



A start-up's collaboration pattern for sustainable transport – the case of networked platforms, electrical and autonomous vehicles

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INTRODUCTION

Starting new companies are today seen as key to innovation and growth of today's society. Start-ups are newly established companies typically based on a novel idea or innovation to be realized in the business market. Drawing on the Industrial Marketing and Purchasing (IMP) approach to business markets, it is well-known that a characteristic feature of business markets is the existence of long-term business relationships among firms (Håkansson et al., 2009; Håkansson and Snehota, 1995). These business relationships are often complex in terms of several organizations and people involved, they contain adaptations as investments and joint innovation efforts (Gadde and Håkansson, 1993; Lind and Melander, 2019). These long-term business relationships are inter-dependent and form network-like structures, referred to as business networks. Hence, for start-ups it is crucial during their starting up phase to develop customer relationships and become part of the business networks (Baraldi et al., 2019). Recently, several studies have shown the importance of initial customer relationships (Aaboen et al., 2011; La Rocca et al., 2013) the role of networks and networking to become embedded (Aaboen et al., 2017; Landqvist and Lind, 2019).

Business networks are constantly changing as new actors may enter the network and existing actors may exit them. According to Guercini and Runfola (2012), business network changes may be decided partly by the network conditions and relationships, and partly by the representations and willingness of the involved actors. The review by Johnsen et al. (2017) point to the potential of applying the IMP perspective on sustainable purchasing and supply management research. Within the IMP literature the vital role of interaction and relationships and networks has been much discussed, however, still much remains to be explored as the business world evolves (Waluszewski et al., 2019).

One such strong evolution force regards sustainability and transport. In order to reach United Nation's global sustainability goals of reduced emissions, one key development is that of sustainable transport solutions. In this study we focus on goods transport on roads. There are many technological solutions being developed, such as electrified vehicles and autonomous transport solutions. Firms in the transport sector are experiencing disruptions, where technological developments are creating uncertainties about what will become the dominant solution on the market. In addition, there are uncertainties as to the speed of change, for instance when there will be fully autonomous vehicles on our roads. The main issue may not be the technology available, but rather the regulatory concerns of autonomous vehicles for road transport (Skeete, 2018). For firms operating in the transport industry more changes are occurring. For instance, other actors are entering the transport arena, actors such as large digital corporations (e.g. Apple and Google) as well as small start-ups providing new technologies. As such, the transport industry is facing challenges in regard to how to meet the expectations of reduced CO₂ emissions as well as new competition for market shares. Indeed, the market itself is changing, where digitalization enables networked business models of transport of goods (Monios and Bergqvist, 2020).

Frostenson and Prenkert (2015) emphasize that a network perspective is fruitful to understand how to manage sustainability, based on that needed resources are not owned or controlled by individual companies. In addition, a recent studies shows that firms aiming to innovate sustainable technological solutions collaborate in networks involving multiple actors, such as other firms, universities and government agencies (Melander and Pazirandeh, 2019). Motives

for collaboration in networks include to gain access to sustainable technologies, where new actors, beyond the firms' regular collaboration partners, are involved. In the situation of sustainable transport, firms also need to collaborate in networks, not only to access technological knowledge, but also for instance to coordinate transport of goods. Recent studies of innovative business models in the automotive and logistics industry indicates that collaboration between multiple actors is key to succeed in the future (Fritschy and Spinler, 2019; Monios and Bergqvist, 2020).

With this fast-changing transport landscape in mind, and the importance of collaboration between actors, our aim is to investigate how a start-up, that has a clear sustainability focus, collaborates with actors to pursue their business idea and in next step to develop sustainable transport solutions. More specifically, we focus on i) what types of collaborations is the start-up engaged in? and ii) for these collaborations, what are the environmental gains?

LITERATURE BACKGROUND

Collaboration for sustainable transport

Sustainable transport concerns many issues, such as emissions, goods transport, logistics systems, vehicles and infrastructure. A study investigating the future development of transport infrastructure points to the importance of collaboration between actors, who need to share information and apply new technologies (Schuckmann et al., 2012). Similarly, von der Gracht and Darkow (2010) argue that collaboration in networks will be important for future transport solutions. Studies on the future developments of the logistics industry shows that actors will utilize new technologies to share information along the supply chain (Monios and Bergqvist, 2020; von der Gracht and Darkow, 2016).

