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Networked business models for current and future road freight transport: taking a truck manufacturer's perspective

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ABSTRACT

Technological development is rapidly having an impact on the road freight transport system. In parallel, there are suggestions for new types of business models to approach the network and complex features of business. In this paper, we raise the question of what this means in the road freight transport business from a truck manufacturer's perspective. The purpose is to analyse the contents of and developments in networked business models for road freight transport in Sweden with the overall aim to contribute to sustainable transport solutions. The paper builds on a qualitative case study methodology of a truck OEM. The results display three forms of networked business models: business models in stable, established and emerging networks. The stable business model is based on the present situation with the truck at the centre. The established business model is partly based on the present and partly on the future with the focus on uptime of the trucks. The emerging business model is future-oriented and contains technological development of connectivity, electrification and automation. Managerial implications regard that coping with the emerging business is necessary but result in great uncertainty regarding how to interact, which resources to invest in and how to coordinate activities.

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Business networks; transport; future business models; actors; interaction

1. Introduction

Technological development is rapidly having an impact on road freight transport, for example, in terms of connectivity as well as the degree and level of automation (Skeete 2018; Fritschy and Spinler 2019; Vural et al. 2020) and electrification (Monios and Bergqvist 2020; Margaritis et al. 2016). Also, the road freight transport system is under transformation to become more sustainable while incorporating new technologies and facing new regulations. A multitude of actors are involved in this development from industry, government and university, providing their individual perspectives on the future development (Melander et al. 2019; Fritschy and Spinler 2019; Palm and Nikoleris 2021).

In parallel, new types of business models are emerging to approach the complex and network-based features of business (Jocevski, Arvidsson, and Ghezzi 2020; Nair and Blomquist 2021) where value creation is neither dyadic nor chain-like. Scholars argue that in order to succeed in today's business climate, actors need to be able to step out of their current roles and develop jointly with new partners (Leminen et al. 2015). So called 'networked business models' have received more

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attention, and a recent literature review points to the need to shift from a firm-level focus to a network-level focus in regard to business models (Jocevski, Arvidsson, and Ghezzi 2020). In addition, firms need in-depth knowledge of capabilities to adapt to new industry prerequisites (Holtström 2021).

The transport industry is, however, described as conservative in terms of a continued focus on price and slow pace of technology adoption (Vural et al. 2020). Truck manufactures, also known as truck OEMs, have held central roles in road freight transport for many years. The current way of doing business in road freight transport is typically based on a business model where truck OEMs sell vehicles to transport providers, ranging from smaller operators to international logistics companies. In addition, truck manufacturers provide various services and offer renting and leasing options. Maintenance and after-sales services are becoming increasingly important. Still, as stated by Monios and Bergqvist (2020): '*the core value creation lies in the truck technology and they compete with other manufacturers on this point*'. In this paper, a truck manufacturer's perspective is taken on current and future potential business models based on the needs to approach the complex network-based features of business (Nair and Blomquist 2021).

The purpose of this paper is to analyse the contents and developments of networked business models in road freight transport in Sweden. Business models describe the logic of business and answer the questions of who is the customer, how can value be created to fulfil the needs of the customer and how can parts of the value created to be captured (Zott, Amit, and Massa 2011). To fulfil this purpose, the paper relies on an industrial network perspective to business markets (Håkansson et al. 2009; Håkansson and Waluszewski 2007). For analytical reasons, industrial networks are separated in activities, resources and actors (Håkansson 1987) being interdependent dimensions across firm boundaries. This perspective enables an understanding of forms of business models with regard to actors involved, their roles in relation to technological development and other actors, resources and activities in the network. The business network is ever-changing, and a business model changes over time as there are dynamic factors in the surrounding environment which affect the development of the business model (Palo and Tähtinen 2011). This reasoning is summarised in two research questions (RQs).

RQ1. What forms of networked business models can be identified in road freight transport?

RQ2. How can forms of networked business models develop in a dynamic environment?

