



# MANAGING GLOBAL SUPPLY CHAINS AND LOGISTICS

## THE ROLE OF SUPPLY CHAIN STRUCTURE

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### INTRODUCTION

This paper addresses the fact that global maritime trade and individual shippers' supply chains are different in scope, in two dimensions. These differences have already been felt by enforcement agencies, such as Customs, but are progressively hindering leading supply chain companies in achieving their ambitious goals. Visibility systems, despite the deployment of ever improving technologies, are confronted with the same issues, which can be traced back to supply chain structure.

The recent Gartner study on supply chain excellence [1] shows how premier league global supply chains can "orchestrate a profitable response to demand" and "focus on people and protecting the planet". On the one hand, personalized products are enabled by new technologies, where consumers can specify preferences

on product and accompanying service characteristics - including delivery - or where those preferences can be learned, using artificial intelligence, from consumer behaviour at the digital interface. On the other hand, the sustainable performance of products can be traced back along the supply chain, again using digital technologies. In this paper, focus will be placed on the second aspect.

### SUSTAINABLE SUPPLY CHAINS

The Gartner study reports on how leading firms in supply chain management are actively managing their corporate and social responsibility through sustainable practices and responsible sourcing; important enablers are supply chain transparency and product provenance. There are a couple of issues regarding the establishment of sustainable performance

in today's complex global supply chains. Products sold in the market can be associated with performance indicators such as carbon footprint and labour conditions at various stages of their journey, but these characteristics are not intrinsic to the product itself. In other words, these characteristics cannot be measured upon inspection of the product. Measurements of upstream processes that can be registered, validated, and linked to the downstream products are therefore required.

The structure of global supply chains impacts the extent to which upstream process characteristics can be linked to products downstream. This observation has become common knowledge and is shared with sustainability-aware consumers. The chocolate brand 'Tony Chocolonely', for example, explains to its



consumers that the structure of the cacao supply chain, with a few multinational trading companies in the middle, obscures the origin of product through mixing [2].

In addition to this, many fashion brands are members of the Better Cotton Initiative (BCI), which explains and promotes the sourcing of sustainable cotton through the use of mass balance; each amount of cotton used in the final product that claims to be sourced in a sustainable fashion needs to be compensated by the same portion of cotton sourced from suppliers that meet sustainability standards [3]. This procedure avoids the costly physical segregation of the sustainable product, but does require segregation at the administrative level with its own challenges of maintaining chain of custody [4].

#### **GLOBAL SUPPLY CHAIN STRUCTURE**

Supply chains consist of multiple stages represented by tiers of suppliers: direct suppliers, suppliers of suppliers, and so on. This already has an impact on the quality management of products themselves; securing conformance to quality standards from suppliers who operate multiple tiers downstream is challenging [5]. Conformance of products to sustainability requirements that are not intrinsic to the product is even harder to certify, as explained above. The question is whether seaports have any role to play here. This may sound like an academic question, but it is not. Enforcement agencies such as Customs and Consumer Product Safety Authorities are directly involved in the monitoring of huge cargo flows passing through seaports, scrutinizing

individual shipments on legitimacy of trade, product safety, tax classification, and other compliance. When an issue is suspected, they need to intervene.

These authorities are challenged because the structure of global supply chains of products is different to the structure of global logistics chains. Firstly, global logistics chains involve the transit of cargo in huge amounts via trade lanes. Within the container trade, maritime vessels carry cargo for thousands of supply chains that bring products to various markets. This implies that the aggregation level of the logistics flow through seaports is different from the one of individual supply chains of shippers, which is an important part of the challenge that border control authorities face [6].

Moreover, there is another difference in scope that was already brought to bear while considering the management of product quality in supply chains. The door-to-door logistics of cargo represents only part of the global supply chain that sources raw materials, produces intermediate products, and finally produces the product that is sold to consumer markets. A product may not be compliant with customs or product quality regulations, but the origin of the issue may be far upstream the supply chain and beyond the scope of the import shipment as declared. This poses an important challenge to these enforcement agencies. The distinction between compliance to regulations and conformance to voluntary corporate responsibility programmes is important, but both are similar in the sense that they are challenged by supply chain structure.

