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Transportation Research Procedia 25 (2017) 806–823

Transportation Research Procedia

www.elsevier.com/locate/procedia

World Conference on Transport Research - WCTR 2016 Shanghai. 10-15 July 2016

Variety in freight transport service procurement approaches

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Abstract

Freight transport is featured by complexity owing to interdependences within supply networks. The aim of this paper is to explore the variety in freight transport service procurement approaches and how these impact on vehicle utilization. The paper relies empirically on a case study featuring different conditions for, and approaches to, transport services from the perspectives of buyers and suppliers of transport services. Three particular dimensions are identified; (1) the nature of the transport needs, (2) the buying firms' share of and influence on the utilization of vehicles, and (3) the division of labor with regard to how the firms handle their needs for transport services. The paper concludes that the variety of transport service procurement approaches impacts heavily on the conditions for vehicle utilization.

Peer-review under responsibility of WORLD CONFERENCE ON TRANSPORT RESEARCH SOCIETY.

Keywords: transport service procurement, buyer-supplier relationships, supply network context, transport service triads, interaction

1. Introduction

Transport efficiency is growing in importance. Efficient use of heavy vehicles, as a key aspect of transport efficiency, is also one of a set of issues subject to increasing attention following the growing concerns of the climate effects of freight transport. All in all, road transport encompasses around 20% of the total carbon dioxide emissions in Europe, with heavy-duty vehicles standing for a quarter of these emissions (EU Climate Action). In order to improve the utilization of vehicle capacity it becomes essential to better understand the conditions for this utilization.

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2352-1465
Peer-review under responsibility of WORLD CONFERENCE ON TRANSPORT RESEARCH SOCIETY.
10.1016/j.trpro.2017.05.459

In this paper we take one such step by exploring the variety in transport service procurement approaches since these approaches are assumed to impact on the conditions for vehicle utilization. The case study is grounded in the specific supply network contexts of the transport services, i.e. we take a micro level perspective on the conditions for transport service procurement and how this impact on vehicle utilization.

Recent empirical studies of transport service procurement suggest that logistics managers prioritize reliability, transport quality, geographic coverage and low price when selecting transport suppliers, and that price is most important when selecting transport solutions (Lammgård and Andersson 2014). However, low price relate to efficient resource use and can thus be achieved by collaborative approaches wherein adjustments of the transport service setting are made to enable more efficient use of vehicles to reduce cost. Moreover, transport service procurement efforts carried out to achieve full truck-loads reduce both emissions and the cost of transport services (Basu et al. 2015; Evangelista, 2014). In more general terms 'environmental purchasing', i.e. environmental actions of a firm in relation to its upstream supply chain, has been found to have a positive impact on firm performance (Carter et al. 2000).

Through exploration of the variety in transport service procurement approaches we set out to identify a set of dimensions with regard to the conditions for vehicle use. The context on which the efficiency depends includes the business networks of the firms that are involved in buying and selling of transport services. Hence, links to the wider business context of these firms are considered as of importance for the understanding of their vehicle utilization. In this regard the study draws on previous studies and notions on the complexity of the business networks in which transport services are embedded. For instance, Sternberg et al. (2013: 493) note that in contrast to how research focusing on transport activities are typically depicted "…a closer look into real-world road freight transport systems reveals more complex constellations involving multiple actors with different functions, leading to a fragmentation of transport planning and control activities and accordingly inefficient execution of road freight transport". In addition, Rogerson et al. (2013) emphasize the influence of contextual factors on the purchasing process for freight transport services.

The aim of the paper is to explore the variety in transport service procurement approaches and how these impact on vehicle utilization. The theoretical framework guiding our exploration is grounded in the industrial network approach (see e.g. Håkansson and Snehota 1995, Håkansson et al. 2009) and especially the role of the relationships between buyers and suppliers of (transport) services and products (subject to transport) (Gadde and Hulthén 2009). The paper is based on an ongoing case study of how three firms approach transport service procurement and how these approaches, and the supply network settings on which these depend, affect the conditions for vehicle utilization.

Transport services are featured by certain unique characteristics compared with other 'transformation' activities. First, they always in one way or another include at least three actors; the transport service provider, the buyer of the transport service and a third party being either the buyer or supplier of the goods subject to transport (depending on who is buying the transport service – the buyer or supplier of the goods). Hence, we draw on the notion of 'the transport service triad' including buyers and suppliers of goods and of transport services (Andersson et al. 2014). However, in many cases the network setting is much more complex and includes a great variety of other actors (Sternberg et al. 2013). Therefore, we extend the analysis of the transport service triad to include other actors influencing the transport activities. Second, every company involved in production of physical products depends on transport activities both up- and downstream. These activities may, or may not, be subject to interdependence that requires management by the parties involved. Third, transport activities are special with regard to the space dimension since they connect other transformation activities (e.g. refinement and/or storage of physical products) that are bound to different locations.

In the next section we present the frame of reference followed by section three in which the method is described. In section four the three cases are presented. Section five contains the case analysis. The paper ends with conclusions and implications for research and practice.

2. Frame of reference

Purchasing was for a long time seen as an administrative task. However, in recent years, purchasing has become strategic and thereby become part of the management agenda for many firms. Gadde and Håkansson (1994) identify three strategic issues for purchasing: the first regards whether to make or buy the product, service or component. If the decision is to buy, the second issue regards the structure of the supply base, meaning the number of suppliers and how to organize the suppliers in relation to one another. The third issue is how to work with suppliers in individual supplier relationships. A key aspect in this issue is the interface with suppliers in terms of resource adaptations, degree of closeness, and thus the extent of interaction with individual suppliers (Araujo et al. 1999). In more practical terms, if the decision is to buy, firms typically have a procurement process including a number of steps or phases from need identification, specification, supplier and/or offering evaluation to supplier selection (see e.g. Anderson et al. 2009).

With regard to purchasing of transport services, those three strategic issues are of relevance. With starting point in the make or buy decision, if the decision is to purchase transport services, the transport procurement process becomes critical, and especially the selection of the service provider and how to work with the service provider. Rogerson et al. (2013) point to the importance of the context of the purchasing process for freight transport services. Sternberg et al. (2013) also point to the need of including multiple actors in their study of fleet control in transport planning. To capture the inter-organizational context of transport procurement, we build on the industrial network approach, also referred to as the IMP research tradition (Håkansson et al. 2009). The IMP research tradition emphasizes the importance of interaction and business relationships between firms over time. Business networks are analyzed in three dimensions: activities, resources and actors (Håkansson 1987, Håkansson and Snehota 1995). Resources are activated by activities and thus; how activities and resources are organized among actors play a vital role for the performance of the firms involved.

In this study we focus on the link between vehicle operations and transport service procurement. Vehicles are activated by transport activities that are interdependent with other activities in the network. The key to understand these interdependencies, and how the firms involved handle them, is the activity patterns that, in turn, influence and are influenced by the firms' approaches to purchasing of transport services. Moreover, how the vehicles, as the focal resources, are tied to other resources and how these resources are organized among the firms is an additional aspect as well as the bonds among actors that may influence the other interdependencies and how these are handled (Hedvall et al. 2016).