The paper builds on a qualitative empirical study of a truck manufacturer in the Swedish context. The empirical analysis includes a relationship with a key customer, and the findings include both opportunities and challenges with current and future business models. The paper contributes to the literature by pinpointing forms of (networked) business models in complex business networks (Jocevski, Arvidsson, and Ghezzi 2020; Palo and Tähtinen 2011; Nair and Blomquist 2021) contributing to the understanding of both the current situation and the future networked road freight transport (Fritschy and Spinler 2019; Monios and Bergqvist 2020). The findings point to three forms of networked business models in road freight transport in Sweden. First, the stable network as the current way of doing business. Second, the established network which partly exists today and is partly what firms strive to develop in the future. Third, the emerging network lies in the future, involving actors in domains such as connectivity, IT systems or retailing. The stable and emerging networks underlie the business models of today where truck manufacturers have taken on the network operator role based on expertise in truck technologies and building relationships with key customers to get to know the customer's business. However, in the emergent network, the network operator role will require different resources and collaboration partners. New technologies of electrification, connectivity and automation in interplay with new actors having capabilities within big data and internet of things (IoT) will make the network and who to interact with more open than ever.

The paper is structured as follows. First, a theoretical background on the industrial network perspective and network business models is provided. Then our case study methodology is explained. Thereafter, the empirical findings are presented including the case of Truck OEM and analysis. The discussion focuses on dynamics of business models in transport, and finally, conclusions and implications are provided.

2. Theoretical frame of reference

Given that the nature of technologies and business models are of such character that single firms cannot alone manage them (Palo and Tähtinen 2011), there are needs for capturing the networks of business. For this reason, the industrial network perspective forms the theoretical base of the paper. This perspective is presented below, followed by details on networked business models.

2.1. An industrial network perspective

This section presents an industrial network perspective to business-to-business markets, referred to as the Industrial Network Approach (INA). One of the starting points is that the business market includes business relationships among companies, and connections between these relationships build up network-like structures (Håkansson et al. 2009). Empirical studies have shown that companies tend to do business with each other on a continuous basis in business relationships rather than in discrete transactions governed by price (Håkansson and Snehota 2017). The business relationships are typically complex in terms of the number of people involved, have considerable impact on and economic consequences for the business involved.

One model for describing and analysing network-like structures is the network model (Håkansson 1987) that for analytical reasons distinguishes between activities, resources and actors. The definition of activities, resources and actors is circular: '*Those who perform activities and/or control resources within a certain field are defined as actors*' (Håkansson 1987). Resources may consist of physical, financial and human assets (ibid.). In addition, knowledge and experience of resources are important in order to use and develop resources. Håkansson (1987) distinguishes between transformation and transaction activities. Transformation activities refer to activities where one resource is improved, based on the use of other resources, while transaction activities link transformation activities to each other. Activities are performed within firms but may be adapted to how other firms perform their activities. The actors are those that act in industrial networks. '*Companies or individuals as actors in business networks are bounded in their perceptions, knowledge and capabilities and therefore different from each other*' (Håkansson and Snehota 1995). An actor is thus defined as having ascribed motives and intentions and is able to behave purposefully.

Hence, the network level analysis is needed for complex sets of business exchanges that span the boundaries of the individual firms and relationships. Based on this, scholars argue for a network perspective to be taken on business models (Bankvall, Dubois, and Lind 2017; Hedvall, Jagstedt, and Dubois 2019). The most critical challenges of business seem not to be at a firm level, but rather at a network level (Leminen et al. 2015).

2.2. Networked business models

Business models describe the business logic of companies, explained as the stories of business (Magretta 2002) or as descriptions of how business is done. More specifically, authors include three main parts focusing on understanding the customers, how to create value and how to capture the value created (Zott, Amit, and Massa 2011) for increasing degree of technological complexity (Nair and Blomquist 2021). If a network perspective is taken on business activity, however, business models need to expand to not only be properties of firms but allow models of networked companies to be 'overlapping or complementary'(Mason and Spring 2011). Networked business

models are becoming increasingly important, and there are arguments in favour of shifting from a firm-level focus to a network-level focus in business models (Jocevski, Arvidsson, and Ghezzi 2020).

