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FROM THE EDITOR

As I write this introduction PTI has recently concluded its Container Terminal Automation Conference (CTAC). During the four-day online event speakers from across the industry explored how terminals are using the latest technologies to overcome a host of supply chain challenges.

In this edition of the Journal, we provide you with a review of the week and highlight some of the key topics that were discussed, including digital twin, standardisation and inland terminals.

We also have a number of interviews with some of the top-level speakers from a number of the leading industry players including Hutchison and DP World. In addition, Yesim Elhan-Kayalar, Advisor to Chief Economist at the Asian Development Bank (ADB), discusses how automation is a key driver of growth for ports and terminals, especially in Asia.

The overall feeling throughout CTAC 2021 was that despite the challenges presented to ports and terminals during the COVID-19 pandemic, most remained resilient. However, those with more advanced automation and digital processes weathered the storm more easily.

For instance, Nawaf Abdulla, CEO, DP World Limassol, told PTI the terminal operator's increased focus on digitalisation centres on adapting to changing circumstances brought about by the COVID-19 pandemic.

While digitalisation was already a big focus already for ports and terminals, in many cases this focus has been accelerated.

Also, in this edition of the Journal, Kalmar talks about the need for container terminals to embrace standardisation and open interfaces.

Kalmar notes in its paper that in order to reap the full potential benefits of container terminal automation, a systemic, standardised approach is required.

Finally, Navis provides insight into an area that is becoming a growing focus within the supply chain - rail operations.

Johannes Leholm, Solutions Architect, Navis explains to readers five ways to modernise on-dock rail operations at container gateways as ports look to increase the size and scope of on-dock rail facilities.

With an increase in container traffic at many ports and terminals it is not sufficient to solely focus on investment in waterside infrastructure improvement. This rhetoric was also echoed at CTAC.

If you missed out on the CTAC event you are able to catch up on the event in full on-demand by signing up at <https://ctac.events/>.

Beth Maundrill
Head of Editorial

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CTAC 2021 IN REVIEW: THIS YEAR'S TOP INSIGHTS AND IDEAS

The Container Terminal Automation Conference (CTAC) had its second virtual outing in 2021.

Entering its 7th year, CTAC 2021 saw over 60 speakers present and discuss future technologies such as artificial intelligence (AI), digital twin and the internet of things (IoT) across, as well as delve into some of the challenges that remain for the industry like the next steps towards digitalisation, automation and standardization.

In addition, two brand new sessions were introduced for the 2021 iteration of the conference focusing on terminal investment and sustainability, topics which are becoming increasingly important for terminal operators and the technology providers who are disrupting the industry.

In this article we will touch upon some of the key themes that came out of the week.

YOU CAN CATCH UP ON CTAC 2021
by registering here <https://ctac.events/>

AUTOMATION AT BROWNFIELD SITES

The focus on greenfield developments may soon be a thing of the past as most are already well underway and there are few locations left with space for new projects.

The industry is now turning to automation and optimisation at brownfield terminals, which is widely recognised as a greater challenge than automating greenfield sites.

Carlos Barbera, VP Product Management, Navis, spoke to PTI about some of the key considerations terminals should be making and some of his predictions regarding the future of automation.

“In the case of brownfield terminal automation, minimising disruption to the existing business is normally one of the most important goals,” he said.

Because of this, it is key for brownfield terminals to consider that implementing process automation ahead of equipment automation can be an effective strategy to

mitigate risk and minimise disruptions.

“Without operators driving the equipment, operational systems need to make more real-time decisions. These automated processes can also be implemented in manual operations which can ultimately speed up the readiness of the terminal to implement equipment automation at a later stage for a quicker return on investment,” he explained.

During the CTAC session ‘Achieving Automation – Retrofitting Automation in Brownfield Terminals’, all experts were unified in highlighting that a port can start small when automating its operations.

Responding to audience questions on which element of a terminal to automate first, Alan Peterson, Industry Segment Leader of Crane Systems at TMEIC Corp, said automation investment at the beginning does not always have to focus on major pieces of equipment such as reachstackers or straddle carriers.

“If you’re not ready to spend big dollars, you can invest in OCRs [Optical Character Recognition] to read characters on container boxes in the yard. You can automate your gate system. You can bring automation to [administrative] processes that are manual in your terminal,” Peterson said.

OCR and Optical Feature Recognition (OFR) can provide major benefits for terminal operators. AI-based OCR image recognition at a gateway can read container numbers and ISO code, amongst other capabilities. AI-based OFR can recognise cargo classification in addition to other Heavy Goods Vehicles (HGV).

The added automation at gateways and in container identification can dramatically improve truck turnaround time, reduce emissions and relieve congestion in a port complex.

Peterson noted that implementing automation into administrative processes, such as automating staff operations, can help the workforce to look at automation “as a practice, instead of an idea”.

Barbera concurred and said, “Start simple – you do not have to go for the big things. Get your software ready, and then you can start to automate your yard. You can automate one block, or one crane, and roll it out to the rest of the facility.”

Rafiq Swash, Founder of AIDrivers, expanded on Barbera’s point by highlighting that ports can be rational with which areas are in most need of improvement when rolling out automation investment.

“The first step is to find out how you can automate the processes or equipment that do not require changes to infrastructure or end-to-end processes,” he said.

“[This can be] rationalised to one crane

or mode of horizontal transport. You can start automating from one, and scale across your yard.”

Rationalisation of yard processes was highlighted by Uno Bryfors, Senior Vice President of ABB Ports.

“We have to look at how complex the terminal process is. Some are straight gateway, some straight transshipment, others are a mix,” he outlined.

“The more processes to be automated, the longer it will take. Brownfield sites are easier [to automate] than some greenfield because there is an existing organisation and existing staff who can be trained.

“The total effort is smaller than having to build from absolute greenfield.”

INLAND TERMINALS

Inland terminals were a key topic for the event’s official AI partner, Inform, which highlighted the digitalisation of these essential parts of the supply chain during the keynote session.

Dr Eva Savelsberg, Senior Vice President and Board Member, Inform, said a lack of digitalisation in the hinterland is negatively affecting the rest of the supply chain, even though seaports are investing heavily in smart technologies.

Inland logistics is currently “not part of the digitalisation chain”, Savelsberg said, and this “affects handling speed” for many stakeholders and can slow down the transportation of goods.

“It is just as important to strengthen these hinterland chains and make them [inland ports] as automated as seaports,” she explained.

“Smaller terminals are behind in digitalisation and over the next few years we need

“STANDARDISATION CAN HELP MAXIMISE COMPATIBILITY, INTEROPERABILITY, REPEATABILITY AND QUALITY.”

- Que Tran

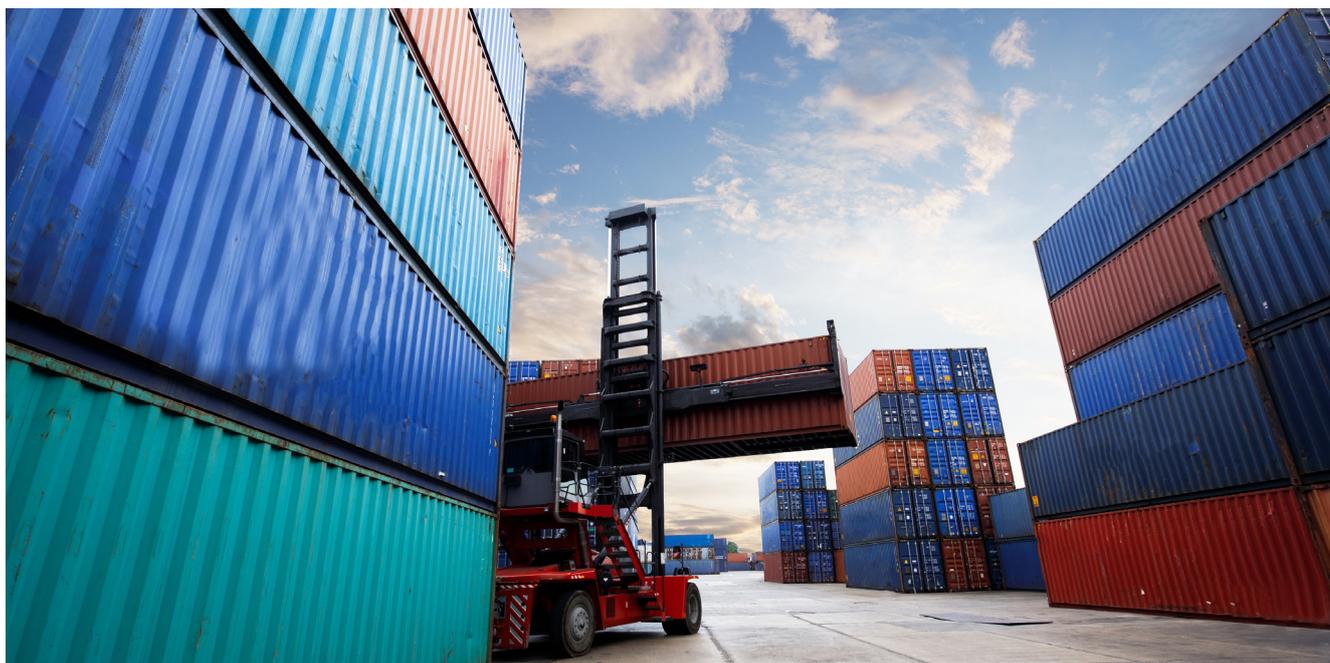
to focus on the hinterland and these hubs to help them take the next step in their upgrade and build a stronger supply chain.”

Savelsberg pointed to KTL Kombi-Terminal (KTL) in Ludwigshafen and the Samskip van Dieren Multimodal terminal in the Port of Duisberg as key examples of AI and digitalisation being used well.

KTL uses a “strong TOS inland system” and a fleet of semi-automated cranes to improve efficiency, according to Savelsberg, and is also pursuing “a lot of AI research” in its digitalisation upgrade. These upgrades have “pushed performance up quite decisively”.

Additionally, by leveraging “strong algorithms” alongside the TOS, KTL is able to use AI to “improve decision making” and massively reduce late arrivals and departures of trains every month.

Inland and intermodal logistics have become increasingly important for the whole maritime industry and it is an area where the carriers have sought to adapt and change their business models from sea-bound transportation and end-to-end logistics providers.



Traffic at inland terminals has driven growth for numerous port authorities and terminal operators, especially in the US. In other parts of the world there have been efforts to improve the flow of traffic on inland waterways and make it easier to share data among stakeholders.

During the keynote session Inform introduced its AI-based Train Load Optimizer as part of its broader logistics offering. The system helps inland terminals make logistics operations more flexible by automating decision-making processes.

It enables real-time re-optimisation of load plans and can adjust to situational changes, which in turn minimises yard re-handling and improves general cargo transportation.

