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TECHNOLOGY EBOOK



THE PATH TO INTELLIGENCE - SUMMER 2018



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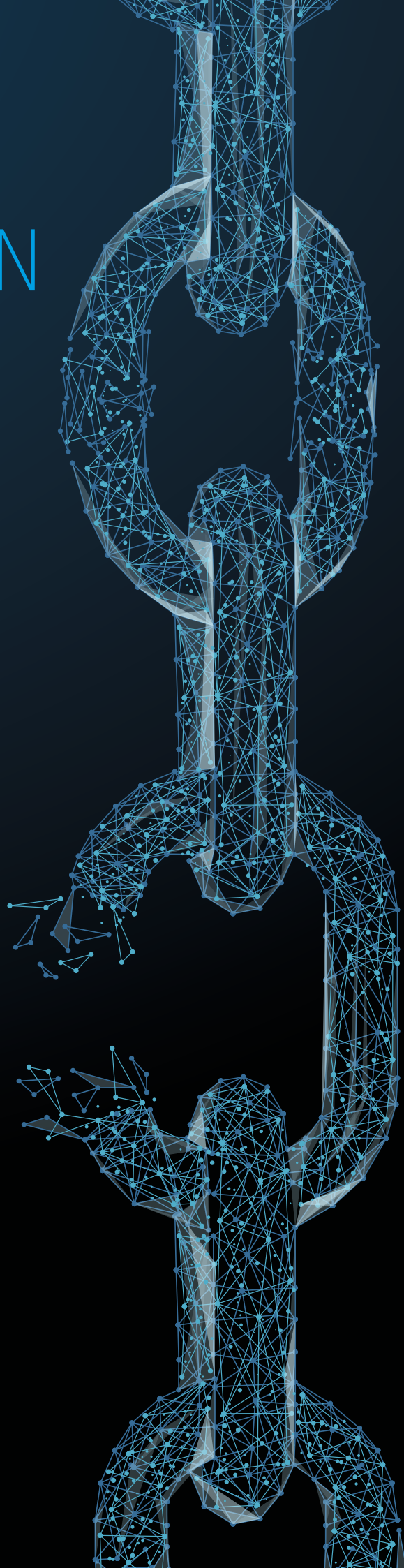
PORT 
TECHNOLOGY

**SMART PORTS & SUPPLY
CHAIN TECHNOLOGIES**

2 - 3 OCTOBER, 2018

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FROM THE **EDITOR**



We're delighted to announce our new Smart Ports & Supply Chain Technologies event and I hope this e-book aids you in getting some key insight into the conceptual framework for the conference.

As the title suggests, we want to further the conversation beyond ports to their interconnecting supply chains, cutting-edge technologies and global landscape of trade enablers, and then take that conversation back to the 'smart' port once more.

An ambitious project, yes, however after sizing up such a move over the last couple of years, the team at PTI feel the time to break new ground within the sector and take the conversation to new levels, with new voices, is now.

It is a genuinely exciting time to be in this industry, as well as to be a human being in this day and age. We sit on the precipice of epochal change, whether such change comes very soon or in a number of years, technology has the capability to drastically reimagine our very civilizations.

This consideration has always been at the heart of Port Technology's operations and is a key reason why we want to explore uncharted territory in the industry and chart new trajectories.

This e-book acts as a foundation for the journey that both the industry and Port Technology is taking, so please read through the papers and get involved in the conversation in whatever capacity you can. Whether that is by writing your own paper, joining the discussions on Port Technology's social media channels or by commenting directly on our content via the new function released on the PTI website.

We've created the aforementioned commenting function as we want to know what you think, and we really, really want to create conversations, ask questions and see how individual expertise can synthesize with other points-of-view so we can play our part in providing dynamic ground for the industry to explore new ways to streamline and develop. Funnily enough, that's exactly what the Smart Ports & Supply Chain Conference is for too.

Richard Joy
Editor

A handwritten signature in dark ink, appearing to read 'Richard Joy'.





PORTS FOR TOMORROW

SMART LINKS IN INTELLIGENT SUPPLY CHAINS

Wolfgang Lehmacher,
World Economic Forum, Geneva, Switzerland

The port is the smart link in the intelligent supply chain. An 'intelligent' port will connect its non-automated, semi-automated, and fully-automated assets in the yard. A digitally connected operating space leverages data generated from within, received or extracted from external sources to reach decisions that benefit the business and its customers.

The system will monitor information about the position and state of assets and goods that approach and depart from the port, and provide insights into weather, labour disputes and congestion.

Smart ports constantly gather and analyse data to establish full visibility of the flows within a port and steer the assets in the safest and most efficient way. The capability of data management, i.e. the gathering, categorizing, computing and storing of data, sits at the core of the intelligent systems. Data is the oil of the digital economy. Digital businesses and

governments capture all types of data that is obtained through the devices of The Internet of Things (IoT) and moves over its data highways to the computing engines.

Data availability, computing power and artificial intelligence (AI) drive visibility and autonomous decision-making along the entire supply chain. Friction in the data flow affects the system, which is why ports need to live up to their role as a smart link in the global world of commerce seriously by collaborating and investing in such technology

DIGITIZING FOR INTELLIGENCE

AI does not only provide the brain that is needed to compute data for decision making, but also the senses to capture and share data through many tools, such as optical character recognition (OCR), which interfaces with other systems of the digital and biological worlds, including humans. Intelligence along the supply chain starts

with digitization, which allows process automation to reduce cost and mistakes by taking paper and human error out of the equation. Digitization also allows the parties to collaborate and transact on the basis of smart contracts. IoT captures and transmits data to inform smart contracts about the position of cargo. The product of digitization is data, which can be used for smart contracts but also analyse and manage the supply chain. Ultimately, smart supply chains use data to steer themselves.