A study of future developments in road transport provides a complex picture with inter-relationships between business trends, traffic levels and CO₂ emissions, which influence decision makers (Piecyk and McKinnon, 2010). In studies of future developments in transport, environmental concerns are often raised, particularly CO₂ emissions in the future are studied (Liimatainen et al., 2014; Piecyk and McKinnon, 2010; Tapio, 2002). A recent study of the future of sustainable goods transports in Sweden shows that there is much uncertainty in regards to developments related to technological solutions, business models, policy decisions, regulations and what actors that will be dominant in the future (Melander et al., 2019). Hence, there seems to be much uncertainty regarding what technologies that will provide sustainable transport as well as how long time it will take for such technologies to be largely implemented on the market. In particular, investment in new infrastructure for electrical vehicles is needed, but there is uncertainty regarding financing of such infrastructure. In regards to autonomous vehicles, there it is argued that autonomous vehicles will trigger a sociotechnical transition within the automotive industry, which has been compared to the transition from horse-drawn carriages to automobiles (Skeete, 2018). In summary, firms involved in developing more sustainable transport face a number of uncertainties. In order to face these uncertainties, firms need to relate and collaborate with networks of other actors in order to access technologies, share knowledge, influence decision-makers and adapt to the changing requirements of our society.

Innovation and starting up in business networks

The foundation for start-up companies are often new ideas, new technologies and/or products and services. Håkansson and Waluszewski (2007) describe and conceptualize innovation as

the embedding of the new resource in three business network settings: the developing setting, the using setting and the producing setting. The starting point for an innovation may be university research, an R&D department at an established firm or an ongoing business relationship. Ingemansson (2010) shows how an innovation developed in the developing setting, i.e. science, that it may be problematic to embed it in the using and producing settings. The producing setting regards the existing production structures and how the innovation may fit into those structures. The actors managing them need to see the potential of developing the production equipment to the new requirements. The using setting regards the users of the innovation and how they are willing to adapt to a new resource. What changes do they need to their resource structures? Often, users are also involved in developing new resources, for example in terms of involving customers in product development (Melander, 2019). The same situation applies for suppliers, as being part of the producing setting, these may be involved as collaboration partners in development of new products (Lind and Melander, 2019). Landqvist and Lind (2019) showed the importance of various networking behaviors of start-ups for embedding in the three business network settings. The form and content of the networking differed among the settings, especially the producing setting stood out as different compared to the using and developing settings. The networking behaviors were more varied in these two settings but in the networking behavior in the producing setting, still as important, was considered more stable. Overall ‘strong ties’ were important as a base for mobilizing resources and in the end be able to embed in the network settings. Start-ups always seem to face challenges during the process of becoming embedded in business networks and it is about trial and error in many ways.

METHOD

This is an on-going research project, which applies qualitative methods and a case study approach (Halinen and Törnroos, 2005). A single case study is conducted with starting point in a company, here called Alpha, has been selected. This company was selected based on its innovative technologies and potential for developing sustainable transport solutions. The company is a start-up which is prominent in the development of electrification and autonomous drive of vehicles. Also, the company has a clear sustainability aim and drives to minimize CO₂ emissions. As a starting point, an initial interview with the company’s product manager has been conducted, which lasted 1h 15 min. A two-hour presentation about Alpha and its logistic platform was part of the data collection. Also, a wide range of documents have been studied, which describes the company’s collaborations with different actors. As a starting point, we structured the data according to which actors that have been collaborating with Alpha, what type of collaboration that there was between the actors (i.e. what kind of relationship that the actors had), what the scope of the collaboration was and finally what sustainability focus that the collaboration entailed.

CASE DESCRIPTION

Alpha aims to develop autonomous, electrified, efficient and environmentally sustainable transport. The firm says that it wants to “*create sustainable solutions for movement*” Alpha has developed an autonomous and electrified truck, however, the ambition is to be a software firm. Alpha develops software for logistic platforms and focuses on sustainable transport solutions. Alpha views its business as Transport as a Service (TaaS). The platform will enable collaborations in transport. The view for the future is to have driverless trucks that can run 24-7. By collaborating with other actors and thereby fill trucks with more goods, fewer trucks will be needed. Alpha is developing this platform themselves and it is aimed to include all modes of transport. The long-term goal is to optimize logistics that will lead to more efficient

transport. Alpha wants to show the whole solution, that is: an environmentally sustainable optimized transport solution. Hence, the need for both the platform and the pod (robot truck).

