Standardisation in container shipping is key to boosting economies of scale
- importance of data collaboration between shipping lines

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The networked economy of container shipping relies on collaboration

In serving the multitude of clients bringing goods from their point of origin to their point of destination, the supply chain industry may be conceived as a network of actors having different capabilities to fulfil the needs of the customer. In such a business network, business actors would be of different sizes and undertake different roles, where some of them are in direct interaction with the client while others may be serving the needs of the client's client. In many industries this has brought companies to focus on core capabilities and pursue business in the so-called networked economy. Each participating actor then has a role as part of such a value creating system.

The supply chain ecosystem is quite complex, involving multiple actors that are continuously trying to enhance their processes, optimise their costs, and enter strategic alliances and collaboration with other partners to better serve their customers. In pursuing business in a networked society efficiently, participating actors must have agreed ways of communicating, to share information on both the key physical parameters, such as the identity and location of containers, and on other important organisational information, such as bills of lading, and timing of operations and movements.

As is becoming clear in container shipping, the collaboration between shipping lines is now evolving from operational collaboration focused on rationalising resources and offering more global coverage, to strategic collaboration focused on IoT (Internet of Things) communications and smart everything data exchange. The container segment of shipping has a profound proven history of collaboration[1] in which they various actors and elements back up each other. Some examples of such collaborative endeavours are:

- Different shipping line alliances, such as 2M and Ocean Alliance signing cooperative agreements including vessel sharing on major global routes. This can be seen as similar to the aviation sector where different airlines form strategic alliances (such as Star Alliance, OneWorld, and SkyTeam).
- Several shipping lines, namely CMA CGM, MSC, and Maersk, have together invested in a French start-up called *TRAXENS* to deploy smart containers across their fleets.
- The top shipping lines have helped establish a non-profit consortium called *Digital Container Shipping Association (DCSA)* to develop technology standards to transform inefficient practices and accelerate digitalisation through a unified industry effort
- The *TradeLens* platform, coming out of the collaboration between Maersk and IBM followed by CMA CGM, MSC, Hapag Lloyd, and ONE becoming engaged as well, is offering opportunities to standardise all the events related to goods movements track-and-trace across different means of transport, stakeholders including cross-border agencies.

Collaboration is a key factor in enhancing the services and increasing the customers' satisfaction, achieving cost effectiveness and meeting sustainability goals. The purpose of this article is to elaborate on some of the possible collaboration opportunities seen in the light of what comes out of digitalisation empowering the network economy of container shipping. What may be seen now is that this

[1] e.g. Panayides P. M., Wiedmer R. (2011) Strategic alliances in container liner shipping, Research in Transportation Economics, pp. 25-38

collaboration is not just happening between different complementary service providers, downstream to the customer; the collaboration is now expanding horizontally between competitors facing the same technical and regulatory challenges.

Historical trends in Capability building among shipping lines

Historically, the shipping lines were more focused on their vessels' capacity, building bigger ships and trying to optimise their stowage plans and routes. The success of their alliances depends on the degree of compatibility of their service networks. Historically, shipping lines have also secured port capabilities by establishing such things as own terminal operator's companies and having their own tugboats operating within the port.

However, bigger ships have not generated significant economies of scale and have yielded only marginal cost benefits for the shipping lines while creating significant costs elsewhere such as the need for dredging deeper draught berths, and wider access roads to the dockside to cater for increased cargo volumes per ship. Hence, the race to build bigger ships has slowed or perhaps even stopped, and shipping lines need are now looking elsewhere to optimise costs. The ongoing efforts in utilising digitalisation for supply chain integration have also put port developments in focus. Trade patterns as well as short first and last mile distribution carried out by not utilising sea transports points to the need to empower a large network of smaller ports to serve the needs of overall sustainability along the supply chain. At the same time, port's does though need to become smarter[2] and concerns have been raised over some ports pushing too hard at establishing themselves as the gateway to larger regions.[3]

Digital solutions easing the burden in collaboration

As an example of historical collaboration among shipping lines, when one carrier has had more bookings than it has capacity, competitor carriers that still have capacity have been approached, so as to still satisfy the needs of the original client rather than refusing a booking outright. This buyer-seller collaboration ensures that the customer is served, and the cooperating competitors both receive revenue by maintaining or even increasing respectively their shipment volumes and capacity utilisation.

