REAL-TIME DATA SHARING IN SUPPLY CHAINS: OPPORTUNITIES AND CHALLENGES

88%

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The sooner data is at hand, the earlier we can act. Big data analytics and Artificial Intelligence (AI) can improve supply chain and logistics management. Analytics is about what is, what may be, and what are options if we wish to influence the course of things building on operational and ecosystem data. Analytics and data sit at the core of digitalization.

In a world of real-time data sharing and AI, supply chain professionals are empowered to make (joint) evidence-based decisions to respond to deviations from plan and crisis situations. This can improve efficiency, quality, safety, and ethics of an area of concern, e.g., a global supply chain operation. Real-time data and descriptive analytics enable close monitoring of equipment, stock levels, and cargo movements, but also of the state and conditions of the supply chain ecosystem, including roads, ports, and oceans. Predictive analytics provide alerts on possible future events to allow for preemptive maintenance of equipment or mitigative operational actions before problems arise. Prescriptive analytics suggest options for solving problems. Data sharing leads to higher visibility, efficiencies, precision in the management of processes, resources, and infrastructure, and improved safety and ethics. Data sharing tools are bridging distances and help create a climate of trust across companies and along supply chains fostering collaboration as a prerequisite of digitalization. Real-time data is what powers automation: autonomous vehicles, vessels, and any kind of processes. Robotic process automation (RPA)

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solutions have already found their place in companies' front and back offices.

Despite the progress, 69 per cent of digital transformation projects fail according to McKinsey. The reasons are hardly technical but mostly managerial and we believe often cultural. In this contribution, we provide an overview of the data sharing landscape also illuding on the importance of ensuring a conducive culture for true digitalization, which includes digital integration and data sharing.

1. PREREQUISITES FOR DATA SHARING

Technologically, the Internet of Things (IoT) and AI play a fundamental role in the digitalization of supply chains. Thanks to increasingly affordable devices and software, connected supply chains are now feasible. Supply chain professionals can monitor end-to-end (e2e) supply chains and the e2e life cycle of a product. 5G, smart sensors, and Digital Twins brought in a new

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dynamic: data is directly collected from infrastructure like cranes, trains, trucks, ships, and bridges and analyzed using algorithms producing results visualized on 3D interfaces. Interoperability between systems of different actors in supply chain networks, including shipping lines, brokers, freight forwarders, cargo owners, and customs authorities is critical for data sharing. AI helps to overcome the challenge of incompatible data formats as well as filling potential gaps in the data flows by deriving probabilities from historical data providing parts to the full picture.

Managerially, trust and culture are critical. But all this requires that partners establish sufficient trust to exchange information throughout the value chain. Progress in digitalization in supply chains and logistics is not a matter of technology but of trust and culture. Trust is easier achieved in a simplified world where rules are concise and incentives clear. In a data sharing environment, this also includes trust in partners' ability to ensure cybersecurity and compliance with regulations, like the European Union GDPR, US CCPA, and cybersecurity compliance requirements by the Federal Trade Commission. Fortified cybersecurity measures like secure databases, data encryption, and cybersecurity audits are warrants of trust. Trust also requires that fears of job losses need to be addressed. Culture is what drives or deprives change. Digitalization and data sharing require a conducive culture. And more than that. It requires leaders that engage and mobilize entire companies and ecosystems. The movement starts with the search for common areas of interest, answering the 'why' question, why should we digitalize

and share data? The 'why' - ideally packed in a few words and lived across the company - guides the what and how. In a digital world and self-organized supply chains, collaboration is a critical cultural component. The industry should not only work towards operational but also cultural alignment in areas of common interest.

Overall, today's winners are digital and collaborative. Digitalization and collaboration operate symbiotically. Digitalization promotes collaboration through swift and efficient digital information exchange enabling effective coordination. Simultaneously, digitalization requires collaboration. We even claim that without collaboration there will be no large-scale digitalization, and without digitalization there will be no large-scale collaboration.

2. SELECTED DATA SHARING USE CASES

Data supports planning, like demand forecasting, optimization of inventory levels, and streamlining of logistics processes. The sooner one gets data, the sooner one can plan, and the easier is replanning in case of deviation from the plan. Real-time monitoring of vehicles and cargo allow for improved operations, e.g., through corrective action and continuous optimization.

