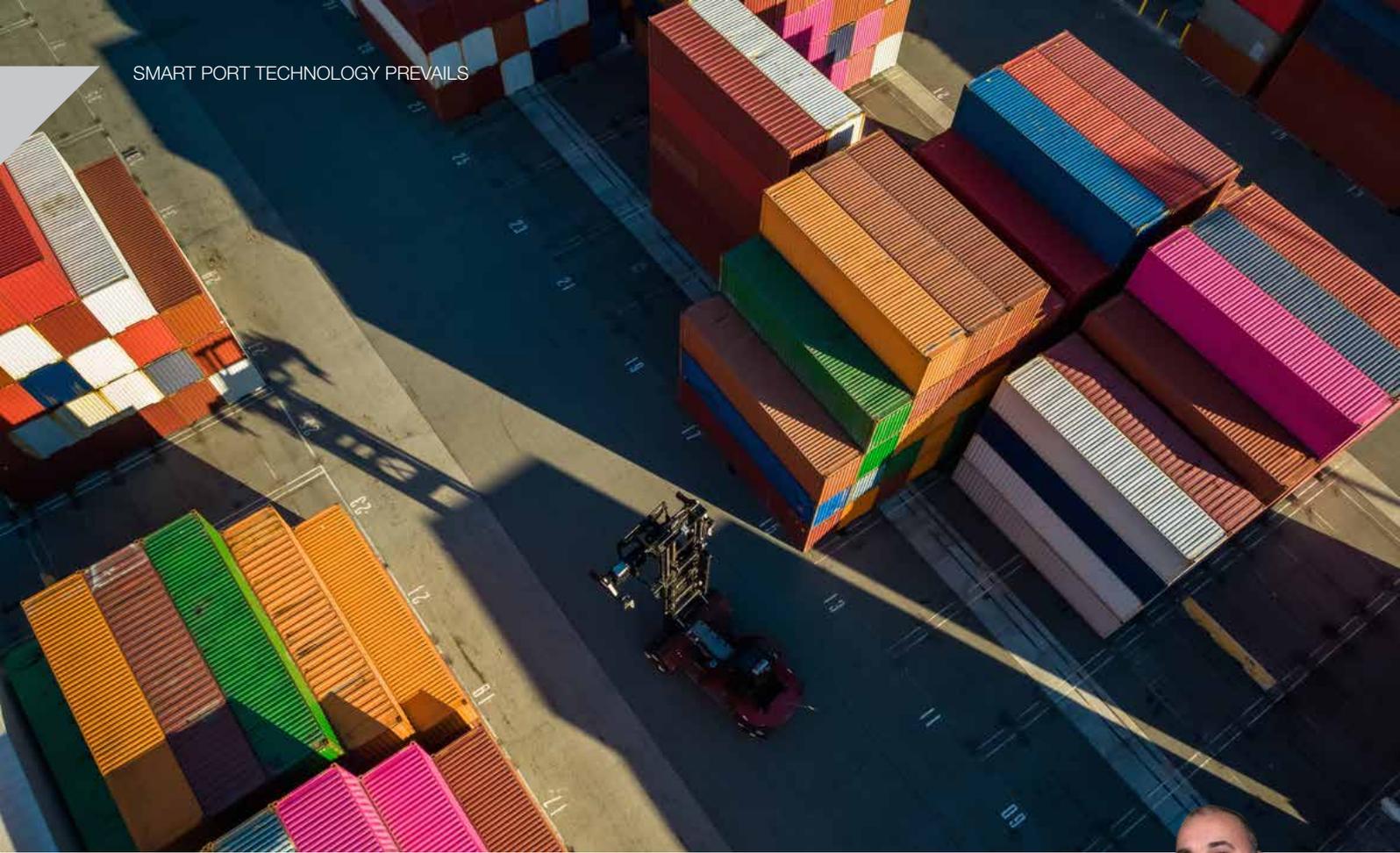
ABOUT THE ORGANIZATION

Port of Rotterdam is Europe's biggest port with a throughput of approximately 470 million tonnes of freight per year. The core tasks of the Port Authority are to develop, manage and exploit the port in a sustainable way and to deliver speedy and safe service for shipping. The Port Authority is committed to digitalisation in order to make the port, and the supply chain, more efficient. The port area is more than forty km long, 12,500 ha of land and water. The direct and indirect added value is estimated to be €45.6 billion or 6.2% of the Dutch GDP.