THE GAIN

Digitizing and smartening the supply chain offers huge tangible benefits. One example is trade and supply chain finance. The Asian Development Bank estimated a global trade finance gap of US\$1.5 trillion in 2016. The gap stems largely from hugely underserved small and medium sized enterprises (SMEs), caused by the massive volume of paper required for communi-

Technologies enabling the digitalization of the supply chain

New technologies	Pre-transaction		Transaction processing			After transaction	
	Product selection	Data entry	Workflow management	Document check	Compliance check	Problem resolution	Client mgmt. information system
Optical character recognition (OCR)		Text recognition from trade documents to minimize data entry		Check for completeness of documents based on transaction/product type	Scrape documents for AML keyword hit		
Artificial intelligence (AI)	Intelligent and personalized marketing: Offer new product sales or client promotions based on insights on clients' needs and behaviors	Populate fields with text extracted from documents (integrate OCR with transaction process)		Validate/remediate data with cross-references, machine learning	Contextual filtering: Identify suspicious or unusual activity and block suspicious transactions based on predictive indicators	Intelligent problem resolution: Track individual error rates and flag users in need of remediation	
Advanced analytics (AA)		Enhanced KYC (e.g., web scrape)	Efficient process and productivity monitoring, and predictive analytics to detect patterns				Reports enable enhanced operational and strategic decisions
Robotic process automation (RPA)			Bridge data flow and communication: Integrate data from different systems into single interface				
Internet of things (IoT)			Ease of tracking goods and documents; dynamic pricing and financing triggered by shipment events; automated payments release based on "smart contracts"		Track document locations: Track goods (location, volume, quality)		
Distributed ledger technology (DLT)	Create smart letter or credit as smart contract on distributed ledger - auto notifications	Replace documentation, checks, data entry, validation, with single digital record	Real time verification and reconciliation; workflow executed as per smart contract conditions; replace payment and funds transfer with cryptocurrency				

Source: Bain & Company
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ation among customs brokers, freight forwarders, transportation carriers and myriad government agencies. Paper-based, manual processes, some created centuries ago, lead to complexity and delays, introduce errors and risks and stand in the way of reliable, real-time information gathering and tracking required for credible financing decisions. Consequently, 52% of SME financial request rejections are due to higher risk and lack of collateral.

Paperless border processes are another source of potential improvement through digitization and automation. In 2016, the United Nations Economic and Social Commission for Asia and the Pacific adopted the Framework Agreement on Facilitation of Cross-Border Paperless Trade in Asia and the Pacific to advance regional coherence. Estimates suggest that the agreement could boost Asia Pacific exports by as much as \$257 billion annually if it fulfils its aim to encourage the adoption of digital tools to facilitate trade. The United Nations Economic Commission for Europe (UNECE) has also found that export times could fall by 44%.

IBM and Maersk estimate that managing documentation represents a fifth of total shipping costs.

THE BRAIN

AI allows computers and machines to function in an intelligent manner, and it

is computing engines that are pivotal to the intelligent supply chain ecosystem. Two important functions connect AI and computing engines. The first is machine learning, which designs and deploys models into applications, processes and other machines. The other is streaming, which controls system data flows. The brain needs to perform the processes of sensing, reasoning and acting. Sensing is needed to capture what is happening in the supply chain. Reasoning is the process that helps to assess the importance of what has been sensed, and acting means taking necessary steps in a reliable way.

OPERATIONAL AND BIG DATA

Millions of sensors, tags and badges allow the collection of continuously small operational data about the status and changes in each and every part of the system. Real-time locating systems (RTLS) identify and track the location of assets, individuals and objects, such as trucks, rubber-tired gantry (RTG) cranes and reefer containers.

Small and big data combined with immense computing power allows the intelligent supply chain to constantly perform predictive analytics and uses machine and deep learning models to:

- Track the developments within and around the supply chain
- Identify trends and anticipate risks and

opportunities to avoid disruption

- Create additional value for government, businesses, consumers and citizens
- Powerful data mining tools can extract data from hundreds of thousands of websites. The software tools connect the operating system with the digital world through application program interfaces (API) and allow slicing and dicing social media and website data according to specific needs. Cognitive operating systems crawl internal enterprise resource planning (ERP) systems to find and filter out information as the basis to make longer term but also short term decisions to ensure the highest fluidity of goods, data and finances along the supply chain and avoid disruption.

DIGITAL EYES, EARS AND VOICE

There are many ways data is captured and shared. Intelligent cameras help to raise security at the gate. Facial recognition ensures that only authorized personnel can enter the port. Cameras feed cognitive operating systems with information taken off number plates and help to monitor and follow the movements in the port, including people moving in office buildings and warehouses. Optical character recognition (OCR) in combination with AI can help to populate fields with text extracted from documents. OCR does not only minimize data



entry efforts but also assists AI tools in checking the progress of documents that validate and remediate data with cross-references. OCR reduces risks by scraping documents for anti-money laundry keywords.

AI powered tools like Alexa help humans to interact easier with the digital world. Chatbots are now ubiquitous in customer service and Google has just announced a device dubbed 'AlterEgo' that can, in their words, read our minds by picking up neuromuscular signals triggered by internal verbalizations. In order to speak, the brain needs to send impulses to our muscles which the systems can analyse and decode. Facebook and Neuralink are aiming at building brain-computer interfaces (BCI) that turn thoughts into text by intercepting brain-signals instead of nerve signals.

AGILITY AND SCALABILITY

Constantly rising amounts of data require systems to scale. A system that reaches capacity is no longer fully reliable and limited

in response. Companies have two options: scale up or scale out.

- Scale up: Extend the specialized hardware with its numerous central processing units (CPU), the brains of the computer where most calculations take place. Scaling up by extending hardware requires procuring, installing and testing.
- Scale out: Use cloud-based systems with distributed architecture that stings together – behind one interface for the customer – numerous computers to scale larger data sets with powerful parallel computing. If something fails, other computers take on the extra load.

PIONEERS

The Port of Rotterdam has installed the port community system Portbase, which offers intelligent services for optimizing calls at the terminals, and efficiently exchanges information between companies and with authorities for planning. This includes analysis to understand how to

bundle containers to and from terminals to reduce costs and emissions.

An application combining several technologies was used by the Australian cotton trader Brighann Cotton Marketing for a shipment of 88 bales of cotton from Texas (USA) to the Chinese Port of Qingdao. The Commonwealth Bank of Australia and Wells Fargo have used a combination of distributed ledger, smart contracts and IoT to facilitate a trade transaction. Sensors allowed the banks to monitor the shipment's route, triggering the smart contract to release payment for the cotton once it crossed a predefined location.