In order to describe and analyze the network setting in which transport services are carried out, we take a starting point in transport service procurement and in the relationships between the buyer and supplier of transport services (Andersson and Norrman 2002, Rogerson et al. 2013). This relationship, however, has a generic connection with the relationship between the buyer and supplier of the goods to be transported (regardless of whom, i.e. the buyer or the supplier of goods, is buying the transport service).

We refer to this as the 'transport service triad'. Service triads in general are emphasized as essential for approaching and researching business services (Wynstra et al. 2015; Yáñez-Arenas 2013). Service triads imply a more complex situation that is different from a situation in which a supplier only relies on one customer. Triads are the smallest possible networks consisting of two (or three) connected relationships (Laage-Hellman 1989) and for studies of transport services in specific, a theoretical focus on triads as units of analysis consisting of buyers and suppliers of goods and of transport services has been suggested (Andersson et al. 2014). The triad relies on (1) the focal dyad between the transport buying company and the transport service provider, and (2) the third party who is the business counterpart to the transport buying company that either sells or buys the goods subject to the transport activities (see Figure 1). While this triad can be considered generic for the analysis of freight transport activities to capture their embeddedness in the exchange of goods (and thus in their supply chain contexts), fourth parties of different kinds also need to be identified in the specific settings when they impact on the conditions for the transport activities.

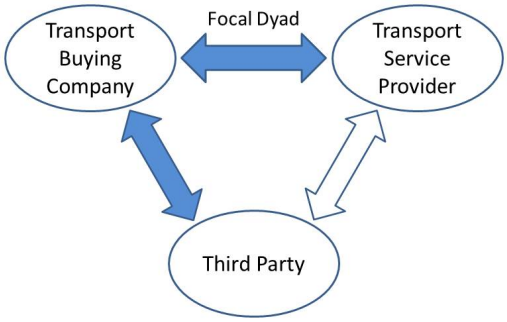

Figure 1. The transport service triad and the focal dyad (relationship between the buyer and supplier of the transport service) for analyzing transport service settings (modified from Andersson et al., 2013). The two blue arrows illustrate business relationships.

Based on the notion of the transport service triad, and thus how transport service providers are involved "in between" buyers and suppliers of goods to be transported, we will address three broad research issues to uncover the contextual conditions for vehicle use. The first deals with identifying and describing the relationships within the triads of concern for the transport operations. The triads set the terms for the focal dyads including the relationships between the transport buying firms and its transport service providers. The second research issue concerns the context and the analysis of the interdependencies among the activities, resources and actors involved in the identified triads. The third research issue focuses on how the identified interdependencies impact on the uses of the focal resources, i.e. the vehicles, and thus on transport efficiency in terms of efficient vehicle utilization.

3. Method

The study underlying this paper addresses the complexity of transport service procurement in an inter-organizational context which necessitates the choice of an exploratory in-depth research approach. Therefore, a case study approach was used in the study. Case studies are recommended in situations when interaction between a phenomenon and its context is in focus and an in-depth understanding is needed (Easton 2010, Dubois and Gadde 2002). The case study includes three embedded sub-cases (Yin 2014) that are grounded in empirical observations from three transport buyers.

The three (sub-) cases of transport buying firms have been selected based on some similarities (ex ante) to identify variety in other dimensions (ex post). The three transport buying companies were selected based on that their operations were known to be heavily dependent on transport and on that they were known to be large buyers of transport services. Hence, the companies were selected based on that they were considered as particularly interesting with regard to purchasing of transport services. When generalizations are concerned these rely on the analytical dimensions identified in the study and thus not to any other general categories of firms or settings. The three cases were found to display variety in five dimensions; (1) how the buying companies' transport needs were featured by time sensibility and resource specificity, (2) how the organizing of the transport operations were handled both internally within the companies, and externally i.e. in relation to the transport service providers, (3) how the transport buying firms' approach make or buy issues when transport operations are concerned, (4) how the transport service buying firms approach the relationships with suppliers, and (5) how the transport buying companies approach the coordination of externally organized transport activities and resources. Most part of this variation was discovered as a result of the interviews, which also had an impact on the analytical framework developed during the study (Dubois and Gadde 2002).

When exploring how transport buyers operate and interact in the network, in-depth empirical data is required. To collect the data and at the same time engage the stakeholders' specific perspectives and knowledge, interviewing was the preferred data collection method (Yin 2014, Bryman and Bell 2011). The interviews were semi structured providing possibilities to relate to each specific and unique context and simultaneously keep a clear focus on the topic at hand (Bryman and Bell 2011).

An interview guide was developed based on previous experience from the industry and prior research. This was followed by an initial pilot study involving interviewees representing transport buyers and transport providers. Apart from validating the interview guide, the pilot study provided input to the developing research framework and sampling-strategy.

Interviewees from transport buyers and transport providers were selected based on their specific role and their knowledge regarding the company's operations as well as interaction with other actors in the network. Of the 12 interviews performed in this ongoing case study, 7 relates to the cases presented in this paper. The interviews, lasting for about one to two hours, were performed at the companies' premises and were all recorded and transcribed. The companies' websites have been used as sources for supplementary data informing the analysis. This complementary material has proven valuable for preparation of interviews and for filling information gaps.

4. The cases

4.1. Dairy Products (DP)

The company Dairy Products (DP) is based in Sweden and part of an international group of companies with presence in Scandinavia and northern Europe. The company has a cooperative owner structure and is owned by milk-producing farmers, currently around 13.500. The operations managed by DP encompass production, marketing and retail sales of fresh milk, fermented products and other dairy based products. The company is heavily dependent on transports, both for transport of fresh milk from the farmers to the dairies, transport between dairies and warehouses, as well as for distribution to consumers, retailers and other customers.

The transports of DP in Sweden, in focus for this study, have been split in two separate operations; One organization for the inbound transports, i.e. milk collection from the farmers and transport of un-packed products between dairies. The other organization, the outbound transport operations, manages distribution of milk and other milk based products. For the inbound transport operation, DP contract external haulers and do not use any vehicles of their own. In the outbound transport operations DP apply a mix of operating own vehicles and purchasing of transports services from external haulers.

Inbound transports

Currently 28 external haulers are involved in the inbound transports for DP. To secure that the transport demands are met, just over 70 vehicles are being used. The contracted haulers work full time for DP and are thus not engaged in any other transport operations. DP claims that the type of assignment requires a high level of efficiency, flexibility and commitment, something that according to DP not often is found in bigger haulage companies. Hence, DP prefers to purchase transport services from smaller haulers, most of them operating only up to seven vehicles in their fleets.

DP regularly revises their need for transport capacity and as a result, the contracts with haulers are re-negotiated every 8 months. The strategy of DP is, however, to establish and maintain long term relationships with the transport operators and there is a limited turnover of contracted haulers. The compensations for each specific activity in the transport chain are re-negotiated once every year; while for diesel costs the compensation is adjusted on a monthly basis. Demands on efficiency and cost reductions lead to that the number of haulers contracted by DP has been reduced over time. The remaining haulers working for the company have according to DP become more efficient and business minded.