Tomorrow's transport systems require actors to collaboratively respond to partners' concerns. We selected some use cases to illustrate the power of collaboration, digitalization, and data sharing in supply chain networks.

Cargo visibility
Visibility or better data is foundational. Data is the oil of the

digital systems. Data allows for analytics to work. The more data the better algorithms are trained, the better the results. Visibility can be established on the level of a vehicle, e.g., a truck or a ship, a loading unit, e.g., a pallet or container, and a piece, e.g., a product or part.

In 2002, large ships began fitting automatic identification system (AIS). AIS transmits dynamic information relating to a ship's course, speed, and heading; static information related to the ship's name, length, and breadth as well as voyage-related details such as cargo information and navigational status, e.g., underway or at anchor. The combination of these information pieces helps situational awareness and collision avoidance.

Maersk was an internet-of-things (IoT) pioneer. In the early 2010s, the shipping line started to install IoT devices on nearly 300,000 reefer containers. Since mid-2015 Maersk has monitored the company's reefers constantly. The devices allow for real-time detection of reefer malfunction, compared to traditional 12/24 hours through physical inspection. Hapag-Lloyd introduced real-time monitoring for its reefer container fleet in 2019 and started in 2022 to install IoT devices on all standard containers of its three million TEU fleet adopting the principles of the smart container . Real-time data from each container make the supply chain more transparent and shipping safer. The IoT devices supply location data based on GPS, measure temperature, and monitor shocks to the container. Additional sensors with different functionalities can be added.

Some containers contain products with sensors establishing visibility on the piece/item level. All sensors gather and share predefined information, like location, temperature, humidity, and shock

in configured cadences of minutes, hours, etc. The further we advance in our development the denser will be the maze of data companies, organizations, and governments can access and leverage.

Ship operations
Real-time sea state observations, like currents, waves, and swell ship operators can route according to ocean and weather conditions optimizing fuel burn and greenhouse gas (GHG) emissions, supporting the 2023 International Maritime Organization (IMO) GHG strategy.

Electronic documents
Examples of document digitization in supply chains are Bills of Lading (BL), Statements of Fact, and a diverse range of certificates. Regulatory acceptance and industry-wide adoption will allow the shipping sector to advance towards automation enabling further optimization of processes and transactions.

However traditional electronic documents are not reliable for data-driven applications. Information such as shipper and consignee details, origins, and destinations are replicated across multiple documents. This redundancy leads to inefficiencies and risk of error. The true transition pivots from document-based data exchange to a data-centric model, like the one applied by IATA's ONE Record.

3. MANAGING THE CULTURAL SHIFT

Behavior change in the economy is regularly triggered by monetary incentives, like cost advantages, subsidies, and revenue opportunities, but also by new obligations. The introduction of AIS is a good example of such an obligation when the maritime sector underwent a major change when the sharing of position, speed, and heading became legally mandatory as a safety requirement. This change resulted

in higher safety standards but also a new market for digital services leveraging AIS data well beyond the scope of its original intentions.

Regulation and sufficiently funded governmental programs can help to focus resources on digitalization and collaboration. This supports academia in their respective basic research, research institutes in their applied research, and businesses in their research and development. Collaboration should be understood as a focus on common areas of interest, e.g., decarbonization and circular economy. Pressure on common pain points drives digitalization and collaboration. The obligation to report on Scope 3 emissions may become the catalyst for a new era of large-scale data sharing across supply chain networks. Decarbonization might turn into a much bigger market opportunity for data services for supply chain networks than what AIS has become for maritime transport.

"TODAY'S WINNERS ARE DIGITAL AND COLLABORATIVE. DIGITALIZATION AND COLLABORATION OPERATE SYMBIOTICALLY."

