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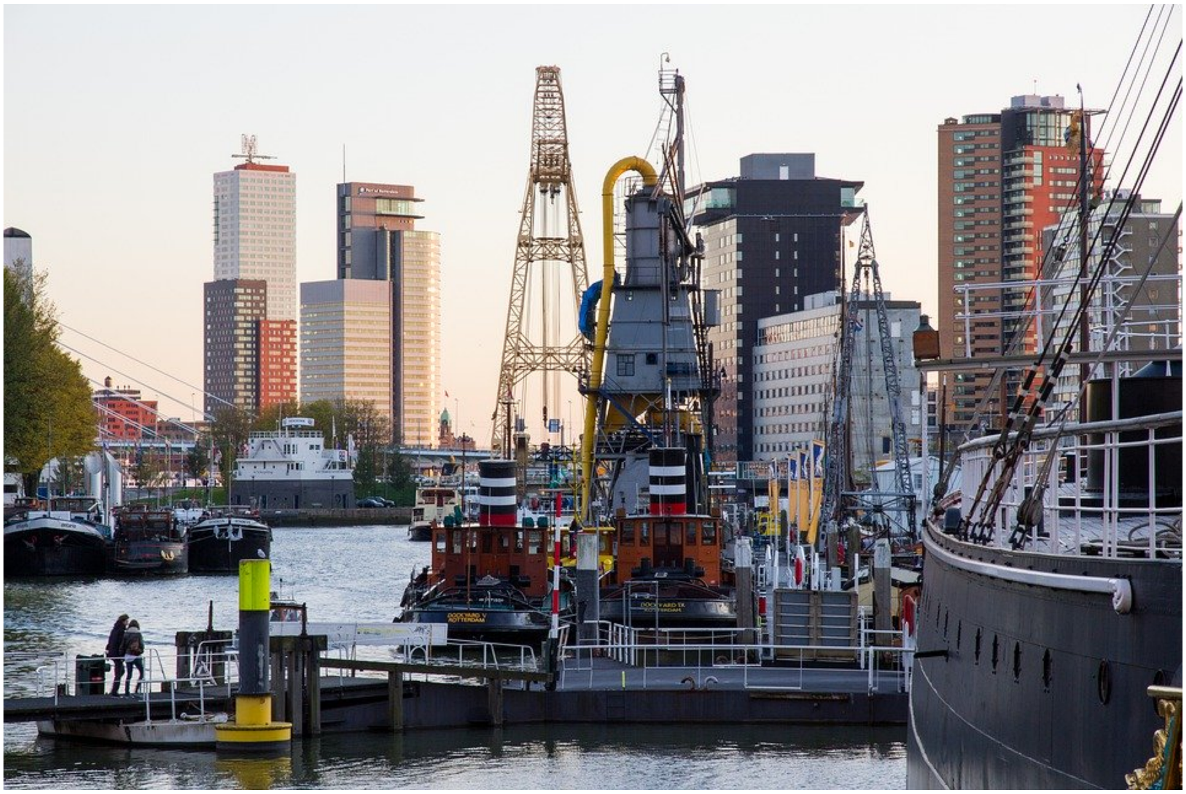

Port of Rotterdam: Introduction of a Digital Platform

MULTI-SIDED PLATFORMS IN EUROPE'S LOGISTICS SECTOR (Case 1)

RSM - a force for positive change

Introduction

In 2016, the European Commission launched the EU Horizon2020 Project SELIS (Towards a Shared European Logistics Intelligent Information Space) to accelerate digitalization of the logistics sector in Europe. Eight SELIS Living Labs (LLs) took place in different geographical settings all over Europe, including the Netherlands, Belgium, Greece, etc. During the project, supply chain visibility was one of the key strategies targeted by the LLs, also strongly related to other strategies like data reliability and quality. The overall aim of all the SELIS LLs was to contribute to the adoption of innovative business models by logistics communities and enabling the participation in a green, agile and collaborative European logistics and transportation system. In summer 2019, the project came to an end and it was time for the actors participating in the LLs to scale the multi-sided platforms launched within the project in a pilot base and implement them in their actual day-to-day business activities. How would the use of a multi-sided platform transform their business? What challenges would they encounter when implementing it? And how to improve the platform in order to make it most effective and maximize its long-term value?

