Seaways

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Smart shipping, smart ports
Making the most of digital opportunities p12

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'Get Smart'

Developing smart maritime ecosystems

Mikael Lind Research Institutes of Sweden (RISE)
Jan Gardeitchik Yaquina Consulting & Management
Jillian Carson-Jackson FNI, The Nautical Institute
Sandra Haraldson Research Institutes of Sweden (RISE)
Phanthian Zuesongdham Hamburg Port Authority

When was the last time you looked at your smart phone? Ten minutes ago? Twenty? Maybe you are reading this article on your phone right now! Just consider how powerful the smart phone has become – you can access data at the touch of a button, store digital documents, make reservations, even order your groceries. Imagine what you could do with that 'smart' technology as the Master or operator of a ship! You could harness that same 'smart' technology to know how well prepared your destination port is to meet your needs. On the flip side, the port would know the status of your vessel – not just the position – but so much more. With this information, both the ship and port could take appropriate actions to seamlessly integrate the operations at sea with the operations in the port. Enhanced digital connectivity is the enabler!

Emerging developments – everything becomes smarter

The current maritime transport ecosystem is often perceived as highly self-organised, with little connection between individual components. This can result in sub-optimal performance in many areas with unnecessary costs at all stages of the supply chain. For example, traditional routing and shipping models can cause unnecessary fuel consumption and wait times. Digitalisation in the maritime sector is challenging the status quo to promote integrated performance at all stages of the global transport chain.

Going digital means that independent 'objects' can be connected. These 'objects' include status on items such as engines, bollards, cranes, and containers, as well as processes such as scheduling, planning and all elements in port call operations. The digital insights from these 'objects' enable companies to better predict activities and ensure effective use of resources. This has given rise to the 'smart' industry, such as smart ships, carrying smart containers, proceeding to smart ports, operating in smart cities. This 'smartness' relies on digitalisation.

The smart port concept is frequently used as a buzzword, with many large, small, and medium-sized ports across the globe pursuing smart

port initiatives. Examples of ports with 'smartness' on the innovation agenda include the large ports of Antwerp, Hamburg, Rotterdam, Singapore, Busan, Los Angeles, Abu Dhabi and also smaller ports like Tyne, Gävle, Rauma, and Limassol. These activities include Living Labs, testbeds, and incubators. While the focus of activities may differ, the agendas include data sharing environments for:

● Optimised and coordinated port operations,
● Real time navigation,
● Smart power,
● Smart logistics,
● The Internet of Things (IoT) and digital twinning (replicating physical assets on a digital platform), and
● Autonomous operations.

In Sweden, the I. Hamn (In Port) initiative is joining small and medium size ports and associated stakeholders in digitalisation, automation, and electrification.

The smart port concept

The concept of the digitally connected smart port emphasises the need to look at the port as both a consumer and a provider of information. As a consumer of information, the port can optimise its operations across the process chain, while as a provider, it sends information to port customers, enabling greater integration of systems.

The digital interface supports the core concept of an 'ecosystem' [see box below], enabling consistent and effective interactions. Within the smart port ecosystem, all actors within the port can access, input, influence and view information about the operations to effectively use resources and reduce pollution. The benefits of this 'smart' ecosystem include:

● Shared situational awareness of the movement of vessel traffic (and other traffic) based on spatial-temporal data;
● Dynamic time slot allocation for port visits enabling just-in-time arrivals, departures and operations, and minimising waiting times and turn-around times;
● Smart containers providing information on their status and position within the port;
● Sensor data on the status of the fairway, including aids to navigation, weather, tides and currents;
● Sensor data on the operation and condition of infrastructure and superstructure, such as rail, bridges or cranes;
● Alignment of services needed during the port call, such as maintenance and bunkering;
● Expedited exchange of digital documents and certificates;
● Lowered administrative burden for reporting during port visits.

As experience is gained with 'smart' operations and more port and allied services become connected in the operations, these value-added services will evolve and grow. Ports could provide services that will affect a multitude of stakeholders in the 'outside world'. These might include enabling shipping companies to optimise resources, providing cargo owners, forwarders, and end-customers with track and trace information, and providing the end-customer with more precise delivery information. The future port will be not only a transhipment hub, but also an important information hub for the whole transportation system.

Smart ports = smart people

People working onboard ships and people operating on the shore will experience increased opportunities to access data that is relevant for their tasks. AIS, as an early digital innovation, has provided us with great opportunities for developing situational awareness to support well-informed decisions. A smart ecosystem uses multiple data streams to support different operations. All actors can benefit from a smart maritime ecosystem – the ship master, operator, agent, VTS operator, fleet operation centre, administration, surveyor, and more. The data must, however, be presented in a way that suits the user. Examples include data integrated into a bridge display system, an image complementing other screens in a control room, a mobile application, or in some other manner defined by a specific user group. At the core, the data remains the same – what will change is how the data is displayed and how the user interacts with that data.

To ensure that everyone involved shares situational awareness, port call optimisation initiatives are essential for enabling accurate and up-to-date information. This approach is based on the premise that processes are streamlined when data that is business critical, but not business sensitive, is shared through standardised message formats and interfaces. The IMO 'just-in-time shipping' initiative and member-based organisations such as the Digital Container Shipping Association (DCSA) are working towards a common technology that enables global collaboration.

Final words – towards a maritime informatics profession

The digitalisation of the maritime environment started many decades ago, with the development of AIS and enhanced vessel and infrastructure monitoring. The continued progress of digitalisation in the maritime ecosystem can promote increased safety, efficiency, and ecological sustainability of the world's shipping industry. The overall 'smart' system relies on effective, secure, and redundant data exchange, within a coherent network which supports data collection, analysis and dissemination. During analysis, the data may be enriched using artificial intelligence.

This new era requires new skills that address the maritime, logistics and digital technology elements of the 'smart' maritime ecosystem. Maritime informatics is emerging as a core skill to develop and operate a digitally enabled maritime practice. As a profession and applied science, it provides a point of intersection between the profession of maritime operations and the science of digitalisation. Maritime informatics can also support collaboration of all those involved in the self-organised ecosystem of maritime transportation and data analytics. If enhanced digital connectivity is the technology enabler, maritime informatics is the profession that will ensure that the smart maritime ecosystem remains grounded in making effective use of that technology.

An ecosystem is a community of interacting organisms together with the environment in which they operate. The port is a self-organised ecosystem within the larger self-organised ecosystem of the global shipping industry. Both depend on distributed collaboration and coordination. In a smart maritime ecosystem, digitalisation is the enabling component.