STANDARDISATION

As the Terminal Industry Committee (TIC 4.0) released its initial batch of technical standards for the ports sector, data standards remained a key topic of discussion at CTAC 2021.

Following the publication of a white paper in March 2021, the Committee released its second publication, “Container Handling Equipment Activity and Power Source Concepts and Definitions” or TIC4.0 2021.1.

To achieve a common language that can be represented in an understandable format, TIC 4.0 has created a semantic set of rules which helps in the creation process of the definitions and vocabulary.

Presenting at CTAC 2021, Boris Wenzel, Founder, TIC 4.0, said, “With the components of this semantic you can define any reality that both humans and machines can understand.”

He added that it can be adapted to any type of protocol and is technology agnostic.

The publications of TIC4.0 2021.1 contains 25 definitions and explains the context for the application of the definitions, the semantics, dataset roadmap and data model.

The work is ongoing, and these 25 definitions are part of the ongoing work to develop a vocabulary for the cargo handling industry.

Standards are key for the industry as Que Tran, Head of IT – Europe & Russia, DP World, noted, “Standardisation can help maximise compatibility, interoperability, repeatability and quality.”

A lack of standards, he pointed out, results in increased costs and reduced operational capability.

DIGITAL TWIN

Digital twins, which are digital representation or ‘twin’ of a physical object or system, can take whole components of a physical entity and virtually map that body into a 3D interface. The technology can provide benefits ranging from carbon emissions output

monitoring of cargo handling equipment to predictive analysis for increases in cargo volumes for the twin operator.

Already in use at some of the more advanced ports in Asia, digital twin usage is picking up steam in Europe, claimed Michael Eichstedt, Senior Manager of Freight and Logistics at Accenture.

Eichstedt said that digital twin usage first began in East Asia in 2018, focusing initially on customs goods flows processing. Since then, Accenture and European ports have tapped into the innovative technology to provide a risk-free predictive and visual model for port operations.

“We are seeing momentum in Europe,” Eichstedt said. “We’re seeing usage in ports in the Mediterranean, the Port of Valencia, and some attempts in other ports.”

The Port of Antwerp, for example, has rolled out its Antwerp Port Information & Control Assistant (APICA) model which the port believes to be a ‘central nervous system’ of all things ongoing at its estate.

“We are working with Telecommunications providers such as BT and some ports in the United Kingdom where those solutions are being tested and applied,” Eichstedt continued.

Moving forward, Eichstedt said ports in North America are not exactly lagging behind on digital twin usage – but there “are only slight attempts,” of IoT and data visualisation.

“[The risk is] if ports do not try to use and apply digital twins. It is a risk-free environment: this is why you use it,” he said.

“Whatever the digital twin represents: Rubber-Tyred Gantry cranes, Ship-to-Shore cranes, TOS displays, or interactions between terminals and harbours as an organisation, you can ensure you represent reality at your port complex.”

THE JOURNEY HAS ONLY JUST BEGUN

During the final day of CTAC 2021, Dr Eva Savelsberg, Senior Vice President and Board Member, Inform, said the industry’s innovation journey has only just begun and that it has “a decade of automation ahead” based on “data sharing tools” such as machine learning.

“It is not a case of if there will be automation, the question is now how we can share data,” Savelsberg said, reiterating the claim she made during Inform’s keynote at CTAC that the next big focus for supply chain innovation should be in the hinterland and inland terminals.

Meanwhile, Nawaf Abdulla, CEO, DP World Limassol, said that the time since the outbreak of the pandemic had been “a challenge” for ports, terminals and the supply chain.

However, it has also brought “opportunities to come up with new solutions to prob-

lems” and emphasised how every part of the supply chain needs to be kept active “in all circumstances”.

Ian James, COO, Yilport Holding, pointed out that the industry does collaborate but only in areas “aren’t really competitive”, such as in how to cut carbon emissions and that the major players need to put competitiveness aside for the common good.

“In areas where data sharing affects our businesses, it becomes very siloed,” James said and warned that if ports do not work together they will be left behind by third parties, who will collaborate amongst themselves and leave the maritime stakeholders at a disadvantage.

Meanwhile, Abdulla said governments need to “reinforce things” and that the ability to collaborate across borders is already there, it just needs the will.

He said the EU’s 27 nations already have shared standards on issues such as climate change and that “the same could be done for blockchain”.

“All players need to have access to data ensure the strength of the supply chain. It isn’t just up to the private operators, governments can play a big role.”

“We all know there are values and benefits to data sharing globally,” Abdulla said, citing blockchain as a technology which could help the industry collaborate.

But there remain issues around how much information can be shared between stakeholders and which of the many possible platforms is easiest to use.

Abdulla called for the maritime industry to take lessons from the aviation industry, which has platforms for the seamless transfer of customer cross-border information.

Written by Jack Donnelly, Beth Maundrill and Max Schwerdtfeger

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- Nawaf Abdulla

**SOME THINK THAT
RAW MATERIALS
EXTRACTION MEANS
TRUCK TRANSPORT.
WE THINK
DIFFERENT.**



CONTAINER TERMINAL AUTOMATION NEEDS STANDARDISATION AND OPEN INTERFACES

Hannes Myllärniemi, Product Manager, and Jari Hämäläinen (Dr Tech.), Director, Automation, Kalmar

Across the globe, container terminal automation is advancing rapidly. Automation, including the insights learned from the data it produces, is recognised as the future of improved container handling safety and business performance. However, when compared with other fields such as automotive manufacturing or the process industries, the standardisation of automation in the container handling business is still in its early stages. Until recently, most terminal automation systems have been based on extensive integration of various subsystems and solutions, rather than conceived as complete end-to-end automation systems such as those in other industries.

In order to reap the full potential benefits of container terminal automation, a systemic, standardised approach is re-

quired. A key element is the availability of open application interfaces that enable terminal operators to customise their automation deployments, allowing third-party developers to provide offerings that are interoperable with the automation system. These additional software interfaces supplement the application-independent core software components of the terminal automation system and significantly extend its capabilities.

When combined with support services and third-party developers, an open automation platform enables robust and diverse business ecosystems that provide new opportunities for terminal operators, independent developers and automation system providers. Ultimately, terminal operators will have a broader range of capa-

bilities to develop their systems with agility, based on their individual business processes and needs.

INDUSTRY STANDARDISATION IS CRUCIAL

In order for terminal automation to develop to the next level in deployment speed and operational efficiency – and for operators as well as other industry players to be able to benefit from this development – a significantly higher level of standardisation is required.

In the past, a major challenge for most terminal automation projects was that many design and implementation questions had to be solved anew each time. These questions range from basic connectivity and equipment functionality to user interfaces and safety guidelines. With ter-

minal operators unsure of the exact specifications needed for a terminal automation deployment, system providers have often needed to “reinvent the wheel” for each customer case.

A markedly different situation can be seen in general process automation. Initially, each manufacturer developed closed systems with unique interfaces for their equipment, but over the decades, the industry converged on a set of interfaces that enable seamless connectivity with standardised technology. This development shifted the competitive focus of automation technology providers away from low-level interfaces and towards higher-value automation systems. Once the connectivity is standardised, diverse industry players can come together to create robust ecosystems that further develop the capabilities of their equipment and software applications.

TIC4.0 HOLDS PROMISE

Over the last year or two, the container shipping industry has been making some strides towards a common, shared approach for determining the key standards needed for terminal automation. The two key organisations working in the field are the Port Equipment Manufacturers' Association (PEMA), and the newer Terminal In-

dustry Committee 4.0 (TIC4.0), an open industry initiative established in 2020 whose members include both terminal operators and system providers.

TIC4.0 has a significant mission in developing the required standard sets for the container handling industry. The association released an introductory white paper and its first set of definitions in May 2021. These definitions serve as the low-level building blocks for further industry standards, laying out the basic terminological, grammatical and semantic framework for the standardised interoperability of automated container handling.

The task undertaken by TIC4.0 is significant in scope, requiring a specific and unambiguous way of defining the required concepts irrespective of the level of technology used in a terminal. Basic examples include providing definitions such as what constitutes a “container move”. These terms have previously been used and understood routinely in everyday language, but they have lacked the rigorous definitions required for unambiguous communication, valid performance measurement and seamless system interoperability.

Despite the challenges remaining, TIC4.0 is a significant step towards achieving the acutely needed level of standardisation in the next few years, not least because the

“IN ORDER TO REAP THE FULL POTENTIAL BENEFITS OF CONTAINER TERMINAL AUTOMATION, A SYSTEMIC, STANDARDISED APPROACH IS REQUIRED.”

association has managed to bring together a wide range of industry players that include major equipment and system providers as well as leading port and terminal operators.

TERMINAL AUTOMATION PLATFORM: WHAT AND WHY?

Until recently, container terminal automation has primarily been conceived as an “add-on” to equipment investment, instead of a comprehensive end-to-end solution. Automation solutions have been assembled





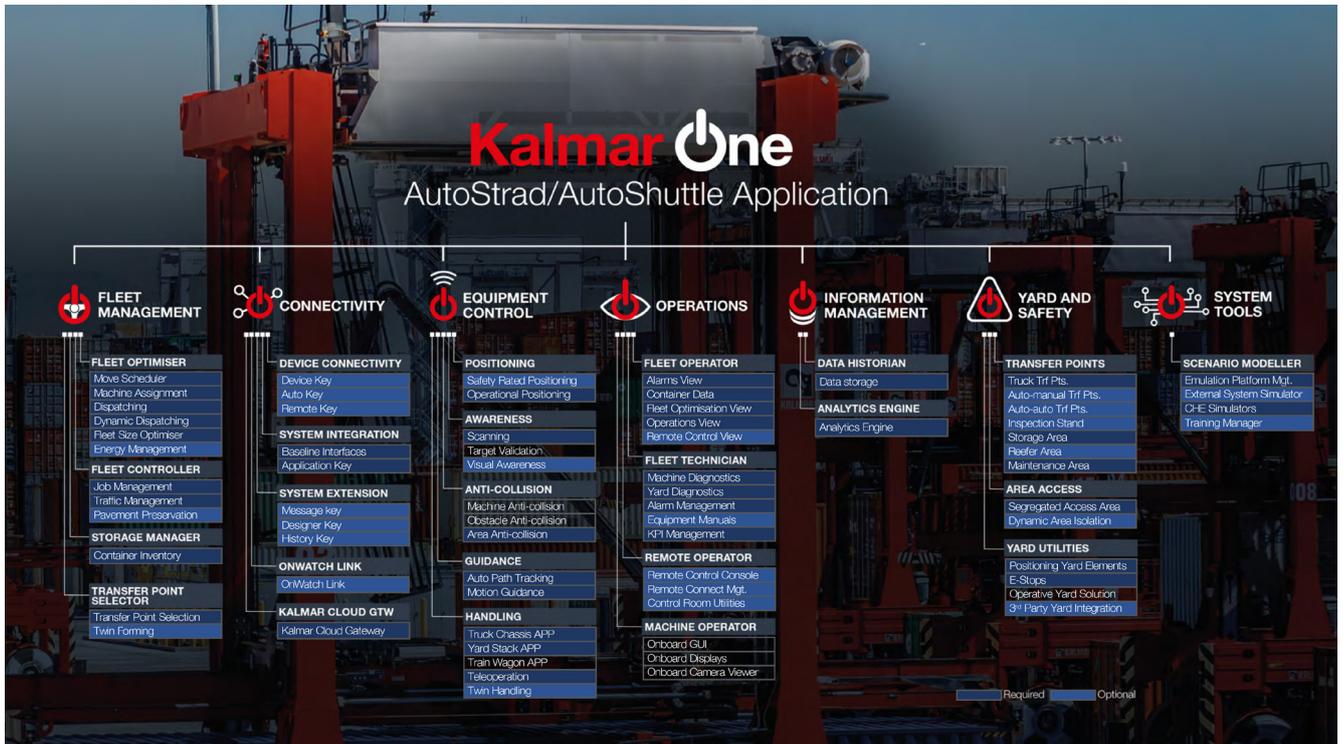
The Kalmar One automation system serves as the link between the various automation products and modules that enable different types of functionality, and the specific applications that are automated at the terminal.

as one-off projects that have required extensive integration of diverse systems and solutions, often from several vendors.

