Transport Efficiency in Supply Networks: The impact of network horizons and network contexts

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INTRODUCTION

The increasing focus on climate change and CO_2 emissions has set pressure on the transport freight sector to reduce its environmental impact. The EU has set goals of a 60 % reduction of CO2 emissions from transport as of 2050 compared to the level of 1990 (European Commission, 2011). In some countries the targets set are even higher. For example, in Sweden the goal is to reduce transport related CO_2 emissions with 70% to 2030 compared to the level of 2010 (Swedish government, 2016). Various measures have been taken to work towards this goal and transport efficiency has appeared at the top of the agenda for industrial as well as societal actors (European Commission, 2016). Technological development of vehicles, types of engines, alternative (non-fossil types of fuel) and electrification efforts are some measures taken to reach these goals. However, according to several sources (Banister, 2000) alternative actions need to be taken to improve transport efficiency. To achieve this goal, moving from a narrow view of transport efficiency to a broader perspective is necessary (Baumann and Tillman, 2004). Although non-technical aspects have been researched, the scope has been rather limited and Aronsson and Huge Brodin (2006) argue that structural and organizational issues have only been addressed on a societal level, mostly concerning infrastructure. The call for a broader perspective on transport efficiency is called for (Arvidsson, 2013:14). How firms organize their supply chains (including transports) and the behavior of supply chain actors are brought up as important areas for investigation and improvements. Rogerson (2016) states that the process of purchasing freight transport is essential in capturing different demands related to different measures such as load factor, fuel efficiency, and empty running of trucks. As such, transport is embedded into broader supply networks involving numerous actors. In this paper we focus on how efforts on increasing transport efficiency are accomplished in a supply network through an initiative to make changes in the (re-) organizing of transport within a business relationship. The basic approach is that to understand how transport efficiency can be improved in a supply chain (or network) the business relationships between the buyer and seller of transport services need to be scrutinized. However, this business relationship is tightly connected to the buyer and seller of the goods since the exchange of goods generates the demand for transport services. This specific supply network context has been referred to as a Transport Service Triad (see e.g. Andersson et al. 2018, Eriksson, 2019). Each of the three involved actors in this triad has its own specific perspective on transport efficiency. Furthermore, transport efficiency is not the only aspect of efficiency that is of concern for these actors. The aim of the paper is to explore how an initiative to improve transport efficiency in a part of a supply network is seen and acted upon from various actors' perspectives.

THEORETICAL FRAMEWORK AND RESEARCH QUESTIONS

Anderson et al. (1994:4) introduce the concept of network horizon which they define as "how extended one actor's view of the network is. The network horizon can be expected to be dependent of the experience of the actor as well as structural network features." This implies that a firm's network horizon includes other firms' direct and indirect relationships which the firm are aware of. Since the awareness of other firms and relationships can develop over time, due to e.g. new information from counterparts, the network horizon can change. This is in line with Storer et al. (2001) that found that if something happened in the network horizon of the firm, that could affect the firm's network horizon. Storer et al. (2001:463) argue "One thing that these organizations had in common (organizations with longer customer horizon; our comment) and which distinguished them from organizations with shorter customer horizons, was that in past years they had been subject to significant problems that had required a thorough chain understanding and considerable work to resolve". Based on their discussion Storer et al. (2001) distinguish between a firm's customer horizon breadth and length. According to Storer et al. (2001:459-460) "A company's customer horizon breadth was measured in two ways:(1) in relation to direct customers only; and (2) in relation to all identified customers downstream" and "…customer horizon length was assessed … in terms of the maximum number of stages named and how far this was from the final end consumer". Thus, one can assess different parts of the network horizon by analysing the network horizon breadth and length.

Holmen and Pedersen (2003) also discuss the firm's network horizon, and elaborate on the paradox that firms are advised both to have a broad and comprehensive networks horizon, but on the other had also advised to have a limited network horizon. They conclude that firms often have a relatively myopic network horizon due to limited resources to use for reviewing and following up other firms and relationships around them. The part of the network horizon that is considered of relevance for an actor is referred to as its network context (Håkansson and Snehota, 1989). This implies that the network context is a matter of perspective where different units within one firm can see different network contexts within the same network horizon. Beyond the network horizon, we have the environment according to Andersson et al. (1994), or as articulated by Snehota (1990:146) ''there is a ''residual'' beyond the context, beyond the horizon, and that is environment."