A networked business model is described as one business model presenting a situation when it is impossible for a single firm to govern all relevant resources and activities needed for developing, producing and marketing technology-based services (Palo and Tähtinen 2011). Such business models seem suitable for the area of transport, where multiple actors are involved in the transport system (Vural et al. 2020; Ghanbari et al. 2017). Related, within transport, networked business models have been discussed (see Monios and Bergqvist 2020; Ghanbari et al. 2017). Ghanbari et al. (2017) use the example of Intelligent Transport Systems (ITS) to illustrate how actors can collaborate by implementing Information and Communications Technology (ICT). In a similar vein, Jacobsson, Arnäs, and Stefansson (2020) point to the importance of sharing information automatically between actors in the transport system. Monios and Bergqvist (2020) describe how technology developments in electric autonomous vehicles (EAVs) will have a major impact on existing actors, whose competitive advantage may disappear, and new business models will be developed. In this new transport system information technology and intelligent software will be the core of the transport market.

3. Methodology

3.1. Case study methodology

This study applies a qualitative case study methodology (Eisenhardt 1989; Easton 2010; Flyvbjerg 2006) to gain rich insight into the logics and context of trucks manufacturers. The case study method is used as it pays attention to the phenomenon in its context and enables telling of a story, as explained by Dyer and Wilkins (1991). The industrial context was a starting point, and a firm referred to here as Truck OEM (made anonymous) was studied as a focal firm. The focal firm, Truck OEM, operates in an industrial market, is world leading for the product range under study and has rich information on different offerings. This firm was a partner in a research project focusing on efficient maintenance in sustainable transport in the Swedish context. Also involved in this project is one of its main customers, referred to here as Post Inc (made anonymous).

3.2. Data collection and analysis

Data collection builds on a combination of interviews, participation in meetings and workshops as well as studying documents. The main part of the data collection was conducted in 2017 and five respondents were interviewed on one to three occasions and thus provided information in an iterative process. Before conducting the interviews, an interview guide was developed that covered the main issues of business models, maintenance offerings and customer relationships while also allowing for flexibility in asking follow-up questions. The interviews treated topics relating to the interviewees' perceptions of the present situation and also reflections regarding the past and the future at a certain point in time (Aaboen, Dubois, and Lind 2012). Hence, semi-structured interviews at Truck OEM has been held with key individuals involved in business model development, particularly related to the maintenance offerings business, with roles such as service contract manager, developer of service contracts and key account manager responsible for the customer Post Inc. Interviews were also conducted with the customer Post Inc, with individuals holding positions such as fleet manager and maintenance manager. Documents studied include internal documents, service contract documents, websites and service manuals.

In the analysis, the value system continuum developed by Möller, Rajala, and Svahn (2005) was used to structure our empirical data into the three value systems underlying the business networks: (i) the stable well-defined value system focusing on the trucks, (ii) established value systems with incremental improvements focusing on the maintenance contracts, and (iii) emerging value systems with radical changes focusing on the future of connected EAVs, see Figure 1.