All the document flow associated with such collaboration has been considered as the inevitable consequence of enabling the different collaborative arrangements. The traditional flow of exchanged documents includes specifications, production schedules, and forecasts such as booking requests, booking confirmation, shipping instruction (BL instruction) and shipment status and tracking via various electronic data interchange (EDI) messages.

Nowadays, taking full advantage of digital technologies is clearly a high priority for shipping lines that wish to benefit from smart assets and big data to transform their processes and gain in efficiency and security. Leading shipping companies are investing heavily in smart assets (smart containers, smart vessels, API gateways, being part of smart ports development efforts, and smart everything) to digitalise their fleet, operations and administration. In this effort, the ecosystem actors are collaborating to define enabling technologies, including specifications and requirements for Internet of things (IoT) communication and data exchange interfaces definitions, and competing in value-added services definitions.

Some of these efforts and expected outcomes are elaborated below.

[2] Becha H., Lind M., Simha A., Bottin F. (2020) Smart ports: On the move to becoming global logistics information exchange hubs, Smart Maritime Network, 20/4-2020 (https://smartmaritimenetwork.com/2020/04/20/smart-ports-on-the-move-to-become-global-logistics-information-exchange-hubs/)

[3] https://splash247.com/covid-19-highlights-gaps-in-smart-port-development/

Uses cases coming out of different standardisations

Smart containers

Smart containers are traditional containers – reefers, dry or tank containers – with added electronics. The added electronics enable the tracking and monitoring of a container during its journey and the conditions under which its contents have been transported. The smart container solution can be configured to send real-time data regarding location, door opening and closing events, shocks and vibrations, temperature or other relevant physical parameters. Smart container data offering door-to-door visibility of the trip execution is conceived as foundational for end-to-end supply chain excellence. Smart container data enable the creation of value adding services such as Estimated Time of Arrival (ETA) calculation, optimising the container flow as part of fleet management services, container utilisation management, monitoring of the condition of the container, CO_2 emission calculations for the journey, as well as predictive maintenance. The UN/CEFACT Smart Container Project has delivered formal global Smart Container Business Requirements Specifications Standards and a standard Smart Container Data Model based on the UN/CEFACT Core Component Library. The next steps in standardisation efforts will be focused on completing a standard describing the data governance rules with respect of the competitive advantages of all the actors, as well as defining a catalogue of standard Smart Containers APIs (Application Programming Interfaces) to communicate all the standard smart container data elements.

In addition to defining standards for data exchange protocols, the collaborative efforts should result in defining the requirements specifications of IoT communication protocols. In fact, one of the biggest cost factors of smart containers is power consumption that is mainly consumed to establish power-hungry cellular communications while roaming. In addition, establishing connections almost everywhere is very challenging due to the highly metallic and harsh environment in which containers are deployed and frequently shielded from mobile communications signals. The leading shipping lines must define the technology to be deployed in smart ports and on smart vessels to ensure extended reach for smart containers with no line-of-sight to enable coherent and sustainable massive deployment of smart containers.

Time stamp data sharing for port call optimisation

During the recent years, a lot of focus has been on using digitalisation for supporting the coordinating and synchronisation of port operations[4] with what happens at sea and in hinterland transport operations. For this purpose, the unbiased, non-proprietary, open, and international concept of Port Collaborative Decision Making (PortCDM) coming out of the European MONALISA project and Sea Traffic Management (STM) efforts,[5] has been brought forward providing both operational and technical guidelines for regional and local implementations. This effort of international standardisation is a way for episodic visiting actors, such as the ships from shipping lines, to be able to share relevant advance information and progress in the same way with all ports to which they make port visits to. By having a standardised way of communicating and with agreed procedures for collaboration, this also enables shipping lines, for example, to e.g. exchange time slots given a delay of one ship with another one that is being closer to arriving. One of the next steps is defining the use cases and the standards interfaces between the data collected from the seaside and the hinterland side supporting the

[4] Lind M., Ward R., Bergmann M., Haraldson S., Zerem A. (2019) Digitalizing the port call process, UNCTAD Transport and Trade Facilitation Series No. 13, UNCTAD (https://unctad.org/en/pages/PublicationWebflyer.aspx?publicationid=2663)

[5] Lind M., Watson R.T., Ward R., Bergmann M., Bjørn-Andersen N., Rosemann M., Haraldson, S., Andersen T., (2018) Digital Data Sharing: The Ignored Opportunity for Making Global Maritime Transport Chains More Efficient , Article No. 22 [UNCTAD Transport and Trade Facilitation Newsletter N°79 - Third Quarter 2018] (https://unctad.org/en/pages/newsdetails.aspx?OriginalVersionID=1850)

optimisation of the port as a transhipment hub,[6] and by that also taking advantage of the smart container data and services.