At the same time, as terminal automation advances, the focus in industry deployment

is shifting from a limited number of new greenfield sites to the automation of hundreds of existing container terminals. These brownfield projects require that the automation system can interface with diverse existing fleets and processes at widely differing levels of automation.

To gain the maximum benefit of automation and to fully utilise their existing equipment and software, terminal operators need the ability to



Each automated Kalmar One application has its own standardised blueprint. The dark blue modules are included in the Kalmar AutoStrad application by default, light blues are optional, and black modules are not applicable for AutoStrads at all.

flexibly customise their solutions, possibly with the help of third-party developers.

As seen in other, further advanced automated industries, successful large-scale container terminal automation will require a balanced combination of two things: firstly, an approach that treats terminal automation as a holistic system, and, secondly, integrated automation platforms based on open application interfaces. These standardised platforms will enable faster deployments without having to build systems from scratch each time. At the same time, they will facilitate the creation of wider ecosystems to further develop the capabilities of the automation platform.

DEFINING THE AUTOMATION PLATFORM

An open terminal automation platform is a set of software interfaces that extend the application-independent core software components of a terminal automation system. For terminal operators, open interfaces can streamline decision-making by integrating all data sources as well as control and monitoring functions into a single, vendor-independent solution.

Kalmar's effort to support this development has been the Kalmar One automation system. Originally, the Kalmar Key set of automation interfaces was launched to provide open and standardised connectivity with the company's earlier equipment control system Kalmar TLS. By extending the open interfaces into an integrated automation platform, Kalmar has wanted to give customers the means to interface with any third-party software or system. Technically, the standard interfaces of the earlier Kalmar Key concept remain unchanged.

With interfaces that enable direct access to the application-independent automation platform core (and thus basic system functionality), the Kalmar One automation system can be extended with additional capabilities for partners and developers to customise and augment automated solutions at a customer's terminal. This aids and speeds the development of new applications, opening up a wider range of potential suppliers and partners that can work with terminal automation.

The Kalmar One automation system serves as the link between the various products that enable different types of functionality, and the specific applications that are automated at the terminal. The four applications that are currently available are Kalmar AutoStrad/AutoShuttle, Kalmar AutoRTG, Kalmar ASC and Kalmar AutoRMG operation. Each specific usage application has its own standardised set of products and modules, which are linked by the open APIs of the automation platform.

ENABLING NEW APPLICATIONS

The concept of an integrated terminal automation platform with open interfaces benefits all parties throughout the industry. Terminal operators will be able to customise and augment their solutions with the exact functionality that they need. At the same time, open interfaces enable smooth and consistent integration of third-party equipment into the original automation system. Technology partners may integrate their products with the automation platform in order to extend the capabilities of the system, while simultaneously creating new markets for their software and hardware products.

The terminal automation platform provides a holistic view of data from multiple sources, allowing terminal operators to optimise their operations with greater ease. Open interfaces also make it possible to build completely new applications for terminal automation. Essentially any manual or automated process or data source can be visualised and connected into the terminal automation system.

Another natural way to utilise the open interfaces of the automation platform is for technology partners to deliver enhanced sensor capabilities for the system. For example, machine vision enables a host of possibilities for improving the safety and performance of automated and semi-automated container handling equipment but requires highly specialised technology.

RISKS AND OPPORTUNITIES

Any opening up of previously proprietary interfaces always involves some degree of risk for the party sharing the technology. Competition could increase; new players

may enter the market to challenge industry leaders, or clients may choose to accomplish in-house what previously would have been delegated to a system provider.

However, it is our firm belief that in terminal automation, shared and standardised interfaces are an absolute necessity for the development of the entire industry, and that the benefits of progressively opening these interfaces greatly outweigh the potential risks. Not even the largest industry leaders have all the possible expertise in-house. When combined with the concept of an integrated automation platform, open interfaces enable a vastly expanded collaborative landscape for the benefit of terminal operators, independent developers and automation system providers alike.

ABOUT THE AUTHORS

Hannes Myllärniemi, Product Manager, Kalmar, 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.

Jari Hämäläinen (Dr Tech.), Director, Automation, Kalmar, has been working 9 years at Kalmar, leading service concepts, offering development, as well as product management and engineering teams in automation and software development. He also worked as the project director for the Kalmar AutoRTG product development. Nowadays his role is to lead automation for mobile solutions. He is a co-founder, as well as a member of the executive council at TIC4.0. Before joining Kalmar, he made a distinguished career in the telecommunications and software industry. His 300 patents in 42 global patent families help smartphone users in their everyday business and pleasure.

ABOUT THE ORGANISATION

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.

“IN ORDER FOR TERMINAL AUTOMATION TO DEVELOP TO THE NEXT LEVEL IN DEPLOYMENT SPEED AND OPERATIONAL EFFICIENCY... A SIGNIFICANTLY HIGHER LEVEL OF STANDARDISATION IS REQUIRED.”

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FIVE WAYS TO MODERNISE ON-DOCK RAIL OPERATIONS AT CONTAINER GATEWAYS

Johannes Leholm, Solutions Architect, Navis

As ports increase the size and scope of on-dock rail facilities, terminal operators need innovative solutions to increase throughput and efficiency.

With global supply chains breaking down due to unexpected surges in demand, large gateway ports face unprecedented challenges in clearing cargo. The Port of Los Angeles' Executive Director recently described the situation as a "once-in-a-lifetime event" after the port handled record container volumes in March 2021.

European gateways continue to experience heavy congestion after the Ever Given blocked the Suez Canal for five days in April 2021. Increased waiting times for cargo at overflowing terminals have forced vessel carriers to announce impromptu container surcharges for truck, barge, and rail exchanges.

Compounding issues further are the severe shortages in labour, containers, chassis, and railcars across supply chains. While supply constraints may loosen in upcoming months, uncertainty around ongoing pandemic lockdowns continue to hamper suppliers' efforts to effectively adapt.

This confluence of events has created a perfect storm where demand continues to overwhelm supply. Gateway terminals, meanwhile, face the formidable task of absorbing these shocks while working down their cargo backlogs before this year's peak season begins.

THE GROWTH OF ON-DOCK RAIL

These supply chain challenges are hitting ports while many are undergoing significant operational upgrades and developments.

Ports and terminals have spent the last decade upgrading their facilities to handle larger classes of vessels used by shipping lines. Longer berths, bigger cranes, denser yards, deeper drafts, and taller bridges are some of the large capital improvements necessary to remain competitive.

These investments now enable terminals to handle significantly more containers per vessel call. Last year APMT Los Angeles discharged and loaded an astonishing 34,263 TEUs during a single call from one of the largest ships in the world, the MSC Isabella.

For large gateway terminals like APMT Los Angeles, waterside infrastructure improvements are not sufficient to handle these large increases in cargo flows. Gateway terminals require inland throughput capacity to match vessel handling through-

put. If inland throughput does not keep up, container dwell times and congestion increase. Fittingly, gateway operators have focused on upgrading inland connectivity transportation options.

Examples of inland connectivity improvement projects include: automated gate and appointment systems for road trucks, larger cranes working over denser sets of rail tracks for on-dock rail, and scheduling and monitoring systems for barges on domestic inland waterways. Each of these inland transportation modes comes with costs and benefits but on-dock inland rail transportation growth is accelerating.

Ports understand that truck throughput is hitting diminishing returns and will not scale at the rate required to meet container volume growth. While trucks remain the most flexible inland transportation option for routing and destination access, they generate more emissions per container moved and contribute to over-congested roadways- two major externalities increasingly targeted by governments.

For ports that have access to domestic inland waterways, barges can be an efficient option for inland connectivity. The primary problem is that they are the least flexible inland option as it is generally not feasible to create new water routes. For many gateways, domestic waterways simply do not exist.

Because inland rail transportation is both sufficiently flexible and scalable compared to truck and barge transport, it is not surprising that many gateways have recently created and completed large on-dock rail expansion plans. Financial subsidies provided by governments and port authorities have fast-tracked development timelines.

Large on-dock rail projects recently completed include: Global Container Terminals Deltaport, Bayonne ExpressRail, Trapac Los Angeles, Virginia International Gateway, and Long Beach Container Terminal. Current projects underway include: Georgia Ports Authority Mason Mega Rail, Patrick Sydney AutoRail, and Nansha Deep Water Port Phase IV.

A majority of these projects feature designs with cantilever Rail Mounted Gantry (RMG) cranes spanning multiple rail tracks with adjacent interchange parking slots for internal prime movers, cassettes, and chassis. This method of operating has been and has become standard at most terminals in the Ports of Rotterdam, Port of Antwerp, and the Port of Hamburg.

ON-DOCK RAIL STRATEGIES AND TOOLS

The strategies and tools listed below contain a range of solutions, from software and systems, to equipment and infrastructure. As ports make important decisions about

on-dock rail expansion plans, these methods can be deployed at different points in a project lifecycle.

1. Rail Planning and Equipment Scheduling

Terminal operators understand how intelligent planning and scheduling tools for vessel and yard operations are critical to achieving higher rates of productivity. Similarly, advanced planning and scheduling tools for rail operations enable faster operations and more efficient use of rail equipment.

Rail planning tools decide where containers go on railcars and in the yard, while scheduling tools decide when containers should be moved and by what container handling equipment. Advanced planning and scheduling tools should leverage all the relevant data available in the Terminal Operating System (TOS). Important data such as yard location, railcar track position, equipment status, container routing, and train arrival and departure times are critical to making optimal decisions.