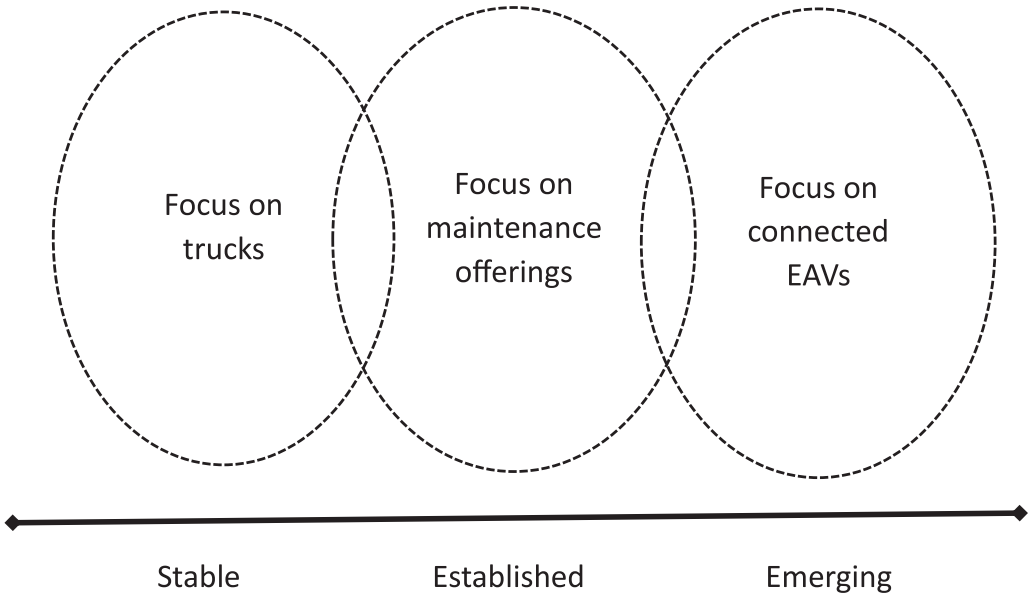

Figure 1. Empirical sorting following Möller, Rajala, and Svahn (2005) value system continuum.

While the interviews relating to the basis for the stable and established networks covered the present situation and retrospect aspects of business and technological development, the data collection regarding the emerging network situation related to the future. For triangulation (Eisenhardt 1989), academic articles have been essential in crafting the emerging business models being future-oriented and characterised by dynamics and uncertainty.

4. Empirical findings

4.1. Stable business model: trucks and basic maintenance offerings

Truck OEM offers a variety of trucks for different application areas and geographical markets under different brand names. The product portfolio is extremely broad. The maintenance offerings are of importance for the products. The maintenance offerings involve a number of stakeholders that need to collaborate in order to achieve successful maintenance offerings. Main stakeholders include customers, dealers, truck OEMs and financial services. In the market under study, 98% of all vehicles from Truck OEM have some sort of maintenance offering. Hence, maintenance offerings are a vital part of the market offering for Truck OEM. For the workshops, maintenance offerings are important as they provide secured business for both sales of parts and maintenance work. The Truck OEM has conducted studies indicating that customer loyalty decreases without a maintenance offering. Hence, customers without a maintenance contract will choose other service providers to a greater extent as time progress. As a truck needs more maintenance the older it is, it stands to reason that more business opportunities are lost the older the truck becomes.

Truck OEM offers three different types of maintenance offerings to its customers: the bronze maintenance offering, the silver maintenance offering, and the gold maintenance offering. The bronze maintenance offering includes preventive maintenance and a basic service plan. This offering is often used as an entry point for a new customer and for Truck OEM to start building a relationship with that customer, as it allows Truck OEM to get to know the customer without any risk. In this maintenance offering, the customer decides where he wants to have his repairs done. However, by providing preventive maintenance, Truck OEM has an opportunity for additional sales. The silver maintenance offering includes preventive maintenance (the same as in the bronze maintenance offering) and additional drive line repair which includes transmission, engine

and drive unit. The gold maintenance offerings include preventive maintenance (as in the bronze maintenance offerings) and drive line repair (as in the silver maintenance offerings). In addition, repairs and remote services are included. Moreover, the gold maintenance offerings include monitoring and an uptime promise, new service planning as well as a number of features online.

4.2. Established business model: maintenance offerings and uptime

Our study is situated in an industrial context, where the maintenance offerings are an agreement between the OEM and the hauler. In focus of our study, the OEM is Truck OEM and the hauler is the customer Post Inc. The maintenance offering supports Post Inc to fulfil its transport assignment to its customers. Hence, the maintenance offering can be seen as insurance for Post Inc that minimises the risk of unexpected costs. The implications are that Post Inc's customers have an interest in Post Inc having such insurance (maintenance offering) on their vehicles (trucks) to ensure timely deliveries to their customers. The maintenance offering helps Post Inc to have well-maintained vehicles and a follow-up history for each vehicle, which enables better information to make suitable decisions about each vehicle.