ENQUIRIES

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REVIEW POR IN THE AIS PORTAL



DISCUSSING THE NEED FOR INTELLIGENT CENTRALISED SYSTEMS



CNB
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Richard Butcher, Executive Vice President – Global Business Development, CNB Tek

The COVID-19 pandemic has created many challenges for the international supply chain and not least for the global ports and terminals that have continued to handle the flow of traffic during these trying times.

The pressures of 2020 have been felt within the operations at ports and terminals as they have implemented a range of alternative operational processes to handle the containers, cargo and vessels that flow through their facilities.

With workforces being affected by lockdowns, social distancing and at worst sickness, the limited ability of personnel to engage at an operational level has meant it has become very clear there is a need for ports to fall back on the technology they have deployed.

Port and terminal management and operational teams have had to rely heavily on their automated and integrated systems to run and manage their workflows. We are

likely to see greater levels of automation being implemented and operators will look for more centralised systems to run and manage the daily operations across their facilities.

TO A CENTRAL POINT

The key terminal operating companies will use the COVID-19 pandemic to look at the adoption of these centralised solutions, with the aim to reduce the overall number of personnel that are physically operating across their facilities. The questions of centralised systems are not new, but the question has always revolved around the level of integration and the ability to harness the valuable data in a real time and ability to make decision on the fly.

We are already witnessing several leading terminal groups running centralised operations, such as their vessel and yard planning, and these are having mixed effects.

“WE ARE LIKELY TO SEE GREATER LEVELS OF AUTOMATION BEING IMPLEMENTED AND OPERATORS WILL LOOK FOR MORE CENTRALISED SYSTEMS TO RUN AND MANAGE THE DAILY OPERATIONS ACROSS THEIR FACILITIES.”

Operators can see that they can reduce the physical head count by operating a central team of planners, but they are also nervous that if things do go wrong not having the applicable personal on the ground could cause issues, it has also become quite complex in terms of handling multiple sites from one location.

Therefore, the need for standardisation is critical, covering all the following aspects:

- Automated gates
- Security systems
- Terminal Operating Solutions (TOS)
- Enterprise Resource Planning (ERP) solutions
- Equipment operations (semi or fully automated facilities)
- Data communications

Having an advanced level of integration across these systems and facilities is critical and this is where many of the terminals are falling well short on those objectives. Although most of these groups are not shy at investing in terms of new technology many still fail to really appreciate the importance of the integration component and to harness the full potential of the technology they deploy.

This is one of the key areas for success, coupled to the speed on which data is received and processed. In this respect many operators are looking at harnessing the adoption of 5G communications across their global terminal portfolios. The essence of capturing the integrated data and the transmission will be essential for rolling out more centralised operational systems.

THE BIGGER PICTURE

Centralised solutions can create higher levels of operational efficiencies, lowering costs and providing a more focused real time flow of data for the corporate management to assimilate. Other benefits will embrace a better handle on their customers' performances, measuring and comparing port calls, focusing, and addressing areas where time savings or services could be improved.

Better information on the performance of operating equipment and more control



over areas such as asset management, planning and traffic flows can be accomplished.

However, greater benefits could be identified on centralised system as the further adoption of Machine Learning (ML) and Artificial Intelligence (AI) are embraced. These solutions could in turn result in the total adoption of human-free central control systems becoming the norm.

As the local port and terminal solutions become less engaging with the central systems holding the majority of the data much of the local TOS will be stripped down versions that perform data capturing and the generation of work orders that are fed from the central systems.