Multi-sided Platforms

Multi-sided platforms (MSP) are "technologies, products or services, that create value primarily by enabling direct interactions between two or more distinct customer or participant groups"[1]. Platforms as such have existed for years; a shopping mall for example, works a platform, connecting consumers and traders. The difference of this era, which is dominated by the growth of information technology (IT), is that the need to own physical infrastructure and assets has been substantially reduced. IT makes developing and scaling up platforms much simpler and less expensive, allows nearly frictionless participation that strengthens network effects, enhancing thus the ability to capture, analyze, and exchange an enormous volume of data that increase the platform's value to all interested parties. Platform businesses like Uber and Airbnb, have grown tremendously, disrupting and revolutionizing their industries[3].

This case was written by Judith Quist and Dr. Anastasia Roukouni under the supervision of Professor Rob Zuidwijk at the Rotterdam School of Management (RSM), Erasmus University. We wish to thank Pieter Hartog, Head of Operational Performance Global Operations APM Terminals, and Carla Gatt and Tao Yue at the RSM Case Development Centre for their time and input.

This case is based on field research. It is written to provide material for class discussion rather than to illustrate either effective or ineffective handling of a management situation.

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A digital platform matches supply and demand of physical goods, services and/or information provision. The position of the platform is in between the two markets as an independent player; the platform host is the "matchmaker". What the platform sells to its users is access. The role of the platform host can differ in intensity (**Exhibit 1**); they could just offer a platform for exchange or retain more control over the interactions and have an integrated payment system and customer service.

Platforms can vary a lot, but they all have an ecosystem with common structure and four main categories of players involved: owners, providers, producers and consumers (**Exhibit 2**). The platform owners have control over their intellectual property and the governance of the platform. Providers serve as the platforms' interface with users. Producers create their offerings, and consumers use those offerings[3].

Many digital platforms create economies of scale, as costs of enabling a transaction decline when the number of transactions increases. This scalability is a reason why digital platforms can cause a disruption to existing market; they can potentially grow fast. Multi-sided platforms are characterized by network effects (**Exhibit 3**) which should be taken into account when defining the relevant market, measuring market power and evaluating the anti-competitive effects as well as efficiencies in competition cases[2]. Network effects can be either positive (value-enhancing) or negative (value-diminishing)[2].

Exhibit 1. Types and examples of platform businesses[3]