There are few requirements regarding vehicle specifications and the haulers are free to choose vehicle brands and models themselves. However, as part of an on-going environmental project, DP requires the haulers to use Bio-Diesel as fuel as long as there are fuel suppliers within range. To help the haulers improving efficiency, and to promote the use of Bio-Diesel, DP offers the haulers to fuel their vehicles with Bio-Diesel at the dairies where fuelling infrastructures have been set up. The same approach for offering the haulers improved efficiency and lower operation costs has been applied for tires. Hence, DP coordinates purchases of tires for haulers involved in their inbound operations. DP has explored the possibility to arrange similar deals with Truck OEM's (Original Equipment

Manufacturer), but according to DP it has not worked out well so far due to that the haulers have different preferences with respect to truck make, model and specifications and also due to a weak interest from the OEMs.

A team of eight planners at DP manages the inbound transport operations for collection of fresh milk from the farms and transport of un-packed products between dairies. The team is responsible for transport planning, purchasing of transports and moreover also responsible for management of bulk tanks and bulk tank trailers. DP own all the bulk tanks and most of the bulk tank trailers, while the trucks are owned by the haulers.

The DP team responsible for transport planning strives to minimize the number of trucks that are required in order to meet the needs defined by two main stakeholders; the farmers with their cows that continuously produce raw milk and the dairies requiring raw milk for production of milk based products for consumers and other customers.

The farmers require that raw milk is collected every 48 hours in order to preserve the milk fresh and limit the need for huge milk tanks for local storage. From the farmers' perspective, the milk collection thus follows a more or less fixed cycle repeated every two days.

For the dairies, however, the daily planning varies more. The production plan of each specific dairy product reflects the customers' needs and thus the amount of raw milk required daily at each diary depends on the forecast of customer orders as well as what products the dairy specialize in. To which dairy that the raw milk shall be delivered thus vary from day to day for the haulers involved in the inbound transport operations.

Instead of having defined a specific time-window for milk collection at each farm, a start-time for each collection cycle has been defined. The route plan furthermore includes information about expected times for loading, driving between each farm on the route, and final transport to the dairy. In contrast to the past, the haulers are more involved in the route planning process today. By involving the haulers, DP can draw benefits from the knowledge that the drivers have regarding the detailed road network being used when collecting milk from the farmers.

The transport plan, revised and negotiated on a yearly basis, is regularly monitored and adjusted when required. As the vehicles are operated 24/7 there are several drivers involved in the transport operations. Thus, the driver scheduling requires close coordination with the planning processes for both vehicles and assignments.

Every 24 hours, the haulers collect milk from about 1.600 milk producing farmers spread over Sweden. A driver may have between one and 20 stops planned on the route, all depending on how much milk the farms are expected to deliver. The number of milk farms has reduced over the years, but the milk volume collected remains more or less at the same level. The demand for "organic milk", milk that has been organically produced, has increased over the years and several farms now specialize in this area. When collecting milk from these farmers, the haulers separate the organically produced milk from the regular by the use of dedicated tanks.

At each stop at a farm, the driver checks the milk quality before initiating the pumping activity. Having verified the quality and the storage temperature, pumping of milk can start. During the pumping activity, lasting only a few minutes, the equipment automatically collects a milk test sample. Before leaving the farm, the driver registers the amount of milk collected and notifies the farmer about the volume as well as the test results from the previous milk collection. The tests encompass a number of factors and the remuneration received by the farmer relies on the test results.

During an inbound transport cycle a number of activities are performed by the haulers. Of the 24 hours available each day, about 23 are planned for transport or transport-related activities. Upon arrival at the dairy, the driver cleans the truck and weighs the truck and its load. After unloading of the raw milk, the tanks of the truck and trailer are cleaned at the dairy by use of equipment provided by DP. If required, the driver fills up fuel at the DP pump station before leaving the dairy for a new collection cycle.

Owing to the nature of the business, i.e. transportation of fresh milk, it is vital that demands regarding continuity and time limits are met by the transport chain. Disturbances that occur must be immediately resolved and interruptions of only two hours may be critical. Haulers normally do not own spare trucks to use as back-up, so other solutions must be found. DP therefore own a number of replacement vehicles that may be rented by a contracted hauler if required. These spare vehicles are kept at the diary where the hauler needs to pick up and leave the vehicles when used. A hauler may decide to rent one of DP's spare vehicles in order to replace a truck that has a breakdown or when a truck is taken out of operations due to planned maintenance.

Outbound transports

In contrast to the inbound transport operation, DP use both own vehicles as well as external haulers for the outbound distribution and for transports between warehouses and dairies. The vehicles owned by DP are primarily used for distribution to customers in the vicinity of the dairies while external vehicles are used for transport between dairies, to external warehouses and for distribution to customers in the area surrounding these external warehouses. One of the reasons for DP to operate a fleet on their own is to secure access to up-to-date knowledge regarding transport related costs, knowledge that is important when negotiating contracts with external haulers. The company operates about 250 own vehicles and engages about 150 vehicles from external haulers. The external vehicles include both truck and trailer and are in most cases branded with the DP logotype.

Due to centralization of order offices, the delivery has become one of the few occasions when DP meet their customers. It is thus very important that all drivers, both DP's own as well as those from external haulers, manage this customer interface in a good way. The service that DP purchase from external transport companies is thus not a mere transport, but also includes activities related to customer care.

The business relations between DP and the contracted haulers tend to be long and the contracts are signed for three years with the possibility to extend on a yearly basis. Price is an important factor, but due to parameters such as delivery quality and precision as well as customer interaction there are more aspects that weigh in when selecting a transport provider.

Planning for the distribution is performed by DP and applies both for the vehicles owned by DP as well as vehicles belonging to external haulers. An exception regards the geographical areas where the requested volume of DP products is lower, areas for which DP cooperate horizontally with other companies for distribution. In order to optimize a route, DP performs simulations based on historical data from a district. The proposed route is thereafter discussed with the sales organization and further on negotiated with the customers. To allow for changes caused by fluctuating order volumes, the fixed route is revised each day and adjusted if required.

The customer orders for deliveries the next day are introduced into the ordering system in two batches, 70% of the volume at 10.30 and the remaining 30% around 17.00. As soon as the orders arrive, the picking activity starts at the milk dairy's warehouse in order to prepare for shipment. Of the 12 DP dairies in Sweden, only a few produce milk and fermented milk, i.e. "milk-dairies", while most dairies are specialized in different milk based products such as yoghurt, butter and margarine. The products produced at these specialized dairies are transported to the DP main warehouses at the "milk-dairies" for intermediate storage before shipment to customers. Around 14.00 loading of vehicles commence and continue until about 06.00 in the morning thereafter

Distribution to customers takes place between 06.00 and 14.00, i.e. during a comparably limited period. The distribution vehicles are therefore only used during part of the day. Deliveries are scheduled to customers for a specific time with a window of +/- one hour and follow well-defined routes adapted for each day of the week. The number of stops may differ, but is usually the same for the same weekday every week. For distribution in areas further away from the dairies, external warehouses or terminals are used for intermediate storage and transshipment.

