Port of the Future: A Sense of Wonder

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INTRODUCTION

For the port of the future, bigger vessels, broader carrier alliances, container capacity consolidation and larger hub and spoke port networks are changing costs and the way profits are generated from operations. At the same time, ports are managing increased investment along with demands for improved productivity and higher level of services.

To manage these changing costs and improve productivity will require significant investment in new technology and changes in operational mindsets and 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, processing huge amounts of data to improve the planning, control and execution of their operations. The work ahead is significant and will ultimately lead to a far more efficient and predictable ocean supply chain, eliminating or drastically reducing the estimated $17 billion waste in current port and carrier business processes.
MEGA-HUBS, CONNECTIVITY & SYNERGIES 
IN THE OCEAN CHAIN SUPPLY

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. 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 providing flexibility and visibility across their entire vessel and port network. Stowage will be planned using a cloud based collaboration platform. Advanced tools integrated with vessel, terminal and port data will help carriers and terminals optimize their asset utilization 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 containerized cargo.

### OCEAN CHAIN SUPPLIES: 
FROM STATUS QUO TO TECHNOLOGIES OF THE FUTURE

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<td>Stowage Planning Process</td>
<td>Poor alignment of stowage plans result in under-utilized terminal resources and a longer vessel turn-around time. The lack of coordination across carrier networks hinders the synchronization of ‘mother’ and ‘feeder’ services. Terminal operators and ocean carriers are often unable to eliminate waste and control costs.</td>
<td>A platform to collaborate on 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 increases efficiency and delivers new cost savings.</td>
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<td>Cargo Information</td>
<td>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.</td>
<td>A cloud based maritime platform providing timely and accurate information across the whole ocean container flow. More applications will be available to leverage cargo information and improve terminal and port operations with the ability to respond to unplanned events in the ocean supply chain.</td>
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| Collaboration across the Container Flow    | Traditional manual processes (phone calls/faxes) and lack of access to information creates unnecessary container moves and late delivery. Carriers are unable to deliver a smooth, end-to-end service to shippers, thus allowing freight forwarders to gain significant market share. | Tools realizing efficiencies though collaboration are coming:  
  • View, discuss, modify and optimize plans in real-time  
  • Notification systems to notify stakeholders of changes, problems or opportunities to address in the supply chain  
  • Common performance metrics to measure and identify opportunities for continuous improvement. |
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 utilization while managing for conditions that affect sailing and cargo handling performance such as trim, weather and lashing.

Once at port, efficiency will be based on end-to-end port operations. Of the total port stay, 62% is accounted for by terminal operations and the remaining 38% is spent waiting for vessel services, berthing and steaming in and out. This time could be significantly reduced with better transparency, richer data exchange and more intelligent solutions assisting these port processes. MAERSK has started to optimize ‘end-to-end port operations’. 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: to provide carriers with a clearer view of terminal berth allocation and availability, and to provide terminals with more visibility of port resources and better container and vessel data quality.
- Vessel Visit Management and Port Processes Control: to provide 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 others)

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

### VESSEL OPERATIONS AT PORTS: FROM STATUS QUO TO TECHNOLOGIES OF THE FUTURE

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<td>Vessel Voyage Optimization</td>
<td>Serious difficulties to maintain ‘slow steaming’ sailing strategies. Uncertainty on actual trim and lashing vessel conditions impact vessel utilization. Insufficient use of data or analytics to deal with contingencies.</td>
<td>Vessel automation, onboard tracking, fleet control and real-time remote control. Energy efficient operations and decision support for better decisions. Proactive management of vessel utilization and voyage optimization.</td>
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<td>Berthing Management</td>
<td>Lack of clear and timely information creates uncertainty about ship arrival which decreases quay utilization and causes wasted gang-time. Ports left dealing with serious congestion problems and terminals underutilizing their berth potential.</td>
<td>Solutions to allow berth utilization to be optimized, enabling 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.</td>
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<td>Vessel Visit Management &amp; Port Processes Control</td>
<td>Lack of coordination with piloting services. Lack of effective resource assignment and port infrastructure utilization. Unplanned waiting times impacting vessel schedules and container delivery. Lack of integrated procedures involving safety, security, environment and operations.</td>
<td>Closer information exchange between port authority, terminal and vessel for key events in the process to minimize idle time. The whole port access to relevant information in real-time for having the vessels, trucks, trains at port available at the right time and place, and integrated procedures.</td>
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A major evolution is taking place in some of the concepts currently 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 that are normally linked to each other will have a technology framework to support integrated planning and holistic optimization in the port of the future. 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 analyze significant amounts of data 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 visibility to operational information from carriers and terminals across the whole rotation of port visits and vessel network. Carriers, alliances and ports will share relevant data for vessel and stowage planning providing operations 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, provide decision tools and analysis.

### CONTAINER TERMINAL OPERATIONS: FROM STATUS QUO TO TECHNOLOGIES OF THE FUTURE

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<td>Integrated Planning &amp; Holistic Optimization</td>
<td>The 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.</td>
<td>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.</td>
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<td>Operations Monitoring</td>
<td>Lack of flexibility to accommodate planning changes. Sub-optimal utilization and allocation of resources. Reactive decision to address congestion and bottlenecks in real-time. Unplanned disruptions impacting performance and profitability.</td>
<td>A digital terminal eco-system able to analyze a large amount of operational data and dependencies before taking a decision. Proactive real-time operation monitoring solution that can respond to changes and exceptions on its own.</td>
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<td>Advanced Integration among Ports</td>
<td>Port-by-Port planning and optimization, 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.</td>
<td>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 utilization.</td>
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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 a technology perspective. A global trade digital framework providing:

- for terminals, necessary information to optimize performance, storage, better handling house-keeping, and to drive effectively capacity, performance and cost trade-offs,
- for carriers, holistic software suites optimizing stowage planning, network value and vessel performance, utilization and capacity,
- for shippers and cargo-owners, data and application platform including visibility and better control, enabling smoother and higher-value service.

Technologies exist today to eliminate an estimated $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 change in mindset.
PORTS OF THE FUTURE
INDUSTRY TRENDS IN CONTAINER SHIPPING

BIGGER VESSELS    BROADER ALLIANCES    FEWER SUITABLE PORTS    CAPACITY CONSOLIDATION

The future will provide technology solutions that will remove current sources of waste for optimizing the flow of containers across the whole ocean supply chain.

AREAS & SOLUTIONS ENABLING THE FUTURE

STOWAGE PLANNING
Joint ‘decision making’ for focusing on network value and fluidity among the ports forming hub-and-spoke models

VESEL 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

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

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

INTEGRATED PLANNING & HOLISTIC OPTIMIZATION
Software being cognizant of the operational processes, addressing the correlation between operational decisions and across different time horizons

END-TO-END PORT PROCESSES CONTROL
Port technology and processes will focus on port optimization not just terminal optimization, including piloting and other vessel services

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’

CONCLUSION