The trend is for more customers to choose the gold maintenance offering. The vehicle will also have maximum uptime. '*A gold maintenance offering customer often buys a gold maintenance offering again*' (service contract manager, Truck OEM). When offering maintenance offerings, it is important to know the customer and understand the customer's business. '*We need to know the customer and we need to know what the customer is doing*' (developer of service contracts, Truck OEM). There are a number of ways to collect information about customers, usually based on the customers' previous behaviour and actions. '*We look at the historical information on the customer, which repairs have been done previously and how they have managed their vehicles historically*' (key account manager, Truck OEM).

The customer, Post Inc, is a large customer with about 550 vehicles from Truck OEM that has the gold maintenance offering. Post Inc has had the gold maintenance offering since 2015, before that the majority of vehicles had the bronze maintenance offering while a few vehicles had the gold maintenance offering. Truck OEM has a special financially adapted maintenance offering for Post Inc, but it includes the same services as a normal gold maintenance offering. '*This customer has a large number of trucks and therefore their maintenance offering is managed though a key account manager. They have a special deal from us as they are an important customer*' (Key account manager, Truck OEM). Post Inc switched to gold in order to have better control over the cost of maintenance. Post Inc receives a report every month for the vehicles and their maintenance from Truck OEM. The report gives Post Inc a large amount of information about each vehicle: '*We already have quite a good overview of our vehicles, but the report provides us with knowledge and keeps us up to date about each individual vehicle*' (fleet manager, Post Inc). In addition, the firms have meetings regularly, where Post Inc has an opportunity to make adaptations to its maintenance offering and to add more services. Post Inc and the Truck OEM describe their relationship as being of an open nature, where concerns can be raised and discussed. Through the maintenance offering, Post Inc obtains detailed knowledge about each vehicle. For instance, Post Inc can see the cost for each vehicle per kilometre. As Post Inc is operating in a very competitive market, it is vital to keep track of costs for each vehicle. Hence, monitoring of its vehicles and their costs is a priority.

Post Inc is an active customer in regard to maintenance offerings, it has several ideas on how the maintenance offerings can be adapted and improved. In the future, Post Inc expects maintenance offerings to expand to cover more areas and to become ever more important. '*We see a trend where we would want more things to be included in the maintenance offerings, such as damage from collisions and similar accidents*' (fleet manager, Post Inc). However, Post Inc points out the importance of being in control of its vehicles, as it believes it has a lot of knowledge about the vehicles and can make informed decisions. Therefore, Post Inc does not see a development where trucks will be leased in the future, at least not in their business area because the margins for haulers are very low

and Post Inc wants to remain in control of its vehicles. However, most important for Post Inc is to be able to have the vehicles serviced at the right time and in the right place. Truck OEM and Post Inc have had a research project aimed towards sustainable transport solutions and future developments in maintenance. The project originated from Truck OEM. Here, Post Inc was a valuable customer that provided input regarding maintenance and was also engaged as a pilot customer.

Considering the relationship between Truck OEM and Post Inc, there are two important interfaces, one between Truck OEM and Post Inc and another between Post Inc and its customers. The interface between Post Inc and its customers requires a transport solution. For Truck OEM, the mission is to develop a transport solution for Post Inc that enables Post Inc to fulfil its commitments to its customers effectively. By making the transport solution actually become a solution (transport) rather than a product (truck), the maintenance offering is the mechanism that enables Truck OEM to offer an integrated transport solution to Post Inc.

4.3. Emerging business model: connectivity and EAVs

Truck OEM foresees a future with more complex vehicles, leading to it being more difficult for customers to do any repairs themselves. In addition, the transport industry is very competitive with small margins, which makes it risky for a firm not to have a maintenance offering. An unexpectedly expensive repair of a vehicle can have a severe impact on a firm's profitability. Hence, a maintenance offering with a fixed monthly cost can be a way for the customer to avoid risk. Truck OEM sees growth potential in maintenance offerings from moving customers from bronze maintenance offerings towards gold maintenance offerings. Technological developments will change the way customers do servicing and how servicing is planned. More vehicles will be connected, and connectivity will enable new services for customers.

