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SMART DIGITAL PORTS OF THE FUTURE

THE PORT AS A DIGITAL NODE:
A CONNECTOR WELL-POSITIONED NOT ONLY AMIDST CARRIERS

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Digitalisation provides opportunities for actors leveraging and operating in the self-organising ecosystem of supply chain and logistics to get aligned. Proactive co-producers empower their own operations through digitally created situational awareness capturing what others are doing and plan to do but also what happens/is expected to happen in their part of the chain. The likelihood is high that the thousands of years old supply chain industry will once again be disrupted by technology, this time as the consequence of enhanced digital capabilities. In the digital age, actors like ports will undertake new roles and are able to position themselves as integrating players of the end-to-end supply chains. Already now, behaviour patterns and practices are changing. An example is the eBill of Lading, supporting smoother processing and early preparation for faster throughputs when goods physically arrive at a port.

THE PORT AS A TRANSPORT HUB – BUT NOT JUST THAT

Traditionally, a port has been conceived as a transport hub. The ecosystem of a port is often constituted by a multitude of different actors of the same and of different types, private and public, to cater for the operations at the port aimed at providing value-added services for direct, such as port visitors, and indirect stakeholders, such as cargo owners/transport buyers.

In the digital age, we can observe how ports are developing into digital nodes as vital parts of an increasingly digital supply chain ecosystem in which digital data streams generated by ports become foundations for visibility, alignment, smooth and seamless operations, and decision-making. A port is thus an enabler of the digital transformation of global supply chain networks.

In a world under pressure to decarbonise transport operations, ports can also support the energy transition. This, by turning into energy nodes supplying not only seaside carriers but all modes of transport with no/low carbon energy. This is far from being simple, considering the uncertainties ahead and the complexities associated with building completely new infrastructures which requires time and significant investments. Furthermore, the port's digitalisation efforts will result into the foundations for higher energy, and even more so when digitalised partners along the chain start to leverage the power of data for collaboration.

LOOKING BEYOND CONNECTED MODES OF TRANSPORT

When we utilise the air transport system as passengers, we wish our connections to other flights to be as smooth as possible. We simply do not want to miss our connecting flight in an air hub or transit airport. Mitigating disruptions during travel, e.g., resulting from ground handling hiccups, late departures and arrivals of planes caused by air traffic control or operations glitches is top of the priority list of airlines worldwide. Airlines operate powerful passenger systems constantly monitoring what is happening in the network to identify disruption risks as early as possible and figure out the most appropriate mitigation measures. In this act of mitigation, data about plans and outcomes from involved service providers at airports is a key enabler. The difference between passengers and cargo is that passengers are active players in the process constantly gathering information and experiences regularly engaging in the resolution of challenges while cargo is passive and needs humans and machines to be moved and dealt with. However, as the supply chain is becoming more digitalised and connected, transport buyers and coordinators are getting

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increasingly able to follow the goods remotely, almost as if they were sitting on top of the cargo itself.

Similar to air hubs and transit airports, many if not all (sea)ports are located at key geographical areas as critical parts in the chain and required to support other supply chain services providers in their efforts to ensure that customer expectations are met. When the flow of goods is disrupted through carriers with delayed arrivals, ports need to take action to ensure that the cargo and subsequent actors, including the end-customer, in the chain are (if possible) not negatively affected (figure 1). The port industry's key interest is the timely loading and unloading of ships and landside carriers and their on-time departure and arrival. Timely information about potential delayed arrivals and departures is critical for planning and preparation which requires that everyone in the supply chain network keeps others constantly informed about the situation and in turn is constantly updated by others. This is best achieved through sharing of status on possibly all movements in the network and the transport ecosystem allowing digital systems to analyse situations and alert relevant actors

FIG 1.

Inter-linked transport nodes in the end-to-end supply chain affecting each other (Illustration: Sandra Haraldson)

on potential disruptions, even suggest solutions for recovery and complex challenges. In this light, a call for slot management in maritime transports enabled by digitalisation has been formulated some time ago, a practice which helps to improve planning/booking for more efficient utilisation of port infrastructure and transport infrastructure through expanding planning horizons far beyond the physical presence of the transport carriers. The digitally empowered port can also keep the cargo owners informed about the planned and actual movements of the goods they have shipped.

PROVIDING TRANSPORT EXPERIENCE BY DIGITALISATION

The data generated in and by various digital systems and by internet-of-things (IoT) devices is growing exponential and more and more digital infrastructure and middleware empowering us to share such data through different data streams is put in place across the global supply chain network. Private 5G networks boost data generation in ports. This supplements the systems capabilities and the IoT devices installed in fixed and moving objects, such as goods, pallets, and containers but also

cranes and bridges. The emerging architectures and maze of data increases connectivity and visibility on location and condition of infrastructure, vehicles, and goods across different modes of transports, countries and continents.

Over more than 20 years the maritime industry is following moving ships thanks to Automatic Identification System (AIS). In many parts of the world, we now see IoT/Radio Frequency Identification (RFID) sensors providing data on train movements while telematics systems inform about driver behaviour and journeys of trucks. Platforms allow for slot bookings for port visiting trucks. Intelligent transport infrastructure, which informs about the situation at hot spots of congestions, allows truck drivers to mitigate and take alternative routes to avoid delays and reach transport nodes and consignees on-time. Customers can benchmark lanes, trucking companies, ports, and shipping companies. The transport ecosystem is thus becoming more connected and transparent.

The maze of historic and actual data is the foundation for descriptive, predictive, and prescriptive analytical services that inform about potential disruption and provide suggestions on

mitigating measures. This is also the foundation that is used in the newly released virtual watch tower network initiative (**www. virtualwatchtower.org**) (figure 2).

Ports can contribute to make supply chains self-healing, i.e., they autonomously take actions based on data analytics and pre-set parametres. Advanced digital systems also provide collaboration spaces where different actors can validate information and discuss potential (collective) actions. Ports have the opportunity to get much smarter and develop services that improve their competitive position. By doing so they also raise the profile and performance of the sector offering 21st century services to all parties involved including cargo-owners.

FIG 2.
Network of virtual watch towers (Illustration: Sandra Haraldson)

CONCLUDING WORDS: WINNING THE COMPETITION BETWEEN PORTS

In the world of movements of goods, the weakest link determines the performance of the entire chain. A delay at one node may cause disruptions in subsequent nodes, everyone may lose, including consignees and cargo owners. But there can also be winners. Ports that gather and provide precise and accurate information to other actors cannot only raise the performance of the chain as they empower subsequent actors and participants to prepare for delayed arrivals, but they can also improve their relevance and value for shippers and consignees. Also, gathering and analysing data helps ports to assess their own performance as the basis for improvements. Cargo owners increasingly are able to see the real picture empowering them to act when needed. Based on this data, ports can develop new data-based analytical services which they can offer to the actors across the maritime ecosystems which would set them apart as true players in the digital age. The anticipated disruption is all about leveraging digitalisation to communicate and collaborate with not just the direct stakeholders of the port, such as landside and seaside carriers, but also the indirect stakeholders, such as transport buyers. This will soon be the standard in totally connected and networked supply chain networks.

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