CHALMERS


# Knowledge Sharing in an Open Innovation Collaboration

## A Case Study of the SEVS Project

Master's Thesis

DAVID KARLSSON
ANA RODRIGUEZ

Department of Technology Management and Economics
*Division of Management of Renewal and Entrepreneurship*
CHALMERS UNIVERSITY OF TECHNOLOGY
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Department of Technology Management and Economics
Division of Management of Renewal and Entrepreneurship
Chalmers University of Technology
SE-412 96 Gotheburg
Sweden
Telephone: + 46 (0)31-772 1000

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# Abstract

During the last decades many of the world's markets have been influenced by economic, social and technological changes. In this new global competition, organizations have realized that they cannot merely rely on traditional R&D capabilities to stay competitive and therefore they have to open up their boundaries to leverage new knowledge from external environment. Open innovation, as Chesbrough coined this new paradigm in 2003 has received increasing attention in literature for many scholars. Exploring and leveraging external knowledge have become critical for organizations when applying open innovation practices.

The purpose of this thesis is to explore critical aspects affecting knowledge sharing in an open innovation collaboration. To accomplish the purpose of the thesis three research questions have been formulated. The first question entails describing knowledge sharing in an open innovation collaboration. This lays out a basis for investigating the other two research questions that concern investigating enablers and barriers for knowledge sharing within an open innovation project and back to the home organization respectively.

The investigation of the research questions has been performed by conducting a case study on an open innovation project called SEVS (Safe, Efficient Vehicle Solutions), in which up to 16 partner organizations from the Triple Helix (industry, society and academia) have participated during in total 4 years. The authors of this thesis conducted a literature review in the fields of collaborations in open innovation, knowledge management and knowledge sharing in order to constitute the theoretical framework of the research. A social relational perspective for how knowledge is constructed was addressed in this study. Thus, this thesis explores knowledge sharing from the perspective of the participants in SEVS and aims to investigate which factors may affect this sharing of knowledge from their perspective. Through the conduction of 11 semi-structured interviews with participants from SEVS, the empirical findings provided the authors with insights and thoughts regarding knowledge sharing in the SEVS collaboration.



**Keywords:** *open innovation, collaborations, knowledge management, knowledge sharing, open innovation arena*

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To those who made this possible, tack så mycket and muchas gracias!

*David and Ana, Göteborg 15 June 2015*

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# 1. Introduction

*This chapter constitutes an introduction to the research topic of knowledge management/sharing in open innovation projects and aims at emphasizing its importance from both academic and managerial point of view. Furthermore, the purpose and research questions are delineated, as well as the delimitations in order to get an overview of the study.*

## 1.1 Background

The purpose of this thesis is to investigate an open innovation collaboration from a knowledge management perspective. The study aims at exploring the knowledge sharing that the participants involved in the SEVS (Safety, Efficient Vehicle Solutions) project may encounter, and moreover to investigate which factors may affect this sharing of knowledge.

The ambition with this background is to give the reader an introduction to what is meant by open innovation and why it has become a popular subject among researchers and practitioners. Furthermore, the intention is also to show why knowledge management and knowledge sharing play an important role in the arena of open innovation. Finally, this background ends with a brief introduction to why SEVS has been chosen as the case study of this paper.

By the publication of Chesbrough (2003) a new innovation management paradigm was set and a new term, open innovation, was coined. Chesbrough (2003) emphasizes that companies cannot solely rely on using in-house capabilities and resources in order to innovate. Thus, firms have to open up their boundaries to exploit and explore knowledge beyond the firm's borders. Moreover, Dahlander and Gann (2010) state that in order for a firm to stay competitive it cannot innovate in isolation but has to continuously involve the external environment in its innovation processes. Open innovation has since then been a popular topic in research (Gassmann, 2006). Every industry is changing today and being capable of adapting to changes is becoming more important than ever (Hamel, 2007). Thus, organizations have to cooperate with different types of partners to acquire ideas and resources from the external environment in order to stay abreast of competition (Chesbrough, 2003; Laursen & Salter, 2006a). Basically, the new paradigm of open innovation emphasis "that valuable ideas can come from inside or outside the company and can go to market from inside or outside the company as well" (Chesbrough, 2006). However, as the popularity of open innovation has increased, some criticism relating to the concept has also incurred. Some researchers assert that many scholars of R&D management may argue that the new paradigm represents a concept that involves practices already employed in other research areas, which also advocate engaging with actors outside the firm's boundaries (Dahlander & Gann, 2010; Gassmann & Enkel, 2004; Trott & Hartmann, 2009), and that research within open innovation is partly recognizing past contributions within similar research areas (Trott & Hartmann, 2009). However, Dahlander and Gann (2010) stress that open innovation compiles previous studies in a way that may encourage a newborn interest among researchers. Moreover, Huizingh (2011) emphasize that the term open

innovation can figure as an umbrella in collecting research scholars that are closely related to each other regarding innovation with external parties. Chesbrough et al. (2014) emphasize that despite the popularity of open innovation, its actual effects are still not well understood.

Applying open innovation may speed up and enhance a firm's innovation processes (West et al., 2006). These processes entail a significant amount of external knowledge exploration and exploitation (Chesbrough, 2003; Van de Vrande et al., 2006). The ability to explore and exploit knowledge has become a key resource in society (Bell, 1973) and the utilization of knowledge is one of the main characteristics in the new paradigm (Chesbrough et al., 2014). Buganza and Verganti (2009) state that firms who are able to rapidly access new knowledge and integrate it into their current processes will most likely be able to achieve competitive advantage. This can be achieved by interacting with the external environment through collaborations, which enable firms to create, develop and sustain inter-organizational relationships, which in turn may facilitate finding solutions and ideas that they would not find by themselves (Erfors, 2004). Firms that are adopting this approach must have enough capacity not only to identify and assimilate new external knowledge but also to develop the capabilities to convert knowledge acquired from outside into action within the organization (Roth, 2002). The key to effective use of knowledge in innovation is that knowledge has to be shared across functional or organizational boundaries (Gibbons, 1994), and hence, an understanding of how knowledge sharing occurs and what factors may enhance or hinder knowledge sharing is necessary.

Subsequently, knowledge sharing comes to play a central part in determining the success of open innovation practices. In line with this, Boer (2005) states that knowledge sharing is indispensable in order to obtain a collective outcome from collaboration in an open innovation environment. Moreover, knowledge flows through the people in the innovation network (International Chamber of Commerce, 2015). Chesbrough (2012) also acknowledge this fact by stating that one has to move people in order to move knowledge. Thus, innovation is a social process and it is only through the people that participate in collaborations that firms can achieve the benefits of innovation (Carayannis et al., 2012). Boer (2005) further states that the participants should share knowledge, since it is their part of responsibility in such collaborations, but it does not always happen in reality. Since knowledge sharing by and large is a relational process it is of interest to investigate what factors may affect knowledge sharing from the participants' perspective.