Features of advanced rail planning and scheduling solutions benefit operators by avoiding unnecessary rehandling while complying with train service and railcar loading rules. Advanced rail scheduling shortens unladen travel distances, long lead times for equipment hand-offs, and reduces equipment handling interference.

Rail planning and scheduling tools can be deployed early in project expansion lifecycles and with existing on-dock rail operations.

2. Workforce Management Tools

Workforce management tools provide greater visibility and control of ground crews working trackside. Ground crews can be responsible for a range of activities including performing railcar and container inspections, railcar spotting, twistlock (interbox connector, IBC) handling, and main-

tenance jobs. While some operators have successfully reduced dependencies on ground crews with technology solutions (see point 3), some activities may still be necessary.

Workforce management tools include mobile apps that ground crews can use to update the status of various activities related to rail in real-time. Control room operators can see the real-time status of these activities via the TOS. These tools also enable operators to schedule ground crew activities to minimise travel distances and interference with other rail activities.

Workflow management tools can be deployed early in project expansion lifecycles and with existing on-dock rail operations.

3. Process Automation Technologies for Rail

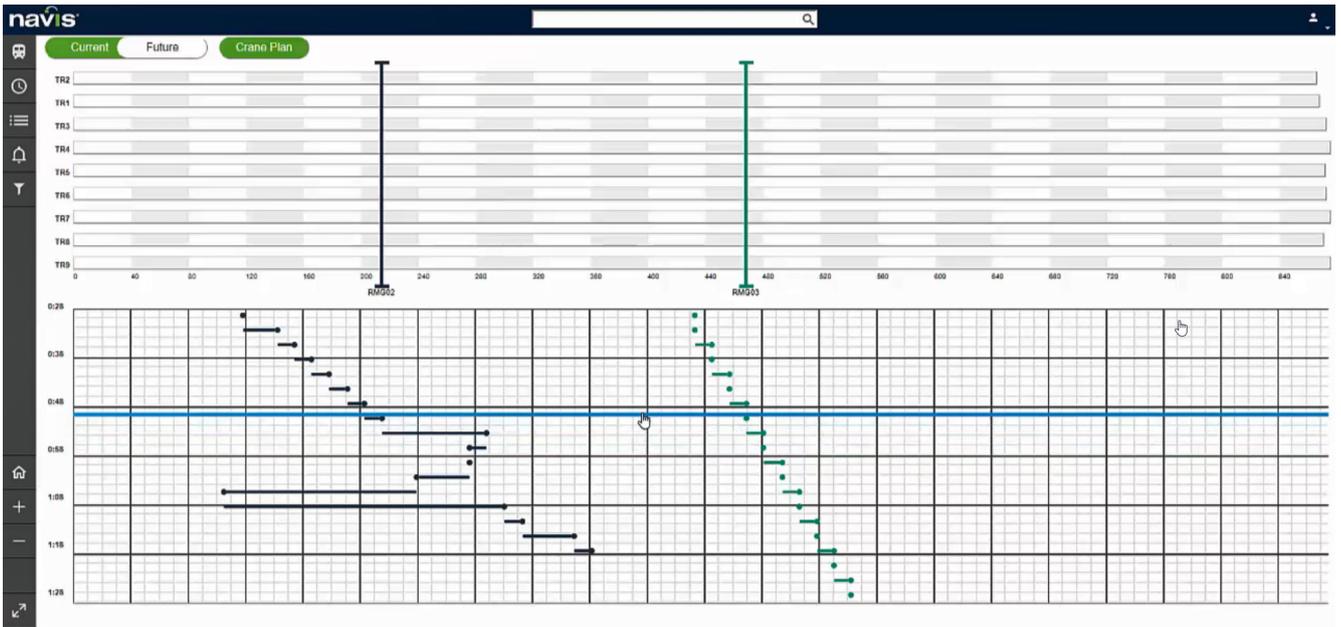
Many terminal operators have experience with process automation technologies that are now common at existing marine terminals: automated gates and container identification, automated reefer monitoring, equipment dispatching, etc.

Process automation technologies enable operators to automate processes that traditionally require human intervention. Process automation benefits operators by reducing manual dependencies while being faster and more accurate.

Process automation technologies for rail focus on specialised solutions made for rail operations. Modern process automation technologies leverage recent advances in machine learning and AI to offer “machine vision” solutions. These solutions can automatically accomplish tasks such as container/railcar inspection and container identification.

Railroads continue to invest in sophisticated process automation for additional activities such as rail track inspection, detailed damage reporting and alerting, and equipment maintenance and repair management.





Process automation technologies can be deployed early in project expansion lifecycles and with existing on-dock rail operations. Process automation technologies typically require an integrated hardware and software solution that can communicate with the TOS.

4. Rail Mounted Gantry Cranes over Rail Tracks

Rail Mounted Gantries (RMG) have become the standard solution to add more track real estate to on-dock operations. Most RMG crane deployments feature cantilever arms that enable the crane spreader to lift and set containers outside of the crane legs. Both single cantilever and double cantilever cranes are popular options. The

most common vendors of these wide span RMG cranes for on-dock rail operations are Kalmar, Konecranes, Kuenz, and ZPMC.

RMG railway cranes may be suitable for on-dock operations if there is a need to add more track length to the terminal. In this case, conventional reach stacker and RTG equipment may not provide the reach or access to operate across added tracks.

On-dock rail yards typically configure RMG cranes to span multiple rail tracks and an interchange zone where prime movers can access and drop chassis and cassettes. Alternative configurations may add stacked container storage blocks under the RMG span, e.g. Bayonne ExpressRail facility includes stack container storage 3 tiers high under cantilever arms.

RMG crane deployments typically re-

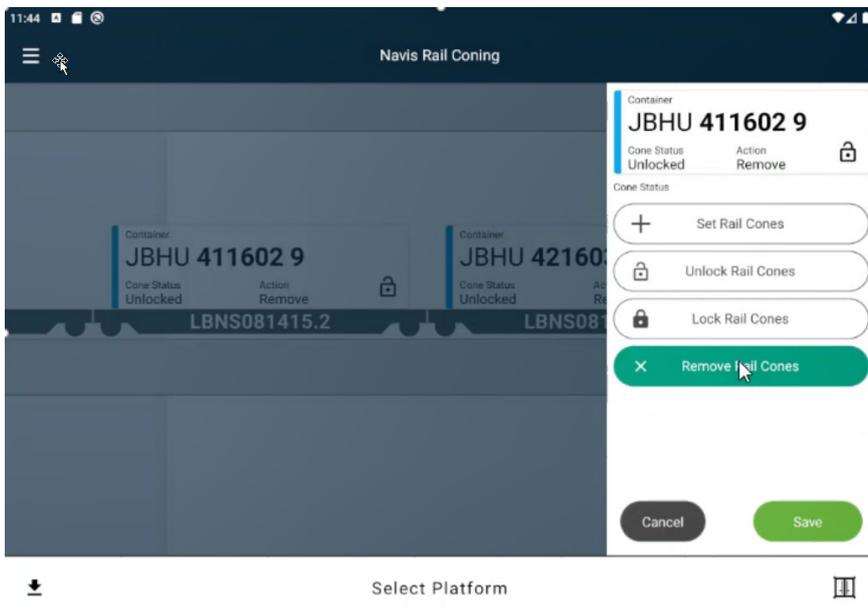
quire significant manufacturing lead times in project expansion lifecycles and require significant civil infrastructure changes that can disrupt existing on-dock rail operations. Manual RMG operations can be integrated with the TOS via Vehicle Mounted Terminals (VMTs).

5. Automated Equipment

Automated equipment for rail operations typically refers to Automated RMG cranes (ARMGs). Automated equipment can also refer to automated prime movers. Examples of automated prime movers include Automated Straddle Carriers, Automated Guided Vehicles (AGVs), and Automated Terminal Tractors. It is possible that Automated RTGs could also operate on rail tracks but there is no reference for this type of operation.

ARMGs have been deployed at multiple on-dock rail yards including: Long Beach Container Terminal, Global Container Terminal Deltaport, Bayonne ExpressRail, APMT Maasvlakte II, Rotterdam World Gateway, and Trapac Los Angeles. ARMGs typically require control system software to execute movements. ARMGs are usually connected to a Remote Control Station (ROS). Remote control operators can remotely control ARMGs when manual intervention is required. ROS can be dedicated to a single ARMG crane or pooled across multiple ARMG cranes. Using an ROS instead of a manned cabin enables operators to swap more quickly and is generally considered to be more comfortable than operating outdoors.

ARMG control system providers include Kalmar, Konecranes, TMEIC, ABB, and Siemens. Control systems are integrated into the TOS to synchronise job order data and equipment status.





Most automated on-dock rail sites do not feature automated prime movers, but there are two terminals currently operating this type of automation: APMT MV II features Lift AGVs as prime movers and Trapac Los Angeles features Automated Straddle Carriers as prime movers

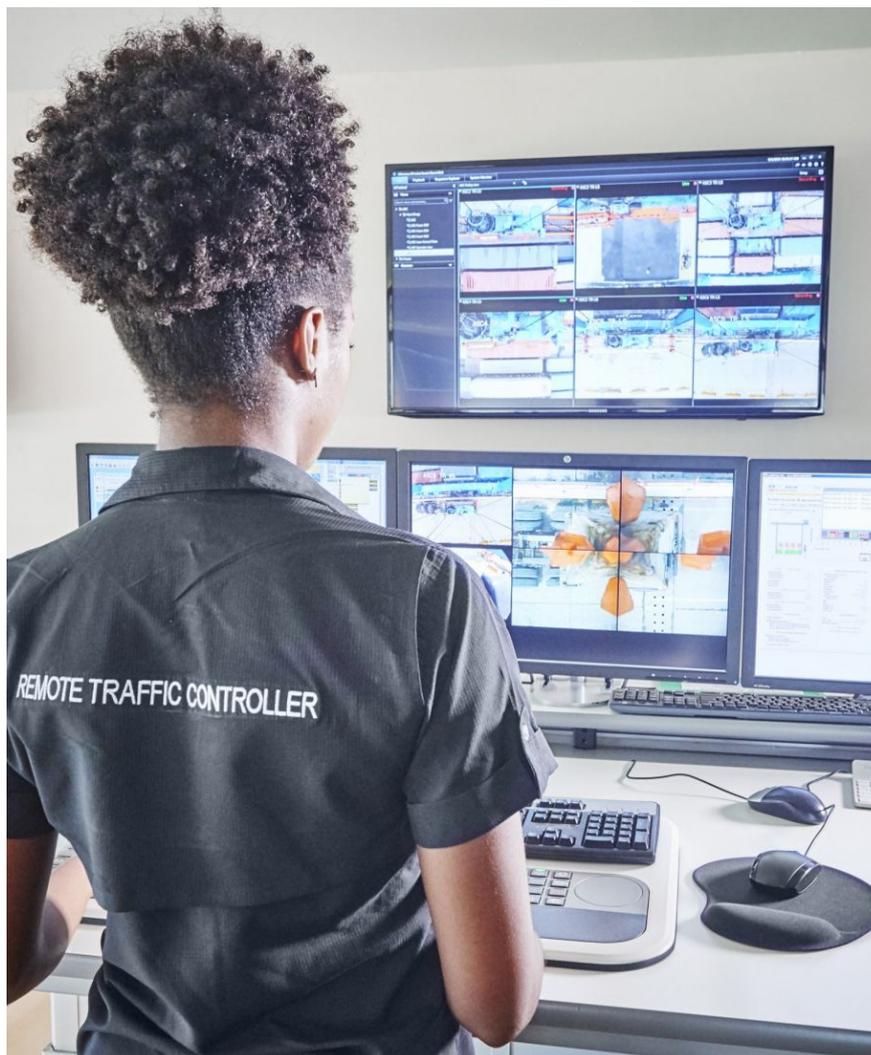
ARMG railway cranes may be suitable for on-dock operations if there is a need to add more track length to the terminal and cranes are anticipated to operate with minimal human intervention.