Having completed the distribution route, the vehicles return to the dairies loaded with empty load carriers. After having cleaned the truck, the load carriers are unloaded. The load carriers are thereafter cleaned and stored before being used for new orders to be shipped.

Also for the haulers contracted for outbound transports DP provide the possibility to fuel up on bio-fuel in conjunction to loading at the diaries. The external haulers are also allowed to use the dairies vehicle cleaning facilities for a smaller fee. As for the inbound transports the external haulers contracted are welcome to purchase tires through the contacts of DP.

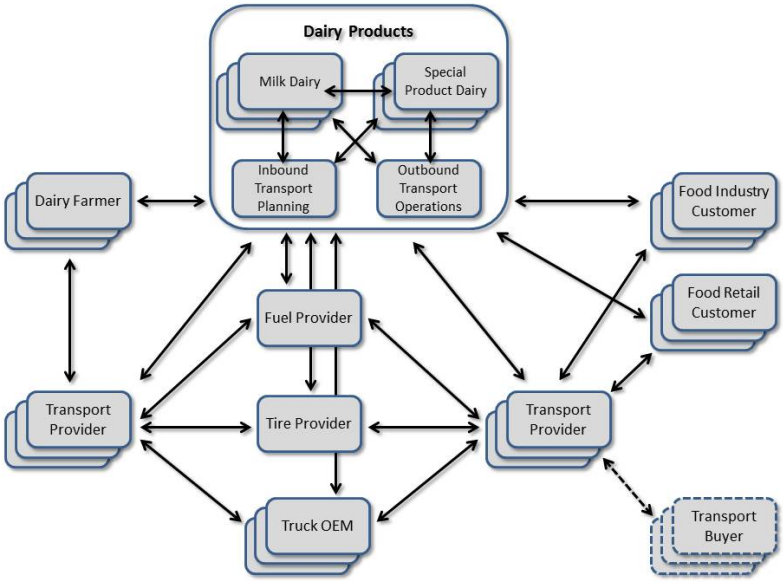

Figure 2: Overview of the DP case main actors and their interactions with regard to transport related activities.

4.2. The Retail Corporate Group (RCG)

The Retail Corporate Group, with headquarters in Sweden, is a public limited liability company with grocery retail as the core business. The grocery retail operations currently operate in Sweden, Norway and the Baltic. In Sweden alone, the retail network includes more than 1.300 grocery stores. Retail Corporate Group's grocery retail business model differs between countries and operations. For Sweden the model encompasses a concept of individual and independent retailers cooperating with each other as well as the Retail Corporate Group. In this specific business model, sourcing, logistics and marketing are part of the company group's responsibilities.

In 2015, a re-organization of the logistics operations in Retail Corporate Group region South-West (in Sweden), the focal organization of present case study, was completed. The re-organization, initiated in 2013, involved warehouses as well as distribution to customers and transports between warehouses. Retail Corporate Group region South-West, hereafter referred to only as RCG, initially operated four warehouses in the region but having completed the re-organization only two remain.

Re-organization of the RGG warehouses results in new transport demands and patterns. Hence transports from suppliers, transports in-between the warehouses, and transports from the warehouses to the retailers, had to be adapted to the new logistics operations.

RCG decided to revise the company's transport purchasing strategy in parallel with the logistics re-organization. The company relies fully on external haulers and does not own any of the vehicles required for its logistics operation. Until the re-organization, RCG signed separate contracts with haulers at each of the four warehouses, something that occasionally lead to uncertainties regarding coordination of, and responsibility for, transports crossing district-borders.

The new transport purchasing strategy of RCG builds on the idea of having one single and common transport operator for the entire region. Improved flexibility and increased simplicity were main drivers behind the revised logistics strategy. Contracts with several local transport suppliers were replaced by a single contract covering the complete region. For RCG this furthermore results in that the company only needs to interface and interact with one supplier responsible for all transports. A complementary driving force for the revised transport purchasing strategy was to improve the possibilities to balance between transport needs in the region and to transfer transport capacity between areas of the region when transport demands fluctuate.

As a result of the new transport purchasing strategy RCG signed a contract with a new single supplier, the hauler Rapid Transports (RT). The contract between RCG and RT ranges over a full five years which is a major change compared to the past. Prior to the new strategy, standard contracts signed with haulers covered only three years.

With the new purchasing strategy, reflected in longer contracts, RCG establishes a new way of working with transport suppliers. The intention is that RCG and RT shall work closer and open up their internal processes to provide improved visibility. The ambition is that the new relationship will result in improved efficiency and reduced costs through mutual adjustments and by creating a common basis of trust. To support this change process the two companies have established a joint project team.

RT, that operates more than 100 vehicles, manages distribution to the 560 grocery shops connected to RCG. The vehicles all belong to haulers that are sub-contracted by RT through individual contracts. RT has applied a transparent approach with respect to its sub-suppliers and therefore the contracts signed reflect the main contract between RCG and RT, also with respect to contract length. The contracts, furthermore, include details regarding the number of vehicles to be allocated by the sub-contractor, distance and operation time that the vehicles will cover in a year, and demands regarding the hauler's possibility to provide additional transport capacity during peaks.

A further reduction in C02 emissions forms an important part of RCG transport strategy and thus the company requires that all vehicles operating for RCG logistics in 2018 shall use bio-fuels only. This target does not only have an impact on requirements for contracted haulers, but also future truck procurement and issues regarding fuel availability. To address these challenges RCG cooperate with RT as well as with truck OEMs and fuel suppliers in joint research and development activities.

The distribution for RCG is reflected in two main models applied, one called 'charter distribution' and the other 'free distribution'. Charter distribution applies when the transport concerns a full vehicle load to be delivered to a single shop. For this type of distribution, RCG is fully responsible for transport planning. The other type of distribution, free distribution, regards situations when orders from several stores are included in the load of the vehicle. For this type of distribution the haulers themselves are responsible for the daily transport planning.

The transport plans reflects demands and needs for each specific cooperating grocery store. These demands, in turn, reflect buying patterns and behaviors of the customers of the stores, the consumers. As the buying patterns of consumers vary between stores and over time this adds complexity to the logistics operation and transport planning. For each store a specific delivery time is defined. The time has been set with consideration to the store's staff planning and limitations of intermediate storage space in the shop. It is important that requirements regarding the requested delivery time are met but to allow for some flexibility a delivery window of 1,5 hours is allowed.

Even if transport-planning processes vary between the two distribution models the same type of requirements regarding delivery times and windows need to be met. For charter distribution, disturbances are more easily observed by RCG, but for free distribution deviations are not always possible to monitor. To enable monitoring and corrective measures, drivers are obliged to report delays. With GPS-based systems installed in the vehicles, it is also possible to locate and follow vehicles in operation.