Alpha has designed and developed a driverless transport pod. The pod is manufactured by partners to Alpha. A pilot of the pod is implemented in Jönköping. It's the first vehicle (that is not a car) that was allowed to drive driverless on public roads. Alpha originally did not want to develop a pod, but as there was no driverless trucks on the market, they decided to develop one. The pod is manufactured by a partner to Alpha. The expectations from the customers are quite high in regards to autonomous drive. Customers want a pod that can drive on the motorway and can go through roundabouts. That is not possible at the moment. However, the pod has been very good for getting attention from the market. But it is the software that is the real contribution to sustainability (and to the market).

Because the pod is driverless, driving on roads is taking longer than expected. There needs to be a redundant safety system (which other manufacturers solve by having a driver that can take over if necessary). The pod has no space for a driver and therefore Alpha needs to find other solutions. Safety needs to be a priority and Alpha is working with partners to develop safety systems. For instance, one collaboration partner is a firm that develops safety systems for drivers that does not have any arms and legs.

Previously Alpha had thoughts about being an AirBnB and create a spot-market, but that would not be an optimal solution (as it would lead to sub-optimization). There is a need for network optimization and collaboration among actors within transport. *“The largest impact that we make is to decrease the number of kilometers of transport.”* The question is: how do we get as high filling rate as possible?

Alpha acknowledges that collaboration is key to succeed with their aim. *“Today's transport is inefficient partly because actors do not collaborate sufficiently.”* In order to manage to fill trucks actors need to coordinate in order to better plan their transports of goods. Alpha clearly show their environmental drive, and this has been very successful since lowering emissions is in the top-of-mind of people, governments and industries. Since transport is responsible for 7% of the total global CO₂ emissions, this makes transport suitable for innovative solutions. At the same time, more sustainable solutions become more affordable, making it possible for more actors to invest in these solutions.

Alpha has several customers that are interested in sustainable solutions and improving the environment. E.g. SRS (Svenska retursystem) has a goal of having fossil free transport by 2025. They are already now ordering transports with a focus on sustainability. However, financing more sustainable transport can be somewhat difficult for Alpha's customers. *“Today many of our customers are buying from their research and development budget, where they are aiming for how to be more environmentally sustainable in their transports. Here, Alpha provides suggestions, helps with planning, provides pods and identifies new pattern of customer needs.”*

WORK-IN-PROGRESS ANALYSIS

Alpha has limited resources but is engaged in collaborations with a range of partners. A summary of actors and how Alpha collaborates with them towards sustainable transport solutions is provided in the table below (Table 1).

Table 1 Selected collaborations with different actors

Actors	Form of collaboration and business network setting	Scope of collaboration	Sustainability focus
Schenker (1)	Customer relationship, in using setting	Installation of first electrical autonomous truck	Reduction of CO ₂ emissions
Ericsson (2)	Marketing partnership, developing setting and potential for using setting	Demonstrate 5G-connected transport solution (remote control)	Demonstrate future of transport at the world's largest mobile event
Forest industry (3)	Research collaboration, developing setting	Study which systems and combinations of new technologies to test to accelerate the transition to fossil free transports in the forest industry	Study innovative fossil free solutions to reduce CO ₂ emissions from transports in the forest industry
Ericsson and Telia (4)	Partnership with focus on connectivity, developing setting and potential for producing setting	Installation of a 5G network	Provide connectivity for electrical and autonomous vehicle
Lidl (5)	Marketing partnership, using setting	Demonstration of transport solution in urban area	Demonstrate future of transport at local mobility event
Lidl Stockholm (6)	Customer relationship, in using setting	Stockholm region, where regular transport between Lidl's central warehouse and stores in the area with electric vehicles will commence this autumn. The scope will subsequently be expanded to include more of Lidl's operations in Sweden	Reduction of CO ₂ emissions
Michelin (7)	Customer relationship, using setting	Commercial deployment of Alpha's solution at the customer's site.	Digitalizing selected transport flows on Alpha's platform: (i) inside fenced area: transporting goods at one of the customer's facilities, (ii) on public road: transporting goods between different customer sites in the city (if approved)
Port of Helsingborg (8)	Innovation partnership, developing setting	Analyze the transport flow in the port area	Explore how autonomous, electric trucks can contribute to both effective and safe transports in harbor areas while radically reducing CO ₂ emissions
Svenska Retursystem (9)	Innovation partnership, developing setting	Test Alpha's self-driving, electric trucks at Svenska Retursystem's logistics center (pilot)	Explore how digitalization and automation of flow of goods can drive change towards a more effective and sustainable transport system
Oatley (10)	Customer relationship, in using setting	Transport goods in Sweden via electric truck	The partnership will allow Oatly to lower its climate footprint on the affected routes by 87%, totalling an average reduction of 107.5 tonnes of CO ₂ per year per truck, a decrease of over

			2,100 tonnes of CO ₂ in total throughout the duration of the contract versus diesel trucks
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Below our analysis is divided into two parts: (i) what types of collaborations is the start-up engaged in and which business network settings are involved? (ii) for these collaborations, what are the environmental gains?