Even though this research area is gaining more attention there is currently a gap in the existing research about knowledge sharing in open innovation arenas. Especially when it comes to the relational aspects of knowledge sharing. As knowledge sharing is deemed to be a critical aspect in innovation, and hence, also in open innovation, this thesis aims to investigate this topic further.

This paper focuses on exploring knowledge management/knowledge sharing in an open innovation project called SEVS, situated in the open innovation arena of SAFER (Vehicle and Traffic Centre) in Gothenburg. By investigating SEVS this thesis contributes with knowledge and the advancement in research regarding the understanding of which relational factors may affect knowledge sharing in an open innovation collaboration. Moreover, the study aims at exploring critical aspects and characteristics that are influencing the phenomenon of knowledge sharing in the SEVS

collaboration from the participants' perspective. Thus, the results from conducting a case study on the SEVS project may be interesting, both from an academic and managerial point of view.

## 1.2 Purpose

The purpose of this thesis is to explore an open innovation collaboration from a knowledge management point of view. More precisely, the aim is to explore critical aspects affecting knowledge sharing under the perspective of the people who are directly involved in the collaboration.

## 1.3 Problem discussion and research questions

Knowledge management plays a central part in open innovation collaborations where new knowledge and insights are supposed to be developed by combining and sharing knowledge between different actors in the collaboration. From this point forward this thesis refers to knowledge sharing as the result of a set of actions, favored or not by different factors, that have the objective of facilitating the sharing of knowledge between the participants involved in the collaboration. It is important to note that knowledge sharing does not refer to a static transmission of knowledge. Rather, it should be seen as an iterative process, or a transformation of knowledge from one part to another. A fundamental assumption in this thesis is that the participants represent a central role in the sharing of knowledge.

One of the biggest reasons for the actors to get involved in open innovation collaborations like SEVS is to get access to external knowledge. In order for external knowledge to be created it is of paramount importance that the actors are willing to contribute with their knowledge to the collaboration. Thus, the participants can be considered to encounter knowledge sharing in two principal situations. First, within the SEVS projects itself where participants get together and create new knowledge by sharing their own knowledge. Second, knowledge sharing also occurs when bringing knowledge back to the home organizations. Since it is through the participants that knowledge sharing occurs it is of great interest to investigate in which manner there might be aspects affecting this sharing of knowledge according to the participants themselves.

In order to determine which are the factors that affect the participant's sharing of knowledge in an open innovation collaboration a common picture of how and where knowledge sharing occurs is deemed to be imperative for this study. Accordingly, the first research question is formulated as follows:

- RQ1: How can knowledge sharing be described in an open innovation collaboration?

The two remaining research questions concern the way that knowledge sharing occurs within the SEVS project and between the participants and the home organization from the participants' perspective. Thus, the second and the third research questions are formulated in the following way:

- RQ2: Which aspects affect knowledge sharing in SEVS according to the participants' perspectives?

- RQ3: Which challenges do the participants experience when sharing knowledge that has been gained in the SEVS project to their home organizations

## 1.4 Delimitations

This study focuses on the SEVS project and the participants' interpretation of the situation. Thus, the research will only be studied from the participants' perspective and not from the participants' managers or organizations perspectives.

Furthermore, the study will only focus on knowledge that is shared in non-monetary terms. That is, there will be no attention put on knowledge that is shared in forms of intellectual properties, licensing and other tradable forms. The reason for this is that knowledge is not directly traded between the stakeholders and the SEVS project. Other aspects play a more decisive role in the sharing of knowledge in SEVS and that is what the thesis aims to explore.

# 2. Theoretical Framework

*In the development of a theoretical framework, literature studies about open innovation and knowledge management in collaborations have been reviewed. This was done to give a broader understanding of how knowledge is shared in an open innovation project. As a starting point for this chapter, the concept of open innovation is explained and elaborated on, stressing the importance of collaboration in firms' innovation processes. This is followed by a literature review within the area of knowledge management and knowledge sharing, which will constitute as a basis for elaborating on the challenges that participants from the organizations may encounter when they engage and share knowledge in open innovation projects, and between project and home organization. Such literature study facilitates the investigation of how knowledge sharing occurs in the SEVS project between participants and home organizations. Furthermore, the open innovation arena is described as an important actor in open innovation collaboration.*

## 2.1 Open Innovation: a new paradigm

This section addresses the concept of Open Innovation and stresses the importance of collaborations due to the benefits existing through relationships and knowledge sharing, as well as important challenges in its implementation. First, a definition of Open Innovation is given and openness as a strategy is discussed. Second, a review of literature on collaborations is done in order to highlight challenges and motives that partners may have when participating in open innovation collaborations.

### 2.1.1 Defining Open Innovation

*"When I wrote Open Innovation in 2003, I did a Google search on the term "open innovation," and I got about 200 links that said "company X opened its innovation office at location Y." The two words together really had no meaning. When I conducted a search on that same term last week, I found 483 million links, most of which were about this new model of innovation. There have been hundreds of academic articles written on the open innovation approach, along with a number of industry conferences on the topic. There is even an annual PhD conference that trains dozens of new scholars each year, all of whom are writing dissertations on aspects of open innovation".*

*Chesbrough, 2012, p. 1*

Firms are increasingly adopting open innovation strategies in their innovation activities (Chesbrough et al., 2014). The concept of Open Innovation was first introduced by Chesbrough (2003a) as a new paradigm, which emphasizes that firms cannot solely rely on using in-house capabilities and resources in order to innovate. Later, Chesbrough et al. (2006, p. 1) defined it as the *"purposeful inflows and outflows of knowledge to accelerate innovation internally while also expanding the markets for the external use of innovation"*. Before Chesbrough coined this research topic with the name of Open Innovation, previous researchers had also identified some evidences of change in the innovation patterns of firms. Hagedoorn (2002) related an overall growth pattern of

newly made R&D partnerships to important industrial and technological changes, higher uncertainty surrounding R&D and shortened innovation cycles that would favor collaboration during the 1980s. Von Hippel (1994) had also identified situations when companies were starting to apply iterative processes with customers outside the firm as problem-solving practices in their R&D. Furthermore, Trott and Hartmann (2009) acknowledge the coverage that Open Innovation receives within the academic literature, whereas they assert that it seems to be a concept of *"old wine in new bottles"* (Trott & Hartmann, 2009, p. 715). They suggest that many scholars of R&D management would argue that the new paradigm represents a repackaging of past concepts and findings within the literature on innovation management. However, Gassmann and Enkel (2004) describe the beginning of this new concept as a moment when firms realize that if they want to commercialize their own ideas as well as other firms' innovations they should seek new ways to bring their in-house ideas to market and incorporate external ideas internally, since successful innovation requires the integration of both internal and external components and competences (Gould, 2012; Buganza & Verganti, 2009). Open innovation then represents the result of dramatic social, technological and environmental changes (Gould, 2012). In order to pinpoint the characteristics of open innovation a comparison between the closed and open model's principles is shown in Table 1.