Furthermore, both the network horizon and the network context are matters of perspective. This implies that different units within one firm, and even different persons, can have different network horizons and contexts. Hence, it is likely that different mangers have different view of the network horizon of a focal firm depending on the experiences of individuals in the firm and which unit/function the individuals are connected to. Thus, the network horizon is used to investigate how various actors have different perspectives on transport efficiency and is used to explain why some actors' efforts of improving transport efficiency might 'clash' with other actors' interest in creating other aspects of efficiency.

From this we formulate the following research questions to be answered:

How do efforts to improve transport efficiency in a business relationship depend on:

- actors' network horizons and network contexts?
- actors' efforts in achieving other aspects of efficiency?

METHOD

The paper is based on a qualitative research approach and case study method. Case-based research is a well-established method in research dealing with business networks (Halinen and Törnroos, 2005). The analytical procedure applied in this paper can best be described as systematic combining (Dubois and Gadde, 2002), matching the theoretical framework and the empirical data as well as the (re-)dictions occurring over time. The empirical data and the findings of this paper stem from a case study conducted between 2016 and 2017 (Eriksson, 2019). The case describes an effort to improve transport efficiency in a business relationship between a wholesaler of installation products, InstaWhole, and one of its main customers, the large construction firm ConFirm. The case also involves the transport service provider, TransFirm. All three firms' perspectives on the surrounding network are essential in understating direct and indirect effects on transport efficiency as well as how different efforts affect actors in the network.

Data were primarily collected through semi-structured face-to-face and telephone interviews, which were transcribed first in Swedish and then translated into English when writing up the case. The length of the interviews varied, but the majority of the interviews lasted between 30 and 90 minutes (average of 75 minutes duration). Additionally, data were collected at site visits at both InstaWhole's warehouse and at TransFirm's terminal. The two site visits provided a good understating of the firms' logistics operations. The site visits lasted approximately 120 minutes. Three people at InstaWhole, three people at ConFirm, and four people at TransFirm were interviewed at 15 interview sessions either by face-to-face or by telephone. The interviewees were identified by snowball sampling where one interview led to another to learn more about the core aspects of the case. It was therefore essential to interview representatives of all three firms to capture diverse perspectives, different business rationalities, and different views on the network.

A CHANGE INITIATIVE TO IMPROVE TRANSPORT EFFIENCY

In this paper we describe and analyse an effort to make changes in a supply network in order to improve transport efficiency. The case deals with an Wholesaler (henceforth referred to as InstaWhole), one of its main customers (henceforth referred to as ConFirm) and an Hauler (henceforth referred to as TransFirm).

InstaWhole is a Swedish wholesaler of installation products, tools and supplies aiming at public and private customers active in, among others, the construction industry. The products are sold through internal sales forces, 120 physical stores and a web portal. The logistics operations are centered around a central warehouse. In average, around 150 trucks arrive and/or depart from the warehouse every day. Orders placed by customers are delivered the day after to customers. Hence, for InstaWhole the service levels to customers is of primary concern. The outbound deliveries from the warehouse to the customers are managed by external haulers that together operate about 550 trucks in InstaWhole's distribution network.

ConFirm is one of InstaWhole's major customers. The primary concern for ConFirm is construction productivity and therefore on-site logistics is a main issue. An IT system is used for pre-booking of time-slots for deliveries to sites. ConFirm tries to buy as much as possible excluding transport to be able to arrange the transport themselves in cooperation with a logistics service provider. However, when buying from InstaWhole, transport is included in

the price of the product and the transport is organized by InstaWhole in cooperation with their haulers.

TransFirm is a small Swedish hauler working for InstaWhole in the Stockholm region. They are InstaWhole's only supplier of transport services in this region and, likewise, InstaWhole is the only customer of TransFirm. TransFirm operates a terminal for materials handling and about 50 trucks. It delivers about 1200 shipments daily to InstaWhole's customers from their terminal. One main activity is to sort the goods coming from InstaWhole's warehouse to its terminal. In order to manage the 'day-after-order-deliveries' to InstaWhole's customers a high degree of planning and flexibility in the use of resources are required. For TransFirm issues as efficiency in materials handling in the terminal and fill rates of trucks and optimization of transport routes are of main concerns.