### SUPPLY CHAIN VISIBILITY SYSTEMS

We will discuss to what extent enabling technologies such as blockchain are useful, given the structure of global supply chains. Supply chain visibility allows stakeholders to have information at their disposal in support of good decisions, helping them to improve performance, reduce costs and boost reliability, as well as facilitating customs compliance, decreasing their carbon footprint, and improving working conditions. As the required data usually originates from other organizations, data sharing is required. The benefits of data sharing for supply chain management has received

ample attention and is advocated by companies across the supply chain. Visibility systems may allow for tracking of international shipments door-to-door [7], but this only provides upstream visibility up to the first-tier supplier.

As a result, any visibility system used by whatever technology needs to acknowledge the scope of the system to which it applies. The first question is how many tiers upstream the system tracks data. In many cases, such data is not collected, and one depends on certification of conformance of product requirements, which is not problem-free as stated earlier.

Second, one needs to understand at which level of aggregation the visibility system applies. A visibility system of an individual retailer, enabled by RFID technology, may face challenges when it seeks to connect with the status of international shipments on board a maritime vessel. Even if milestone data can be shared and linked to the shippers' consignment, the question is whether the shipper is able to derive useful information from it. What is the value of 'pilot on board' milestone data beyond the scope of the seaside handling of a vessel? The visibility system of a deep-sea carrier, enabled by blockchain, may provide the shipper with useful information about the cargo's status, especially when it concerns conditioned, perishable goods. However, connecting decisions in the maritime logistics chain - e.g. the navigation of a deep-sea vessel - to the preferences of individual shippers' supply

chains faces the challenge of difference in scope. Perhaps the population of shippers that represents on-board cargo can be segmented, so that their shared interests are sizeable enough to be addressed?

### CONCLUSIONS

We have acknowledged the difference in scope of global shipper supply chains and global logistics chains of maritime trade. First, there is a different level of aggregation where individual consignments of shippers represent only a very small portion of the cargo on board deep-sea vessels. Second, a global door-to-door logistics shipment of goods represents only a single tier in a multi-tier global supply chain. Both of these differences in scope represent a major challenge for visibility systems and the stakeholders which use data to make meaningful decisions. Addressing the consequences of these differences in scope is not just a matter of introducing even better technologies, as it also requires a profound understanding of what the implications are. Maybe such understanding can be derived from a profound analysis by human experts, or by the use of machine learning if sufficient data is available. Alternatively, it could be both.

### ABOUT THE AUTHOR

Rob Zuidwijk is Professor of Global Supply Chains and Ports at Rotterdam School of Management. He holds a PhD from Erasmus University in Mathematics. His work has been published in journals like California Management Review, Transportation Science, Manufacturing & Service Operations Management, Communications of the ACM, and Production and Operations Management. He actively participates in the collaborations SmartPort and Topsector Logistics with industry and government and coordinates various funded research projects on international logistics and transport, and global supply chains.

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[1] The Gartner Supply Chain Top 25 for 2019 published on May 15, 2019 and available via <https://www.gartner.com/en/supply-chain/research-tools/supply-chain-top-25>. Quotes are taken from p.3.

[2] Tony Chocolonely shares its story via <https://tonyschocolonely.com/us/en/our-story>.

[3] BCI reports on use of mass balance via <https://bettercotton.org/resources/key-facts/fact-3-use-of-mass-balance-traceability/>.

[4] International Sustainability and Carbon Certification puts requirements on mass balance procedures; see <https://www.iscc-system.org/wp-content/uploads/2017/02/ISCC-PLUS-204-01-Mass-Balance.pdf>.

[5] See the global supply chain blog by Guillaume Roles (UCLA) via <https://blogs.anderson.ucla.edu/global-supply-chain/2017/03/quality-management-in-supply-chains-performance-and-conformance-.html>.

[6] This difference in scope has already been highlighted in Port Technology International, Edition 79: Rob Zuidwijk (2018). Ports in Global Supply Chains: Challenges and Opportunities, available via [https://www.porttechnology.org/technical\\_papers/ports\\_in\\_global\\_supply\\_chains\\_challenges\\_and\\_opportunities](https://www.porttechnology.org/technical_papers/ports_in_global_supply_chains_challenges_and_opportunities).

[7] See for example the note by Brian Ball (Aberdeen Group) via <https://www.aberdeen.com/opspro-essentials/best-class-supply-chains-maximize-upstream-visibility/>