Delays in, or absence of, deliveries to a shop result not only in disturbances for the logistics arrangements of the store but may ultimately lead to loss of sales. Likewise, disturbances have an impact on the logistics operation of RCG warehouses. If loading is delayed, space that has been reserved for later shipments will be blocked, thus causing disturbances in the overall planning.

Not only is it important for RCG that a vehicle is available when required and planned but also that the vehicle is of the right specification. The type, size and loading capacity must match demands regarding volume and weight of cargo, load carriers and loading and un-loading infrastructure. By using vehicles with limited differences with respect to specification and loading capacity the transport planning process is facilitated.

More than one driver is normally assigned to each distribution district, something that provides flexibility and enables a better continuity in services. As the driver frequently visits the same stores the driver becomes familiar with the practical arrangements such as unloading. As a result of this, both delivery efficiency and quality may be improved over time.

In the collaboration between RCG and RT also further development of transport planning is a common area of interest. Through closer cooperation and exchange of knowledge the partners aim to improve efficiency with respect to transport planning. Moreover, this will also allow for possible improvements with respect to vehicle planning, maintenance planning and driver scheduling.

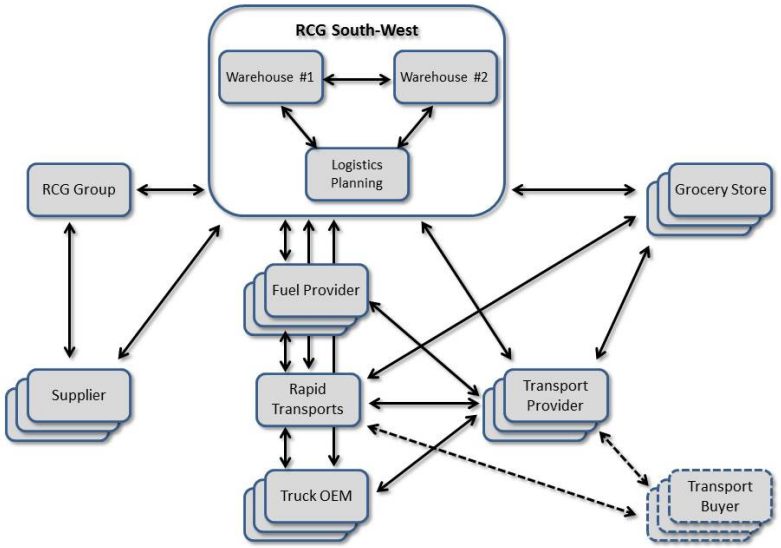

Figure 3: Overview of the RCG case main actors and their interactions with regard to transport activities.

4.3. Forest products (FP)

Forest Products (FP), an economic association, represents a major group of Swedish forest owners, primarily located in the southern part of the country. The area covered by FP's operations has been divided in three regions, each of them further on divided into districts. Through the association the forest owners own a group of firms related to forestry management, forestry services and forest-based products. The firms, with around 3.500 employees, operate three business areas offering forestry services and producing timber goods, paper pulp, biofuel and energy. FP purchase timber, from members as well as external suppliers, and provide the production facilities of the company group with raw material for further processing.

Main products of the business area for timber goods are sawn and planed timber as well as interior fittings in wood. Eleven sawmills, each of them specialized with respect to specific input raw material, products and markets, form part of the business area's operations. The business area for pulp production operates pulp mills producing soft- and hard-wood pulp. The business, moreover, offers a range of services in areas such as logistics and support. Surplus energy and heat from the pulp process has also become part of the company's product portfolio.

The FP group is heavily relying on transports purchased from external suppliers but at the same time they also maintain an internal transport company. The internal hauler operates a number of vehicles, vehicles adapted for transport of timber, wood chips or pulp. The FP hauler, only providing a limited part of the transport work required, is internally looked upon as a transport-reference and transport-development company. Thus, the company operates vehicles in order to gain up-to-date data regarding the cost of transportation. Moreover, the company actively pursues and evaluates solutions that will further develop its transport operations. As external haulers seldom have capacity enough to engage in technological development, they may now instead leverage on the results from development activities managed by FP.

The transports are purchased by representatives from the region together with the central purchasing within FP. The length of the contracts varies between one and three years but the relationships are often long term and turnover is limited. The external haulers operate between 1 to 10 vehicles and FP prefers to cooperate with companies that "have muscles" and are willing to invest in the business relation and grow together. The haulers contracted by FP are allowed to sell their services also to other customers and may also use subcontracted haulers. The ultimate requirement from FP is that the order quotas must be delivered according to plan. Even if relationships with haulers subcontracted by FP's transport suppliers are more distant, FP also see an advantage in that there are less contact

interfaces in the daily operations. As the contracts relate to transports in a specific geographical area, companies in or close to that area have an interest in quoting for these contracts. As a result, the haulers are spread out over the region.

Relationships with haulers are managed in the same way, for external haulers as well as the internal FP haulage company. The transport planner aims at meeting every contracted hauler three times a year. Furthermore, there are regular meetings between the haulers and FP where the current situation, business arrangements, and the future cooperation are discussed.

Each month FP's saw and pulp mills establish a joint plan reflecting their needs of raw material for the coming month. The plan results in a material order that is sent to each of the FP's three regions. The order, specifying the volume that each region has to deliver to each and every industry of FP, is when received further divided into sub-orders addressed to each of the districts in the region. On top of these internal needs, orders from external industries and customers are added.

For timber, the transport leaders of the region manage the continued steps of the planning process. To secure that the demands of each industry are met, the transport leaders divide the monthly order into weekly plans. These are furthermore divided in quotas defining the type of timber to be delivered, the weekly volume, which sawmill to deliver the timber and, from time to time, also which day to deliver the quota. In the quota, both volumes as well as the receiving sawmills vary from week to week.

Thursday is the planning day for timber transports and at the end of the day each contracted hauler receives an order regarding the quota to deliver during the coming week. The schedule starts the coming Sunday and ends on Saturday the following week. When compiling the orders, the transport planner uses an IT-tool with information about the haulers transporting for the region. The quota received by the hauler does not include information about where to pick up the timber, thus the haulers themselves establish a detailed plan for loading points. In case that the quota order does not include requirements regarding specific delivery days the hauler furthermore needs to divide the weekly volume into daily quotas.

Each morning the transport leader follow-up on deliveries completed and compare with the plan. If over-delivery or under-delivery is observed, the transport leader contacts the hauler in order to discuss the deviation as well as its reasons. If required, the transport leader thereafter establishes a revised delivery plan in dialogue with the hauler.

For transports of material other than timber, for example pulpwood and wood chips, the planning processes differ. In the case of transport of pulp wood the quota received by the hauler only reflects the weekly volume to deliver. For wood chips the transport plans are based on remote visual monitoring of the size and growth of the wooden pile storages. For improved efficiency FP collaborates with external companies involved in similar forest-related operations. The cooperation results in that loads are being exchanged with other haulers in the region. Hence, the involved companies are able to jointly improve the transport work and vehicle utilization.