An initiative to improve transport efficiency

InstaWhole and ConFirm has worked in a business relationship for over 30 years. The current service level from to customers is 99%. ConFirm is very satisfied with InstaWhole as a supplier and the service levels it provides. In construction projects where ConFirm acts as main contractor, there are also several subcontractors involved. Many of these also use InstaWhole as a supplier. This means that several customers of InstaWhole can often be found at one and the same construction site. Since the deliveries are directed to the customers rather than the construction sites/projects, this means that a specific construction site often gets multiple deliveries each day from InstaWhole. However, these deliveries are not coordinated since each delivery is related to a specific receiver (customers) rather than to the site/project. Hence, each customer (either ConFirm or one of the subcontractors working on site) is given individual time slots for delivery to the construction site. This means that a certain truck might have to wait at the gate to a construction site to match several time-slots related to different customers (the main contractor ConFirm or one of the subcontractors) during a day. However, from a construction production perspective, it is important that the time-slots are in accordance with the production time plan at site and the on-site logistics planning so that material handling on site and construction operations can be matched and performed efficiently.

In 2015 InstaWhole approached ConFirm with an idea to reduce the number of delivery days from five (daily deliveries Monday to Friday) to twice a week (Mondays and Thursdays) to reduce CO2 emissions from transport. The main idea was to decrease the number of transports in the business relationship between InstaWhole and ConFirm and to increase the possibilities for consolidation of goods in the Stockholm area. The initiative was realized in 2016 and a one-month trial project was launched. Therefore, also TransFirm became involved in the initiative as the one operating the actual transport services. The idea was that buyers at ConFirm's should plan their purchases in a way that allowed for deliveries on these two days.

However, this did not end up as planned. First, not all relevant people in all projects and construction sites got information about the project and the new procedures for order placement. Second, not all people at ConFirm wanted to change their planning. They were used to a very 'good' service level from InstaWhole with very short delivery times and this new procedure required a lot more 'planning ahead' which they were not used to. During the trial project 794 orders were placed and 2460 items were sent to 160 receiver addresses. Out of the 794 orders, 667 were delivered on Mondays and Thursdays in accordance with the project specifications. The rest of the 127 orders were not delivered in accordance with

project specifications and were spread over 10 days (not Mondays and Thursdays). The reasons for why these orders were delivered the 'wrong days' were a result of 'panic orders' that needed to be delivered due to construction productivity reasons and could therefore not wait.

InstaWhole's IT-system has a built-in function that automatically processes the order to be delivered the day after. This became problematic in the project since orders arrived in an ongoing basis all week but should only be processed and delivered twice a week. One option would have been to restrict the buyers at ConFirm to only place order twice a week. However, this was considered a too strong restriction for the buyers and their current routines. So, in order to handle this issue InstaWhole made an adaption of their IT system so that orders could be temporally stopped and then reactivated. Still another option would have been to adapt the pick-and-pack routines for orders and then stored the goods until time for delivery. This was however, seen as a too large adaptation of the warehouse activities that would impact on warehouse efficiency in a negative way. Another issue relates to the fact that many of the subcontractors working on ConFirm's construction sites are also customers of InstaWhole. However, they did not take part in the trial project. This meant that TransFirm still had to deliver products to ConFirm's construction sites on a daily basis directed to other customers of InstaWhole (i.e. the subcontractors). All in all, this resulted in that consolidation of goods could be made Mondays and Thursdays concerning the goods ordered by ConFirm but the rest of the days load factors decreased due to the deliveries to subcontractors (but not to ConFirm). However, in some projects TransFirm's representatives managed to come to an agreement with people at the construction site to adapt time-windows so that they did not have to wait at the construction site in order to match several delivery time-windows for separate customers.

ANALYSIS AND DISCUSSION

This section analyses the network horizons and network contexts of the three focal firms are scrutinized.

InstaWhole's network horizon and network context

InstaWhole's primary focus is to offer their customers outstanding service levels. They do so by providing their customers an assortment that fits their customers' use context. This is accomplished through about 3000 suppliers. Furthermore, a key issue is to work with warehouse efficiency and order processing. For the physical distribution to customers they rely on some large transport service providers and some small local transport service providers. The network horizon of InstaWhole can be said to cover these primary actors, their suppliers, their customers in various segments and their transport service providers. In the change initiative described in this paper the network context that was considered relevant was rather narrow. When approaching ConFirm with the initiative to reduce the number of transports InstaWhole did so with a focus on this customer relationship and the transports generated by the exchange of goods in this specific relationship. Hence, InstaWhole's other customers, such as installation firms and contractors, working as subcontractors at ConFirm's construction sites, were not considered part of the context of the change initiative. Therefore, InstaWhole can be said to have had a rather short customer horizon in this project, not considering its other customers relevant for the change. Furthermore, TransFirm was not involved in the initial discussions of the initiative but rather had to handle the consequences of the new requirements on deliveries when they appeared. Hence, InstaWhole's overarching

network context that triggered the managerial actions was focused on the single customer relationship with ConFirm. This myopic view led to that the other customers (the subcontractors of ConFirm) that could potentially have contributed to increased transport efficiency were left out.