There is potential in connectivity, (IoT) and the use of Big Data. However, there are legal restrictions that make it difficult to exploit the full potential of IoT and Big Data analytics. In the area of transport, with individual drivers for each vehicle, there are restrictions in collecting and sharing data. Connectivity allows for an integrated information flow between the on-board system (data from vehicle) and the off-board system (back office). The back office has more intelligence and conducts diagnostics and analytics. Through connectivity, there can be seamless integration between the on-board system and the off-board system, something that was not possible before. The truck OEM sees great potential in how both real-time and historical data can provide better maintenance for vehicles as well as improved communication with customers.

However, connectivity does not only provide a number of benefits, it could also be a potential risk for Truck OEM. If, for example, a bronze maintenance offering customer is able to receive information from a connected vehicle that it soon needs to replace a part of the truck, then the customer has an opportunity to make a price comparison to find the cheapest place that can do the maintenance and repair on the truck. '*Connectivity could cannibalize our business*' (developer of service contracts, Truck OEM). In the future, the Truck OEM will be able to use collected data and collaborate as well as sharing information to a greater extent internally than it does today. The maintenance offering organisation can expand its collaboration with the product development organisation to measure warranty times and to investigate needs for expanding coverage on maintenance offering times. Sharing data and analysing existing data on trucks, customers and maintenance offerings can provide opportunities for improvement in a number of areas. However, Truck OEM is aware that its role in the future may change as connected EAVs enter the market on a larger scale.

Together with Post Inc, Truck OEM has developed an app-based solution that is now being tested at Post Inc, in order to improve how maintenance can be conducted and gain access to more vehicle data. The driver uses their mobile phone to make a pre-trip inspection of the vehicle. Through the app, the vehicle is tracked, and the app can provide visibility, decision-making support and completion of some administrative tasks. Truck OEM wants to learn as much as possible about the vehicle and how it is driven. '*The app gives us the opportunity to get both the drivers' views as well*

Table 1. Analysis of networked business models in road freight transport.

	Stable networks	Established networks	Emerging networks
Key actors and interaction	Truck OEMs, customer interaction with transport providers	Truck OEMs, customers and customers' customers (including transport buyers, providers)	Collaborations within boundary-crossing domains, such as IT, big data, transport, data sharing
Key resources and activities (value system)	Trucks, workshops, service, preventive maintenance, repairs	Uptime of trucks, careful and customised planning of predictive maintenance	Electricity infrastructure, IT platforms, software, connectivity of vehicles
Transport service	Transport delivery, use of truck	Transport solution	Transport network

as the vehicles' diagnostics' (fleet manager, Post Inc). The app provides information to the back office and can provide reports related to maintenance issues. In the pilot test of the app, Truck OEM, Post Inc and the maintenance workshop are part of the network that receives information from the app. There are high expectations from both Post Inc and Truck OEM for the future of accessing digital information. '*The app provides us with important information. In the future, this could be expanded to include more communication*' (Fleet Manager, Post Inc).

4.4. Case analysis

There are three forms of business models in road freight transport in Sweden taking a truck manufacturer's perspective. First, the stable network has its basis in the current way of doing business. The business model is based on the truck and truck technologies (Monios and Bergqvist 2020), workshops and preventive maintenance function as key resources and activities. The business model relying on the established network partly exists today and is partly what Truck OEM strives to develop in the future. The role of Truck OEM spans a wider range in relation to customers' business, and in this model the 'network operator' role (Monios and Bergqvist 2020) is held by Truck OEM, as it already has established networks, knowledge and key customer relationships to build on. Workshops, preventive maintenance in relation to more advanced technologies are integrated in the truck and maintenance, which in turn requires a different type of interaction with customers (transport providers), as well as servicing and workshop partners and customers' customers (the transport buyers). Truck OEM needs networking capabilities to manoeuvre this role. The customer relationship builds on trust and interaction to exactly understand customer needs as in the case of Post Inc. The customer relationships may also serve as a foundation for testing new features, such as the app-based solutions.