Maersk has introduced a remote container management (RCM) system that permits monitoring the moves of cargo. This is particularly relevant for sensitive, higher value refrigerated container freight, where elements such as rough weather can knock off a container. However, the installation of IoT devices to track roughly 300,000 reefer containers took Maersk close to three years.

Maersk has also recently announced the formation of a joint venture with IBM to apply digitalization of supply chains and blockchain to trade. This initiative is engaging an ecosystem of corporations, customs agencies, and logistics companies. The goal is to take the paper out of the chain and make all processes transparent.

SMART GOVERNMENTS

The de facto central banks of Hong Kong and Singapore recently announced plans to connect the Global Trade Connectivity Network (GTCN), the trade finance platforms they are developing, which will use distributed ledger technology. Their objective is to make the multi-trillion-dollar funding of international trade more efficient and reduce the risk of fraud in letters of credit (LOC) and other transactions. Linking the two digital platforms is part of a broader plan between the Hong Kong Monetary Authority and the Monetary Authority of Singapore to join forces on distributed ledger and other financial technology.

Another example is the single window. The one simple point of entry that can ease submission of import and export documents and other supporting evidence offers extraordinary gains. According to 'Paperless Trading: How Does It Impact the Trade System?' by the World Economic Forum and UNECE, in Senegal the electronic single window reduced border preclearance and clearance processing time by 90%, from an average of two weeks to just one day. The cost of border processes has decreased by 60%.

Governments need to find ways to ensure full IoT coverage. This is particularly true for those that are responsible for large countries. Humans need large bandwidth – IoT does not. There is a difference between watching videos and tracking a container. IoT needs strong antennas to provide national and global coverage.

BEYOND THE TECHNOLOGY

Technology is an enabler. It is a means to an end and not an end in itself. Enablers are components of a digital strategy that improves, adjusts or reinvents business models. The business model is what drives real value for customers and businesses. Thus, digital transformation is business model transformation.

Here are some basics for future organizations:

- Upgrade legacy IT systems and shift to a modular, more adaptable architecture that uses middleware and application programming interfaces (API)
- Define an advanced technology roadmap, and prioritize use cases for proof of concept, specific business models and cost-benefit cases

- Invest selectively in new technologies, such as AI and robotic process automation, to harness near-term benefits and prepare for developing longer term solutions
- Explore strategic partnerships with other ecosystem participants
- Design a next-stage operating model, including new governance and ways of working

Moving towards a new way of working is critical in making the supply chain and ports smarter. Orchestrating the change towards a digital organization requires strong leadership. Transformation roadmaps and digitization programmes are needed to back up the push. Most digital programmes start with experimentation. The successful ones are selected to be taken to scale them throughout the enterprise, with all the challenges and obstacles, including securing funding and changing the thinking and behaviour of people.

THE DARK SIDE

Security and other risks associated with automating processes, transactions and decision-making along the supply chain will arise. This should not hold us back, we just need a new quality of risk management. In the Fourth Industrial Revolution, cybersecurity is the responsibility of leaders. The good news is that cyber-risk can be managed with traditional risk management tools. However, the magnitude of the potential damages requires a more holistic analysis and attention from the top. Further, the exchanging of successful practices across systems will help to increase resilience.

Some operating systems will be private or semi-private, within a specific sup-

ply chain, operated in a closed group of trusted parties. Other platforms might need to be neutral to attract and not scare off participants. Despite the advantages of fully integrated systems, we might need to think about some level of fraction for security reasons. Companies, governments and banks will be forced to develop robust API gateway infrastructures to be able to connect safely with all types of platforms. The cyber war is the battle of bots. AI powered agents wait at the gateways but also patrol the systems to detect malicious activities at the earliest stage.

LOOKING AHEAD

Smartening the supply chain requires coordinated change across the ecosystem of buyers, sellers, brokers, carriers, banks and governments. In theory, it requires the simultaneous adoption of required technologies along the entire chain. However, technologies will develop irregularly, with certain supply chains or businesses achieving early benefits, and certain countries moving faster than others. Harmonization of standards allows for scaling across different platforms. Common regulation and interoperability between platforms are prerequisites for the full exchange of data across the global connected network of supply chains with ports as important links.

Building intelligent ports and systems requires investment, collaboration and the mitigation of risks. Realizing a largely automated supply chain that makes and executes its own decisions requires moving from manual to digital, from connected to intelligent. We have embarked on the journey. Let's make it an enjoyable and enriching experience for all.

ABOUT THE AUTHOR

Wolfgang Lehmacher is an author, global executive, advisor, entrepreneur, and expert in the field of supply chains, transport and logistics. Lehmacher has been involved in various major change initiatives in the supply chain. He has been President and CEO of GeoPost Intercontinental and a Member of the Executive Board, as well as Director: Supply Chain and Transport Industries at the World Economic Forum.

ABOUT THE ORGANIZATION

The World Economic Forum (WEF) engages with political and business leaders within the world society to shape global, regional and industry agendas. It was established in 1971 as a not-for-

profit foundation and is headquartered in Geneva, Switzerland. It is independent, impartial and not tied to any special interests. The Forum strives in all its efforts to demonstrate entrepreneurship in the global public interest while upholding the highest standards of governance. Moral and intellectual integrity is at the heart of everything it does.

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World Economic Forum Switzerland
91-93 route de la Capite
CH-1223 Cologny/Geneva
Switzerland
Tel: +41 22 869 1212
Fax: +41 22 786 2744
Email: contact@weforum.org
Web: www.weforum.org



NIELS KRISTIANSEN, CHIEF EXECUTIVE OFFICER **ANDERS OLIVARIUS**, CHIEF PRODUCT OFFICER **THOR THORUP**, CHIEF COMMERCIAL OFFICER PORTCHAIN

Portchain is a start-up that wants to solve the toughest operational problems for the world's leading shipping players.

It has just received US\$ 1.63 million (€1.4 million) from the European Commission's Horizon 2020 project as one of 55 companies chosen from 1,600 applicants in Europe that is receiving the research and innovation programme funding.