Automated equipment deployments typically require significant manufacturing

lead times in project expansion lifecycles and require significant civil infrastructure changes that can disrupt existing on-dock rail operations. ARMGs and control system software are typically installed with physical remote-control workstations by the control system vendor. Control system software is required to be integrated with the TOS.

CONCLUSION

As the global supply chain remains in the spotlight, logistics professionals need to find ways to optimise operations and will need to implement solutions to solve challenges swiftly and efficiently, especially in the current uncertain environment brought on by the pandemic. As ports and terminals continue to upgrade operations to enable better collaboration, manage larger shipments and streamline workflow, on-dock rail operations are becoming more innovative to increase efficiency and throughput at container gateways. Modernised on-dock rail operations will become essential for ports to remain competitive in the industry and once the investment is made, it will help positively impact the level of service and the business' bottom line.



ABOUT THE AUTHOR

Johannes Leholm is a solutions architect at Navis where he works with operators to identify the most effective strategies to implement new technologies at ports and terminals. Previously, Johannes worked as a product manager and sales engineer where he was responsible for implementing and designing automated solutions that accelerate productivity at some of the largest and most advanced ports in the world. Johannes holds a degree in Industrial Engineering and Operations Research at UC Berkeley.

ABOUT THE ORGANISATION

Navis is a provider of operational technologies and services that unlock greater performance and efficiency for the world's leading organisations across the cargo supply chain. Navis combines industry best practices with innovative technology and world-class services, to provide comprehensive management of the supply chain for safer, smarter and more efficient cargo operations. Navis Rail offers a portfolio of solutions including an integrated platform for planning and optimising freight railroads, a terminal operating system (TOS) to manage intermodal rail yards, as well as on dock rail solutions for marine terminals. www.navis.com

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DP WORLD LIMASSOL'S RESILIENCE THROUGH DIGITALISATION

Interview with Nawaf Abdulla, CEO, DP World Limassol

DP World's continued success throughout 2020 and 2021 has been the result of the company's continued forward-planning in digitalisation investments. DP World Limassol, the multipurpose Cyprus port, is no different.

Since DP World was awarded a 25-year concession in 2016, the terminal has processed more than 3,500 commercial vessels and over 3 million tonnes of cargo.

The terminal operator is in the process of implementing the modern cloud-based Zodiac Terminal Operating System (TOS) at the port.

ADAPTING TO THE CHALLENGE

Zodiac is already in full operation on conventional cargo and ro-ro operations, and DP World Limassol is now in the final test-

ing of its container module, with the final module – cruise vessels – due to be integrated into the TOS by the end of 2021.

The new automated TOS will eliminate the need for carrying of papers of cargo manifest of all players in the port community: including head office, shipping lines, and customs.

Nawaf Abdulla, CEO, DP World Limassol, told PTI the terminal operator's increased focus on digitalisation centres on adapting to changing circumstances brought about by the COVID-19 pandemic.

"We've moved into automating our payments, minimising the number of direct contacts to come to our cash points, increasing our online transactions," he said.

Abdulla continued that terminal management has placed a focus on simplifying

manual processes, encouraging synchronised data flow between the terminal and the Port Community System (PCS).

Agents can now upload their cargo manifest currently at the terminal, and also cargo in the future.

"We support digitisations and improving the business workflow without having any interruptions – and without having the need for the physical request of attendance of those individuals in the port," he noted.

Abdulla said the TOS removes the burdens of cargo manifest being sent through Excel sheets, and removes paper-based crane logs and tally sheets, for example.

"That is all being now done on the tablet where you are connected in real time to the system," Abdulla said.

The result for port actors is a dynamic and real-time presentation of their cargo movements as it is processed through DP World.

Clients have automatic notification of release of cargo, as well as seamless integration with customs and ports charges. As soon as cargo is rolled off the ship, customs are made aware, allowing clients to pay customs duties, and enabling immediate pick-up.

"Whether it's a weekend, a public holiday, morning, afternoon, or nighttime, it doesn't matter. You're still able to get your cargo off. You're still able to pay your cargo. You still able to clear the goods out of the port on time," Abdulla explained.

The system also manages warehouse activities, highlighting the cargo levels in warehouses, and inventories left for more than 90 days.

If the cargo passes the 90-day mark, the cargo certifies as unclaimed, which automatically notifies the terminal and customs agents to lift the cargo for auction, simplifying the port business and giving clarity to agents of goods flows in the facility.

Abdulla added that port agents are also able to capture through the tablet's imagery of any damages to vessels or port infrastructure, giving users an all-encompassing service when accessing the port.

"It allows us to capture, through the tablets, any damages or scratches. Take a photo, and you can put in discrepancies, such as that cargo was discharged with damage. It's already saved.

"It can be shared with the client, so it simplifies the delivery of the goods, whereas before we have had to do this manually," he said.

"What does this mean for the community? The community will be able to immediately have a report of all cargoes being discharged and loaded. It has allowed us to move things faster and quicker," Abdulla explained.

A HANDHELD FUTURE

Smartphones and handheld devices are allowing ports to manage daily yard operations more efficiently. APMT Barcelona's 5G smartphone rollout for its safety pilot is another example of ports harnessing handheld.

Abdulla said handheld devices for port operatives is a key objective for DP World going forward. "It is a goal. It is an objective. It is an easy way to manage our businesses."

On the back end of staff operations, every DP World employee is equipped with an app to allow them to remotely clock-in anywhere in the terminal and receive their timesheets, reducing kiosk queue-ups and

allowing the port to continue social distancing rules.

"Today, where employees have to come to a particular kiosk where they punch in and punch out: we are transforming this into an application," he said.

"The system, which is based on the WiFi within the terminal, identifies the personnel within this zone of the port, allows you to punch in from your mobile.

"It doesn't allow people to gather in one point, reducing social distancing issues and potential exposures, and everybody can be in segregated places."

Moving forward, Abdulla said DP World will continue to explore the benefits of Artificial Intelligence (AI) and Machine Learning (ML) to move away from manual transactions.

"The future is purely: how can we do things faster? How can we do things smarter? Can we do it through the apps? Can you do it through the tablets? That's exactly where we are going," he said.

UNDERSTANDING YOUR TERMINAL

Abdulla said DP World Limassol has circled the company's integration with blockchain-based digital container logistics platform TradeLens as an area of focus in the year ahead.

The terminal is implementing blockchain into its TOS to better secure and improve efficiencies of its cargo processes and will be fully operational by around 2025.

DP World Limassol is undergoing site testing of the technology, which has experienced some delay due to regional COVID-19 lockdowns affecting air travel to verify data transfer scenarios to customers in Spain and the UK, Abdulla said.

Abdulla emphasised that the terminal's investment in emerging technologies going forward is based on understanding the current infrastructure and demands of port actors on the ground.

DP World, UAE Region, for example, announced in April 2021 it would be researching further into Quantum Computing's (QC) impact on the supply chain.

Abdulla noted that DP World Limassol has yet to delve into business case of QC – but will be taking best practices from other DP World terminals on the technology and applying QC to its own unique operations.

"[Investments] are related to how developed our infrastructure is on the ground," Abdulla said.

He expanded further that ports could go to the "maximum level of digitalisation," but may still be dragged down by a community or stakeholder who is still requiring signature for paper, or the release the documentations notifying of dispatch.

"If that does not [progress] far quicker, no matter how you do, you're going to

held behind. Especially when it comes to customs; delivery orders by the shipping lines; [and] custom inspections that have to be done in the classic style," he outlined.

Success for Abdulla and DP World Limassol moving forward would hinge on ensuring ports and terminals are "on the same path" with the port community, aligning on digitalisation efforts and embrace of a movement away from manual.

"There's a similar challenge in the future, so that's why for me it's a collaborative effort that everybody has to put in order to become a more successful business environment."

Written by Jack Donnelly

ABOUT THE INTERVIEWEE

Nawaf Abdulla, a UAE national, joined DP World in 1997 back in Dubai, UAE. Nawaf has now been working in Ports and Terminals for over two decades. When Nawaf joined DP World, only two Ports in UAE were within the company's portfolio, wherein today, there are over 150 operations around the World.

ABOUT THE ORGANISATION

In April 2016 DP World Limassol was awarded a 25-year concession to exclusively operate the multi-purpose and Cruise terminal in Limassol commencing February 2017. The terminal's activities, comprising of three multi-purpose quays, include break-bulk, general cargo, Ro-Ro, Oil & Gas services and the brand-new passenger terminal. DP World Limassol port is the main cruise port of the island located on the Southern coast of Cyprus and considered as one of the largest and busiest ports of the Mediterranean. The brand new 7,000 sqm Cruise Terminal commenced operations in July 2017, offering Cruise lines and passengers a plethora of services to accommodate all their needs accompanied by the high standards and efficiency of DP World Limassol. Additionally, DP World Limassol is a stable, secure, friendly and responsible environment for transit and Home port Cruising with numerous destinations in the Eastern Mediterranean Sea being an overnight sailing. As in all locations where DP World operates, DP World Limassol is a part of the local community and providing new job opportunities.



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aerodynamic design



reduced operational costs



less maintenance



lower energy consumption



process optimization using IoT
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AUTOMATION AND DIGITALISATION VITAL IN THE FACE OF MARKET VOLATILITY

Interview with Stephen Ashworth, Managing Director, Hutchison Ports Thailand

Automation and digitalisation remain the two best approaches in order to handle increasing container volumes. It is also key that ports and terminals make investments in these areas in order to prepare for unforeseen supply chain disruptions.