The ML and AI will provide the ability to manage the data and perform and learn the way in which operations and tasks are performed, these can be automated and autonomously transmitted to the machinery that physically handles the movement of the containers across the various facilities.

The systems will be fed with data on inbound vessels, gate moves, physical yard planning and the availability of assets that are allocated to handle the processes. The equipment will adopt more robotics, and these will manage and filter information about the running performances of the machinery. The result being that predictive maintenance can be analysed and managed from a central system as well as centralised equipment procurement can all takeaway decisions that were made at a local level.

MANAGING DATA FLOWS

Other centralised approaches have seen the adoption of smart port eco-systems which have helped to provide a lot of visibility across the inland clearing depots, container and distribution hubs and the various transportation operators that pick up and deliver containers to the ports. These eco-systems work by capturing and processing this critical data, resulting in more efficient localized planning, trucks arriving for specific containers can be processed, and equipment and work orders will be performed allowing for traffic flow to move whilst reducing congestion levels and allowing for real time data to be shared.

By managing data flows from a central point can provide far reaching benefits for numerous parties, but those ports that look to adopt these types of solutions will certainly benefit to form closer ties with the shipper and carrier communities.

There will always be discussions around centralised systems versus regional and localised solutions, particularly when looking at every terminal that would need to be conceptualised and the ability to manage multiple sites could become very complex in nature due to different restrictions and

operating environments. But as technology becomes smarter these issues will become secondary in comparison to the overall savings and benefits that could be achieved.

However, if COVID-19 has taught us anything it is the fact that a pandemic can cause chaos across a port whilst new measures and additional costs have been incurred to maintain the safety of the workforce. Lots of interaction between management and operational teams have been performed in a virtual environment proving that these methods can work well.

If we look beyond that and start to integrate the next generation of centralised control centres then much of the daily activities can be performed from one location, whilst ultimately introducing the newer technologies such as ML and AI will ultimately remove the human element for good.

Yes, the future is coming whether we like it or not, so we will have to watch and wait as to the decisions that will play out during the coming years, but I certainly believe that centralised systems will be further enhanced and adopted as the need to become more automated will drive those decisions forward.

ABOUT THE AUTHOR

Richard has over 35 years of management experience gained across the maritime, ports and technology arena. Having been engaged on multiple consulting engagements with Leading Ocean Carriers, Port Operators and Technology Groups. He has considerable exposure of working with Middle East based Maritime Organizations in Abu Dhabi, Dubai, Saudi Arabia, and Qatar.

ABOUT THE ORGANIZATION

CNB is tackling the problems of ocean freight logistics supply chain through the first principle methodology, where they understand that unless the data collection of the physical movements of cargo does not happen without any human intervention and in digitised form; productivity cannot be enhanced. CNB uses IIOT, AI and ML based solution to optimise operations in Ports, containers yards, depots and transports to deliver tangible benefits on time and resources deployed. They do fully automated real-time planning based on real-time data collected through the IOT systems deployed at these infrastructures through which the EXIM cargo moves in any geography.



THE IMPACT OF COVID-19 ON CONTAINER VOLUMES OF MAJOR WORLD PORTS

SITUATION UP TO OCTOBER 2020

Professor Theo Notteboom, Shanghai Maritime University, China; Ghent University, Belgium; Antwerp Maritime Academy, Belgium; and University of Antwerp, Belgium

Q1 2020: THE EARLY MONTHS OF THE CORONAVIRUS

The Coronavirus emerged in China in December 2019. A full lockdown in China followed in January 2020, with an immediate effect on trade volumes as production activities were halted and ports were forced to downsize their activities. The closure of factories generated a supply shock in China. The disruptions in China and later also in other East Asian economies started to disrupt global supply chains, which made container carriers to announce a first wave of blank sailings. Given the sailing time between Asia and major markets in Europe and North America, the full impact of these blanked sailings on European and North American ports became only visible from March 2020 onwards.

