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Container Logistics supported by Digital Platforms

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Abstract We discuss how the container logistics industry could make further use of multi-sided digital platforms, and what information services offered on such platforms could look like. We elaborate on information services on digital platforms in support of container logistics, and point at ongoing research that addresses a number of aspects in more detail.

Keywords Container Logistics, Digital Platform, Multi-Sided Platform, Synchromodality

1. Introduction

In this paper, we address the question of how the logistics industry could make further use of multisided digital platforms, and what information services offered on such platforms could look like. We first discuss multisided digital platforms, the information services deployed on these platforms, and then consider container logistics services offered via the information services on the platforms. We also discuss ongoing research which considers a number of aspects in more detail.

2. Multisided Digital Platforms

There is a variety of services that are offered via multisided digital platforms [6]. These platforms allow producers and consumers of e.g. logistics services to connect with each other, moderated by information services offered on the platform, and reap the benefits of the network effect: The more users make use of the platform, the more value the platform may offer to its users. Companies such as Booking.com and Uber.com have transformed industries exploiting these benefits. The question remains: In what manner could the container logistics industry make further use of these multisided digital platforms, and what could information services offered on such platforms look like? This paper addresses these questions and specifically connects them with some ongoing research on container logistics and information services.

Information services provide value to users of the platform. Actors in logistics systems may act either as consumers or producers of information services. They may produce by bringing in data of which they are the unique providers, as they have proprietary information about for example the location of their assets and the planning of their operations. They may consume information services while coordinating their actions with other actors on the network and while making use of information from multiple organizations.

Information services that enable logistics services may stand alone on a digital platform, but they may also be interconnected. For example, a particular information service helps prepare a customs declaration for container import, while another information service helps

to consolidate freight for transport by means of containers. The latter information service may very well support the former on the platform. Our earlier research on the matter [5] studies pricing of digital platforms of which users may be both consumers and producers of information services, and where information services on the plaftform show a hierarchical structure in which some information services provide input to other information services.

As one may infer from [3], transport market mediation may follow two distinct strategies. First of all, an intermediary may procure logistics capacities and transform them into logistics services on a network. Secondly, an intermediary may chose to offer information services on a multi-sided platform that help connect the various stakeholders. In container transport, both models appear in practice. Deep sea container terminal operator Europe Container Terminals in the port of Rotterdam has developed European Gateway Services, offering transportation services while procuring inland handling and transportation capacities. Terminal operators are also exploring information brokerage to smoothen container logistics between sea side and land side, without direct involvement in inland transport or inland terminal handling.

In the container logistics industry, multi-sided platforms have emerged. TEUbooker.com offers on-line booking services for container transport, together with monitoring services, for transport between terminals within the port of Rotterdam by means of various modes of transport. In this example, demand for and supply of container transport is matched. Companies like Matchbacksystems.com and Boxreload.com offer on-line matching between import and export orders to reduce empty mileage of container truck drayage. Here matches are made to consolidate transport. We now explore the opportunities to further develop multi-sided platforms for container logistics.

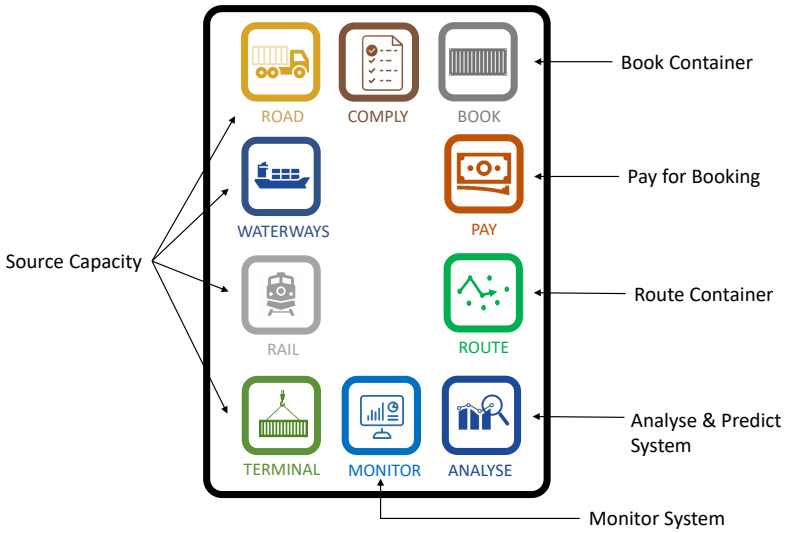
3. Container Logistics Services offered via Digital Platforms