Based on the monthly order each region negotiates with the forest owners in order to establish a plan for disforestation. Having cut down the forest, the resulting timber and pulpwood is collected in intermediate storages at the side of the road. The target for FP is to have about one third of the coming month's needs available in intermediate roadside storages. When an intermediate storage has been established this is recorded in an internal IT-based support system. For each roadside storage there is a record describing the location, when the forest was cut down and the type of material stored.

The delivery quotas received by the haulers do not include requirements regarding which specific roadside storage to pick up. Hence must the haulers themselves establish a weekly and daily transport plan. To support this planning process, access to an IT-based tool is provided by FP. The tool provides the haulers access to information about all roadside storages previously recorded. The IT-based tool used by the haulers furthermore includes a mobile terminal for mounting in the driver's cabin. This terminal provides map-based information regarding the roadside storages and can moreover provide route suggestions for transports from the storage to the receiving industry. Information about the age of the timber in a roadside storage plays an important role as FP request that the oldest timber is used first. The reason for this is that there are limits for how long the cut down timber may be stored in the forest before transport and the fact that FP strives for short lead-times in the supply chain.

When the timber transport arrives at a sawmill the volume of the timber load has to be measured. There are two main methods for this, either the complete load is measured on the truck and trailer or, more frequently, each log is measured individually as an initial step of the saw mill's cutting process. The measurement process has a limit with

respect to capacity and thus the delivery quotas established must reflect this restriction. The weekly quota planning therefore often specifies which day that the sawmill is expecting the load. The quota does not, however, include details such as an exact delivery time and thus this is left open for the hauler to decide.

The hauler's vehicles are in operation from Sunday to Saturday and the drivers work in two shifts. The vehicle specification and equipment differs depending on the specific transport assignment. For timber transports the load locking mechanisms differs depending on the distance of the transport. Hence, for shorter transport distances with more frequent loading and unloading, an automatic locking system is installed. As a result of that the vehicle specifications are adapted to the specific type of transport assignment it becomes more difficult to replace a vehicle if required due to breakdown or maintenance.

The industries of FP relies on a continuous flow of raw material and an interruption may in worst case lead to that the industry may have to close down. Due to the sensitivity with respect to material flow, as well as the restrictions resulting through that the vehicles specifications are adapted to the assignment, it becomes critical that the vehicles are well maintained and remain operational.

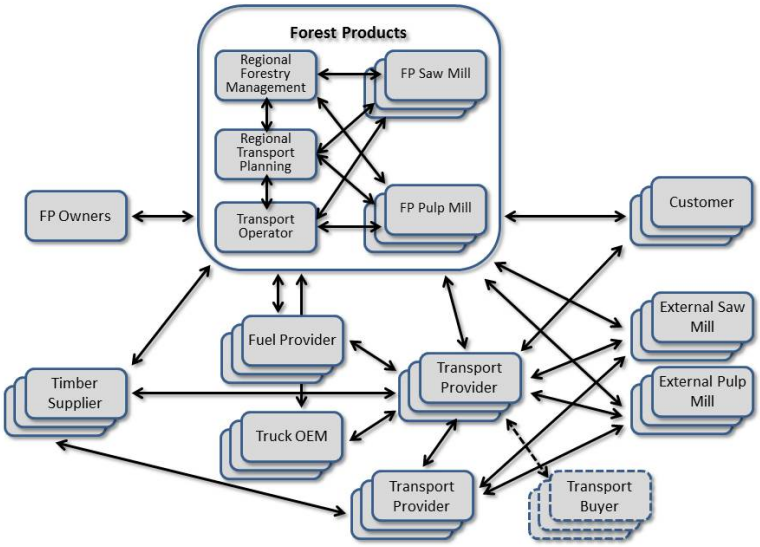

Figure 4: Overview of the FP case main actors and their interactions with regard to transport related activities.

5. Analysis

All three cases are featured by interdependencies among activities, resources and actors. Table 1 provides an overview of a number of interdependencies identified in the cases.

Table 1: Examples of interdependencies identified among activities, resources and actors

Case:	Activities	Resources	Actors
DP	Cows producing milk ↔ Collecting Milk	Bulk Tanks & Bulk Tank Trailers ↔ Trucks	Farmers ↔ Inbound Haulers ↔ DP Dairies
	Collecting Milk ↔ Milk Transport ↔ Vehicle Washing ↔ Vehicle Weighing ↔ Unloading ↔ Fuelling up	Organic Milk ↔ Dedicated Bulk Tanks	DP Milk Dairies ↔ DP Special Product Dairies
		Bio-Fuel infrastructure ↔ Trucks	DP Dairies ↔ Customers
RCG	Transport Planning RCG ↔ Planning RT ↔ Planning Sub-contracted Haulers	Truck Specification ↔ Load ↔ Loading/Un-loading Infrastructure	RGC ↔ RT ↔ Subcontracted Haulers
	Transport planning ↔ Vehicle Planning ↔ Driver Schedules	Truck ↔ Driver	RCG ↔ RT ↔ Fuel Suppliers
	Operations development RCG ↔ Operations development RT	Driver ↔ Grocery Shops	RCG ↔ Grocery Shops
FP	Timber delivery ↔ Volume measurement ↔ Mill process	Truck Specification ↔ Type of Timber and/or transport	FP ↔ External Haulers ↔ Other Transport Buyers
	Disforestation ↔ Timber transports	Truck ↔ Mobile IT-system Terminal	Forest Owners ↔ FP
	Timber transport planning ↔ Mill production plans/processes	Type of Timber ↔ Mill Equipment	FP ↔ External Industries (Load exchange)
		Truck ↔ Timber Crane	Haulers ↔ Mills

The transports of DP are split in two separate operations, one with main focus on inbound transports and the other related to the outbound transports. Both operations display triads with strong interdependencies among activities, resources and actors. For inbound transports, the chain of activities from milking at the farmers to the diaries' production is subject to sequential interdependence wherein DP, both in a short and long time perspective, coordinates the transport activities. In this 24/7 operation no disturbances are accepted and therefore DP owns spare trucks to replace the haulers' vehicles if required. As the representative from DP put it; "… (the process) is ruled by biology … the cows will give milk all the time … and we can never pause …". Likewise, the outbound transport operations include activities with sequential interdependencies, ranging from customer orders, picking, loading, transport and unloading. Resource ties have been built into the structure e.g. through that the bulk tanks owned by DP are fitted on the trucks owned by the haulers and that dedicated vehicles are used for collection of organic milk. Moreover, the bio diesel infrastructure installed at the diaries represents important resource ties. The strong bonds between DP and haulers of inbound and outbound operations are manifested in long-term business relations and a low turnover of partners over time. Bonds between DP and its haulers are also reflected in how DP leverage on the company's size and volume when offering bio-fuel and tires for its haulers. In the outbound operations strong bonds are present in the relation between DP and their customers, with an impact on adjustments of DP's production plans and related transport activities, but also between the shops and the haulers involved in distribution. Fourth party influences exist both for the inbound and outbound focal triads. Fuel providers, tire providers and Truck OEMs all play an important role in the daily operations. Moreover, interdependencies with respect to external transport buyers are visible in the outbound operations.