At the helm of Portchain is its three Co-Founders, Niels Kristiansen, Chief Executive Officer; Anders Olivarius, Chief Product Officer; and Thor Thorup, Chief Commercial Officer, who all worked at management consulting firm McKinsey & Company before starting the company one and a half years ago.

Together, they and their growing team of nearly a dozen employees want to create a user-centered software that streamlines the port call process and reduces time and cost for all parties involved.

Given the scope of the upcoming Smart Ports & Supply Chain Technologies Conference, Port Technology Editor Laurence Doe recently interviewed the Portchain co-founders to see how they plan to influence the container shipping supply chain.

LAURENCE DOE: WHY DO YOU WANT TO IMPROVE THE CONTAINER SHIPPING SUPPLY CHAIN?

ANDERS: There is such a great appetite in this industry for new solutions and so many ways to apply advanced analytics, but a lack of intelligent solutions to do that, which is why we decided to make the jump and do this.

THOR: In the container shipping industry there is a lot of untapped value in in-

creased collaboration, especially amongst carriers and terminals, and that's one of the things we are leveraging a lot.

LD: HOW ARE YOU HOPING TO DEVELOP AFTER SECURING THE EU GRANT?

A: The grant will allow us to grow the team, which is important to us in our position as a new software company.

We will be adding more technicians. We already have a great team of software engineers and data scientists, but we will be adding more as we see ourselves as not only a software company, but also as a data analytics and AI company.

We already have some commercial traction in running one important pilot in Antwerp, so what the EU funding will do is allow us to continue down that road, to get out in more ports and demonstrate the value with more carriers and terminal operators.

LD: WHOM ARE YOU APPROACHING WITH YOUR SYSTEM?

T: We are approaching both carriers and terminals. Our solution contains three key components. The first is a standalone system for terminal operators who want to optimize their operations.

Second is a standalone carrier system that optimizes the short-term schedule. Then the last collaborative part brings carriers and terminals together.

A: In a pilot at Antwerp, a leading carrier, ship agency and terminal used our system in live operations to plan port calls, which was interesting as we saw that it would make the process more efficient in providing key information on port calls quicker.

They provided weekly feedback on the system.

We would turn that feedback into technology features and go back for advice. It was a great way to get a true understanding about how all the parties felt about the product and quickly adapt it to their needs.

LD: WHAT IS IMPORTANT WHEN CONSIDERING WHO TO APPROACH?

T: Like in all industries, when you are a young company, you have to find customers who have an 'early-adopter' mind-set.

These are future stakeholders who want to be at the leading edge of development, who want access to the latest technology, the latest artificial intelligence and want to use that in terminal and vessel operations.

You need people who are forward thinking and I think those are the people that we are fortunate enough to have found both on the carrier side and the terminal side, and that is an important aspect for a young company like us.

LD: WOULD YOU CALL YOUR COMPANY AND ITS SYSTEM 'DISRUPTIVE'?

A: Our business model and approach is definitely not to disrupt the industry, but the technologies that we are applying in terms of artificial intelligence are of course what enables us to make that change in operational performance.

For example, with cloud-based technologies and artificial intelligence, we are able to provide better planning and resource optimization than when the human mind has to do it alone.

Therefore, what we are really focusing on is applying these disruptive technologies to the industry, but combining them



with decision support plans and our users' deep experience.

What we believe is that extensive experience is the foundation of existing berth plans in terminals. When you then combine that with AI, that is when the synergies happen and the big impact materialize.

T: Some of the complex decisions that carriers and terminals make every day happen thousands of times a day on an industry scale.

They revolve around how to optimize the whole terminal and fleet and, of course, the planners who we are trying to help have a lot of experience but recognise that they spend so much time doing this that they need decision support tools to help them.

The fact is that the technology, until recently, has not been able to handle that before and now, with the advent of arti-

cial intelligence, we can build something that simplifies it and makes existing systems produce better-optimized decisions.

A: We want to give planners super powers in terms of how they plan.

I think our tool will provide a more optimal solution that will drive a significant impact on the bottom line and free up planners to spend their time on making the tough choices that is harder for a machine rather than the repetitive and manual tasks.

That is where the two of them come together to make more impactful operational decisions.

LD: HAVE YOU EXPERIENCED ANY PROBLEMS WITH GETTING CARRIERS AND TERMINALS TO SHARE DATA?

N: The main worry is that if you share data among competing companies, you cannot guarantee that competing companies will

use the data in a win-win situation.

That is why you need to solve this with more than one solution.

There needs to be a neutral party to handle the sharing of data for security purposes, and within the right silos – to the right people and at the right time. What is also important is that there is a win-win situation for applicable cases.

LD: IS PORTCHAIN THE NEUTRAL PARTY THAT CAN MAKE DATA SHARING A SUCCESS IN THE SHIPPING INDUSTRY?

T: The vision is that we are able to, with the value we have already demonstrated at Antwerp, expand into more ports.

By demonstrating, more broadly, how our technology works, we are hoping for a network effect that starts to get a unified use of information and standards to make the process more efficient.

We want to do that on as big a scale as possible to benefit our clients.



PORT COMMUNITY CONNECTIVITY

PLATFORMS AND LANDSIDE

CONTAINERCHAIN

Chris Collins, Chief Operating Officer,
Containerchain, Singapore

In my last technical paper in The Journal of Ports and Terminals on Container Logistics 4.0, I identified platforms and data ecosystems as one of the foundational pillars for digital transformation and new value creation in logistics and shipping. In this paper, I take a more focused look at the evolution of digital platforms across the container logistics supply chain and the importance of their connectivity to port, terminal, and landside logistics operations.

PERSONALIZED DISRUPTION

Over the past few years, tech giants such as Alibaba, Amazon, Apple, eBay, Facebook and Google, as well as younger disruptors like AirBnB and Uber, have graphically demonstrated the power of platform technology to connect multiple consumers and producers via digital applications. Processing multiple interactions and transactions at unprecedented scale, speed, and scope. These major digital platform economies are continually mining the vast quantities

of data generated to optimize operations and enable 'mass personalization'.