**Table 1:** *Contrast between Closed and Open Innovation principles (Chesbrough, 2003a)*

| Closed Innovation Principles | Open Innovation Principles |
|---|---|
| The smart people in our fieldwork for us. | Not all the smart people work for us so we must find and tap into the knowledge and expertise of bright individuals outside our company. |
| To profit from R&D, we must discover, develop and ship it ourselves. | External R&D can create significant value; internal R&D is needed to claim some portion of that value. |
| If we discover it ourselves, we will get it to market first. | We don't have to originate the research in order to profit from it. |
| If we are the first to commercialize an innovation, we will win. | Building a better business model is better than getting to market first. |
| If we create the most and best ideas in the industry, we will win. | If we make the best use of internal and external ideas, we will win. |
| We should control our intellectual property (IP) so that our competitors don't profit from our ideas. | We should profit from others' use of our IP, and we should buy others' IP whenever it advances our own business model. |

The table highlights some differences in perspectives between the closed and the open innovation principles. As can be seen, the closed model has a more traditional and protective perspective on innovation whereas the open model recognizes that it is necessary to engage the external environment in the innovation process.

Consequently, firms have to open up their boundaries to exploit and explore new knowledge beyond their borders, as they look to advance their technology. Organizations need to move from an environment that is closed to views and reactive to one that is open to views, proactive and focused on collectiveness (Boateng, 2011). As stated before, the topic of open innovation has become popular in research (Gassmann, 2006) and a lot of literature has been written about it. Giannopoulou et al. (2010) have in a thorough literature review on open innovation made an attempt to compile the existing literature by identifying and categorizing the research on open innovation in seven major categories and dimensions. Those categories and dimensions are depicted in Table 2.

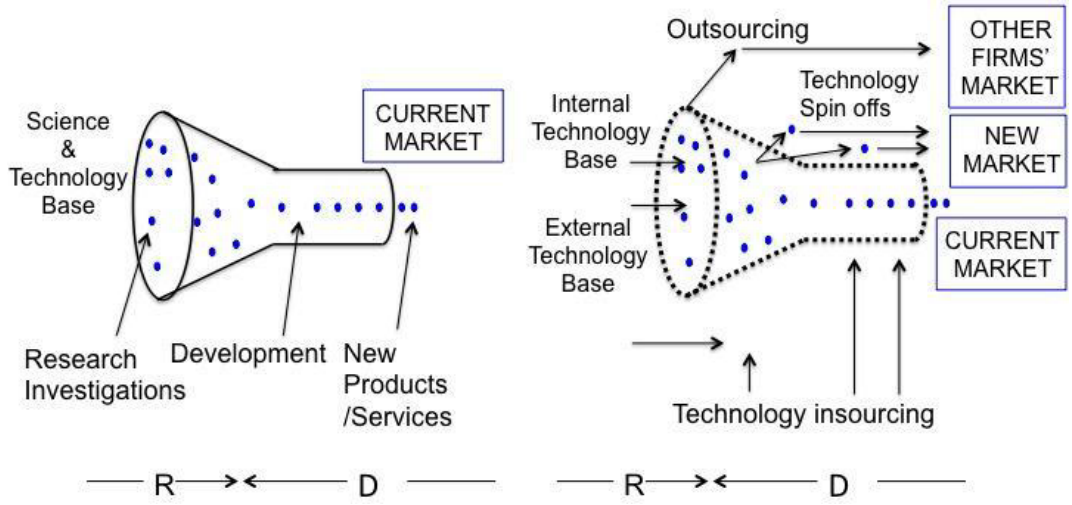
**Table 2:** *Current dimensions/categories in the Open Innovation literature (Giannopoulou et al., 2010)*

| Categories | Keywords |
|---|---|
| Organizational Design and Boundaries of the Firm | Organization, organizational setup, organizational units, R&D organization, mechanisms, structures, process, inside-out process, outside-in process, inward process, outward process, product development process, stage gate model, stages, capabilities, competencies, resources, absorptive capacity, relative capacity, TCI capabilities. |
| Open Strategy | Strategy, strategic choice, strategic approach, technology exploration, technology exploitation, out-licensing, R&D alliances/collaborations, partnerships, academia, communities. |
| The Human Factor in OI, Culture and Leadership | Leader, leadership, culture, mentality, mindset, cultural change, human factor, employees, customers, communities, motivation, motives, incentives, teamwork, team |
| Communities for Distributed co-Creation with Customers and other Collaborating Actors | (Online) community, brand community, participations, OSS, open source, open standards, customer, customer involvement, customer participation, virtual worlds, avatars, co-creation |
| IP, Patenting and Appropriation | IP, intellectual property, IPR, intellectual property rights, technology assets, knowledge, sharing, free revealing, selective revealing, appropriability, regimes, patent, patent system, IP auctions, IP protection, secrecy. |
| Innovation Intermediaries: A new Business Model Arising | Technology or innovation intermediaries, knowledge brokers, solution providers, solver brokers, solution brokers, solution seekers, brokerage, technology transactions. |
| The Triple Helix: Industry, Academia and Government Policy | Industry, regional innovation systems, clusters, academia, universities, industry-academia linkages, government, policy, policy makers, innovation systems, innovation regimes, global innovation networks. |

Gould (2012) defines innovation as the process of making changes to something established by introducing something new that will add value to end users of a product

or service. Through the transformation of firms' solid boundaries into more porous boundaries, innovation can easier be transferred between the external environment and the company's internal innovation processes (Chesbrough, 2003; Gassmann & Enkel, 2004). An illustration of the two states is shown in Figure 1. The figure to the left represents the closed innovation model while the figure to the right represents the open innovation model.

**Figure 1:** *Closed innovation model and Open innovation model (Chesbrough, 2006)*




The figure illustrates the differences between a closed and an open development funnel. What can be seen is that a porous boundary enables a firm to engage the external environment in the development of new products or services, which basically occurs via exploration and exploitation of knowledge. One big difference between the funnels is that the closed funnel delivers new products and services to the current market whereas the open funnel delivers new products and services either to current markets, new markets or to other firms' market.