Intermodal container transport involves use of multiple modes of transportation in sequence, where standardized loading units (containers) are transshipped that hold the cargo. The planning of intermodal transport is sensitive to disruptions, as there are dependencies between the planned consecutive transport and handling activities. A delayed arrival of a container disrupts the planning of the equipment that handles and forwards the container in ensuing stages.

These issues have motivated the more dynamic planning of resources, referred to as Synchromodal transport [1]. Containers are booked without specification of the mode of transport. A booking service on the digital platform as indicated in Figure 1 will specify the needs of the customer, e.g. timely delivery of the goods at the destination, but not the capacity reservations on the modes of transport. Also the payment service will not be driven by the tariff of the capacity reserved, but by the opportunity to deploy resources in a flexible way; a more restrictive transport request will result in a higher tariff. The routing service will be dynamic and will depend on the booking requirements and the available resources. Van Riesen et al. [7] use revenue management methods in the booking of container transport to guide the allocation of capacity to multiple customer classes for premium and basic services.

Synchromodal transport not only requires vertical collaboration among providers of transport and handling capacity in consecutive stages in the transport chain. It also requires horizontal collaboration between providers of capacity as alternatives, to allow optimal routing of containers through the network. The digital platform creates value by allowing such collaborative arrangements to be dynamic as well. In particular, the information services on the platform not only match demand and supply of container transport. There is also a need for services that help offer composite container logistics services. For instance, based on the requirements as defined by the booking, and based on the current state of the transport system, a route will be established for a container upon arrival. An analysis of expected performance of the route supports the route selection.

FIGURE 1. Information services provided on a multisided platform in support of container transportation.



Such analysis may use historical data next to data on the current status of the transportation network to predict costs, throughput time, and reliability of door-to-door solutions. Providers of logistics services may benefit from such analyses to plan their resources in an optimal way, and route containers optimally. Customers may rely on those service providers that have demonstrated to be cost effective, fast, and reliable, according to the monitoring and analysis dashboards offered by the digital platform.

The routing of the container through the network requires the deployment of various transport and handling resources on road, rail, waterways, and terminals. A route is feasile only when the required capacity of resources are actually available. Although no capacity has been reserved in the booking stage, the capacities of these resources still need to be planned ahead. Capacity planning is not based on reservations made in advance, but on prognostics regarding the potential to deploy particular resources to accomodate arriving containers. The current literature has established methods to select and deploy transport and handling capacities on networks to meet demand. For river vessel transport this has been studied in [8] and references given there. The sourcing of capacity for network services under demand uncertainty on intermodal transport networks has received attention in [4], where consolidation of network flows appears also to be driven by risk pooling. Routing of containers through intermodal networks with uncertain troughput times has also received attention [2]. Ongoing research also investigates routing on stochastic networks, but addresses the impact of collaboration between transport operators, by sharing transport orders and logistics capacities, on the network performance in terms of costs and reliability.

Additional value added services on the digital platform provide, among other things, the required information to comply with regulations enforced by governmental agencies such as customs, and agreements made between supply chain partners.

4. Outlook

The planning and execution of Synchromodal transport by means of multiple organizations moderated by digital platforms requires further research. A number of current research topics

read as follows. First of all, demand demonstrates itself as the actual demand for freight mobility, not as the need for specific transport and handling capacities. There is a need to better analyze this demand. Second, the sourcing strategy of capacity for Synchromodal services is not straightforward, as demand does not reserve dedicated capacity. Third, the benefits of horizontal and vertical collaboration to establish Synchromodal services are not straightforward, where benefits can be described as cost savings, throughput time reduction, or reliability enhancement. Fourth, research aims to analyze the emergent performance of the Synchromodal network as a result of the planning and execution of logistics services by individual organizations. The presentation will elaborate on these research efforts.

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