In the B2B space, platforms present a unique way to conduct business, while they grow exponentially in size and importance, providing unparalleled opportunities for value creation. The World Economic Forum's Digital Transformation Initiative predicts that platform-driven interactions will enable approximately two-thirds of the US\$100 trillion value at stake from digitalization by 2025. To survive in the new digital economy, enterprises will either need to embrace platform connectivity, or risk falling dramatically behind in the fast-moving push toward more collaborative supply chain efficiency.

PORT COMMUNITY SYSTEMS

Ports and landside connected supply chains are, of course, essentially physical platforms and ecosystems in themselves. They are physical nodes where a complex web of private and government entities

converge to interact and transact the business of international trade. It comes as little surprise then that the port sector was one of the first to develop the concept of information sharing platforms with the launch of the first EDI-based port community systems (PCS) in Europe back in the late 1970s and early 1980s.

A neutral and open electronic platform enabling intelligent and secure exchange of information between public and private stakeholders to improve the competitive position of seaport and airport communities, a PCS typically facilitates both B2G and B2B transactions, providing a standardized system to process data related to exports, imports, transshipments, consolidations, hazardous cargo and maritime statistics reporting. In many parts of the world, regulatory and trade process compliance is a core function. Increasingly today, PCS also form part of larger government trade facilitation, simplification and digitalization initiatives through 'Single

Window' and e-Trade programmes.

Whilst traditionally PCS's play a key role in facilitating the flow of cargo and information through ports, they tend to be limited in their connectivity with landside and hinterland ecosystems. Additionally, they too often focus on promoting the importance of information capture over providing practical digital applications that incentivize users to share information in real-time as part of solving the operational problems that create inefficiencies in the supply chain itself.

Practical digital platform applications that seek to reduce landside congestion and pollution, optimize facility utilization, expedite tri-modal traffic flows to, from, and within port areas, share information in real-time allowing proactive operational planning amongst participants (whether it be shippers, 3PLs, hauliers and other inland operators such as dry ports) are evolving rapidly and are all aimed at unlocking trapped value created by today's inefficiencies. The importance for the industry to connect these often-independent platform applications to a PCS is a critical evolution required to deliver the true benefits of digitization to the container logistics supply chain.

PORTS LEADING THE WAY

Major port centres including Antwerp, Hamburg, Los Angeles, Long Beach, Rotterdam, Singapore and others, plus shipping line and global terminal operators looking to get more embedded in the supply chain 'beyond the gate', are embarking on digital initiatives to capture, harvest, pool and share more data in more collaborative, real-time ways, with maritime and landside logistics stakeholders.

The Port of Rotterdam's CFO recently said that investing in soft digital infrastructure is now as important as the physical infrastructure itself. PSA International, the operator of the Port of Singapore and an international network of terminals, has laid out its vision to work with customers and partners on improving E2E cargo flow with new solutions that "exploit the opportunities which digitalization offers, taking advantage of the fact that PSA already operates at key nodes of global trade and supply chains." Other multinational terminal groups have also expressed their intent to get closer to shippers and provide more inland connectivity, intelligence and value added digital services.

These enterprise and geographic-centric initiatives are crucial as is their connectivity to digital landside logistics (LL) platforms. Designed to optimize the movement of containers from port gate to door and back again, LL platforms connect the ecosystem of cargo owners, landside logistics provid-



ers and transporters, marine terminals, shipping lines, inland depots/ports, and warehouses/DCs.

Singapore has recently provided two significant examples of this strategic direction under its National Trade Platform – with plans to connect over 10,000 of its existing registered users to a single independent Transport Integrated Platform (TRIP) that has already connected a large majority of the landside containerized supply chain, and in doing so, delivered significant operational and economic benefits to its stakeholders.

BEYOND THE PORT

Independent B2B LL platforms offer a critical path for the myriad of SME players that make up a significant number of any inland cargo community – many still with limited-to-no digital resources – to get connected to the network and in some cases, access digital business applications and processes to improve their day to day operations via adopting a digital industry 'baseline'. They also provide the central 'link and structure' to connect and enable emerging technologies such as Internet of Things (IoT) real-time tracking and sensors, blockchain / distributed ledgers, analytics, and artificial intelligence (AI) that can exponentially improve data quality and value to the benefit of all the platform participants.

But to extract maximum mutual value from the emerging platform economy – and avoid simply replacing current data silos and outdated manual processes with new digital divides – stakeholders, owners and operators of PCS's and independent LL platforms must work out how to collaborate and communicate on a local, regional and cross-border basis.

Interoperability via APIs and standardization of messaging flow are key, enabling a network made up of a system of systems to be created. Equally important are the rules of engagement and governance within and between different (and possibly competing) data ecosystems, as well as between private and public-sector interests.

KEY TAKEAWAY POINTS

Balancing out platform competition and collaboration, international and localized solutions, closed and open offerings and free market choice against regulatory oversight is a very difficult challenge, but not one that can be avoided if we all want to reap the benefits of digital collaboration.

One thing is certain, the technology is on hand to address enduring supply chain stakeholder concerns about fulfilment inefficiencies, lack of coordination and poor visibility. But approaching the upcoming inevitable proliferation of digital platforms and offerings from an earlier mindset will not get us to where we want to go. As Einstein said: "We can't solve problems by using the same kind of thinking we used when we created them." Coordinated discourse between market players and policymakers is therefore crucial as we enter the next wave of digital development and application of technology to drive operational and economic efficiency across the container logistics supply chain.

ABOUT THE AUTHOR

Chris Collins is the Chief Operating Officer of Containerchain, a digital operations and collaboration platform provider to the landside container logistics community.

ABOUT THE ORGANIZATION

Dedicated to simplifying operational processes, improving customer service levels, and driving down the cost of moving containers from port-to-door, Containerchain's platform and products provide real-time paperless information exchange, automation of manual processes, proactive operational planning tools, total container movement visibility, and real-time synchronized connectivity across the supply chain.