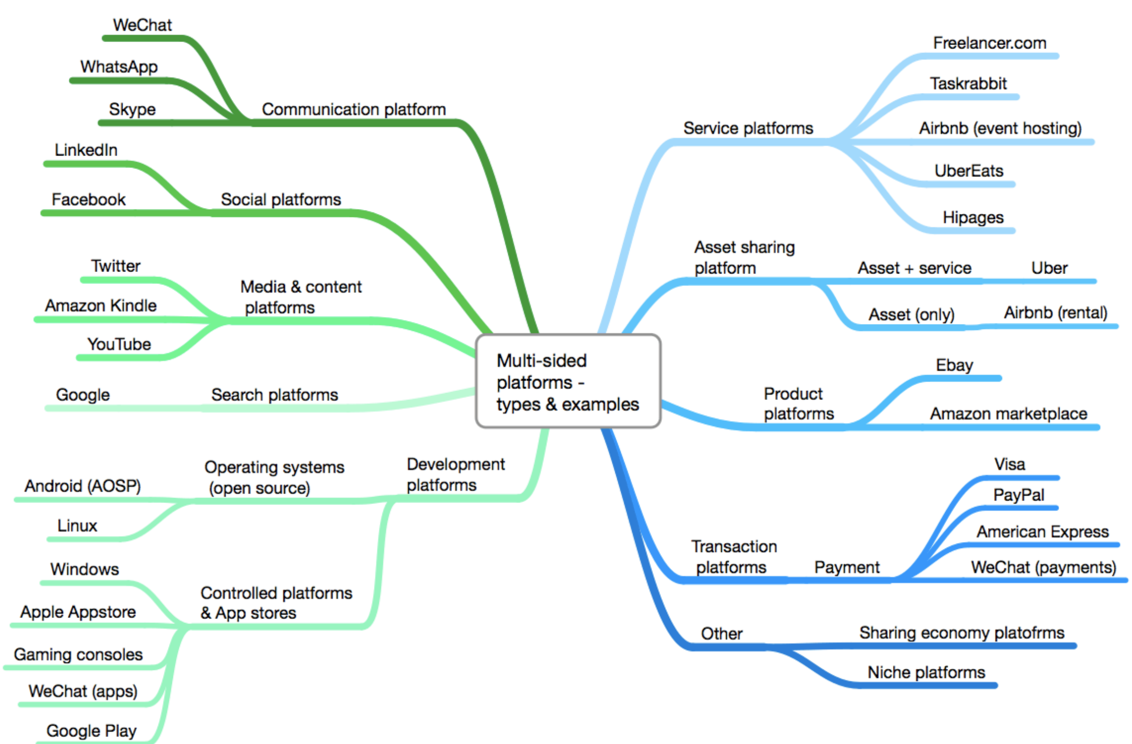


Exhibit 2. The players in a platform ecosystem[4]

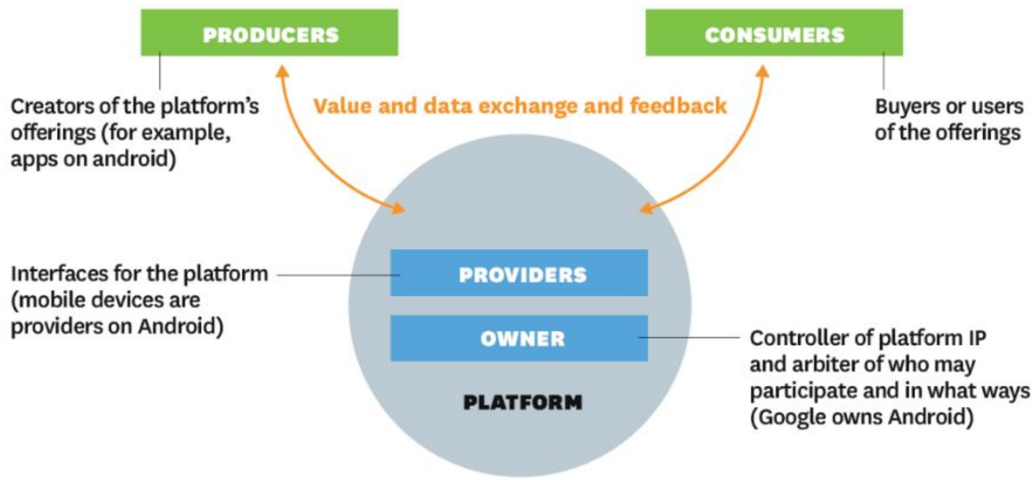
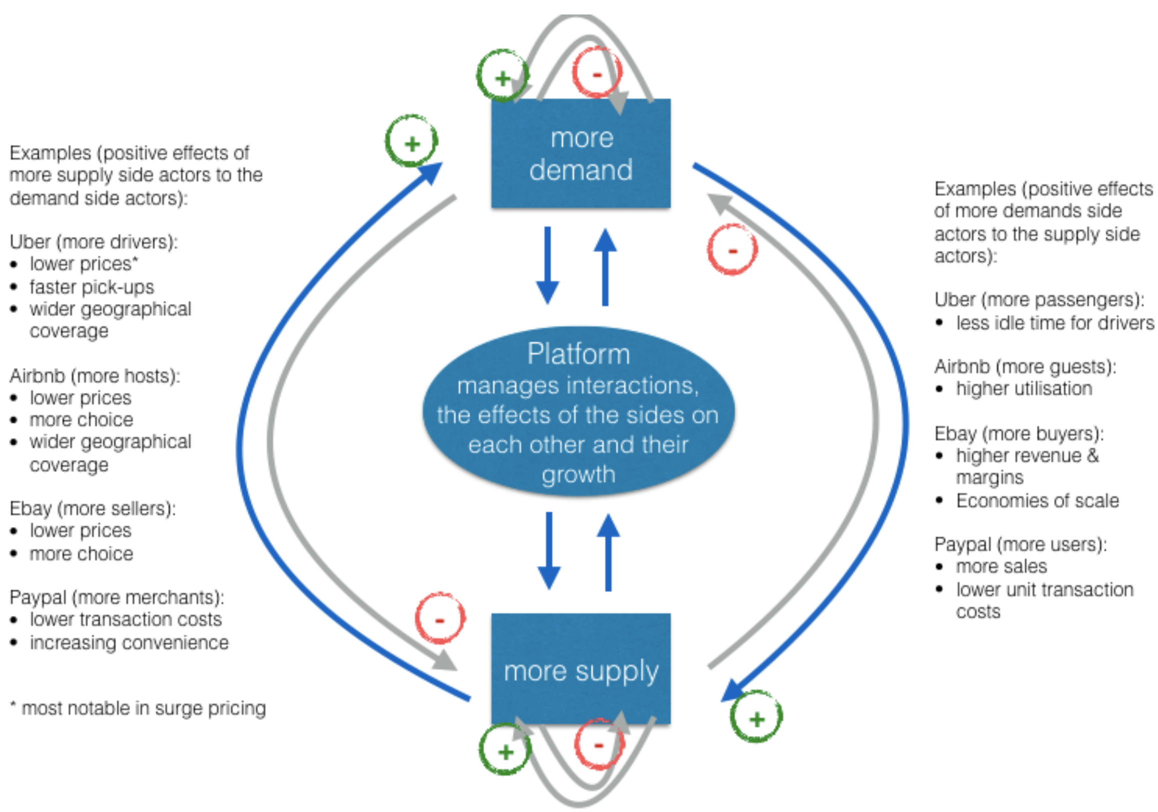