First, we have identified different types of collaborations which empirically can be divided into two groups: “marketing and sales related collaborations” and “innovation-focused collaborations”. In the first group, marketing and sales related collaborations consists of collaborations in the form of customer relationships, marketing partnerships and a partnership with focus on connectivity. These collaborations originate in the developing setting and with potential for developing relationships in the using setting. The customer relationships include installation of both the physical product (the electrical and autonomous truck) and Alpha’s software platform at the site of two different customers. The marketing partnerships consists of demonstrations of Alpha’s transport solution, where in one collaboration the demonstration was at an international mobile event and the other was at a local mobility event. Finally, the partnership with focus on connectivity concerned the installation of a 5G network. All of these actors that collaborate with Alpha are large and established firms with well-known brands in their respective industry.

In the second innovation-focused group, the collaborations consist of research collaborations and innovation partnerships and these mainly origin in the developing setting. Here, we can observe many types of collaboration and plans for how to develop them in various ways. The research collaboration was with a trade organization and consisted of a study aimed to understand how the transition to fossil free transports in the forest industry could be accelerated by using new technologies and systems. The innovation partnerships included the analysis of transport flows in a specific port area as well as to test the electrical and autonomous truck at a specific logistic center. One partnership was with a Swedish port and the other was with Svenska Retursystem, which is an organization that is owned by two trade associations (the Trade Association for Grocery of Sweden and the Swedish Food & Drinks Retailers Association).

The environmental gains in the marketing and sales related collaborations consists of demonstrating potential emission reductions by using the digital platform and the electrical and autonomous truck, as well as installing the electrical and autonomous truck and thus reducing CO₂ emissions in that actor’s transport activities. The environmental gains in the innovation-focused collaborations evolved around studying and exploring different transport solutions and how these solutions could lead to a reduction in CO₂ emissions.

TENTATIVE CONCLUSIONS, NEXT STEP AND FUTURE RESEARCH

We see a distinction in the type of actors that Alpha collaborates with in the two empirically grounded groups of collaborations. The marketing and sales related collaborations includes actors that are established firms, while the innovation-focused collaborations include actors in the form of trade associations, organizations owned by trade organizations and a Swedish port. The relationship building is mainly practiced in the developing setting with attempts towards entering the using setting. Alpha have different focus in their collaborations depending on the type of organization with which it collaborates. The environmental gains so far seems to evolve around *demonstrating* and exploring potential emission reductions.

We see evidence of intense activity and relationships building in the developing setting also with potential customers and this is in line with the results of Landqvist and Lind (2019). Some actors may also be potential collaboration partners with regard to the producing settings. For next steps of our research, we will study how Alpha collaborates with different actors towards the goal of sustainable transport solutions by using a wider network. In this way, we may be able to further inquire into the producing setting for start-ups when embedding in business networks. The producing setting in terms of developing supplier relationships for new ventures is an area called for further empirical investigation (La Rocca et al., 2019). This area of developing supplier relationships and embedding new solutions in the producing settings may be what the transport sector needs in the evolution to sustainable transports.

Demonstrating as an activity based on certain resources of other actors is a key activity that could be interpreted as a 'connection' between the developing setting and the using setting. For the future, we aim to study the connections between the relationships, i.e. take a network-level perspective. In this way, we aim to reveal how the startup becomes embedded in the existing developing, using and producing settings. The connections seems interesting to understand further based on calls for further studies on proximity among settings made by Ingemansson and Waluszewski (2009).

There are interesting notions herein in relation to sustainability, because the collaboration partners are mainly large, established firms and the startup has to find its way in collaborating with them simultaneously. The sustainability aim of Alpha is clear and it has its unique challenges in becoming embedded in an existing business network because not all actors will share its sustainable principles, or at least not to the same extent or be able to adapt to them. In the business network settings and in their overlaps/connections, we may identify enablers and hinders to using electric vehicles. Also, our focus is mainly on environmental sustainability, but to become a sustainable startup it needs to survive financially and make money and generate sufficient income in the future. Would it even be trade-offs involved in different networks positions, the sustainability position and other incoming earning positions? Importantly, we see that the business network settings framework may help to further the understanding of the sustainability transition with regard to this particular case and potentially also for transport in larger terms.

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