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Web: www.containerchain.com



END-TO-END PLANNING PROCESSES

Dr. Oscar Pernia Fernandez, Vice President, Applied Innovation, Navis and XVELA, Rotterdam, the Netherlands

I imagine a future where a terminal will be able to adjust its operations dynamically to meet the required service level agreement (SLA) for each vessel in the supply chain. This terminal of the future will perform in an ecosystem that helps a vessel get in and out of port efficiently while providing visibility and predictability to the whole ocean supply chain. There is a long way to go, but we are clearly moving toward such a future, and automation and digitization are central drivers in turning this dream into reality.

Before we can reach this future, we have to address fundamental constraints in the way the current container shipping industry works. While we may talk about collaboration and data sharing, at present planning processes across the container flow take place in silos, with little standardization or real-time information exchange and few opportunities for collaboration. As a result, all stakeholders lack the critical visibility and connectivity required to reach the next level of efficiency and productivity.

This paper elaborates on the meaning of end-to-end planning processes and emphasizes some standardization principles around processes and solution-based technical integration. I will also elucidate our approach at Navis to reshape the container shipping industry by getting back to our planning solution roots and by empowering our company's collective knowledge, commitment and innovation DNA.

THE NAVIS STORY

I was amazed to discover that in 1985 terminal planners were performing their jobs with paper and stickers. Not that long ago, planners had to manually monitor and manage the discharge and load operations of containers. In 1986, Navis founder Dr Jon Shields completed his PhD entitled: A Computer-Aided Container-ship Stowage Planning System. This was the root of Navis's influence on container planning.

Dr Shields and his team used their knowledge and passion to create a

new solution for stowage planning. Introducing ground-breaking innovation within the vessel planning process, they developed a software product that integrated the rising processing power of computers with a user-friendly graphical user interface – a far cry from paper and stickers.

Today, the world is different. Computer science and engineering have progressed substantially and the problems we must solve today are more complex. While the original Navis product did grow from stowage to all related terminal planning processes, such as vessel planning, berth planning, yard planning, intermodal, and so forth, the current focus at Navis – and XVELA in particular – is on leveraging connected technologies to integrate planning processes.

END-TO-END PLANNING VALUE

PROPOSITION

The problems carriers and terminals are trying to tackle with digital initiatives and



End-to-End Planning Processes

end-to-end (E2E) planning processes are as follows:

- **Planning lead time:** Planning processes across the container flow are not well integrated and this results in a myopic view of overall process performance, as well as a continuous back-and-forth/manual intervention, causing long lead times
- **Network flexibility to changes:** The container flow is driven by dynamic variables and the carrier network needs to be flexible to accommodate the inherently changing conditions across the container transportation
- **Exceptions/contingency recovery:** Unexpected disruptions incur significant costs and long recovery processes in ocean supply chains, as networks are not ready to deal with exceptions and contingencies in a standard form
- **Operational efficiency:** Process automation and analytics capabilities, particularly those leveraging new technologies, will necessitate evolving human roles and reduced OPS 'crews' for managing the different planning processes

The value brought about by solving or mitigating these problems and the potential enablement of new, related opportunities includes:

- **Standardization & simplification:** Standardize what is possible to standardize and render IT solutions to support this standardization and simplification, including more integration between processes such as stowage, berthing, vessel and yard planning
- **Integrated joint planning:** Clear guidelines and evaluation criteria both on process-specific performance and its SLA with other processes which influence that process, for example, stowage quality enabling terminal performance (BMPH)
- **Continuous improvement:** Analytical

capabilities to capture the execution outcome in order to retrofit the planning process, identify improvement opportunities, and make the planning process more prescriptive and adaptive.

- **Ecosystem synergies:** As the IT landscape becomes more diverse and software platforms more sophisticated, it is important that the technology in this ecosystem establish natural connectivity and data capabilities for holistic value generation

STANDARDIZATION

There are fundamental changes needed in today's planning processes. If our industry is able to standardize processes end-to-end, the digitalization and automation of those processes will become the easier challenge. Our industry is a 'Plan B' industry; the user experience is exception-based and so far we have not augmented humans, machines, or software to manage the uncertainty of exception scenarios in an integrated and proactive manner.

The overall ocean supply chain and the individual actors are demanding advanced connectivity and integration. We must foster paradigms that will move the industry toward further decentralization of the management of specific processes, thereby allowing greater transparency and traceability control along the supply chain, connecting vessels, ports, terminals, inland, and all related assets.

The focus on integration is not trivial and we see many actors progressing on acquiring, partnering, and developing software solutions to empower digitalization across the enterprise. The key focus is on data integration – making data consistent, agnostic, and connectable, with real-time connectivity to make applications seamlessly interact to support specific processes.

Key to this data integration is standardization and the consolidation of practices already established in other industries with regard to process engineering and middleware systems. These are fundamental to making complex and embedded systems both 'carrier grade' – reliable, tested, and proven, and 'mission critical' – vital to support key business operations.

Several port operators and technology suppliers are executing huge digital transformation plans with the goal of improving operations management and subsequent service to the ocean supply chain. A clear direction on standardization of processes and technology integration will benefit all, with lower implementation risks and higher impact.

It's time and it has been done already; when looking at how other industries have leveraged standardized processes and integration of technology in operations, our industry is clearly behind.

CONCLUSION

Ocean supply chain demand is no longer just about time and cost. The new logistics models, such as those of Amazon or Alibaba, require an integrated network from product manufacturing to product delivery, and from customer experience to market analysis, hence exigent requirements on reliability, transparency, and predictability across the cargo flow.

Terminals, in particular, are subject to planning changes/exceptions, suffering serious data quality constraints from the supporting information, as most of the processes are not standardized. So the perception that terminals are the only bottleneck is not completely fair. The end-to-end connection of planning processes is a fundamental requisite to transform terminals into intelligent network nodes.

Technology solutions will not magically solve our problems. The emerging technologies cannot enable change if we don't unlock the potential of connecting



SIMPLIFICATION AND STANDARDIZATION

Streamline planning processes, enabling consistency across ports and practices for exception management and contingency recovery.



UNLEASHED DATA FOR INTEGRATED PLANNING

Make planning data accessible, connectable and usable across processes; extract and contextualize data to empower joint planning.



CONTINUOUS IMPROVEMENTS AND OPTIMIZATION

Align KPI baseline and SLAs for holistic optimization and execution feedback loops for planning excellence and adaptability.