In the early months of the virus, the container volume situation in individual ports was largely determined by their exposure to trade with the Far East. For example, among European container ports, Rotterdam (no. 1 in Europe) and Hamburg (no. 3) handle the highest number of containers in relation to China. Furthermore, China represents about 30% of Hamburg's container throughput and about one fourth of Rotterdam's volume. These figures are excluding intra-European transshipment flows linked to the mainline services from/to China. Europe's second largest container port, Antwerp, is less exposed to China: 12% of total TEUs handled in 2019. Valencia (no. 5 in Europe in 2019) and Bremerhaven (no. 7) show similar shares of about 10 to 12%.

Despite the fact that the effects of the

COVID-19 crisis only partially affected the Q1 2020 throughput figures, most ports recorded negative growth figures. Mediterranean transshipment hubs Gioia Tauro (+52% caused by the take-over of Medcenter CT by Terminal Investment Limited in 2019) and Algeciras (+6.6%) and the mixed transshipment-gateway port of Antwerp (+9.5%) were the only European ports posting strong growth figures in Q1 2020. The port of Antwerp recorded strong growth on all trade routes except for the Far East (-2.2%). TEU volumes in Rotterdam declined by 4.7%, Hamburg -6.6%, Bremerhaven -3.2% and Le Havre -23%. Le Havre initially was heavily affected by the French national strike during December 2019 and January 2020. In March 2020, the port's strong exposure to trade with China further affected its first quarter results.

Barcelona's container volume declined by 14% (almost fully attributable to a 27% decline in transit traffic) while Valencia had to accept a 5% volume drop.

Q2 2020: THE HEALTH CRISIS GROWS INTO A PANDEMIC

In mid-March, the World Health Organization officially declared the Coronavirus as a pandemic. At that time, the supply shock in Asia faded as factories were reopening on a massive scale. However, the sharp rise in full and semi lockdown situations in virtually all European countries and parts of the Americas generated a demand shock. This resulted in a second wave in blank sailings with container carriers withdrawing up to 20% of their network capacity on the main trade lanes and idling more than 2.5 million TEU of fleet capacity or more than 10% of the world's container fleet. For some ports, the blank sailings implied 20% to even up to 50% less vessel calls for April and May. This second wave of blank sailings negatively affected Q2 2020 volumes in main ports on the east-west trade routes.

As expected, the vast majority of the large container ports in the world recorded negative growth figures in the first half of 2020. The worst performers in H1 2020 among the large Asian container hubs included Dalian (-31%), Shenzhen (-10.8%), Port Klang (-9.3%), Shanghai (-6.9%) and Kaohsiung (-6.8%). Tianjin (+2.9%), Qingdao (+0.3%), Singapore (-1.1%), Busan (-1.1%) and Guangzhou (-1.6%) were among the least affected ports in the Far East. The situation in North America was far worse with all top ten ports of the continent recording negative growth. The situation in H1 2020 was particularly bad in Seattle/Tacoma (-18.3%), Los Angeles (-17.1%) and Norfolk (-12.4%), while Houston was able to limit the TEU drop to 2.3%. In Europe, the port of Antwerp was the only large gateway port which was able to reach a volume level in H1 2020 comparable to H1 2019 (+0.4%). Algeciras and Bremerhaven recorded a rather modest decline, while others saw their TEU throughput drop by more than 20% (i.e. Le Havre and Barcelona).

Q3 2020: SUSTAINABLE RECOVERY OF CONTAINER VOLUMES OR TEMPORARY RESTOCKING PEAK?