Exhibit 3. Potential network effects of multi-sided platforms[2]



Port of Rotterdam

It was August of 2018. Pieter Hartog, the managing director of APM Terminals - a seaport container terminal where transfer facilities were provided between ocean navigation, land navigation, and in-land terminals - looked out of his office window. His view was that of the fully automated container terminal on Maasvlakte II in Rotterdam, the Netherlands. The Madrid Maersk was just docking in the terminal and the large Super Quay Cranes (SQCs) started to unload the containers directly onto the Automated Guided Lifting Vehicles (ALGVs). It was one of Maersk's largest container vessels with a majestic length of 399 meters and total capacity of 20,568 TEU. Hartog always enjoyed looking at this fully automated and highly efficient process.

Hours later after a long day of meetings and conference calls, Hartog looked out of his office window again to find the container yard almost full. He knew that within a couple of days, most of the containers would be either transshipped to a different port or would find their way to their final destination on land. Due to its strategic location in the delta of the rivers Maas and Rijn, the port of Rotterdam was a very well-connected one. This made transport via barge very convenient.

In 2015, 80% of the world trade volume was facilitated by seaborne transport and these volumes consisted mainly of containerized cargo. This continuously increasing flow of containers led to port congestion, which did not only affect port operations, but caused increasing delays on hinterland transport as containers in transfer missed their connection to barge, rail or truck services. Furthermore, following the Paris agreement, which established a new sense of urgency on reducing the carbon footprint, moving cargo away from congested roads to railways and waterways became more of an imperative for the Port of Rotterdam. Reducing the amount of containers transported by truck became one of its main environmental objectives. While barges improved sustainability, using trucks improved reliability. What solution could the Port of Rotterdam find to reduce congestion, delays and mitigate the issue of reliability versus sustainability?

Industry Background

APM Terminals had a global terminal network consisting of 72 operating port and terminal facilities in 69 countries around the globe. The company was an independent business unit within the Danish based Maersk Group where it was part of the Transport and Logistics division. APM's terminal at Maasvlakte II was officially opened in 2015 and was capable of dealing with the world's largest containerships of that time due to its depth of 20 meters and advanced Ship-to-Shore container cranes. APM Terminals made a global commitment towards environmental sustainability and aimed at reducing road congestion and highway truck traffic; and thus, had a stake in increasing reliability of intermodal transport.