ECOSYSTEM AND NEUTRAL APPROACH

In-house and third party providers' solutions will need to connect data components and solutions, generating further value for all stakeholders.

End-to-End Planning Value Proposition

processes, leveraging data, and fostering value-creation mind-sets for operational and environmental efficiency and sustainability.

At Navis, while building, launching, and piloting the XVELA platform as a groundbreaking collaboration concept for the container shipping industry, we have gained insight into some of the related opportunities that are available in our industry:

- How connected technologies from XVELA and Navis ensure the availability of critical planning information exactly when it is needed, enabling more informed decision-making and better service
- How early visibility and collaborative planning can help ocean carriers and terminal operators identify and capitalize on new opportunities to increase efficiency
- How machine learning enables semi-automated stowage to simplify and speed up vessel stowage planning while improving utilization
- How ship owners and managers can gain real-time vessel performance data to monitor, analyse and optimize fleet performance and improve energy efficiency

All in all, digitization and automation, along with the use of emerging technologies, will help us realize the vision to enable faster and more open collaboration across the container flow. However, we must also achieve the standardization and integration principles outlined in this article if our progress is to be lasting and consistent.

ABOUT THE AUTHOR

Dr. Oscar Pernia (Telecommunications Engineer and Industrial Engineering PhD) is responsible for Applied Innovation at Navis and XVELA, leading ATOM Labs in Rotterdam and focusing on the discovery and experimentation for Navis software solutions while tackling ocean supply chain related problems. During his career, Oscar has supported different organizations in two main areas: building new capabilities and creating highly motivated and talented teams, and driving IT solutions and operational processes together to produce tangible business results in those companies. For more than 15 years, the baseline of his work has been centered on the implementation and optimization of processes and solutions for ports and terminals, with the last 10 years focused on automated terminals, participating in more than 30 terminal projects globally.

ABOUT THE ORGANIZATION

Navis
Navis, a part of Cargotec Corporation, is a provider of operational technologies and services that unlock greater performance and efficiency for the world's leading organizations across the shipping supply chain. Navis combines industry best practices with innovative technology and world-class services to enable our container terminals and carriers alike to streamline their ocean supply chains and

better collaborate together, transforming how goods are efficiently delivered. Whether tracking cargo through a port, automating equipment operations, or managing multiple terminals through an integrated, centralized solution, Navis provides a comprehensive set of solutions to optimize terminal performance, vessel performance and cloud-based collaboration that drives transparency, efficiency and profitability to a network of ocean carriers and terminal operators.

XVELA
XVELA provides a transformative, cloud-based collaboration platform and maritime business network that drives transparency, efficiency and profitability to ocean carriers and terminal operators. Through real-time collaboration, shared data and actionable visibility across the vessel rotation, XVELA enables terminals, carriers and their operational partners to work together to simplify, coordinate and synchronize their operations, starting with stowage planning and quickly expanding to berth management and port call optimization. The result is a win-win solution that allows both terminals and carriers to forge new efficiencies, improve customer service and reliability, and capture substantial untapped savings across the ocean supply chain. www.xvela.com

ENQUIRIES

Web: www.xvela.com



DP WORLD 

DP WORLD

LINKING THE SUPPLY CHAIN

Rashid Abdullah, CEO: Europe & Russia,
DP World, Dubai, UAE

Technological disruption has altered every aspect of our lives. The changes caused by disruption have been so dramatic and irreversible that none of us could have foreseen them. In fact, our current world, with all of its high-tech distractions and ever-increasing connectivity, is incomprehensible to our very own parents.

From voice-activated homes, to algorithms finding our new favourite bands, the incessant march of disruption has left no stone unturned. Maritime logistics is no different, with technological changes challenging traditional notions of supply chains, logistics networks and terminal operations. While many operators may be perturbed by the rate of change, sticking your head in the sand and hoping for the best is not a viable business model in such a competitive and dynamic sector.

BIGGER, BETTER SHIPS

The capacity of the biggest container-ships afloat has risen sharply in the last five years and more than doubled since 2000. The basic economics explain this

shift; larger sizes have led to a more cost-efficient offering – something that is worth celebrating in our sector. The ships on the seas could get even bigger, within reason.

Yet, larger ships require a different approach to loading, sorting and discharging cargo; an approach that many terminal operators have been slow to pick up. Port terminals require wider loading berths to accommodate these bigger ships and cranes with a greater reach and capacity. The cost-efficient offering of larger ships is tarnished if it takes the terminal operator twice as long to get the cargo off the ship and onto the next stage in the supply chain.

Terminal operators need to wise up to the reality of larger ships, harnessing the latest technologies to help them accommodate these behemoths of the sea. For example, in the UK and Belgium – at DP World Southampton and DP World Antwerp Gateway – we have invested in state-of-the-art super post-panamax cranes that can handle the largest of ships. A greater reach with larger lifting capaci-

ties allows the decanting of large cargo ships at impressive speeds, making sure that we squeeze out any of the potential delays out of the supply chain. For us, as a primarily origin and destination operator, it's extremely important to have fast, efficient craning capacity, as we are the first touch point for cargo leaving the shores, and the last when it comes ashore.

In addition to the increased craning capacity we have at our terminals, we have also introduced autonomous cranes. Automating cranes and other terminal operations is nothing new, but developments and advances in autonomous technology and machine learning have meant we can better integrate autonomous cranes into our yard handling, as well as programming more sophisticated and complex loading and discharging procedures of containers.

FORECASTING, TRACKING AND

TRANSPARENCY

Technological innovations that are also changing the way we manage, operate



and maintain our terminals are those technologies that allow for better forecasting and tracking, as well as providing greater stock transparency. Technologies within this subcategory are by no means ubiquitous and some require extensive investment, while others are relatively cheap to integrate into existing operations.

As stated before, the maritime logistics industry is ripe for disruption and those who seek to dare to challenge the status quo will reap significant benefits in the future. Within the paradigm of modern trade and booming e-commerce, forecasting product cycles and changes in consumer demand, as well as providing transparency to merchants using your network, is crucial for creating successful and lasting partnerships.