While both the stable and the established networks are part of the business network today, the emerging network lies in the future. The business model relying on emerging network is taking a different shape involving actors in domains such as connectivity, IT systems or retailing, and the 'network operator' role is still open in this future network. Here, new technologies in interplay with new actors are forecast to change the business landscape, as suggested in the shape of level 5 automation (Skeete 2018) and EAVs (Monios and Bergqvist 2020). The trucks of today and the transport they fulfil are still of value, but the ownership, function of drivers and remote driving, actor interactions, servicing and repair may require new skills not within the scope of truck OEMs and their service partners. See Table 1.

5. Discussion

5.1. From stable towards established business models

A networked business model is a business model where no single firm is able to govern all relevant resources and activities needed for developing, producing and marketing their offerings (Palo and Tähtinen 2011). As seen in our study, multiple actors are part of, and enable, the truck manufacturers'

business models. From our case we see that the truck manufacturer wants to move away from a business model relying on stable networks, moving its customers towards a business model relying on established networks. Through this change, the truck manufacturer enables closer relationships with customers and better access to vehicles in use. The established network includes actors relying on digital information from the vehicles to plan, execute and follow-up on maintenance activities. As the freight transport becomes more complex, and there is a shift towards focus on delivering up-time instead of vehicles, this puts more responsibilities on the network of actors to coordinate and execute activities more seamlessly. Hence, the most critical challenges are no longer at a firm level, but rather at a network level (Leminen et al. 2015).

Moving from a stable towards an established network does not necessarily mean that partners in the old network are left behind. On the contrary, often these actors are part of the transformation towards the established network. However, as seen in the established network, there is a growing focus on connectivity and providing digital solutions to customers. Hence, not only does the focal firm need to develop these competences in-house, it also needs to collaborate with new actors that can provide connectivity and facilitate the development of mobile solutions and data transfer.

5.2. The emerging future of connected EAVs

The studied truck OEM is facing radical changes on the market, with the development of transport solutions based on new technologies, particularly connected EAVs, which puts emphasis on networked business models (Fritschy and Spinler 2019; Monios and Bergqvist 2020). Facing this scenario with connected EAVs implies that new business models will have to be developed and that new actors will enter the market (Melander et al. 2019; Monios and Bergqvist 2020). The recent study by Monios and Bergqvist (2020) argues that EAVs will revolutionise road freight transport and that more traditional business models based on OEMs selling trucks to operators could disappear. For complex innovations, Nair and Blomquist (2021) discuss the role of opening up 'design spaces' allowing for interaction and negotiation of goals with an example of land-based high-speed transport system. Our findings are in line with this, pinpointing the need for the networked business model, opening up needs for multiple actors to interact and provide value to their business models.

The future of freight transport is facing radical changes, partly due to technological developments. A number of studies point to difficulties due to developments such as electrification within freight transport in different geographical areas, such as Germany (Anderhofstadt and Spinler 2019) and Italy (Galati et al. 2021), showing, similarly to our study, that managing technological changes is challenging for actors in the network. A study focusing on the impact of autonomous trucks on business models in the automotive and logistics industry in Germany for the year 2040 provides three scenarios for the future (Fritschy and Spinler 2019). In these scenarios, the truck manufacturers take on different roles, ranging from the truck OEMs are expected to be coordinators of offerings consisting of entire systems for EAVs, to a scenario in which the truck OEM's business models will be under attack, for example, from high-tech giants, mobility operators, or tier 1 suppliers, who will offer similar products and services. In this scenario OEMs will own EAVs and offer capacity as a service. In the third scenario truck OEMs fail to invest in EAV technologies and will basically be providing hardware as contractual manufacturers.