Hinterland Container Transport Overview

At that time about 90 per cent of all non-bulk cargo worldwide moved by shipping container. The universal size of containers allowed them to be conveniently transported between different modes of transport. Several actors were involved in the international trade and transportation, such as shippers (consignors and consignees), shipping lines, hinterland transport operators, deep-sea terminals, inland terminals and freight forwarders. A diagram with a complete overview of the actors involved in the international container transport chain can be found in **Appendix 1**.

Shipping Process

After arriving at the port of destination, containers were discharged at one of the deep-sea container terminals. The container terminal placed the containers in its yard where they were then collected by one of the hinterland operators to be transported further, either via an inland terminal or directly to the destination. The mode of transport was selected by the shipper, shipping line or freight forwarder depending on the contracts made between the different parties. Diagrams with the different hinterland transport chains can be found in **Appendix 2 and 3**.

In case of barge transport, the barge operator requested a certain time slot for a specific amount of moves with the barge crane at the deep-sea terminal based on the arrival or departure of the deep-sea vessel. Subsequently, the container terminal made a plan and communicated the planned start of the operations and the planned end of the operations.

Although these first or last legs of the international door-to-door transportation chain represented only a small portion of the total distance, they generated a big share of the total lead-time and transportation costs. An effective and high capacity multi-modal hinterland network relied on the design and the coordination between the different parties that were involved. At that time there was only limited information sharing between the different parties within this part of the supply chain because the parties were afraid that transparency might reduce their individual competitiveness and flexibility. Moreover, there was often none or little information available on the actual reliability of the hinterland connections of the port of Rotterdam. Tools that were available only included transport between terminals and did not consider any real time data and, thus, generated only limited visibility.

Actors Involved

There were large differences between barge waiting times at different container terminals. Due to a lack of data transparency these differences were relatively invisible and therefore delays at specific terminals were affecting all terminals. When the data visibility would increase, shippers and other transport planners would be able to better distinguish

between different terminals, which would then have the potential to diminish the adverse effects of the barge delays on the modal split.
Hartog's idea was to build an online platform that would provide all hinterland actors with better insights, to allow for a smoother process with enhanced visibility. As different actors within the supply chain experienced different types of problems, he deemed it relevant that these different actors would all be represented in the research team.

These actors involved:

Deep-sea Terminal Operators: The APM Terminals are in charge of all terminal handling activities. The deep-sea terminal is in control of both moving containers from the stack to inland transport modes as well as of the loading and unloading of seagoing vessels.

Barge Operators: They are responsible for the transport of containers using barges via inland waterways. As it is important, in order to increase sustainability, to move a larger portion of the containers through barge, their role is important.

Shippers (consignor/consignees): End-customer within the container shipping supply chain. Smaller shippers often hire a freight forwarder to handle their shipments, whereas larger shippers tend to have direct contact with transport operators. The consignor is the owner of the content of the container and the consignee is the receiver of the goods[5]. Normally deep-sea terminals have no direct contact with the shippers.

Freight Forwarders: A freight forwarder is a company that receives and ships goods on behalf of a shipper. These companies are often regarded as the travel agents for freights. The company either books space for shipments or dispatches them via asset-based carriers. The freight forwarder chooses whether to ship a consignment by truck, rail or barge. However, in practice this decision is often made in collaboration with the shipper depending on the size of the shippers and the size and value of the consignments.

Shipping Lines: Sea transport can be booked either by merchant or carrier haulage. Merchant haulage refers to cases in which the shipper arranges the container transport, whereas under carrier haulage (also referred to as liner's haulage pre), the end haulage of a container is the responsibility of the shipping line[6]. Shipping lines are therefore also involved in the hinterland modality decision-making process.

Port of Rotterdam Authority: The mission of the Port of Rotterdam Authority is to create economic and social value by working with stakeholders and customers to achieve sustainable growth. It is an autonomous company established to develop the port area. The Municipality of Rotterdam and the Dutch State are both shareholders of the company.