The RCG case is also featured by strong interdependencies, in particular among activities and some of the actors. This triad is heavily influenced by the focal dyad in which the strong relationship between RCG and RT, the single source of transport services, is extended to the transport operators as a set of fourth parties dealt with jointly by RCG and RT. The transport planning is also undertaken jointly by RCG and RT and is subject to high demands on flexibility of the transport operators and rigid time windows set by the needs (of capacity planning) of the grocery shops. If a truck is absent when loading is planned at the RCG warehouse there will be consequences for both stores

and RCG. As the interviewee from RCG explains; "… there will be delays in the delivery to the grocery store which results in loss of sales … and we also need to empty the storage area in the warehouse …". Through the drivers the transport operators develop bonds with the grocery shop staff, which is perceived as important from a performance point of view. Resource ties between all actors of the focal triad are observed, one being related to that the vehicle specifications must reflect the volume and weight of the load and moreover be adapted to the loading infrastructure of DP warehouses and un-loading infrastructure of the stores. According to DP, the company's new transport purchase strategy should result in improved efficiency and reduced costs for both buyer and supplier. Strong bonds between DP and RT will enable this through mutual adjustments and by creating a common basis of trust. Apart from the end customers, the vehicle OEMs and fuel suppliers are involved as fourth parties. Through collaboration with these companies RCG and RT develop long-term strategies for vehicle usage. Similar to parts of the outbound operations in the DP-case the transport operators do not work exclusively for RCG or RT but are expected to utilize their excess capacity for other customers. The transport operators' activity planning thus includes all aspects of vehicle utilization including all maintenance activities.

Timber transports in the FP case are embedded in a complex chain of interdependent activities. In this case the chain of activities starts with disforestation resulting in intermediate roadside storages. In the next step, vehicles transport timber from these storages to the mills according to well-defined delivery plans. Even though the daily deliveries are not subject to hourly time windows as in the case of RCG, failure to deliver the required volume to each mill may potentially result in costly production interruptions. "In the worst case, a mill may need to close … and (as a result of this) we may lose the contract", the manager from FP underlines. Furthermore, restrictions such as the one caused by limitations related to the mills' load measurement process have an impact on delivery plans. Vehicles are subject to resource ties both with regard to the specific usage context and to special equipment such as timber lifts, load locking mechanisms and mobile IT-terminals. The FP case actor structure is further complicated by the fact that several of the key actors in the triad are parts of the same group of firms although organized into separate business units. As external haulers contracted by FP are allowed to use sub-contractors themselves, and perform transports for other customers than FP, this results in additional interdependencies. Fourth party connections include external haulers with whom FP exchanges transport assignments to maximize the use of vehicle capacity, as well as direct collaboration with vehicle OEMs to affect both short and long term conditions for the vehicle use.

Although the three cases all display strong interdependencies among activities, resources and actors the scope of control over activities, resources and actors exercised by the transport service buyers differ among the cases. As a result from the different approaches to transport service procurement the cases illustrate different conditions for vehicle use. In the inbound operations of the DP-case the haulers work exclusively within the focal triad which entails that DP carries out all planning for the use of vehicles. In the case of RCG and FP, the vehicles are used also beyond the focal triad a fact leading to increased complexity and interdependencies.

In addition, the transport routes also affect the coordination and performance of the transport activities, and thus the use of the vehicles. In the DP and RCG cases the sites to and from which the transport activities are taking place are 'fixed' which facilitates the planning of transport activities although, especially for RCG and for DP's outbound operations, the short term planning depends on external demand factors and needs that are updated frequently. In the FP case, in contrast, the transport planning is complicated by the location of the timber to be transported to the mills since these pick up locations are varying and often remote.

For the vehicle operators, i.e. the owners and drivers of the vehicles, the three settings provide different conditions. In the inbound operations of the DP case they operate as resources within the wider production operation of DP. The haulers' main concern is to keep their vehicles in a good condition and establish driver schedules that meet DP's needs. In the outbound operations of DP, the RCG case and the FP case vehicle operators need to sell their capacity and plan for the use of their vehicles on their own since they do not work exclusively for the focal transport buyers. Independent of the specific setting in each case, planning activities are considered key to efficient transport operations. Not only do the haulers need to secure that the vehicle planning matches the requirements of each specific assignment but also that interdependencies between vehicle plans, driver scheduling and maintenance planning are addressed. Close collaboration across firm boundaries with respect to planning furthermore creates possibilities for improved efficiency in terms of vehicle usage.

Furthermore, all three cases include transport operations that comprise explicit demands related to delivery times, delivery windows or delivery quotas. In the case of DP, the farmers rely on that the milk is picked-up according to strict schedules and the dairies require supply of milk in order to meet productions plans. In the RCG case, the retail

stores need to fill up their shelves and expect groceries to be delivered according to well defined delivery windows. The demands observed entail activity interdependence. It is noteworthy, however, that even if the cases show similarities with respect to demands regarding delivery times or quotas, the reasons behind these requirements differ.

To secure that delivery times and delivery quotas agreed are met, the transport assignments need to be completed as planned and expected. A prerequisite for this is that the vehicles of the haulers are operational and possible to use for their intended purpose. Even if it is possible to establish back-up solutions using spare vehicles that are kept in reserve, this is not common. Trucks are expensive resources, and investing in vehicles that are used mainly as buffers in case of emergency is something that companies strive to avoid as far as possible. To allow for that the vehicles are operational and available for use, vehicle maintenance is a key activity that needs to be addressed as part of the wider activity structure impacting on transport efficiency.

Taken together, the three cases above illustrate different ways how the transport service triad is embedded in a business network setting (see Figure 5). There are examples of interdependencies originating in the behavior of the end customer demands, the role of contracts in relation to sub-contracted haulers and needs for dedicated bulk tanks in relation to specific products such as organic milk. Hence, the interdependencies do not only occur within the transport service triad but also stretch outside in relation to other connected relationships.