The chaos of the pandemic saw a considerable drop in global consumption, which was followed by a rapid increase in manufacturing output in Southeast Asia caused by a surge in demand from North America and Europe. The volatility has made planning port operations and managing supply chains more difficult.

Speaking exclusively to PTI, Stephen Ashworth, Managing Director, Hutchison Ports Thailand (HPT), said recent events have demonstrated how technology can improve port and terminal operations.

“There is no question that automation is the way forward to cope with increasing volumes, productivity related demands from our shipping line customers and unforeseen events such as the current COVID pandemic or a sudden shift in trade patterns caused by supply chain disruptions,” Ashworth said.

While Hutchison Ports saw year-on-year (YoY) declines in traffic in all of its Southeast Asian terminals in 2020, the beginning of 2021 has witnessed “a significant increase in volumes” at several hubs in the region, the result being container congestion, according to Ashworth.

“At our terminals at Laem Chabang operating under Hutchison Ports Thailand for instance, we are now seeing strong volume growth in most long haul east-west and in-

tra-Asia services,” Ashworth said, attributing this to booming consumer markets.

The uptick in container volumes has made terminal planning and operations “very challenging” and this has been driven by what Ashworth described as the “domino effect of vessel delays”.

Although the obstruction of the Suez Canal in March 2021 did not significantly affect HPT according to Ashworth, the continuing uncertainty shows how automation technology can help maintain productivity.

“If you also take into consideration the pandemic and the potential for supply chain disruptions, you do begin to see how the implementation of technology to our operations and processes can help to safely increase terminal productivity and mitigate

the risk of unforeseen events such as the pandemic.”

HPT is rolling out a digital platform to “integrate and control the entire scope” of its operations, including yard and gate usage, overall monitoring and equipment utilisation at Terminal D, the most advanced deep-sea hub in Thailand.

TERMINAL D – THAILAND’S SMART PORT HUB

Opened in 2019, Terminal D’s Phase 1 is now fully operational with 1,000m of berth space, six super post-panamax ship-to-shore (STS) cranes and 20 rubber tyred gantry (RTG) cranes, all of which are operated remotely. Phase 1 capacity will be approximately 1.2 million TEU and once it is fully completed, annual throughput will be 3.5 million TEU.

Once completed, the \$600 million Terminal D will be one of the first container handling hubs to be fully equipped with remote control technology for its entire quay and RTG crane fleets.

In total, it will offer 1,700m of berth space, 17 quay cranes and 43 remote-controlled RTGs. It will be one of the biggest symbols of Thailand’s progress as a maritime nation.

This may accelerate yet further in the short term as Southeast Asian exports grow to meet pandemic-induced demand in the major consumer markets of North America and Europe and some companies divert manufacturing operations from China.

Ashworth explained that all current and future STS and RTG cranes will be operated using remote control technology. Furthermore, HPT is currently piloting six autonomous, driverless trucks as part of the “overall technology transformation”.

The terminal, according to Ashworth, has “already created and strived for technological advancement that enables the realisation of real-life benefits for shipping customers, port users and operations”.

“The use of such technology has improved overall accuracy and safety and has significantly reduced the level of carbon emissions. We are also seeing gradual improvements to berth productivity from the remote-control STS cranes.

“In addition, we are considering the deployment of automated, driverless trucks at Terminal D and in this regard, we are currently piloting six such trucks to ascertain whether this will be technically and operationally feasible.”

Ashworth said these trucks are equipped with a smart operating system and a system of radars, cameras and sensors to detect its surrounding environment and prevent accidental collisions.

The results of the pilot programme have been “encouraging” and so far, 12,000 con-

tainers have been successfully loaded and discharged from vessels by the autonomous trucks, according to Ashworth.

“Finally, we are rolling out a programme of digitalising of our landside processes at Terminal D and at our other terminals at Laem Chabang.

“This includes the automation of our gate procedures to become paperless with the driver holding a pre-cleared card which can be swiped in a machine at the gate in which our terminal operating system will immediately recognise them.

“We have also implemented a system of issuing electronic invoices to our customers which has significantly reduced paper usage and are now rolling out an electronic payment system and, working with our major shipping line customers, an electronic delivery order (e-DO) system via the Global Shipping Business Network blockchain platform.”

MAKING THE MOST OF GREENFIELD AUTOMATION

It has been suggested by numerous industry experts that the pandemic will and has already caused an acceleration in technological innovation and research.

However, Ashworth told PTI that HPT’s upgrade at Terminal D started “way before” the pandemic because, as it was a greenfield site, Hutchison was able to plan and design the terminal in full at the beginning of construction.

Terminal D’s berth design and crane capacity already allows it handle some of the largest ocean-going vessels currently in operation, and with the “simultaneous introduction of technology”, it will become more efficient in the future and capable of handling even larger ships.

The Southeast Asia region has invested in smart technologies as a way of moving an increasing amount of cargo in as efficient manner as possible, and Thailand has been no exception.

In August 2019, it became the second country in Southeast Asia after Singapore to officially join TradeLens, the blockchain-enabled supply chain platform launched by A.P. Moller-Maersk (Maersk) and IBM, as part of its ‘4.0 Strategy’ and efforts to transfer vital data between stakeholders.

Investments in smart technologies and automation have been the subject of speculation since the beginning of the pandemic and there remains debate over how far terminals should go when volumes are so erratic.

However, during the Container Terminal Automation Conference (CTAC) 2021 hosted by PTI, Ashworth said automation made it easier to use resources, such as being able to adjust software during times when volume is slow, as key benefit.

Additionally, Ashworth said HPT will not exceed automation investment as a result of the pandemic as it has been a very unusual time for container ports and terminals.

“We have invested the right amount, nobody will invest in something which might happen in the future, we tend to invest just behind the curve, otherwise you run the risk of ending up with excess capacity,” Ashworth said at CTAC.

Written by Max Schwerdtfeger

ABOUT THE INTERVIEWEE

Stephen Ashworth is currently Managing Director – Thailand & South East Asia for Hutchison Ports, the ports and related services division of Hong Kong listed CK Hutchison Holdings Limited (CK Hutchison).

Prior to his current position, Ashworth was Managing Director – Myanmar, Thailand & Vietnam for Hutchison Ports between 2015 and 2016 and Chief Executive Officer of Hutchison Ports Indonesia between 2010 and 2014.

Between 2002 and 2010, Stephen was Asia Pacific Chief Financial Officer for the Constituency Management Group (CMG), the marketing communications division of the US listed Interpublic Group. Stephen is also a member of the Institute of Chartered Accountants in England and Wales and the Hong Kong Institute of Certified Public Accountants.

ABOUT THE ORGANISATION

Hutchison Ports is the ports and related services division of CK Hutchison, one of the largest companies listed on the main board of The Hong Kong Stock Exchange. CK Hutchison has five core businesses – ports and related services, retail, infrastructure, energy and telecommunications.

Hutchison Ports is the world’s leading port investor, developer and operator with a network of port operations spanning 26 countries throughout Asia, the Middle East, Africa, Europe, the Americas and Australasia. Over the years, Hutchison Ports has expanded into other logistics and transportation-related businesses, including cruise ship terminals, airport operations, distribution centres, rail services and ship repair facilities.

In 2019, the Hutchison Ports Group handled a combined throughput of 86 million TEU of containers.



TATA CONSULTANCY SERVICES LOOKS TO CONNECT WITH PORTS ACROSS THE GLOBE

Interview with Sridharan Narayanan, Global Head - Ports & Cargo Strategic Business Unit, Travel, Transportation & Hospitality at Tata Consultancy Services

As the mindset of ports has changed over the past 12 months, Tata Consultancy Services (TCS) sought to connect and partner with hubs across the globe at the Container Terminal Automation Conference (CTAC) 2021.

Speaking to PTI, Sridharan Narayanan, Global Head – Ports & Cargo Strategic Business Unit, TCS, said, “It is important for TCS to participate in this event to identify and build partnerships with vendors who have complementary ideas and innovations for the connected ecosystem.”

He also said that TCS wants to further understand the evolving expectations and needs of the industry and to align its product roadmap accordingly. TCS is keen to share its offering with the industry, which includes:

- TCS DynaPORT – TCS DynaPORT is a one-stop digital terminal operating system (TOS) that streamlines order-to-invoice processes and supports multi-modal and multi-purpose requirements. This helps in Planning, Optimizing, Recording, Monitoring, and Analysis of, Marine Rail Terminal & Depot Operations with Integrated Invoicing Module
- TCS SWIM – TCS Software for Intelligent Messaging (SWIM) is an Electronic Data Interchange (EDI) for B2B Communication between Marine Terminals and the external trading partners using standard and custom messaging protocols
- TCS VBS – TCS Vehicle Booking System (VBS) is a terminal appointment system for trucks to pick-up and drop-off Con-

tainers/Cargo in the Marine terminals

- TCS DynaPORT Terminal Analytics - Business Analytics Solution to provide real-time insights into KPIs for strategic and tactical decision making to improve Port processes, assets, and resources.

The product line help effectively manage various industry challenges related to agility, productivity and optimisation. It will also let terminal operators manage their operations across multiple different terminals using single solution, given the support for multi-tenancy.

Other challenges identified by Narayanan include the lack of transparent, scalable and cost effective solution to handle real-time B2B communication with port authori-

ties, government agencies and customers, such as communication with port authorities, customers, and shipping lines.

DynaPORT, Narayanan said, can offer small and medium sized terminals operating in multi-purpose and multi-modal terminal environment to handle end-to-end operations.

TERMINALS REACT TO SUPPLY CHAIN DISRUPTION

Ports have recognised that they need to have a sustainable and resilient infrastructure to withstand disruptive situations such as the COVID-19 pandemic.

Narayanan identified numerous ways terminals have reacted to events since early 2020 when the pandemic began to impact the supply chain.

According to Narayanan, terminals have started investing in community collaboration platforms, such as blockchain, that enable real-time secure data exchange, and automation and optimization for effective resource management, making value chain more agile and responsive.

Internet of Things (IoT) sensors and 5G are also being leveraged for real-time monitoring or tracking of container and cargo status, cargo carrier location, equipment and personnel movements, and terminal traffic or congestion will provide an edge to deal with future disasters, Narayanan said.

“Terminals have also implemented hands-free or contactless operations using Natural Language Processing (NLP) and vision analytics, remotely or fully automated equipment using programmable

logic controller (PLC)/equipment control system (ECS) and an ability to operate port or terminal remotely using networking and collaboration platform are key trends in the industry,” he said.

The pandemic has meant ports must consider a “mobile workforce”, working remotely with a connected workforce for activities such as documentation, planning, and control- separate from on-ground operations.

AI IN PORTS

Narayanan said that Artificial Intelligence (AI) has potential to play a big role in enhancing the intelligence of TOS and enabling terminals with decision-making systems instead of decision support systems.