These future scenarios indicate that the role of the truck OEMs in the network is not given, that it could continue to have a dominant role, as it has today, or that it could be reduced to having limited influence in the networked business model. Also, Monios and Bergqvist (2020) identify alternative roots for future business models for truck manufacturers: One alternative is business models relying on that transport is provided on a per km or t-km basis and/or focuses on automation and electromobility, where trucks operate 24/7 and a new network operator sets up a network of battery swap stations. However, this business model requires extensive investments in charging infrastructure, an issue where there seems to be a great deal of uncertainty around which actor

will make these investments (Melander et al. 2019). The 'emergent' networked business model and alternative business model by Monios and Bergqvist (2020) holds IT as the core source of value creation; here digitalisation enables dynamic decision making in real time, automated transport planning and stock replenishment. An IT actor will probably be dominant in the network and buy or rent trucks from truck manufacturers.

6. Conclusions and implications

The main findings from our study concern the investigation of the networked business models of road freight transport system in Sweden. The investigation takes a truck manufacturer's perspective, and we add to previous studies of the future of truck manufacturers and their potential business models (Fritschy and Spinler 2019; Melander et al. 2019; Monios and Bergqvist 2020) by explicitly adding the network dimension and its dynamic features of networked business models (Jocevski, Arvidsson, and Ghezzi 2020). Business models relying on these three networks present different opportunities and challenges to involved actors and encompass different scopes of freight transport. All three contain individual requirements for relationship building with different actors in the business network.

While the stable and emerging systems underlie the business models of today for truck manufacturers, which to a great extent rely on the truck and preventive maintenance to ensure the uptime and use of trucks with varying degree of customer interaction. In both networks, truck manufacturers have taken on the network operator role based on expertise in truck technologies and building relationships with key customers to get to know the customer's business. However, in the emergent system, the network operator role will require different resources and collaboration partners. New technologies of electrification, connectivity and automation in interplay with new actors having capabilities within big data and IoT will make the network and who to interact with more open than ever.

The study points to a number of managerial implications regarding the role of truck manufacturers. The truck manufacturer's role in the emergent network may take different directions. One direction for a truck manufacturer would be to try to aim for a 'lock-in' effect and invest in and segment the established network role in order to stay in it as a network operator. The transport industry described as slow in technology adoption (Vural et al. 2020) may be factors supporting this direction. This direction may contain several opportunities in the short term, but in the long term there is a risk of this role diminishing or becoming obsolete (Fritschy and Spinler 2019; Monios and Bergqvist 2020). Another direction would be to try to 'leave' the established network role and make all investments in relation to the emerging network. The goal in this direction is to build expertise and collaborations with actors specialised in IT systems domains since it is suggested that it will be necessary in order to manoeuvre the network in relation to the future. This direction is uncertain since the future and the time scales are also uncertain (Melander et al. 2019). The opportunities include being the actor setting the scene and thereby having the right cast to take on the network operator role in the future. The third direction is based on combining the two: staying as the strong business in the established network and at the same time preparing for this change to come through investments in new areas. The obvious risk is being 'caught in the middle' and not being able to capture value in either today's or tomorrow's business models. The choices are in the hands of the managers of truck manufacturers. Irrespective of chosen direction, what should be prioritised is the relationships with the customers since the interaction with them will be key also in the future. Even small solutions such as app-based solutions may be big steps towards identifying a new role in emerging networks.

Our study relies on a case study methodology and provides identification of forms of networked business models within freight transport from a truck manufacturer's perspective. The study is limited to this case, where we identify forms of networked business models. The emerging business model with a focus on connected EAVs carries many uncertainties, as this is a future business model,

where the speed, acceptance and implementation of these new technologies are uncertain. Future studies could further explore these networked business models from other actors' perspectives. It would, for instance, be interesting to explore the views of technological start-ups or software firms that are planning to enter the road freight transport networks. Future studies could also aim towards greater generalisability, where a combination of qualitative and quantitative methods could be applied.

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