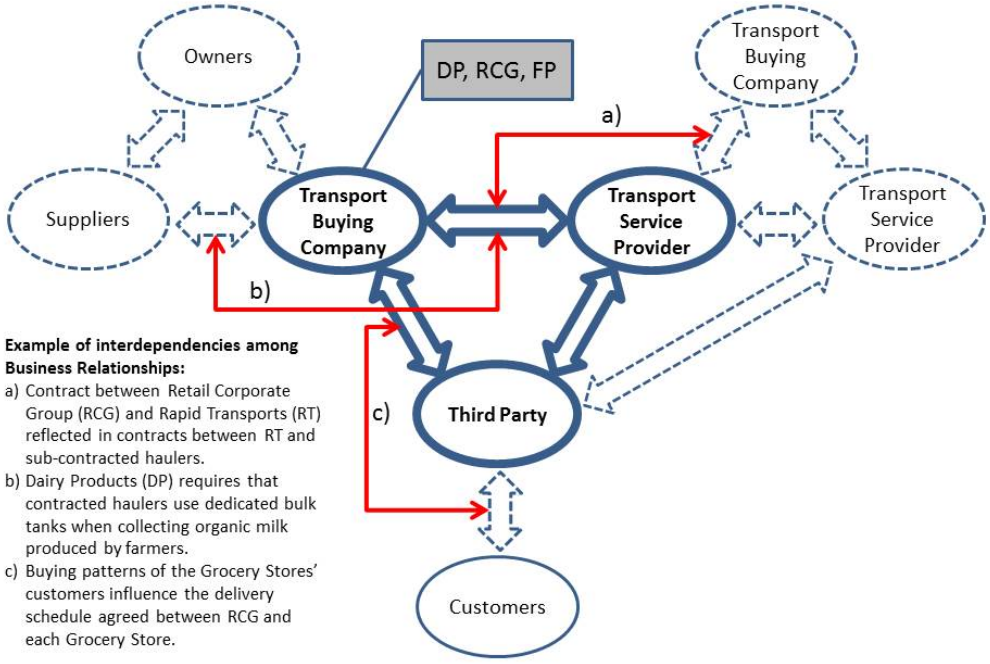

Figure 5: Embeddedness of the transport service triad in a business network setting.

It means that for companies involved in transport service procurement, the interdependencies and the specific demands in relation to different actors need to be understood. Below conclusions and implications following from these observations are presented.

6. Conclusions and implications

6.1. Conclusions

In this paper we have looked into three cases of how large transport service buyers handle their needs for transport services and how these approaches impact on vehicle utilization. The buying firms' needs and the scope of the

individual firms' control and coordination within the focal transport service triads display variety in several ways. Based on the case analysis we identify three dimensions in which the conditions for transport service procurement and vehicle utilization differ.

First, the nature of the transport needs, in terms of (1) the location of pick-ups and delivery points, (2) the time windows of pick-ups and deliveries, and (3) the specificity of the transport related resources, plays important roles since these conditions are decisive for the coordination of the transport activities and thus also for vehicle utilization. However, there are different ways to cope with and adjust to these needs and this, in turn, may be dealt with by the buying firm alone or in interaction with the transport service supplier and/or other parties. The following two dimensions concern such purchasing managerial aspects.

Second, the buying firms' share of and influence on the (total) utilization of the (individual) vehicles differs. In one of the cases the transport operators work exclusively for the transport buying firm while in the other two cases the vehicles are also used for other customers and purposes. This puts different requirements on activity coordination within and across buyer-supplier relationships. The transport operator who is not fully engaged by one customer to utilize its vehicle(s) efficiently depends on being given certain degrees of freedom in order to be able to coordinate its activities across the set of customer relationships. The possibility to utilize the vehicles efficiently is also affected by the extent of resource ties involved between the vehicles and other resources involved in the focal triads of concern.

Third, the division of labor with regard to how the firms handle their needs for transport activities (i.e. whether it operates its own fleet and/or is buying the services from external suppliers) and its scope of coordination of the vehicle operations are also subject to variety. This dimension is related to the second one since transport operators working exclusively within one focal triad become an extension of the buying firm's resource constellation and thus the planning of the transport activities is in these cases possible to integrate into the transport service buyer's overall planning. The scope of coordination may also be subject to the buying firm's procurement approach in terms of make or buy decisions. By letting the transport operators take on some part, or all, of the activity coordination needed (in view of the basic conditions) the buying firm may provide its suppliers opportunities to improve the efficiency of their operations and thus to optimize or maximize the vehicle utilization.

6.2. Managerial implications

The three cases illustrate transport operations that comprise specific demands related to e.g. delivery times, delivery windows and delivery quotas, and how these demands are grounded in interdependencies among resources and activities in the supply chains including the buyers and suppliers of the goods subject to transport. Furthermore, the unique and dynamic settings in each one of the cases drive the development of highly context-specific sets of requirements on transport services. For actors involved in the process of transport service procurement, transport planning and vehicle operation it thus becomes critical to identify, understand and address the unique and specific demands in each such setting. In particular, the heterogeneity of each such setting can be contrasted against the perceived homogeneity of transport services per se. The cases also illustrate how integration of transport providers in these specific settings enables transport service buying firms to benefit from both economies of scale and of integration in their transport related activities.

A key managerial issue of concern for transport service-buying firms regards the share of the transport provider's capacity. When a transport provider's capacity, or a specific set of its resources, is dedicated to one customer, operation and planning becomes more straightforward and subject to coordination within the relationship between the two firms. In the more typical case, i.e. when the capacity is shared across several relationships, both operation and planning becomes more complex owing to different demands conditioned by the specific customer settings. These differences may either be complementary or divergent. Working with operations and planning of transport services across a set of relationships may foster efficient utilization of vehicles if the transport operator benefit from interaction with its customers, provided that the customers are willing and able to adjust. Hence, a managerial issue of concern for companies working in structured networks of buyer-supplier relationships is that knowledge of and interaction with the specific settings of their individual counterparts can be taken advantage of. Through adjustments made in interaction with the customers, the differences in customer needs may be developed into complementarity

instead of divergence. One of the cases also illustrates a more direct form of horizontal collaboration wherein transport service buyers share some part of their external transport capacity to cope with geographical constraints in combination with resource specificity.

To summarize, the three general strategic purchasing issues concerned with (1) how to manage individual supplier relationships, (2) how to design the network of suppliers, and (3) how to handle make or buy decisions, are all vital to address for transport service buying firms in order enhance transport efficiency within and beyond their own influence boundaries. All three issues have to be considered in view of the buying firms' basic conditions set by specific interdependencies in their supply chains. However, when transport service buying firms are interacting with their transport service providers, and other parties influencing their transport related activities, these needs - that in a short term perspective may be considered as 'given' - may be developed to further improve the transport efficiency in terms both of efficient vehicle utilization and in terms of efficient materials flows.

6.3. Research implications

Capturing the heterogeneity of transport settings in case studies at the micro level is arguably valuable in order to supplement and contrast studies based on quantitative research. This case study illustrates how a business network perspective can contribute to develop an understanding of the complexity inherent in transport service settings. In particular, we suggest that 'the transport service triad' is useful as a unit of analysis in further micro level studies of transport to integrate transport activities into the supply chain contexts that conditions and serves them. Moreover, the study illustrates that business relationships do not occur in a vacuum. Instead, they influence and are influenced by what happens in other business relationships. Extending the scope of analysis from individual buyer-supplier dyads to triads involving both buyers and suppliers of goods and of transport services makes it possible to identify and analyze the substance and function of both dyads and triads. Further developments of conceptual tools to advance the analysis of how transport activities are organized can be developed based on dyads and triads as complementary units of analysis.

Acknowledgements

This research has been carried out within the project "Efficient Maintenance for Sustainable Transport Solutions" (EMATS), a project co-financed by FFI - Strategic Vehicle Research and Innovation in Sweden.

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