Opportunities and Challenges

The capacity and efficiency of the hinterland network were very important for the competitive position of the port, and therefore, attracted a lot of attention, not just from stakeholders in the role of hinterland transport operators, but also from a growing number of ocean carriers and container terminals. Many container terminals aimed to increase operations efficiency by expanding or upgrading their terminals and limiting dwell times. However, many ports were dealing with strict environmental legislation and no or limited expansion space. Following the Paris agreement that came into effect on the 4th of November 2016, a new sense of urgency regarding CO_2 reduction became a pending concern for stakeholders in the Port of Rotterdam. One possible solution to reduce congestion, and hence CO_2 emissions, was that of developing an intermodal hinterland network.

Of all the containers that entered the port of Rotterdam via the Maasvlakte II, 30 per cent were transshipped further via the sea and did not have an impact on hinterland connections. The remaining 70 per cent were transported via trucks, barges or trains. In 2005, 47% of the containers that travelled inland were transported by road, whereas the agreement was made that this number could not exceed 35% by 2035.

In addition to this, there were major barriers towards intermodal transport as this involved the replacement of traditional patterns with new practices, which required a high level of coordination and the integration of resources. Intermodal transport is defined as "the transport of goods within a loading unit (container, swap body, semitrailer) or vehicle (truck) by at least two different modes of transport (road, rail, inland waterways, shortsea shipping) without handling of the goods themselves when changing the mode of transport"[7]. Changes were perceived to be difficult due to the competitive nature of these relationships.

Many shippers were under the impression that intermodal transport performance was worse compared to unimodal road transport (when only one transport mode was used)- on different quality measures including reliability and speed[8]. Trains and barges were not able to offer routes that are as direct as the road, as their fixed rail and waterway structures were less extensive than the road network. Risk of non-movement and associated high costs were substantial as there were points of interchange between different modes of transportation[9]. Therefore, intermodality was most successful in circumstances in which transportation costs could be kept extremely low, thus for example very long distance transport. Other reasons involved regulatory or natural barriers (e.g. mountain ranges) or unavoidable shipment costs (e.g. at major sea ports)[10]. Points of interchange also increased the risk of damage, due to the necessity of shuffling containers around[11].

A combination of an increased lead-time associated with intermodal transport and a decreased reliability, ultimately led to higher levels of safety stock. This larger safety stock was necessary to guarantee the same service level, and thus a trade-off between transportation and inventory costs needed to be made[12]. Although intermodality had been discussed for decades, most European shippers still preferred unimodal road transport[13].

Delays in the barge container handling had been an issue of importance all throughout 2017. This problem was partly caused by an increasing size of deep-sea vessels that were causing large peaks in the number of crane moves. This subsequently led to an increased strain on terminal resources as all barge operators requested similar time slots to retrieve their containers at the same time. Evofenedex[1] indicated that 70% of the parties that reported delays considered moving their container flows to truck instead. The CEO of the port of Rotterdam, Allard Castelein, was afraid that this movement would eventually lead to a reversed modal shift, an increased pressure on landside operations, high costs and frustrated supply chains.

This was not the first time that a lack of data visibility was catching up with APM Terminal. No matter how automated the terminal processes were, the data logged in the terminal processes were not generally shared with hinterland parties. Shippers had very low visibility into the status of their containers as they moved through the supply chain, especially during the first and last legs of transport. As remarked by a big shipper in the Netherlands that exported about 70,000 containers a year, the time between the moment that a container leaves their premises and the time it shows back up on their radar when it enters the deep sea terminal, is like a big black box. In between there is no data exchange whatsoever.

However, sharing data was easier said than done. Each terminal had its own system, just like each transport operator, freight forwarder and shipping line. A lot of the relationships between these parties were competitive in nature and some parties could even take advantage of the lack of visibility. A shipper mentioned that each terminal had its own website and the shippers did not know which container will arrive at which terminal, which basically required the shipper to check each and every website individually for finding one single container.