As it was intended to show, Open Innovation is a growing concept and also its definition. This study chooses to adhere to a recent definition of open innovation, seen as *"a distributed innovation process based on purposively managed knowledge flows across organizational boundaries, using pecuniary and non-pecuniary mechanisms in line with the organization's business model"* (Chesbrough et al., 2014. p 17).

## Openness as a strategy

As openness in innovation is concerned with the permeability of firms' boundaries, it enables knowledge to flow in and out of organizations (Dahlander & Gann, 2010). Two broad kinds of activities in which organizations divide attention and resources are knowledge exploration and knowledge exploitation (March, 1991; Van der Vrande et al., 2009). Knowledge exploration refers to the activities of searching for new knowledge whereas knowledge exploitation concerns the propagation of known adaptations (Fang et al., 2010). Both concepts are widely recognized in the area of innovation (March, 1991). Fey and Birkinshaw (2005) state that a higher degree of

openness enhances a firm's performance when it comes to bringing new ideas to the market. Openness constitutes a key strategic decision for managers (Drechsler & Natter, 2012) and there is no optimal way to execute a unique style. This is because the approach will be shaped by external conditions and the organizational culture of the firm (International Chamber of Commerce, 2015). The concept of openness is presented in the open innovation literature in different ways. Two means of determining the degree of openness is by the number of external sources of innovation (Laursen & Salter, 2006a) or by the diversity of collaborations (Drechsler & Natter, 2012) in which the parties are involved. Jia and Xia (2008) describe the network relationships as resources that positively affect the innovation process by providing substantive benefits such as knowledge sharing.

Gassmann and Enkel (2004) identify three dimensions through which organizations may open up their innovation processes: the inside- out, outside- in and coupled process respectively. Lichtenthaler (2009) refers the first two as outbound innovation and inbound innovation. An explanation of those innovation processes is provided below:

1. **Outbound innovation/ Inside- Out Process**

The strategy of outbound innovation concerns firms who actively pursue external technology exploitation to commercialize technological knowledge exclusively or in addition to its internal application (Lichtenthaler & Ernst, 2006). Ershi et al. (2013) say that firms who choose the inside- out approach look for external organizations who are better suited to commercialize the existing technology of the firm (or part of it). They focus on the externalization of knowledge with the purpose of bringing ideas to the market faster than what is possible through internal development (Gassmann and Enkel, 2004). This approach includes practices such as out- licensing or intellectual property (Erchi et al., 2013; Gassmann & Enkel, 2004).

2. **Inbound innovation/ Outside- In Process**

Inbound innovation involves the acquisition and leveraging of external resources. That is, the systematic practice of integrating external inputs into a firm's new product (Sisodiya et al., 2013). Companies who choose the outside- in approach may invest in cooperation with suppliers and customers and integrate the external knowledge gained (Gassmann & Enkel, 2004). Ideas are external to the firm in this case, and technology in- licensing, acquisition or joint development constitute examples of these practices (Ershi et al., 2013; Gassmann & Enkel, 2004).

3. **Coupled Process**

The coupled strategy combines the outside- in (to gain external knowledge) with the inside- out process (to bring ideas to market), which requires cooperation between companies in strategic networks (Gassmann & Enkel, 2004).

Moreover, Chiaroni et al. (2010, p. 222) describe inbound and outbound innovations as: *"(i) inbound Open Innovation, which is the practice of establishing relationships with external organizations or individuals with the purpose of accessing their technical and scientific competences for improving internal innovation performance and (ii) outbound Open Innovation, which is the practice of establishing relationships with external organizations with the purpose of commercially exploiting technological knowledge"*.

Dahlander and Gann (2010) identify two additional categories in which financial factors are considered to depend on the pecuniary or non-pecuniary logic of the exchange. These categories are shown in a greater detail in Table 3.

**Table 3:** *Types of openness (Dahlander and Gann, 2010)*

| | **Outbound innovation**<br><br>**Revealing** | **Outbound innovation**<br><br>**Selling** | **Inbound innovation**<br><br>**Sourcing** | **Inbound innovation**<br><br>**Acquiring** |
|---|---|---|---|---|
| **Logic of exchange** | Non-pecuniary-indirect benefits | Pecuniary-money involved in exchange | Non-pecuniary-indirect benefits | Pecuniary-money involved in exchange |
| **Focus** | Revealing internal resources to the external environment (e.g. Allen, 1983; Henkel, 2006; Nuvolari, 2004; von Hippel and von Krogh, 2003) | Out-licensing or selling products in the market place (e.g. Lichtenthaler and Ernst, 2009; Chesbrough and Rosenbloom, 2002) | Sourcing external ideas and knowledge from suppliers, customers, competitors, consultants, universities, public research organizations, etc. (e.g. Fey and Birkinshaw, 2005; Lakhani et al., 2006; Laursen and Salter, 2006b) | Acquiring inventions and input to the innovative process through informal and formal relationships (e.g. Chesbrough and Crowther, 2006; Christensen et al., 2005) |
| **Advantages and disadvantages shaping extent of openness** | | | | |
| **Advantages driving openness** | Marshal resources and support (Henkel, 2006)<br><br>Gaining legitimacy from external environment (Nuvolari, 2004)<br><br>Foster incremental and | Commercialize products that are on the shelf'<br><br>Outside partners may be better equipped to commercialize inventions to the mutual interests of both organizations (Chesbrough and Rosenbloom, | Access to a wide array of ideas and knowledge (Laursen and Salter, 2006a)<br><br>Discovering radical new solutions to solving problems (Lakhani et al., 2006) | Gaining access to resources and knowledge of partners (Powell et al., 1996)<br><br>Leveraging complementarities with partners (Dyer and Singh, 1998) |

| | | | | |
|---|---|---|---|---|
| | cumulative innovation (Murray and O'Mahony, 2007; Scotchmer, 1991) | 2002) | | |
| **Disadvantages driving closeness** | Difficult to capture the benefits that accrue<br><br>Internal resources can leak to competitors (Laursen and Salter, 2006b) | Over-commitment to own product and technologies make it difficult to out-license (Lichtenthaler and Ernst, 2007) | Many sources create an attention problem (Laursen and Salter, 2006a)<br><br>Difficult to choose and combine between too many alternatives (Sapienza et al., 2004) | Difficult to maintain a large number of ties with different partners (Ahuja, 2000)<br><br>Risk of outsourcing critical dimension of the firm's business |

As Table 3 illustrates, the non-pecuniary relation involves indirect benefits and could be related to a revealing and sourcing nature of innovation depending on if it is an outbound or an inbound innovation approach. In the pecuniary situation money is involved, which instead concerns a selling or acquiring nature of innovation. The table further expresses the focus, advantages and disadvantages of the four different situations.

