

THE PORT OF THE FUTURE

CAPTURING THE SENSE OF WONDER

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For the port of the future, bigger vessels, broader carrier alliances, container capacity consolidation and larger hub and spoke port networks will be changing costs and revolutionising the way in which profits are generated from operations. Simultaneously, the port of the future will manage increased investment along with demands for improved productivity and higher level of service.

To reach this stage of development it will require significant investment in new technology and changes in operational mindsets and in the way technology is used. Port operators of the future will be managing far more information technology than in the past; leveraging cloud based networks to connect with far more shipping partners, and processing huge amounts of data to improve planning, control and execution of operations.

The work ahead is significant and will ultimately lead to a far more efficient and predictable ocean supply chain, while eliminating or drastically reducing the estimated US\$17 billion waste in current port and carrier business processes.

MEGA-HUBS, CONNECTIVITY AND SYNERGIES

In the port of the future, transshipment hubs will play a critical role. Trade routes will be based on a hub-and-spoke network with large hubs feeding multiple smaller ports, and intermodal logistics will be a critical part of the overall system to move containers between the different modes of transportation: deep-sea, feeder, barge, rail and road.

Carrier vessel networks will use advanced connected systems that provide flexibility and visibility across their entire vessel and port network. Stowage will be planned using a cloud-based collaboration platform with advanced tools integrated with vessel, terminal and port data to help carriers and terminals optimise their asset utilisation and carrier network reliability.

The port of the future will be integrated into a maritime information network where relevant data is accessible and shared with shipping partners in a secure environment. Automatic processing of cargo information across this maritime network will provide container movement transparency and efficiency, as well as support other port processes associated with the flow of containerised cargo.

'PIT STOP' VESSEL OPERATIONS

In the port of the future, vessels will be constantly and reliably connected to the internet and can be automatically routed and controlled to increase sailing performance and vessel utilisation, while managing conditions that affect sailing time and cargo handling performance such as trim, weather and lashing.

Once at port, port efficiency will be based on end-to-end port operations, not pure terminal operations (terminal operations typically account for 62% of the total port stay. There is 38% of the port stay that vessels spend waiting for vessel services; berthing, steaming-in and out). This time could be significantly reduced by better transparency, richer data-exchange and more intelligent solutions assisting these port processes. Maersk have started to optimise 'end-to-end port operations' already, and in the future the following activities will be the norm:

- Vessel arrival: with a strong focus on carrier schedule monitoring and data availability, leveraging accurate vessel positioning data compared with vessel pro-forma schedules and planned vessel ETA
- Berthing management: carriers will have a clearer view of terminal berth allocation and availability, this will in turn provide terminals with more visibility of port resources and better container and vessel data quality
- Vessel visit management and port process control: better visibility and coordination of vessel visits through information sharing and collaboration platforms with shipping partners responsible for ship arrival and departure (pilots, tugs, mooring and so forth)

Area	Status Quo	Technology: The Sense of Wonder
Stowage Planning Process	Poor alignment of stowage plans results in under-utilised terminal resources and a longer vessel turn-around time. Lack of coordination across carrier networks hinders the synchronisation of 'mother' and 'feeder' services. Terminal operators and ocean carriers are often unable to eliminate waste and control costs	A platform to collaborate in the vessel stowage planning and execution process, providing the necessary visibility to positively impact the overall terminal related planning and carrier network performance. A network providing real-time transparency to enable increases in efficiency and new cost savings
Cargo Information	Cargo information infrastructure not adequate to provide transparency and visibility for the different stakeholders. Insufficient and inaccurate information for critical container parameters such as weight. Container tracking is limited	Cloud-based maritime platform providing timely and accurate information across the whole ocean container flow. More applications available to leverage cargo information and improve terminal and port operations. Ability to respond to unplanned events in the ocean supply chain
Collaboration	Traditional manual processes (phone calls/faxes) and a lack of access to information creates unnecessary container moves and late deliveries. Carriers unable to deliver smooth end-to-end services to shippers, allowing freight forwarders to gain significant market share	Tools realising efficiencies through collaboration: <ul style="list-style-type: none"> - View, discuss, modify and optimise plans in real-time - Notification systems to alert stakeholders to changes, problems or opportunities in the supply chain - Common performance metrics to measure and identify opportunities for continuous improvement