Narayanan listed the following examples of where AI can show promise at ports and terminals:

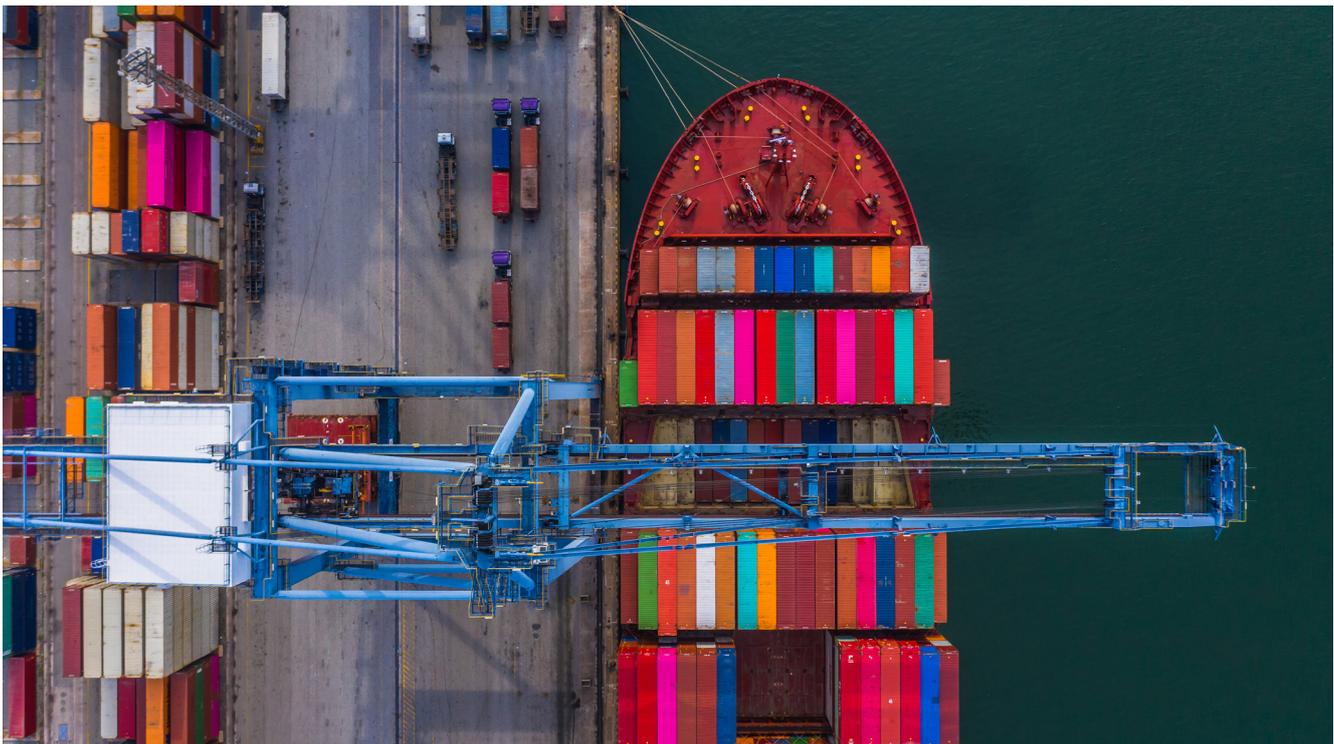
- Forecasting & Simulation aspects: Forecast workflow, traffic & simulating the operations based on the forecast. Considering the automation, simulation will play important role in understanding the impact and adjust the parameters/process of day-to-day terminal operations.
- Another area to support simulation is Virtual Reality which will provide realistic view and enables the operational support to ensure safety and security. Remote management, training of personnel & mobile workforce
- Smart Machines: Identifying the right job and location for the job, by the equipment, without any manual instructions/intervention.

- Use Machine Vision to identify equipment entering and exiting terminals and to classify the truck load and identify container numbers and damages.
- Intelligent Operations automation: Automated trouble desk, to identify damages of containers using machine vision and automate the workflow
- Goal Oriented Planning: Optimising the load plan, scheduling the equipment to meet the objectives
- AI-based prediction of turnaround time for vessel, rail and truck to provide the options for the stakeholders for planning & operations optimisation.

“Terminals often face complexities involved in management and governance to deal with multiple vendors to implement and integrate various enterprise system besides terminal operation system. Terminal operators are looking for a single vendor who has expertise and solutions from their partner ecosystems catering to their strategic growth and transformation related to their ICT needs,” he said.

Tata Consultancy Services (TCS) is an IT services, consulting and business solutions organisation that has been partnering with many of the world’s largest businesses for over 50 years.

Narayanan highlighted, “TCS being one of the world’s Top IT System Integrator, TCS can be your single vendor to meet all IT and automation needs of ports and terminals such as Infrastructure (including cloud), Enterprise Solutions, Application Development and Maintenances Services, Blockchain, Analytics & Insights, IoT, and AI.



“Ports & Cargo, a dedicated Strategic Initiative Group (SIG) of TCS, provides Terminal Operating System (TOS) and ancillary products and solutions for marine terminals, Intermodal Rail, Warehouses, and other allied players including Cargo Freight Stations (CFS) & Inland Container Depots (ICDs).”

CHALLENGES TO BE MET

Narayanan has identified a number of other challenges that are still present in the ports and terminals industry and offered ways in which TCS solutions can be used to solve these issues.

For instance, he said “Many small/mid-size terminals operate multiple types of cargos such as containers and breakbulk, or bulk and roro, in their terminals, and they expect a common system to cater to these varying requirements. They also expect their TOS to be comprehensive to handle their end to end operational needs.”

From Tata’s product line, Narayanan said that the TCS DynaPORT can assist with these small and mid-size terminals’ need for a common system. It is a one-stop digital TOS that handles end to end terminal operations (Order to Invoice) and supports multi-modal (truck, vessel, rail) and multi-purpose requirements.

He also spoke about regional terminal operators who own multiple small terminals within their regions.

“It is cumbersome and expensive for them to manage terminal operating solutions individually for each one of these terminals. At the same time, they are also finding difficult to leverage the best practices across terminals,” he said.

TCS DynaPORT is multi-tenant, he explained, supporting multiple terminals accessing the application from one centralised installation.

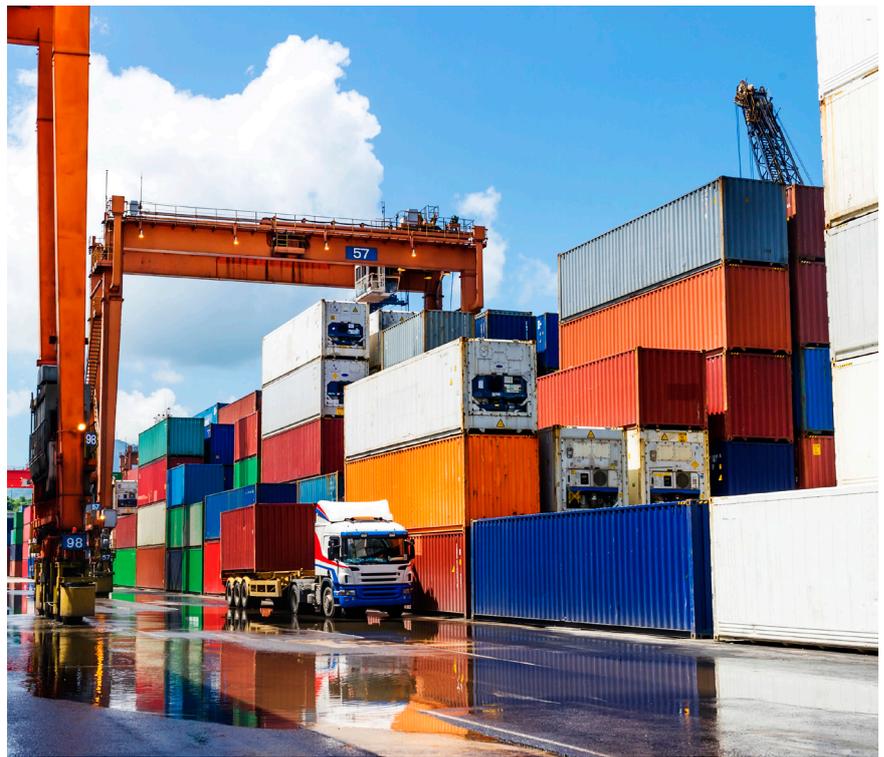
“Each terminal’s configurations are maintained separately and thereby provide terminal specific access to users, ensuring data integrity. This reduces the IT operations cost drastically and at the same time ensures that the unique needs of the terminals are met.”

This results in a harmonised process which leverages best practices from across the terminals, and can be rolled out to all terminals.

Additionally, TCS DynaPORT’s standard API interfaces can connect with all third-party systems and devices. This ‘APIfication’ makes it easy to meet the needs of current and future integration requirements with their stakeholders, Narayanan explained.

AUTOMATION AS A SOLUTION

Finally, he said that terminals are under continuous pressure from shipping lines and their customers to increase their pro-



ductivity and decrease their operational costs. On the other hand, vessel sizes are increasing, which forces the terminals to handle more volume within time and available space. Terminals want to enhance their capability and optimise their capacity to meet these demands.

“Automation (either semi or partial or full), helps terminals to mitigate these challenges to an extent. TCS, with their DynaPORT solution helped many of its customers to handle these challenges,” he said.

“Also, automation support for the yard Container Handling Equipment (CHE) by providing semi-automated and remote-controlled yard CHE’s integration with core TOS systems enables the increased productivity and safety of equipment and personnel deployment in yard operations.”

According to Narayanan TCS DynaPORT has the intelligence to increase the productivity of planners and controllers by introducing automated vessel load planning and sequencing, automated yard planning, and optimisation of move equipment like internal transfer vehicles or straddles.

Reducing shuffles, increasing productivity and reducing costs at the yard are also key. Narayanan highlighted configurable yard planning and optimisation tools such as automatic location generation for stacking containers, and best container pick-up for delivery containers for vessel load and truck/rail delivery, considering various operational constraints to work towards these optimisation goals.

ABOUT THE INTERVIEWEE

Sridharan Narayanan heads the Strategic Business Group at TCS that addresses solutions for Sea Ports, Railways and adjacency sectors.

He has held a number of senior leadership roles during his 30 years’ experience within the industry, and has helped shape global strategy, operations and delivery at EDS, CMC, and TCS. He has successfully led a multitude of high profile, complex client engagement across sectors including implementation of a comprehensive Intelligent Transport Systems solution for one of India’s leading public transport organisations.

Narayanan holds a bachelor’s degree in Electronics & Communications Engineering from University of Madras.