Figures 1 to 3 provide an overview of the year-on-year (YoY) TEU growth figures of the main ports per region for the first nine months (Europe) or 10 months (Far East and North America) of the COVID-19 crisis year 2020 and also for the financial crisis year 2009. In Europe, Antwerp remains the only large gateway port in the top 15 which was able to reach a volume level in the first three quarters of 2020 comparable to last year (-0.2%). The majority of

Figure 1. Top 15 European container ports: year-on-year TEU growth in the first three quarters of 2020 and in 2009

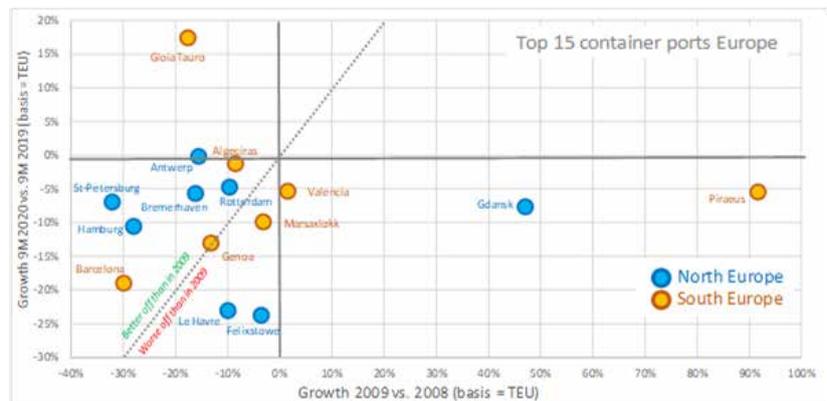


Figure 2. Top container ports in the Far East: year-on-year TEU growth in the first ten months of 2020 and in 2009

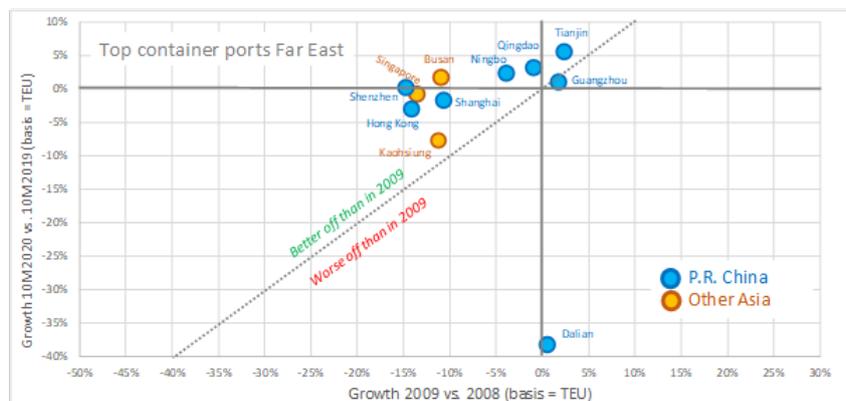
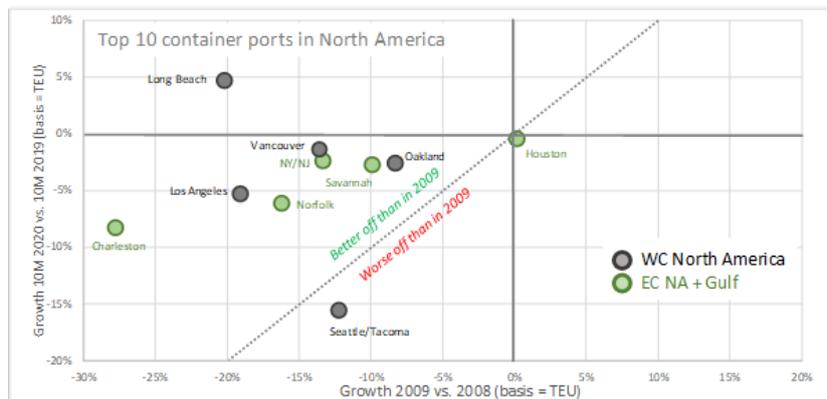