Hartog was dreaming about an integrated solution that would provide transparency for all hinterland parties involved, but simultaneously saw privacy, security and responsibility issues popping up everywhere. He also knew that many shippers were concerned about the additional costs accompanying any data solution especially the players that were operating in a low margin business or with low value products. He was wondering how he could make sure that APM Terminals did not end up spending a lot of money but at the same time he did not want to be left with fragmented efforts and shallow competences. Hartog would like to be sure that in case his company decided to solve

[1] Evofenedex represents the interests of some 15,000 companies in the Netherlands that export, import and transport goods on their own account or subcontract through a professional transport company. They come from all sectors of industry such as machinery, chemical and agricultural sectors, but also in the field of wholesale, retail and business services (https://www.evofenedex.nl/).

this issue with an innovative solution, all the actors involved would also put in comprehensive efforts to achieve a worth-having result; a solution that could open new paths and potentially transform the container industry.

Conclusion

Hartog sighed as he was tired and wanted to go home, but there was still work to do. Last week he received a phone call from the Global APM Terminals Headquarters based in The Hague. Parliamentary questions were being addressed to the Dutch minister of Infrastructure & Water Management of the Netherlands about the barge congestion and extremely long waiting times for barges in the port of Rotterdam. Due to the large delays in barge planning, the APM Terminals at Maasvlakte II was being affected by negative public opinion.

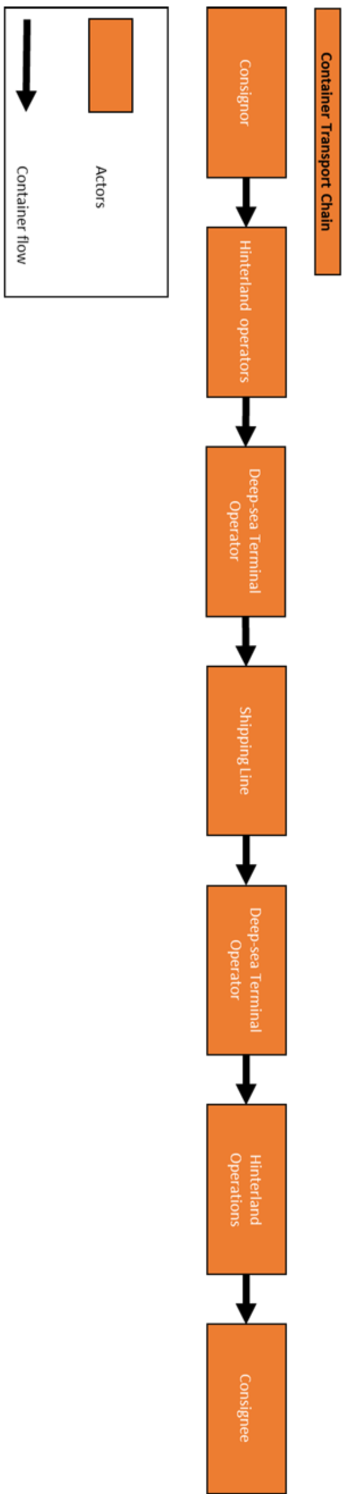
While sharing data was most probably not going to be an elementary task and encouraging all stakeholders to jump on board was going to be proven a headache, a long-term solution was required-urgently! Would creating and developing a multi-sided platform help move cargo away from congested roads to railways and waterways? Would such a solution aid to reduce the amount of containers transported by truck and thus, help Port of Rotterdam target one of its main environmental objectives?