ConFirm's network horizon and network context

ConFirm's primary focus is productivity in their construction projects and on their construction sites. Hence, on-site material handling and logistics is a main concern as well as the matching of off-site logistics and transports with on-site requirements. Hence, for ConFirm, certain time-windows for material deliveries are important so that congestions around construction sites are avoided as well as the fact that planned operations on site depend on the deliveries of material at certain times. The network horizon of ConFirm covers mainly the material suppliers and subcontractors that they have direct relationships with as well as their main supplier of transport services. On the customer side, a wide variety of various types of customers can be found within the network horizon. In the change initiative described in this paper the network context that was considered relevant from ConFirm's perspective was rather diverse. Different parts of the ConFirm organization became involved and affected and they regarded the network context differently. First, on the general management level, the information about the initiative was not transferred to the project/construction site level which meant that some of the persons working in the projects did not plan according to the new specification, which, in turn, resulted in that 'panic order' had to be managed. Furthermore, people responsible for planning and purchasing have become used to the high service level of 'the-day-after-order-deliveries' and such behavior is not easily changed. Hence, various network contexts were identified at ConFirm. Even though that many people at ConFirm are probably aware of that many of their subcontractors are also customers of InstaWhole, no action to bring these subcontractors into the project was taken. Obviously, there were different network contexts on various levels in the ConFirm organization. The fact that ConFirm and their subcontractors handle their purchasing activities separately is probably one explanation to why actions were not taken to include the subcontractors.

TransFirm's network horizon and network context

TransFirm's main focus is to keep up good service levels to InstaWhole and the deliveries to InstaWhole's customers. Their business relies on achieving a high degree of transport efficiency, hence efficient resource use in terms of, for example, fill rates in trucks, and route optimization. In order to accomplish this they need as much flexibility as possible in how they can plan the deliveries with regard to time. Another aspect relates to terminal efficiency when sorting and handling goods in their terminal, something that is dependent on how the initial sorting is done in InstaWhole's warehouse. The actors within TransFirm's network horizon are InstaWhole and InstaWhole's customers in the Stockholm area to which they deliver on InstaWhole's behalf. From TransFirm's perspective the change initiative meant that they still couldn't consolidate all goods twice a week since the deliveries to subcontractors still were handled the 'traditional' way. However, in some situations, representatives at TransFirm handled this on a local level and managed to interact with people at construction sites to agree on adapted delivery windows. The view of the situation as regarded from TransFirm could hence be transferred to some representatives of ConFirm and subcontractors at local construction sites. In this way, some of the subcontractors actually got involved in the project indirectly.

CONCLUSIONS

The analysis shows how the network horizons are different between the three focal actors. Based on their respective network horizon they have different network contexts, depending partly on that they view the network from different angles but also that they have different views on what are the most important issues to focus on, e.g. different aspects of efficiency. Some actor prioritises construction and construction site efficiency, some other warehouse efficiency and service levels and effectiveness, and another one focus on transport efficiency. The case illustrates the problem of missing out parts of the network when considering a change, hence having a myopic network horizon. One can suspect that if the subcontractors working at ConFirm's sites had been identified as part of the relevant network context from the beginning, the efforts of increasing transport efficiency would have been easier to accomplish. However, the actors would still have their different focus and some actors do not consider transport efficiency a main issue. The study also illustrates how hard it can be to discover what is the relevant network context for a certain change effort. It also shows how network horizons can be expanded to include other actors, for example when TransFirm started to interact directly with ConFirm and their subcontractors to adapt delivery time-windows. To conclude, when trying to increase transport efficiency in part of a supply network it needs to be regarded in light of other aspects of efficiency that might be more relevant for other actors. In this paper we have shown how the concepts network horizon and network context can be helpful tools to understand these issues.

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