While consumers may purport to be more discerning than they actually are, merchants and suppliers are having to tighten up their supply chains in light of the numerous scandals that have taken place in a variety of sectors, such as garment manufacturing. Providing transparency and comprehensive logs of cargo information and port throughput to these merchants, which can easily be integrated into their systems, is going to become essential for terminal operators.

The DP World global network has invested heavily in our terminal ecosystems to improve our ability to forecast, track and

provide reliable information at the drop of a hat. By using smarter technologies, we have helped drive efficiency savings and improved the service we offer our partners. Our 'Where's My Container' service, for example, has been rolled out at our terminals in the UK and we are looking at rolling it out across our other European terminals in a phased manner. This gives our customers real-time insight as to where their cargo is by using their individual identification code, putting them at ease and helping them manage their customers' expectations.

We also displayed our sustainability efforts through DP World's Solar Power and Global Education Programmes, and have also launched an innovation incubator 'InnoGate' to encourage employees to think out of the box and develop ideas that improve what we do and how we do it. To date there have been 1,972 staff generated ideas that have led to 139 success stories.

CONSUMER TRENDS DRIVING

TECHNOLOGICAL DISRUPTION

Disruption often feels like it appears from nowhere, but there is always a driving force, whether it is conscious or not. In our game, the customer is king. The changing rate of consumer demand, the form that demand takes, and the expecta-

tions customers have of the supply chain's ability to deliver, are all driving substantial technological shifts.

One of the major trends driving technological disruption within port ecosystems is the need for speed, fuelled by the ever-growing offering of next day deliveries. As merchants continue to offer faster and cheaper delivery times on goods, the logistics supply chain is having to streamline itself, squeezing out inefficiencies and investing in technology that helps them live up to lofty customer expectations.

When speed is the name of the game, and ships are getting bigger, integration is the route to success. Getting containers off of the bigger ships and onto the next stage in the chain in a timely manner is key for any terminal operator. For many of these operators, a lack of clarity and organization in this stage of the supply chain is a major cause of delays, incurring costs and frustrating merchants at the same time. Intermodal port offerings that integrate sea, road, rail and even barge, with automated loading systems and stock oversight are becoming more of a prominent model within maritime logistics, as providers are seeking to cut out cost by gaining back those minutes, hours and days that would be lost by using more traditional operations.

We have seen first-hand the difference an intermodal model can make. At DP

World Constanta in Romania, our operation allows cargo to be removed from incoming ships and onto rail heading across the country and with the potential to reach the hinterlands of west Europe at a lightning fast rate. This level of integration is made possible by the technology we use to forecast and streamline our operations.

As such, we are aiming to encourage a port-centric model throughout our terminals. For example, London Gateway's logistics park offers importers an exciting opportunity to tighten up their supply chain solutions, cutting costs, time and carbon emissions by locating their landed cargos closer to major population centres. The development of a Common User Facility (CUF) means that logistics services and activities can be offered on a 'pay-as-you-go' basis, ranging from basic devanning to cross-docking, storage and value-added activities such as pick-and-pack, labelling, pre-retail and distribution.

As well as reducing costs, port-centric logistics can also streamline operations and improve customer service because containers are unloaded, checked, stored, picked and distributed from a single port-based location. As a result, customers benefit from lower costs, shorter lead times, a more efficient supply chain, a reduced carbon footprint, and cost-effective logistics and distribution. We want to help our customers perfect the port-to-shelf element of their supply chain.

CLEANER SOLUTIONS

With the International Maritime Organization meeting recently in an attempt to thrash out a pathway for shippers to aid in the global effort to decarbonize, DP World has already been recognized for its leadership position by the Carbon Disclosure Programme (CDP). Technological advances are allowing us, as terminal operators, to offer cleaner and better solutions to our partners, something that we have an economic and social imperative to do.

Larger ships still need fuel. In order to harness the efficiency savings of emerging technology and decarbonize our operations, we have put cleaner, renewable energy at the heart of our network's future. At our facility in Antwerp, we have built an onsite bio-gas plant and installed wind turbines to decarbonize our terminal operations. Our Antwerp Gateway terminal is the greenest terminal in the Port of Antwerp. In some terminals, we have taken this further by installing electrified cranes to help load and unload ships and aid yard work, as well as integrating electrified barges. As renewable energy becomes ever more cost-effective due to advances in technology, we are planning



to continue our journey to creating a zero-carbon logistics network.

Remote control cranes in our terminals at DP World Yarimca and Rotterdam World Gateway are energy saving through more accurate positioning on the ship with smoother and efficient movements, giving consistent productivity that's unaffected by external factors. At DP World London Gateway, our grid connected cranes regenerate energy back into the electricity grid for reuse.

Our latest straddle carriers are using hybrid technology that harnesses regenerative energy and stores it into the battery for future use. We continue to investigate other concepts and technologies for existing RTGs and Straddle Carriers to further reduce the carbon footprint of our operations.

CONCLUSION

Technological advances, and the subsequent disruption they cause, can make our ports greener, bigger and better. But this will not happen overnight. Changes of this magnitude require terminal operators to think differently about their operations, how they can be improved and where technology will bring the greatest gain, whether it's to their internal processes and systems or to the service they are offering their customers. Changes are never easy to undertake, but when the alternative is being left behind, the entire sector has to move forward.

ABOUT THE AUTHOR

Rashid Abdulla has been recently appointed as CEO & Managing Director of DP World's Europe and Russia Region. Rashid has extensive industry experience and moved on from his most recent role as CEO & Managing Director of DP World's Asia Pacific Region; where he contributed significantly to the success and growth of multiple business units in the region.

ABOUT THE ORGANIZATION

DP World is a leading enabler of global trade and an integral part of the supply chain. It operates multiple yet related businesses – from marine and inland terminals, maritime services, logistics and ancillary services to technology-driven trade solutions. It has a portfolio of 78 operating marine and inland terminals supported by over 50 related businesses in over 40 countries across six continents with a significant presence in both high-growth and mature markets.

ENQUIRIES

Rajeev Shankar
Regional Marketing and Communications
Manager
DP World Europe and Russia
Email: rajeev.shankar@dpworld.com



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