Figure 3. Top 10 North American container ports: Year-on-year TEU growth in the first ten months of 2020 and in 2009



top 15 ports still record negative growth figures, despite a modest recovery of container trade volumes in Q3 2020. Le Havre, Barcelona, Genoa and Hamburg saw their TEU throughput drop by double digits. These are all gateway ports serving mainly national hinterlands which are subjected to intense competition for transshipment

flows, and with a strong specialisation in containerised consumer products mainly originating from Asia. Cosco-owned Greek hub Port of Piraeus and the Port of Gdansk in Poland, two fast climbers in the European container port ranking in the past years, both recorded negative growth figures for the first time in many years. When com-

paring 9M 2020 growth figures to 2009 growth figures, it becomes clear the two crises had in many cases a very different impact on container throughput development in the top 15 ports in Europe. Note that Piraeus and Gdansk had recorded a remarkable growth during the financial crisis of 2008/2009, as this coincided with major governance and ownership changes in both ports.

Except for Dalian, all major ports in the Far East experienced less volume impacts in 2020 compared to the 2009 crisis. About half of the depicted ports even achieved a modest YoY TEU increase in the first 10 months of 2020, while only Dalian and Kaohsiung had to accept significant volume drops.

In North America, many ports have reported record monthly throughput figures for September, October and November 2020, mainly due to large-scale restocking taking place. Volume growth would be even higher if supply chains were not confronted with equipment shortages (empty containers) and port congestion. The recent trade volume peak has partly compensated the very negative results of H1 2020. For example, the YoY TEU loss in Los Angeles declined from 17% in H1 2020 to only 5.3% for the first 10 months of 2020. Comparable trends are observed in other ports, with Long Beach recording a 4.7% growth for 10M 2020. Just like in Europe and the Far East, there is a weak correspondence between container volume changes during the 2008-09 financial crisis and during 2020.

Overall, the ports that have been impacted the most (in terms of an initial steep decline followed by a strong restocking phase) usually have a strong orientation on consumer products and a strong position as gateways for containerised trade flows in relation to Asia. However, it remains to be seen whether the current spike in containerised trade is going to last long.

The medium to long term prospects for the underlying demand remain uncertain. Second waves in the number of infections have resulted in new lockdowns in quite a few western countries, and it is expected that the forthcoming vaccination rounds will only start to have a real broader impact on economic life in the second half of 2021. The economic aftermath of the pandemic will likely unfold in different ways across the world.

Note: For a further in-depth discussion on the impact of COVID-19 on ports, we refer to “NOTTEBOOM, T., PALLIS, A., RODRIGUE, J.-P., 2021, Disruptions and resilience in global container shipping and ports: COVID-19 pandemic vs. 2008-2009 financial crisis, Maritime Economics and Logistics, <https://doi.org/10.1057/s41278-020-00180-5>”



“THE PORTS THAT HAVE BEEN IMPACTED THE MOST USUALLY HAVE A STRONG ORIENTATION ON CONSUMER PRODUCTS AND A STRONG POSITION AS GATEWAYS FOR CONTAINERISED TRADE FLOWS IN RELATION TO ASIA.”

ABOUT THE AUTHOR

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Theo Notteboom is professor in maritime and port economics and management. He is Research Professor at China Institute of FTZ Supply Chain of Shanghai Maritime University in China, Chair Professor ‘North Sea Port’ at the Maritime Institute of Ghent University and a part-time Professor at Antwerp Maritime Academy and the Faculty of Business and Economics of University of Antwerp. He is co-director of Porteconomics.eu and past president of the International Association of Maritime Economists (IAME).

ABOUT THE ORGANIZATION

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PortEconomics is a web-based initiative aiming at generating and disseminating knowledge about seaports. It is developed and empowered by the members of the PortEconomics group, who are actively involved in academic and contract research in port economics, management, and policy. Since October 2012, Port Technology International and PortEconomics have been engaged in a partnership. www.porteconomics.eu



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WHY NOW IS THE TIME TO EMBRACE SAAS-BASED TOS

WHAT GLOBAL CONTAINER TERMINALS NEED TO KNOW ABOUT THE BENEFITS OF SAAS-BASED TECHNOLOGY

Sumitha Sampath, Vice President, Cloud Operations, Navis, and Ajay Bharadwaj, Senior Director, Product Management, Navis