Appendix 1. Explanation of Roles

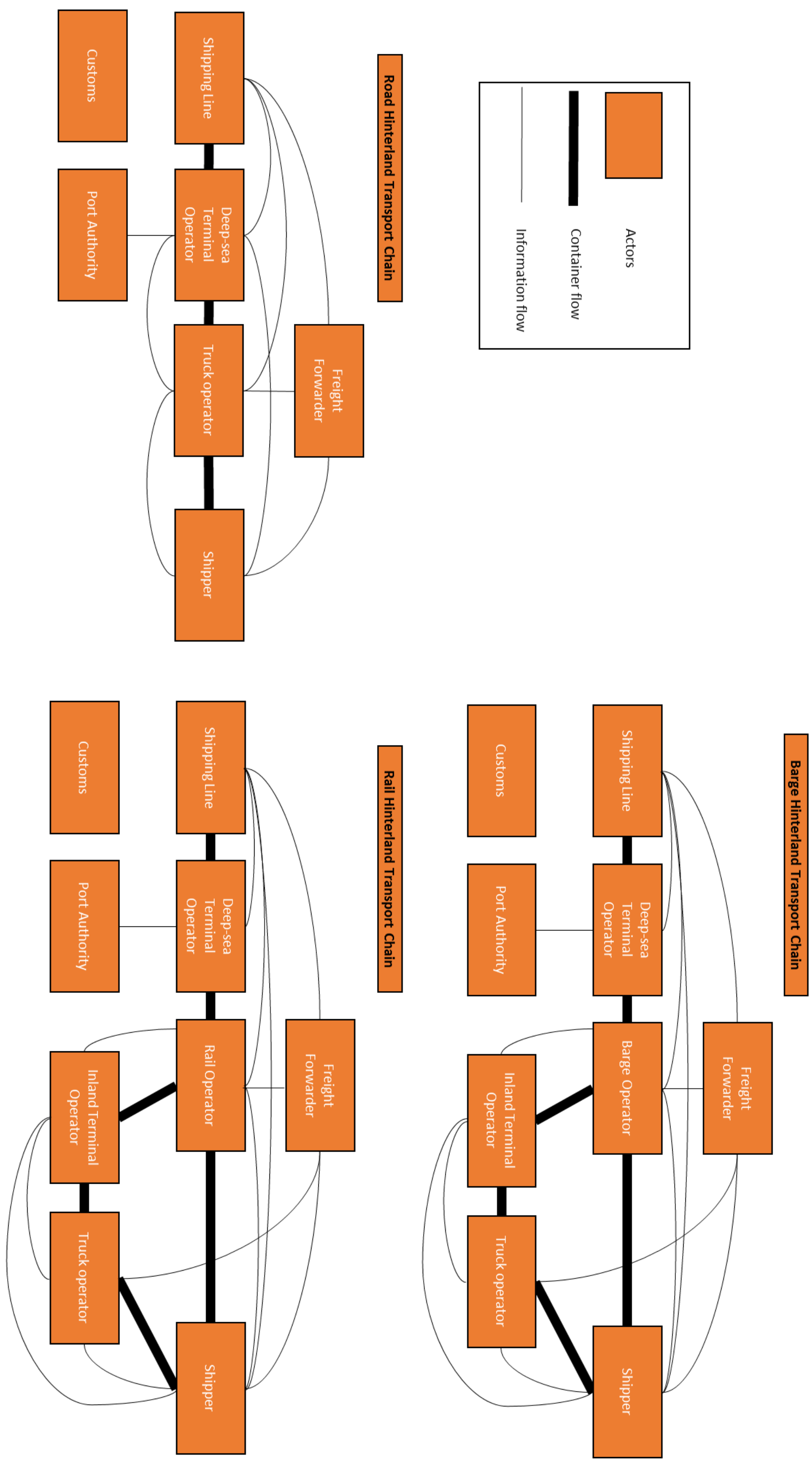
Shipper (Consignor/Consignee)	End-customer within the container shipping supply chain. Smaller shippers often led a freight forwarder handle their shipments, whereas larger shippers tend to have direct contact with transport operators. The consignor is the owner of the content of the container and the consignee is the receiver of the goods[14].
Container Shipping Line	Responsible for shipping the container from one port to the other.
Deep sea Terminal Operator	In charge of all terminal handling activities. The deep-sea terminal is in control of both moving containers from the stack to inland transport modes as the loading and unloading of seagoing vessels.
Freight forwarder	I.e. external logistics provider. Has the responsibility of the door-to door delivery of the container. Typically, the freight forwarder does not own any ships, terminals, or equipment but merely acts as an agent between the shipper and transport operators.
Barge operator	Barge operators are responsible for the transport of containers using barges to transport the containers via inland waterways.
Rail operator	Rail operators are responsible for the transport of containers using trains to transport the containers via rail.
Trucking Company	Trucking companies are responsible for the transport of containers using trucks to carry the containers.

(Source: Adapted from De Langen et al., nd[15])

Appendix 2. Overview of Container Transport Chain



Appendix 3. Overview of Container Transport Chain



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