### 2.1.2 Collaboration in Open Innovation

Innovation determines in a great part the competitive advantage of a firm (Jiménez-Jiménez et al., 2008) According to Huxham (1993), collaborations between organizations may lead to collaborative advantage, and hence, the creation of synergy effects. This occurs when something new and extraordinary creative is produced, which could not be achieved by the organizations themselves. Organizations need to be capable of continuously create, acquire and transform new knowledge into competitive advantage (Foong et al., 2004) and thus the possibility of achieving collaborative advantage may be a motive for an organization to pursue collaboration in an open innovation environment. The collaboration investigated in this research gathers stakeholders from the three levels of the Triple Helix (industry, academia and society) and addresses challenges associated to technical, social and environmental changes regarding the future of transportation. This kind of complex settings has gathered the attention of public and private organizations in recent years according to Bouwen and Taillieu (2004). They further describe it as a "recent trend" that public and private authorities start to get involved in collaboration around complex technical and social

issues. As Bouwen and Taillieu say about these kind of collaborations: "*The central concern is always an interdependent involvement of the stakeholders, the development of a shared problem definition, the coordination of the different actions on all levels and the orientation towards a shared common script and action strategy" (Bouwen & Taillieu, 2004; p. I).* Also Ili et al. (2010) suggest that actors in the automotive industry seem to be suitable to engage in open innovation practices rather than closed innovation.

Working in partnership is one factor that may positively affect innovation (Darroch & McNaughton, 2002) and R&D collaborations seem to improve firms' performance (Chesbrough et al., 2014). As the demand for innovativeness increases, organizations need to be enriched with new external knowledge brought by employees from related industries or by collaborations (Bröring & Herzog, 2008). Herstad et al. (2008) define collaborations as the development of knowledge through relationships with specific partner organizations with the implication of mutual exchanges of knowledge. West and Lakhani (2008) allude to the concept of open innovation communities as a collection of varied organizational members, where organizations approach the community as a strategic motivation with the aim of leveraging the outcomes of the community in order to achieve benefits. Under a holistic perspective, external collaboration has received a lot of attention in the literature on open innovation (Grönlund et al., 2010). Mashilo and Iyamu (2012) consider open innovation practices as a great opportunity for growth for both individuals and organizations. Jia and Xia (2008) identify some factors regarding knowledge that positively affect innovation, such as being sensitive to market changes, working in partnership, disseminating knowledge or being flexible and opportunistic, among others. Moreover, several authors have identified benefits on collaborations for both individuals and organizations, as shown in Table 4.

**Table 4:** *Benefits on collaborations*

| | **Benefits** | **References** |
|---|---|---|
| **Organizational level** | Continuous investment and promotion of open innovation | Mashilo and Iyamu, 2012; Gloor, 2012 |
| | Reputation and firm recognition, growth of competitive advantage | Gloor, 2012; Jeppesen and Frederiksen, 2005; Koza and Lewin, 2000 |
| | External exchange of knowledge, reuse and sharing of resources and capabilities | Mashilo and Iyamu, 2012; Gloor, 2012; Antikainen, 2007; von Hippel and von Krogh, 2003; Kang and Kang, 2009 |
| | Sense of efficacy, efficiency and productivity, influencing, agile | Kollock, 1999; Gloor, 2012; Mashilo and Iyamu, 2012 |
| | Skill personnel, location of experts | Mashilo and Iyamu, 2012; Gloor, 2012 |
| | Value creation for all the partners involved | Dreyer and Busi, 2005 |
| **Individual level** | Reputation and enhancement of professional status | Lakhani and Wolf, 2005; |
| | Friendship and personal relationships, social support | Gloor, 2012; Hagel and Armstrong 1997 |

| | | |
|---|---|---|
| | Care for community, attachment to the group enjoyment, fun | Kollock, 1999; von Hippel and von Krogh, 2003 |

Even though there are a lot of benefits associated with engaging in collaborations, not every decision to participate in open innovation collaborations necessarily leads to successful performance for firms, and despite its rapid diffusion in industry, it also entails its challenges (Wallin & Krogh, 2010). Mahr et al. (2010) identify an inherent lack of control linked to openness. As the implementation of open innovation in practice is challenging, managers need to pay attention to issues of non- technical nature, such as motivation, knowledge types or governance (Wallin & Krogh, 2010). Reichwald and Piller (2006) stress that there is a lack of coverage on "toolkits" for community collaboration and also Wallin and Krogh (2010) hold that the literature is still silent about incentives and rewards for external participants to contribute to open innovation projects. On the other hand, several challenges concerning people involved in collaborations have been found. According to Yström et al. (2015) any open innovation initiative depends on knowledge sharing and organizations engaging in open innovation practices are expected to benefit from collaborations by acquiring and absorbing new knowledge transferrable in new capabilities for innovation. This happens through the employees. Chesbrough (2012) says that successful open innovation efforts require people who can transfer knowledge effectively and a certain degree of creativity to connect knowledge from different sources. Actors within open innovation collaborations have to face with serious challenge regarding knowledge sharing such as uncertainties, trust and openness (Yström et al., 2015).

Teece et al. (1997) suggest that sustainable competitive advantage relies on firm's ability to exploit internal and external competences and thereby building capabilities to manage changing environments. Furthermore, Moustaghfir and Schiuma (2013) highlight the importance of understanding how the application of knowledge management initiatives serves to convert a firm's knowledge resources into competitive advantage. Creating something new is not significant unless that new invention can be utilized to add value to the participants in the collaboration (Carayannis et al., 2012) and value that is created through open processes would approach that of a public good (Giannopoulou, 2009; Chesbrough & Appleyard, 2007). It is seen as the deepest dimension of inter- organizational interactions and therefore firms may have a number of reasons to include collaborations in their innovation processes (Herstad et al., 2008).

## The open innovation relationship

Gould (2012) emphasizes that open innovation collaboration makes it possible to gain an aggregation of knowledge through other actors. While technology can make information sharing easier, collaboration and innovation still depend on the intentions of those sharing (Jia & Xia, 2008). According to Brockhoff (1999), innovations are driven by research and development because of the interaction between participants. Carayannis et al. (2012) hold that people, through their intervention and management, represent the means of realizing the benefits of innovation by organizations. Besides, there are critical factors that ultimately determine the success of the relationship and

collaboration management can reduce the risk of non- fulfilling the expectations of the parties involved. (Uygun & Schmidt, 2011).