There is no doubt that software as a service (SaaS) has disrupted the traditional on-premise license software model. From finance and HR to sales enablement and marketing, companies are increasingly adopting subscription-based SaaS solutions in virtually all functions of their businesses. This surging demand shows no sign of slowing. In 2020 alone, global analyst and advisory firm Gartner¹ (Costello & Rimol, 2020) forecasts that the SaaS market will grow to more than \$104B. By 2022, that number will increase to more than \$140B.

Yet when it comes to the container shipping industry – and terminal operations in particular – adoption of SaaS-based solutions

has been relatively slow despite the availability of viable and proven offerings. For many terminals with highly complex operations and well-established processes/workflows, comfort with the status quo is often a formidable roadblock. Concerns around operational disruption, a lack of skilled personnel to implement and manage system upgrades, and limited advocacy for change are also contributing factors – and have stalled terminals from reaping the benefits of SaaS.

But the tide is changing and momentum is building. Pioneering container terminals around the world have begun to publicly acknowledge their commitment to SaaS-

based TOS solutions and cloud-hosted services – with many more expected to follow suit. A recent survey² (Navis, 2020) of global container terminals revealed that interest in cloud solutions has risen 40% in 2020 compared to 2019. Further, 79% of survey respondents reported having an existing timeline to move or considering moving to the cloud. So why is now the right time for the industry to collectively make the jump?

THE FORCING FUNCTION

Container terminals routinely face natural disasters and other acts of God that tem-

porarily disrupt or suspend operations. But in 2020, the COVID-19 pandemic posed a very different and unprecedented set of challenges that, from it, will cause many terminals to reassess the way they operate and innovate in the future.

As the world collectively quarantined and largely transitioned to remote work, container terminals grappled with needing to protect the health and safety of terminal staff on-site while ensuring smooth cargo flows in and out of the terminals. While on-premise technology delivered the functionality needed to keep terminals operating, its limitations in terms of remote access and flexibility for terminal personnel came into view.

But flexibility wasn't the only need demonstrated by the pandemic. As volumes changed dramatically, the need for agility was felt amongst terminals who were scrambling to adapt existing solutions to scaled operations.

With the ever-present risk of COVID, and an urgent and significant shift in society's acceptance of flexible working conditions, it's become increasingly clear that SaaS-based terminal solutions can address evolving needs of both the terminals they serve and the individuals that use these systems day-in and day-out.

THE BUSINESS CASE FOR SAAS

COVID-19 challenges aside, with container volumes growing, there is ever-mounting pressure on terminals to handle cargo with increasing speed and cost-efficiency. While on-premise solutions have delivered on this promise for decades, as the market needs to continue to evolve, so too must the technology. With an eye on the future, terminals are now beginning to realize the tangible benefits that come with running TOS in the cloud. These include:

COST PREDICTABILITY & CONTROL

McKinsey³ (Chu, Gailus, Liu, & Ni, 2018) reports that software accounts for approximately 40% TOS TCO for a typical terminal operator - followed by services, hardware,

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“SAAS SOLUTIONS HELP CREATE A STRONG BUFFER BETWEEN TERMINALS AND MALICIOUS ACTORS, BUT BEST PRACTICES SHOULD STILL BE PUT IN PLACE.”

personnel and downtime. Furthermore, that report shows 20% of terminals view cost savings as one of the top expected benefits of moving the TOS to the cloud. While the value and necessity of the TOS is clear, it's also evident that cost-savings will continue to be a key driver for terminals looking to innovate with the technology they use. A SaaS-based TOS delivers a variety of savings when compared to traditional on-premise software – from cost control and an increased ability to flex operations up or down, to staying agile without needing to incur costs to further build out infrastructure or staff when conditions.