ABOVE

The digital solution to manage supply chain disruptions through VWT

Sandra Haraldson, RISE
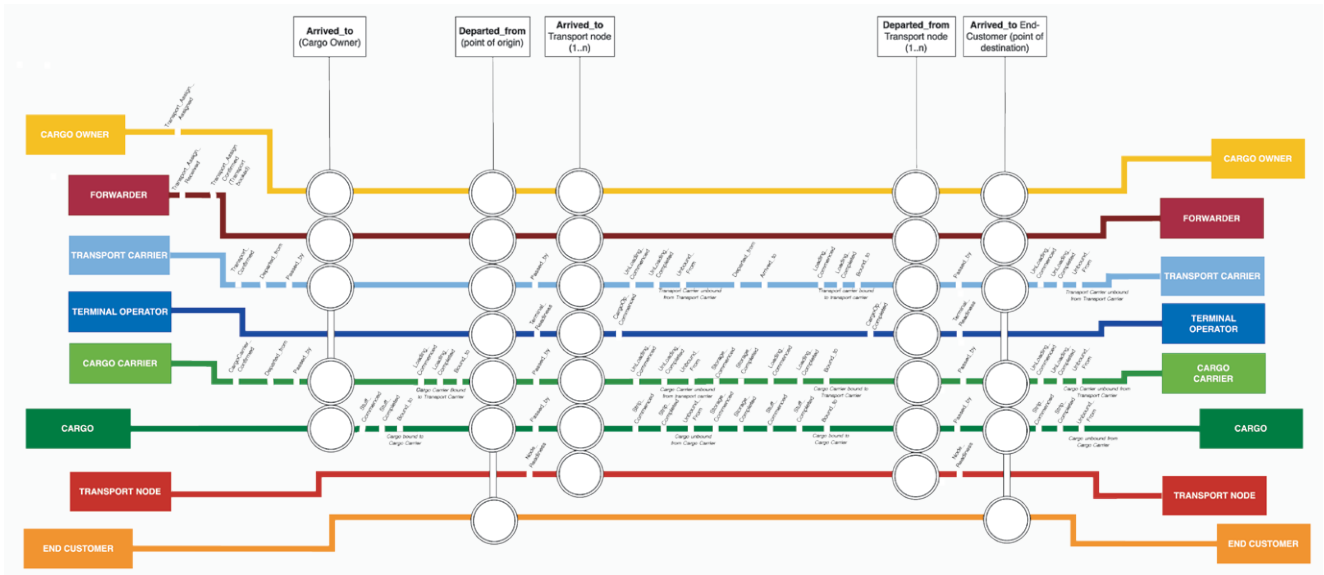
CLOSING REMARKS

Real-time data sharing is a prerequisite for dealing with major common interests and challenges in the economy and society. What is required is to address the technical and social aspects of the digital transformation. An example for such a socio-economic approach is the Virtual Watch Tower (VWT); a mix of diverse community and digital solutions. The shipper-driven and terminal-centric VWT (www.virtualwatchtower.org) or VWT network / VWTnet applies a novel approach to data sharing as the foundation for extended digitalization and collaboration in supply chains.

The impartial and inclusive VWT, which is sponsored by a group of likely evolving neutral and trusted organizations like RISE and A*STAR's IHPC, follows operationally the contractual relations between actors, e.g., cargo owners and forwarders, with a power-of-attorney (PoA) helping the sharing of private data along the end-to-end chain. In its design, the VWT applies a minimalist approach to:

- architecture, i.e., the VWT leverages the digital infrastructure and architecture of the VWT community members in an internet of VWTs / VWTnet approach through minimalistic downloadable builders with minimalist analytical services;
- private data sharing, i.e., only minimal private datasets are required to be shared and feed the VWT services;
- public data and analytical services provider arrangements which are distributed and can be accessed through APIs;
- VWT proprietary analytical services and collaborative tools to largely avoid duplications of existing offerings;
- the VWT legal entity that will carry and represent the solution;
- governance; and
- onboarding procedures for new members and partners.

The concept of coopetition sits at the core of the VWTnet. While competing on sales and sourcing markets, VWT members co-create for collective use a common tool to augment each member's and the community's ability to deal with economic constraints and societal challenges like supply chain disruptions and GHG emissions respectively.

We believe that novel solutions like the VWT are becoming the new normal in the 21st century and you can be part of the movement.

Contact the authors of this article to join us in our efforts to drive improvements and positive global change, in supply chain management.

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