Open innovation relationships also concern a number of different forms of participants such as organizations (Vanhaverbeke, 2006), networks of experts (Rohrbeck, 2010), communities of practice (Ystrom et al., 2010), innovation "ecosystems" where participants collaborate informally (International Chamber of Commerce, 2015), individuals and other actors who may or may not formally represent their employing institution (West & O'Mahony, 2008). Also, Lundström et al. (2012) say that the source of valuable offerings outside the organization derives from different actors and is "refined" in collaborative innovation communities (Baldwin et al., 2006). According to Howells (2006), new actors have emerged as intermediaries in a supportive way. His definition of intermediary as *"an organization or body that acts as an agent or broker in any aspect of the innovation process between two or more parties"* (Howells, 2006, p. 720) seems to be commonly accepted among researchers (Munkongsujarit & Srivannaboon, 2011). Intermediaries have also been described as bridges (Bessant & Rush, 1995), brokers (Hargadon & Sutton, 1997) and third parties (Mantel & Rosegger, 1987). Howell (2006, p.720) further states that activities associated with such intermediaries can include: "*helping to provide information about potential collaborators; brokering a transaction between two or more parties; acting as a mediator, or go-between, bodies or organizations that are already collaborating; and helping find advice, funding and support for the innovation outcomes of such collaborations"*.

Alliances and collaborations with other organizations enhance collaborative advantage and companies have realized that this is a fundamental requirement for their health and success (Uygun & Schmidt, 2011). Research about the impacts of collaboration has been done mainly at firm level and there are not many studies performed on how collaborations affect the performance of R&D projects (Chesbrough et al., 2014) nor on what the "toolkits" for community collaboration should be like (Reichwald & Piller, 2006). However, Chesbrough (2012) says that firms do not need to be large to open up their processes, but to have the vision and determination to do it. Thus, organizations may have the ability to collaborate and co- create, which can be referred to the concept of "collaborative capacity", coined by Beier (2014). In addition, the same way organizations engage in open innovation collaboration through proper attitudes, they need to develop competencies to successfully leverage new opportunities. This means, open innovation requires that firms have sufficient capacity to identify valuable external information in order to internally integrate it, which is known as absorptive capacity (Cohen & Levinthal, 1990). The more knowledge flows among participants in the collaboration and the better absorptive capacity an organization has the more value from the collaboration can be extracted (International Chamber of Commerce, 2015). Jia and Xia (2008) refine this concept by adding that absorptive capacity is *"the intervening factor between knowledge sharing and innovation capability"* (Jia & Xia, 2008, p. 228).

Besides, Loermans (2002) says that knowledge is created as a result of a learning process that occurs within organizations and conversely, organizations learn when new knowledge is shared. Garvin (1993) summarizes this fact saying that creating, acquiring and transferring knowledge are included in the process of organizational learning, where organizational knowledge is created (Foong et al., 2004) and the engagement of individuals is required. The culture of open innovation should be one of openness,

learning and collaboration, as said by Jia and Xia (2008). Also Jiménez-Jiménez et al. (2008) point out that transformation of knowledge, in terms of exploitation, requires employees to share information and knowledge. According to Gibbons (1994) *"the sharing of knowledge across functional or organizational boundaries, through using cross- functional and inter- organizational teams, is seen as the key to effective use of knowledge for innovation"* (Jia & Xia, 2008, p. 229).

## 2.2 Knowledge Management in Open Innovation: from a Knowledge Sharing perspective

This chapter addresses the nature, relevance and role of knowledge management and knowledge sharing in open innovation. First of all, knowledge and knowledge management are introduced and defined. Furthermore, the chapter provides a review of knowledge sharing literature in order to elaborate on the aspects and factors that have been found to be determinant in the sharing of knowledge.

### 2.2.1 Definition of knowledge

In the attempt of exploring how knowledge sharing occurs, it is convenient to briefly define knowledge in order to further continue with other concepts such as knowledge sharing and learning, which constitute important factors in the study.

The utilization of knowledge affects a firm's performance. Pham and Swierczek (2006) state that organizational knowledge can be regarded as a strategic asset that is critical in order for firms to achieve innovation performance. According to Carayannis et al. (2012), knowledge matters more than ever in ways that are unpredictable and uncontrollable. One central aspect in open innovation is how knowledge is utilized to create something new (Chesbrough et al., 2014). As market changes, competition becomes fiercer and product life cycles shorter, organizations that are constantly creating new knowledge and continuously innovate are those that become successful (Nonaka, 1991). As knowledge resources constitute key strategic assets for organizational performance (Moustaghfir & Schiuma, 2013; Pham & Swierczek, 2006), knowledge management becomes critical for the competitiveness of a firm (Nonaka, 1994).

Knowledge management aims to develop awareness of ideas existing outside an organization's boundaries and share them internally (Jia & Xia, 2008). It enables individuals and entire organizations to collectively create, share and apply knowledge to achieve their strategic objectives (North & Kumta, 2014) and composes a concept that has recently become popular in management literature (Lundvall & Nielsen, 2007). In order to develop a continuous flow of innovation processes, organizations need to establish knowledge management strategies (North & Kumta, 2014).

#### Knowledge, Information and Data

Knowledge distinguishes itself from many other assets as it does not get diminished when shared with other actors (Antikainen et al., 2010). Moreover, knowledge can be said to be a public good since it is both non-excludable and non-rivalrous (Blakely et al., 2005), which means that it is difficult to exclude others from taking part of knowledge and that using knowledge does not affect others' use of it. Davenport and Prusak (1998) distinguish knowledge from data and information and emphasize that the terms should not be used interchangeably. This categorization has been generally accepted among researchers because it facilitates the understanding of what is meant by knowledge. In this conceptualization and definition of knowledge, the differences between data, information and knowledge are explained. Data are facts, which are both discrete and objective in nature and are related to an event (Davenport & Prusak, 1998). Moreover, pure data has no meaning in terms that it does not contain any judgment or explanation of it. According to Davenport and Prusak (1998) information can be described as a message between a sender and a receiver. It can also be seen as processed data (Boer, 2005). Davenport and Prusak (1998) also state that information is meant to have an impact on the receiver in terms of changing the receiver's perception of something. Thus, if the receiver does not change its perception of something, it is not information but rather data.

What is meant by knowledge has for a long time been discussed and elaborated on by epistemologists. Due to the complexity of knowledge, this study does not aim to give a definite definition of knowledge but rather to establish a basic conceptualization, suitable and coherent with the way in which knowledge sharing will be described later. This is important in order to not create ambiguities.