ABOUT THE ORGANISATION

Tata Consultancy Services is a purpose-led transformation partner to many of the world’s largest businesses. For more than 50 years, it has been collaborating with clients and communities to build a greater future through innovation and collective knowledge. TCS offers an integrated portfolio of cognitive powered business, technology, and engineering services and solutions. The company’s 469,000 consultants in 46 countries help empower individuals, enterprises, and societies to build on belief.



PORT AUTOMATION IN ASIA AS DRIVER OF GROWTH

Interview with Yesim Elhan-Kayalar,
Advisor to Chief Economist at the Asian Development Bank (ADB)

Ports in Asia are continuing to break away from siloed data sharing, opening up new opportunities to take advantage of emerging technologies like 5G and automation in terminals.

Globally, the ports and maritime stakeholders have struggled to standardise and establish common information and dataset sharing parameters.

Many point towards issues such as uncertainty over ownership of a single data platform; concerns over data sharing's impact on competition; and stakeholders holding onto data to monetize the sale of information on equipment performance, shipping arrival schedules, or carbon emissions.

The ports of Asia, which dominated the newly released Container Port Per-

formance Index from the World Bank and IHS Markit, are "moving away" from siloed data share and reaping the benefits, according to Yesim Elhan-Kayalar, Advisor to Chief Economist at the Asian Development Bank (ADB).

"There has been a lot of literature on this, that everyone wants [data], but nobody wants to share it," explained Elhan-Kayalar.

"I think we're moving away from that. Information can be perceived as power – some people may wish to not share it. But we have been increasingly seeing that the technology is there, and the benefits of sharing data are there.

"We are coming up to the point where it is not altruistic to share information with others, it actually serves your own pur-

pose. Because the better information you have, the more optimal decisions you will be able to make."

ASIA LEADING FROM THE FIELD

Elhan-Kayalar highlighted that Asian ports which had 'smart port' features fared better at the beginning of the COVID-19 pandemic. Essentially, those investing in digital connectivity and encouraging data exchange amongst port authorities, shippers, and freight forwarders to give greater transparency to cargo-owners for the flow of products through the supply chain.

"If you know nothing about what the others are going to do or how they're going to react to your decisions, you're always in a position of iteratively trying to find the most optimal outcome," Elhan-Kayalar said.

“Whereas a mutually agreed information set that [port stakeholders] all agree to contribute to means you are better equipped to see what the feasible courses of action would be when you are optimising cost, revenue, time, or whatever your target, performance indicator might be.”

The result, Elhan-Kayalar continued, is that despite ‘Black Swan’ unforeseen events such as that of the COVID-19 pandemic or the blockage of the Suez Canal, Asian ports were largely resilient to its crippling impacts on transport and logistics chains.

“We know countries, particularly in Asia, have been leading growth – and they’re expected to have a very healthy growth in 2021 and 2022,” she said. “They are very much using their ports, not only within the region, but also to supply for the rest of the world.

“As a result, it’s very important to see what more can be done to even further increase the efficiency and ensure that the ports can support economic development, employment, business resilience and continuity.”

For those smaller ports, the ADB has seen the pandemic trigger a push for operators to “pick up the pace” on digitalisation – both from a demand and supply perspective, and from government agencies themselves.

“There is definitely an interest to automate and digitalise across the ports. I think they have also benefited to a certain extent from that there were a number of programs ongoing in developing countries

in the region about automating their container terminals or introducing smart port systems.”

Elhan-Kayalar said in the Philippines the emphasis has centered on digitalisation projects of moving from paper-based port transactions to online-based systems at the end of 2020.

“The ones that could make their digital systems live or who already had some digitalisation in motion fared better.”

THE IMPACT OF DATA ON 5G, AUTOMATION

Elhan-Kayalar noted that successful data-share amongst Asian supply chain actors will allow port communities to better harness digitalisation benefits from the likes of 5G and automation in terminals.

Globally, ports have utilised 5G’s ultra-low latency and fast speeds for safety pilots; improved remote equipment automation; and overall improved communication flows.

Elhan-Kayalar stressed that establishing data flows amongst parties is central to fully realising the potential of 5G.

“You may have a 5G [network], but if the stakeholders within the port are not willingly sharing real-time information, 5G is not going to be very effective or create much value,” she said.

Whilst a 5G private network may be able to transfer information on the status of the health of a crane cable to a port repair team in real time, for example, the crane manufacturer needs to first have the facilities and the tools to share that data to

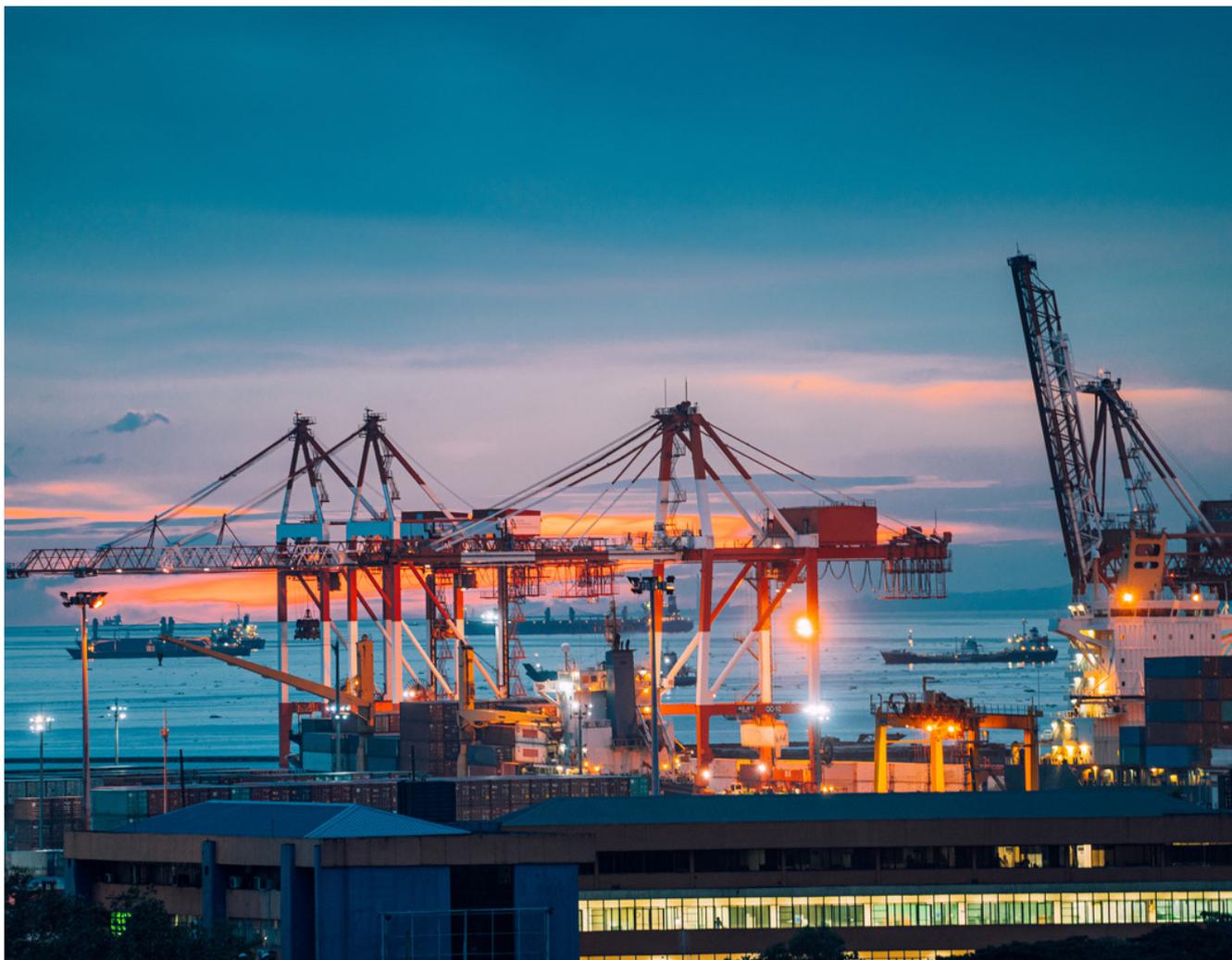
“WE ARE COMING UP TO THE POINT WHERE IT IS NOT ALTRUISTIC TO SHARE INFORMATION WITH OTHERS, IT ACTUALLY SERVES YOUR OWN PURPOSE.”

a platform where the port authorities can make a decision.

“It is important to have contextually relevant solutions for different ports,” explained Elhan-Kayalar. “Of development, smart ports and countries will come into it at different stages, depending on not only their financial resources, but also the level of development of their of their ports, where they’re starting from, and their appetite to put in these changes to adopt these new technologies.”

“If there’s a common target with a mutually agreed platform of who is going to share what information, when, and with whom – and they adhere to that model, then you have a winning model and you are going to create value,” Elhan-Kayalar noted.





DIGITALISING SMALLER PORTS AND FINANCING THEM

The rollout of private 5G networks and on-line data sharing platforms will of course require considerable investment from port authorities.

For smaller Asian ports to digitalise and develop information sharing tools for its customers, Elhan-Kayalar is buoyant on the growing options available.

“There are a lot of different types of financing sources now that are available, which may not necessarily have been a natural go-to financing source for infrastructure investments in transport sector or ports. It will be important to explore some of those alternatives as well,” she said.

Elhan-Kayalar said Asian ports can look further than traditional public-sector financing, private-sector driven or public-private partnership routes. She highlighted options from development banks like the ADB; social and green financing options; and regional caucuses like multi-country associations that create value for their regions.

She continued that, whilst COVID-19 has been a “massive disrupter” for all of the

ports and maritime community, it has also been a major opportunity to increase the pace of adoption for digitalisation.

“Developing a port is not only about building infrastructure, but it’s about investing in the economy and the future of the people,” she explained. Using complete and reliable information in real-time is a “very powerful tool and resource”.

Elhan-Kayalar continued, noting that greater communication and cooperation on real-time data can be a fantastic resource moving forward.

“The more efficient the port, the prospects of exports are higher, as are the prospects of linkages to the rest of the world and economic development,” she argued.

“We have seen that efficient port development has been particularly successful if different elements of port operations have been automated and smart processes integrated.

“Then we see the holistic development in an economy and how it all contributes to economic development and resilience through that setup.”

Written by Jack Donnelly

ABOUT THE INTERVIEWEE

Yesim Elhan-Kayalar has over 30 years of work experience in development sector and academia in 27 countries. She has worked at national and regional levels to create long-term development solutions in finance and infrastructure sectors. Currently, she develops policy and knowledge solutions for high impact development assistance in Asia and the Pacific.

ABOUT THE ORGANISATION

The Asian Development Bank (ADB) is committed to achieving a prosperous, inclusive, resilient, and sustainable Asia and the Pacific, while sustaining its efforts to eradicate extreme poverty. It assists its members and partners by providing loans, technical assistance, grants, and equity investments to promote social and economic development.

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