Area	Status Quo	Technology: The Sense of Wonder
Vessel voyage optimisation	Serious difficulties to maintain 'slow steaming' sailing strategies. Uncertainty on actual trim and lashing vessel conditions impact vessel utilisation. Insufficient use of data or analytics to deal with contingencies	Vessel automation, onboard tracking, fleet control and real-time remote control. Energy efficient operations and decision support for better decisions. Proactive management of vessel utilisation and voyage optimisation
Berthing management	Lack of clear and timely information creates uncertainty about ship arrivals which decreases quay utilisation and causes wasted gang-time. Ports left dealing with serious congestion problems and terminals under-utilising their berth potential	Solutions to allow berth utilisation to be optimised, enabling a smoother flow of ships and feeders at the quay. Better visibility for carriers on berth availability and proactive interaction with terminals on berth allocation and vessel turn-around
Vessel visit management and port processes control	Lack of coordination with piloting services. Lack of effective resource assignment and use of port infrastructure utilisation. Unplanned waiting times impacting vessel schedules and container delivery. Lack of integrated procedures involving safety, security, environment and operations	A closer information exchange between port authority, terminal and vessel for key events in the process to minimise idle time. The whole port accessing information in real-time; having vessels, trucks and trains at port available at the right time and place. Integrated procedures

Port authorities such as Rotterdam and Hamburg have initiated technology projects with the aim of making end-to-end port operations more efficient and significantly improving port process control and asset management. For fast vessel turnaround, or 'pit stop' port operations, the utilisation of existing data from technologies (VTS, AIS, TOS) and other systems supporting vessel operations will be essential to optimise overall port performance.

A 'QUANTUM LEAP'

A major evolution is taking place in some of the current concepts used for driving operational planning, control and execution practices at terminals. But it is not enough, and several industry experts are calling for more progress or a 'productivity quantum leap'.

Related operational decisions are normally linked to each other: the port of the future will have a technology framework to support integrated planning and holistic optimisation. This will provide visibility for operations across all time horizons, areas of operations and modes of transportation. Computing power will assist real-time decision making and help terminal operators to analyse significant amounts of data quickly to better manage trade-offs and improve overall planning and execution.

Terminals need to execute operations across different operational areas addressing performance, balance and correlation in order to keep

capacity and profitability shift by shift, vessel by vessel. New technology and user interfaces for monitoring operations will help operators easily see what's coming next, and address bottlenecks and congestion, before issues impact performance. Systems will provide recommended options for dealing with unplanned disruptions.

Finally, the port of the future will manage operations as part of a 'synergistic league' of ports with visible operational information from carriers and terminals across the whole rotation of port visits and the vessel network. Carriers, alliances and ports will share relevant data for vessel and stowage planning providing operational staff with more time and flexibility to respond to changes and plan berthing and yard operations. A collaboration platform will provide an environment for the secure exchange of data and a choice of applications to facilitate the flow of this information, providing decision tools and analysis.

CONCLUSION

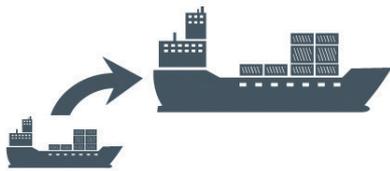
This article provides a viewpoint of the current status and a 'sense of wonder' about what the 'port of the future' will look like from technology perspective. It is a global trade digital framework providing:

- For terminals: necessary information to optimise performance, storage, better handling house-keeping, and to drive capacity, performance and cost trade-offs
- For carriers: holistic software suites optimising stowage planning,