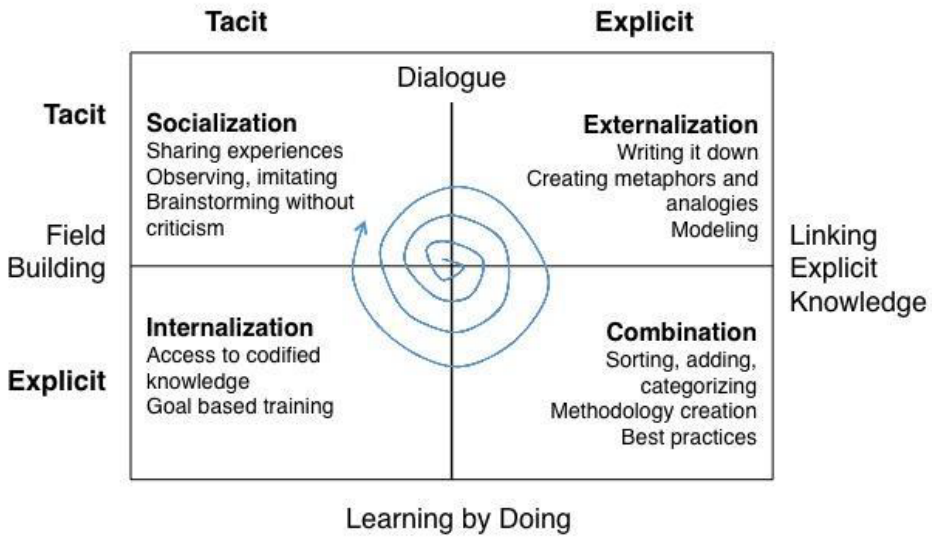
According to Nonaka (1994) knowledge can be defined as "justified true beliefs". This is a quite broad definition and a more detailed definition is advocated by Davenport and Prusak (1998) who define knowledge as *"a fluid mix of framed experience, values, contextual information, and expert insights that provides a framework for evaluating and incorporating new experiences and information"* (Senaji & Nyaboga, 2011, p. 147*).* This thesis chooses to adhere to the latter one by Davenport and Prusak.

Knowledge can also be discussed from an entitative and relational perspective. By the entitative orientation, knowledge can be interpreted as being possessed by individuals whose ontology is distinguished from external and internal nature (Dachler & Hosking, 1995). Thus, knowledge can be understood as entities in a group. Contrary, the relational perspective perceives knowledge as something that is socially constructed and socially disseminated (Dachler & Hosking, 1995). In this thesis knowledge sharing is investigated from a relational perspective. One reason for having this approach is that it may facilitate exploring knowledge sharing in an open innovation collaboration where knowledge can be understood as something that is shared, or constructed through a collaborative relationship (Dyer & Singh, 1998; Roth, 2002), emergent from relationships and interpersonal abilities (Roth, 2002). Moreover, knowledge cannot be taken out of context or treated as something packaged in tradable or controllable transactions (Dyer & Singh, 1998).

## Tacit knowledge and explicit knowledge

One useful way of categorizing knowledge is to divide it into tacit and explicit knowledge; two concepts introduced by Polanyi (1958). Those terms has since then been a conventional way of categorizing knowledge. However, since knowledge is rarely entirely tacit or entirely explicit, this categorization should merely be perceived as a simplification that facilitates the understanding of the complex area of knowledge (Pedersen et al., 2003). According to Nonaka (1994) explicit knowledge is associated with knowledge that can be transferable in formal terms such as documents and systematic language and is only a tip of an iceberg in relation to the entire frame of knowledge. Tacit knowledge is on the other hand referred to personal knowledge that is difficult to formulate and communicate (Nonaka, 1994). Tacit knowledge is hard to imitate by others, which makes it a potential source of competitive advantage (Foong et al., 2004) and inherently difficult to exchange (Powell, 1990). Nonaka (1994) identified four different modes of how current knowledge can be exchanged into new knowledge through the interaction between the above tacit and explicit knowledge. These are socialization, combination, internalization and externalization, as depicted in Figure 2.

**Figure 2:** *Spiral of Organizational Knowledge Creation (Nonaka, 1994)*




In the context of socialization, tacit knowledge is created from tacit knowledge. This often requires social interactions between individuals where experiences are shared. However, tacit knowledge is difficult to share. Contrary to socialization, the conversion from explicit knowledge to explicit knowledge is called combination. This is done by mechanisms of conversion such as meetings and telephone conversations (Nonaka, 1994). Moreover, knowledge through combination is created by rearranging and reconfiguring old explicit knowledge into new explicit knowledge.

The two remaining modes of converting knowledge are done through the interaction between tacit and explicit knowledge. When tacit knowledge is obtained from explicit knowledge it is called internalization, which is closely related to the theories of organizational learning. When knowledge instead is exchanged in the other direction it is called externalization. This area does also connect to the organizational learning, even though it is not as thorough developed as for the internalization concept (Nonaka, 1994). Although there are four different patterns of exchange that can create new knowledge separately, the true essence of knowledge creation is when those modes continuously interact and influence each other. McElroy (2002) says that collaborations

lead to innovation through the social process of "knowledge about knowledge" of its members.

In addition to the explicit and tacit knowledge, another characterization of knowledge also seems to fit in this research. Based on the fact that knowledge resides within individuals, this other approach distinguishes three types of knowledge that enhance value creation in firms (Ipe, 2003): know-how, know-what and dispositional knowledge (Lowendahl et al., 2001; Roth, 2002; Grant, 1996). Know-how concerns knowledge that is subjective, experience-based and know-what concerns knowledge in a task-related approach that is more objective in nature (Ipe, 2003). Know-how and know-what are two types of knowledge that relate to tacit and explicit nature respectively (Roth, 2002; Ipe, 2003). Further, dispositional knowledge is seen as knowledge that concerns the talents and abilities of the individual (Ipe, 2003).

### 2.2.2 Knowledge Management

The literature on knowledge management is quite broad and it is not easy to define the concept. Rather, a convenient approach is to present a set of aspects and characteristics of knowledge management that can set an approach of why knowledge is shared in open innovation and how this relates to the strategy of organizations (Boer, 2005).