DCSA Track and Trace Standards

The focus of the DCSA is to simplify shipment visibility across multiple carriers, enabling them to better plan and optimise their shipment handing activities. DCSA Track and Trace Standards describe the underlying set of processes along with the data and interface standards needed to communicate the fundamental track-and-trace information across multiple carriers. Next steps could be reviewing and redesigning these processes taking advantages of emerging relevant standards and new data availability, namely the smart container services and data on berth arrival, departure planning and port operations. This consistent approach, endorsed and supported by the shipping lines, is already implemented in their ongoing digital projects.

Combinations of the different initiatives

The DCSA shipping industry is currently working on providing requirements specifications for the IoT communication technologies of the smart container to ensure a better coverage for the smart container. While the smart container standard has enriched the UN/CEFACT data model with smart container and geofencing data, the DCSA track and trace standard is also aligned with the former data model thereby taking advantage and preserving existing investments.

DCSA has also started an initiative to achieve significant pollution emission reductions through advanced berth arrival and departure planning, at scale building upon standardised principles of collaboration and standardised data sharing.[7]

Standardisation – a key to enable business benefits coming out of collaboration

With the ramp-up of new and emerging technologies, standards and horizontal collaboration between competitors are now more necessary than ever. A standard is an agreement among a business network constituted by actors that share the same common object of interest.[8]

Adoption of global multimodal standards is a win-win situation, since these standards guarantee interoperability. Standards enable stakeholders in the logistics chain to reap the maximum benefits from smart container solutions, while enabling them to share data and associated costs. Standards-based solutions increase the ability to collaborate, which in turn increases efficiency. Additionally, data exchange standards reduce development and deployment costs and cut time to market for IoT solution providers. This is also valid for final customers as they will be able to get the maximum value of their data regardless the shipping lines they booked with.

Examples of contemporary standardisation initiatives are the Smart Container standardisation efforts,[9] port call messaging[10] for the integration of what happens at sea and in ports, and track-and-trace

[6] Haraldson et al (2020) Decision support for port visits, forthcoming chapter in Lind M., Michaelides M., Ward R., Watson R. (Ed.) Maritime Informatics, Springer

[7] Bergmann M., Schröder M., Ward R., Andersen T. (2020) Maritime Digitalisation: the foundation for tomorrow's Port Calls, 4/5-2020, Smart Maritime Network (https://smartmaritimenetwork.com/2020/05/04/maritime-digitalisation-the-foundation-for-tomorrows-port-calls/)

[8] Haraldson et al (2020) Decision support for port visits, forthcoming chapter in Lind M., Michaelides M., Ward R., Watson R. (Ed.) Maritime Informatics, Springer

[9] Becha H. The Power of Parameters in Smart Container Solutions: Delivering data that matters, from periodic events to context-based alerts (https://maritime-executive.com/blog/the-power-of-parameters-in-smart-container-solutions); Becha H. The UN/CEFACT Smart Container Project, The magazine of international Institute of Marine Surveying, issue 91, March 2020 (https://www.iims.org.uk/wp-content/uploads/2020/02/The-Report-March-2020.pdf)