Area	Status Quo	Technology: The Sense of Wonder
Integrated planning and holistic optimisation	Terminal system is a disconnected puzzle that can't provide the data to best manage terminal operations for profitability and efficiency. Lack of operational intelligence to provide the 'smart' analysis for decision-making processes	An integrated planning solution to correlate operational decisions across quay, yard and horizontal transportation for the different time horizons, providing resource allocation and flexibility to accommodate planning changes and to create contingencies
Operations monitoring	Lack of flexibility to accommodate planning changes. Sub-optimal utilisation and allocation of resources. Reactive decision making to address congestion and bottlenecks in real-time. Unplanned disruptions impacting performance and profitability	A digital terminal eco-system able to analyse a large amount of operational data and dependencies before taking a decision. Proactive real-time operations monitoring solutions that can respond to changes and exceptions on its own
Advanced integration among ports	Port by port planning and optimisation without visibility across ports and carrier network. Operational improvements are very limited because there is little time for re-planning when operations are about to start. Many decisions have to be taken with insufficient information	A platform providing an environment to support advanced integration with terminal software applications, and supporting processes for better collaboration. Collaboration in turn creating 'healthy hubs' that will improve network reliability across the ocean supply chain, and improve asset utilisation

PORTS OF THE FUTURE

Industry Trends in Container Shipping



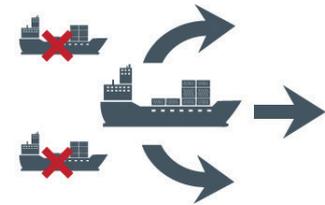
Bigger Vessels



Broader Alliances



Fewer Suitable Ports



Capacity Consolidation

The future will be provided by technology solutions removing current sources of waste for optimizing the container flow across the whole ocean supply chain.

AREAS & SOLUTIONS ENABLING THE FUTURE

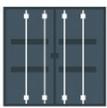
Mega-Hubs, Connectivity & Visibility at OCEAN SUPPLY CHAINS

STOWAGE PLANNING



Joint 'decision making' for focusing on network value and fluidity among the ports forming those hub-and-spoke models

CARGO INFORMATION



Cargo information is accessible and shared in a timely and accurate fashion, enabling consistency for planning processes and safety and secure operations

TRANSPARENCY & COLLABORATION



Digitalized container flows, 'end-to-end' traceability and effective driving for capacity, performance and cost trade-offs

'Pit Stop' Vessel Operations at PORTS

VESSEL SAIL & NAVIGATION



Ships as connected assets interacting with cloud software application for automatic routing, monitoring and tracking; addressing sailing performance and vessel utilization

BERTHING SCHEDULE



Nexus between carriers and terminals to leverage efficiency and reliability for vessel visit management, maximizing terminal handling capacity. Full visibility for flexibility while managing berthing and yard allocations

END-TO-END PORT PROCESSES CONTROL



Port technology and processes focus on Port Optimization not only Terminal Optimization, including piloting and other vessel services

Productivity 'Quantum Leap' at TERMINALS

INTEGRATED PLANNING & HOLISTIC OPTIMIZATION



Software being cognizant of the operational processes, addressing correlation between operational decisions and across different time horizons

OPERATIONS MONITORING



Proactive real-time solution responding to changes and exceptions on its own, including smart analysis on productivity and/or cost to recommend effective decisions or adjustments to users

ADVANCED INTEGRATION AMONG PORTS



Carriers and terminals sharing information well in advance, with operational processes and decisions optimized 'among ports' instead of 'port-by-port'

- network value as well as vessel performance, utilisation and capacity
- For shippers and cargo-owners: a data and application platform including visibility and better control, enabling a smoother and higher-value service

Technology exists today to eliminate an estimated US\$17 billion of waste through the adoption of more integrated solutions. But for the vision of the port of the future to be fulfilled, it will require strong industry leadership and a paradigm change in mindset.