UPGRADING FOR INNOVATION

While eager to implement the latest and greatest solutions - whether its new possibilities emerging around AI and machine learning, or mobility and collaboration- terminals often can't take advantage as soon as they'd like due to upfront costs or lack of resources to upgrade. Once on a cloud-based TOS, software upgrades are automatically available for customers, giving terminals immediate access to obtain the newest features without needing to update software on-site, or wait for devices to update.

INCREASED PROTECTION

Between COVID-19 and recent natural disasters, terminals are growing more concerned about having the proper resources to manage and protect operations should unforeseen circumstances occur. However, looking beyond natural disasters, the shipping industry has been subjected to man-made threats as well. In fact, the top four shipping companies have experienced cyberattacks since 2017⁴ (Cimpanu & Cimpanu, 2020), including ransomware. Cloud-based software deployments provide more security compared to traditional on-premise models thanks to a centralized core, making it easier to monitor for inconsistencies that could be overlooked with on-premise solutions and identify, and ultimately prevent cyberattacks.

SaaS solutions help create a strong buffer between terminals and malicious actors, but best practices should still be

put in place. As terminals expand and networks increase, managing IT infrastructure becomes increasingly difficult so it's important to use the support included with cloud-based offerings to make the most out of the relationship. At the same time, terminals should still be conducting tests to confirm systems and functions are operating the correct way. Outside of best practices, application security plays a vital factor when migrating to the cloud. Terminals can take comfort knowing that cloud solutions have defined processes and controls in place for real-time protection, aiding to further secure privacy. From a regulatory perspective, those terminals using SaaS solutions are not bottlenecked when it comes to compliance and guidelines, as providers are well-versed in regional regulations.

FLEXIBILITY OF USE ACROSS TERMINAL TYPES

SaaS-based software is no doubt for all – big entities, smaller operations, individual consumers and everyone in between. Its use is no different in terminal operations, and luckily, we've begun to learn more about real-world implementations from the very terminals living and breathing the journey to the cloud.

Large terminals – even those with multiple sites, highly complex operations and high container volumes – are embracing the promise of the cloud. In 2017, Finland-based port operator Stevedore revealed that two of its container terminals - Vuosaari (Helsinki) and Mussalo (Kotka) – went live with an industry-leading TOS hosted in a private cloud environment. And just this year, YILPORT announced it was implementing cloud solutions at five of its terminals following a successful pilot in 2019 that enhanced data sharing, communication and visibility among its global teams.

For smaller to mid-sized terminals, SaaS has been increasingly embraced as a viable, flexible and extensible option for TOS implementations and upgrades globally. In the past year alone, Tropical Shipping (St. Croix & St. Thomas), Ultraport Punta Arenas (Chile), FMT Port Manatee (Florida,



USA) and Port of Belize have committed to or rolled out operations supported by SaaS-based TOS offerings.

Lastly, the adoption of SaaS technology is extending beyond the port to inland and intermodal operations, specifically in the areas of rail planning, scheduling and asset management. For example, rail freight operators Kansas City Southern and TasRail announced the implementation of SaaS-based technology for their operations.

CLOSING

SaaS-based technology has undoubtedly proven its value and benefits in other markets. Just as the financial services and airline industries have been disrupted and significantly improved user experience due to cloud-based solutions, now is the time to accelerate the use of SaaS within the broader ocean shipping supply chain. With McKinsey expecting the adoption of SaaS-based TOS to increase 67% within the next five years, the future is bright – if not a bit ‘cloudy’ – on this much-needed transformation.

FOOTNOTES

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ABOUT THE ORGANIZATION

Navis provides operational technologies that unlock greater performance and efficiency for our customers, the world’s leading terminal operators. The Navis N4 terminal operating system (TOS) represents more than 27 years of experience and innovation that enables terminals to optimize their operations and move cargo smarter, faster and more efficiently.

As an industry leading technology, more than 270 container terminals worldwide, including some of the world’s most advanced automated facilities, have partnered with Navis to improve performance, reduce costs and minimize risk.



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