[10] Bergmann M., Schröder M., Ward R., Andersen T. (2020) Maritime Digitalisation: the foundation for tomorrow's Port Calls, 4/5-2020, Smart Maritime Network (https://smartmaritimenetwork.com/2020/05/04/maritime-digitalisation-the-foundation-for-tomorrows-port-calls/)

standardisations[11] supporting global trade. For this purpose, there are several organisations that enable collaboration among different actors, such as the United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT) using the Smart Container Business Requirements Specification (BRS) to ensure that the various ecosystem actors share a common understanding of smart container benefits, the IMO/FAL (International Maritime Organization Facilitation Committee) developing the IMO Reference Data model to facilitate alignment of definitions that come from different standardisation bodies, as well as efforts pursued by e.g. the International PortCDM Council (IPCDMC), the International Task Force Port Call Optimization (ITPCO), and the H2020 funded DataPorts project focused upon event definitions, messaging standards, operational processes, and data sharing environments (including the definition of a service market place). The latter efforts build upon the facts that shipping lines are collaborating with actors together with operating within the port. The standardised definition of the data elements that different devices and operations can generate accelerates integration and the use of data from many sources on different platforms for the enhancement of operations. In addition, utilising different types of data, such as data from smart container data, port call operations, timing of ship movements, and track and trace enables open communications channels between supply chain actors.

Shipping lines will be limited in their ability to provide their customers with business intelligence coming out of the solutions above for their customers in the absence of a global standards. Standards data models and standard APIs will help stakeholders to make the necessary transformation to achieve supply chain excellence.[12] Indeed, APIs are key to ensuring simplification and acceleration of the integration of digital services from various sources. Data sharing is particularly important in the logistics supply chain due to the large numbers of diverse players and because container movements are global.

Easy access to information for all the relevant stakeholders enables situational awareness (e.g.in other words; the status, progress, and outcome of a particular process) and empowers data-driven risk analysis and decision-making.[13]

Conclusion

As pointed out by the European Commission, the many zettabytes of data that are channelled from the source to use in diverse business cases is going to expand exponentially towards more increasingly becoming generated by connected IoT devices.[14] This also means that it will be increasingly possible to derive business intelligence from the combination of multiple sources for the better good for the industry. In doing so, it is important to distinguish between the sharing of business critical rather than business sensitive data, so as to promote the actors' willingness to share data.[15]

Digital data standards are now being introduced to encourage the generation of data streams and to facilitate their combination, especially in the logistics chain, as concrete examples of where collaboration is enabling this development. The use of a standard for sharing data on the timing of port

[11] Lind M., Simha S., Becha H. (2020) Creating value for the transport buyer with Digital Data Streams, The Maritime Executive (https://maritime-executive.com/editorials/creating-value-for-the-transport-buyer-with-digital-data-streams)

[12] Becha H. How Standard APIs Open the Door to Powerful Digital Services, (https://hananebecha.home.blog/2019/11/28/the-un-cefact-smart-container-project/); Becha H. Standardization Supporting Global Trade, Port Technology International, Ed. 91 (https://www.porttechnology.org/editions/shipping-2020-a-vision-for-tomorrow/)

[13] Lind M., Ward R., Bergmann M., Haraldson S. (2019) How to boost port call operations, Insight no 10, Global Maritime Forum

[14] European Commission (2020) A European Strategy on data, Communication from the commission to the European Parliament, The Council, The European Economic and Social Committee and the Committee of the regions, Brussel 19.2.2020

[15] Lind M., Chua C.P., Bergmann M., Fu X. (2019) Enabling Efficient Tanker Operation through Collaboration and Data-sharing, Ed. 89, pp. 128-131, Port Technology Journal (www.porttechnology.org)

call events allowing for estimations on the cargo flow and a foundation for the exchange of time slot allocations between shipping lines.

It is important to note that the communication technologies are on the agenda as current challenges for the shipping lines. Like telecoms companies, shipping lines must collaborate to define communication technologies - communication is a commonality that transcends beyond competition enabling the necessary adoption of smartness in the networked economy of container shipping.

Other areas to consider, but not discussed in this article are aspects associated with cyber security, a common approach to the identification of consignments, the handling of empty containers positioned in different parts of the world, solutions associated with the digitalisation of bill of lading, aligning common processes used in container shipping, and IoT standards for container shipping.

Collaborating between shipping lines is a win-win strategy for reducing transportation costs, empty miles and environmental impact provided that logistics are willing to take advantages of the emergence of big data and increasingly interconnected communicating objects (IoT). Improving the technological aspects is clearly a high priority to getting ahead at this pivotal time of changing regulations and growing demand for business and at the end of the day provide a better service to the end customer. As in many other industries some areas are fully okay to collaborate while others might be more sensitive. The establishment of the DCSA is the proof that the leading shipping lines have come to an agreement to reinforce the utilisation of standards in the container industry.

About the authors

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