ABOUT THE AUTHOR

Dr Oscar Pernia joined Navis in December 2011 to manage the planning, development and execution of its automated terminals product strategy. Prior to joining Navis, he worked for TTIA, first automated terminal in the Mediterranean by Hanjin Shipping where he lead terminal implementation and optimization. Before TTI, Oscar spent eight years in IT with the Algeciras Bay Port Authority where he held a variety of positions, managing several projects focused on technology and process optimisation.

Manuel Perez is the Strategy Director at Xvela. He recently joined Navis to manage the design, development and execution of Xvela products. Prior to joining Navis, Manuel worked for Maersk Line for 17 years in various operational roles and led the development of several IT projects focused on efficiencies and process optimisation.

ABOUT THE ORGANISATION

In a time when vessels are getting bigger and industry demands are increasing, terminals are facing tremendous pressure to be more efficient and productive. Navis understands that as operational processes become more complex, efficiency, collaboration and productivity are essential. As a trusted technology partner, Navis offers the tools and personnel necessary

to meet the requirements of a new, and ever-evolving, global supply chain. The Navis N4 terminal operating system is a platform that can integrate partner technologies, enabling terminals to optimise productivity and enhance the service delivered to its customers.

Ocean carriers and terminal operators know that efficiencies can be gained, waste eliminated and rev-enuue increased through better collaboration on vessel stowage planning and execution. But the tools and incentives to change these business processes have been lacking—until now. Xvela is a new venture that utilises the legacy of the Navis PowerStow vessel stowage solution to provide a transformative, cloud-based collaboration platform and network. Xvela enables carrier and terminal vessel planners to easily connect and coordinate vessel stowage planning and execution activities. The result is reduced vessel operation and terminal costs and improved utilisation of critical crane, vessel and man-power resources.

ENQUIRIES

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INDUSTRIAL REVOLUTION 4.0

In August 2015, a Navis white paper, The Port of the Future, received much optimistic feedback mixed with many versions of the question “but where do we start?”. While everyone knows that the ocean container supply chain, needs a dramatic change to reach peak efficiency, it’s difficult to see the forest for the trees. Together, we need to reach a higher vantage point where we can conceptualise and articulate a vision about the future, so that we may bring it into being. Part of this effort is to make the vision credible, attainable, and profitable for the industry’s main actors. Certainly, for change of the scale we are proposing, a sea change, there is a lot of work to be done in many different areas.

This industry is driven by forces and dynamics that make good ideas, even the smallest improvements, difficult to realise. These are primarily attributable to two reasons. On the one hand there is myopic thinking on the part of some players who view this as a zero sum game. On the other hand, most players see the gains to be made but lack the information systems, tools and data that are needed to realise these opportunities.

As such, this level of change requires a holistic view that benefits the entire shipping ecosystem. We must go to the root of the problems, which begins with a focus on the operational processes we are trying to reform and the data available to drive those improvements. While advanced optimisation and analytics are promising, the most sophisticated

algorithms will not make a difference until we get to a different stage of transparency and collaboration. Before the quantum leap can be achieved, we must establish a new mode of thinking about fundamental operational processes, such as stowage planning, berth management and vessel port call, and how those processes, and the people and technology involved, interlock and impact each other.

We are on the threshold of a new era in the ocean supply chain. And for those of us ready to reshape the future, these are exciting times. Industrial Revolution v4.0 is promoting automation and data exchange in manufacturing technologies. We don’t know yet what it will mean for our industry, but what we know is that it must be an integrated and comprehensive transformation, led by a new generation of thinkers who challenge the status quo and 30+ years of best practices & technologies, and aspire to a global solution, involving all stakeholders to create an end-to-end and irreversible impact.

And when we will get there, and we will, a universe of opportunities will emerge; technologies like Artificial Intelligence and Machine Learning will be applied and will create the impact that is already happening in other industries by companies like Amazon, Paypal, Google and LinkedIn.

The Future is not something we will be traveling to; the Future we are talking about needs to be created.