In a review of knowledge management literature, Boer (2005) compiles two applicable definitions of knowledge management. Scarbrough and Swan (2001) state that management of knowledge consists on a set of tools and practices centered on the communication and exploitation of knowledge in organizations, which is similar to Wiig (1993), who sees knowledge management as a field of *"deliberately and systematically analyzing, synthesizing, assessing, and implementing knowledge-related changes to attain a set of objectives"* (Wiig, 1993, p. 458). In addition, two definitions regarding knowledge management and organizational learning respectively are worth including in this study. As mentioned before, Jia and Xia (2008) define knowledge management as the development of awareness of ideas outside the boundaries of an organization in order to share them internally and to foster innovation. Besides, Narver and Slater (1990) share a similar definition for organizational learning. They see it as the acquisition of existing knowledge from the environment, distributed within the company and further interpreted for future use.

On the other hand, some authors view knowledge management as the management of "knowledge processes" (Wiig, 1993; Van der Spek & Spijkervet, 1997; Tsoukas, 1996; Davenport & Prusak, 1998). Boer (2005) states that these authors identify these knowledge processes as it is depicted in Figure 3 in the form of a value chain of knowledge.

**Figure 3:** *Knowledge processes (Boer, 2005)*


Finally, as Roth (2002, p. 22) put it: "*most knowledge management tools are built around the idea of centralizing, specifying and decomposing knowledge while, as we have come to understand, knowledge is much more complex"*. Knowledge in this thesis is addressed under its social and relational perspective.

## 2.3 Knowledge sharing in open innovation

The literature on knowledge and knowledge management is quite broad and sometimes even abstract, which makes it applicable in many different fields. The same occurs with the concept of knowledge sharing, since there are many different perspectives that can be chosen for its study. This chapter provides the insights found in the literature review concerning knowledge sharing and it is advisable to remark that the results of such literature review are oriented towards the perspective of how knowledge sharing occurs in collaborations, at the level of participants who may take part in projects of open innovation. In first place, a theoretical context in which knowledge sharing occurs is explained as well as the definitions addressed in the study. Secondly, some models and theories that describe the environment in which knowledge sharing may occur are presented. Lastly, challenges and factors affecting the phenomena are explained.

### 2.3.1 Defining knowledge sharing

The current section aims to describe the context and framework in which knowledge sharing is expected to be explored, in order to give a definition and conceptualization of it and further explore the challenges associated with it. Similarly to the definition of knowledge, the definition of knowledge sharing is highly dependent on the perspective. Argote and Ingram (2000, p. 151) introduce the concept of knowledge transfer in organizations as *"the process through which one unit (e.g., group, department, or division) is affected by the experience of another"*. Important to note here is that knowledge is not something that can be *"taken out of context and treated as something to transport"* (Paulin & Suneson, 2012, p. 88). From a relational perspective of knowledge, knowledge sharing is seen as a social process through which the actors involved in the activity gain new knowledge and insights that should be transferrable into new capabilities and opportunities for others to innovate and achieve competitive advantage (Moustaghfir & Schiuma, 2013). Boer (2005) defines knowledge sharing as the *"collective understanding as well as the ability to transform this understanding into actions and skills"* (Boer, 2005, p. 4). Moreover, Roth (2002, p. 22) bases himself on Brown and Duguid (1991) when arguing that *"tacit and explicit knowledge only become practical knowledge when individuals can apply their own experience and contextual understanding in order to interpret the details and implications for action"*. For the case of study addressed in this research, knowledge sharing should represent an important enabler to future uses of new knowledge that is acquired through the participants in collaborations.

### A context for knowledge sharing: The activity system theory

According to Boer (2005), knowledge sharing should be studied by describing the context in which it takes place. Different natures for knowledge have been described in previous sections and it has been pointed out that this study adheres to a relational perspective of knowledge.

Boer (2005) proposes an adaptation of the activity theory of Engeström (1987) as a way of establishing a framework for knowledge sharing. As said before, this thesis explores

knowledge sharing in open innovation collaborations, concerning a relational perspective of knowledge and in terms of how individuals who participate in such initiatives perceive knowledge sharing. The activity theory conceptualizes knowledge sharing not as an end itself, but as a means towards an end (Boer, 2005). Knowledge sharing in open innovation collaboration may constitute the means for achieving better performance.

Thereby, the activity theory may facilitate to establish the context of knowledge sharing because it concerns cultural, social and physical aspects. As Boer (2005, p. 84) put it: *"both the social and technical as well as organizational aspects are taken into account. The strength of activity is not only to identify the different components of the activity system(s), but also to analyze the dynamics of the relations between these components in a holistic perspective. In fact, all the components of the activity system can provide a starting point for further research of knowledge sharing"*. However, it is advisable to remark that the activity system approach entails strengths as well as weaknesses as shown in Table 5.

**Table 5:** *Strengths and weaknesses of the activity theory*

| **Strengths of activity theory** | **Weaknesses of activity theory** |
|---|---|
| Explicitly addressing contextual components | Static representation |
| Avoiding mono causally explanation | Underexposure of strategy, power and knowledge sharing |
| Combining top down and bottom up analysis | Little attention to temporary settings |
| Including consensus as well as conflict | Modeling is time-consuming |
| Recognizes the temporal interconnectedness | |
| Applicable for different organizational settings | |
| Applicable for different levels of analysis. | |

It is important to stress the fact that the activity theory is more focused on long lasting activities than on temporary organizational settings. Despite this fact, Boer (2005) says that the components of the activity system can be applied for both long and short collaborations, and since this study aims to explore knowledge sharing in open innovation collaborations whose length is a priori unknown this will not constitute a serious indication. He holds that *"the activity system is perfectly suited not only to describe traditional organizations, but also new organizational settings"* (Boer, 2005, p. 77). The following Table 6 shows four different possibilities of organizational settings that can be analyzed according to the model.

**Table 6:** *Comparison of four ways of organizing (Boer, 2005, p. 77)*

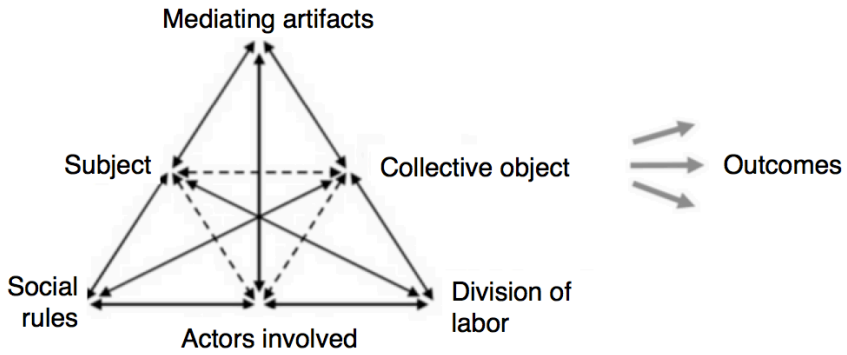
| | **What is the purpose?** | **Who belongs?** | **What holds it together?** | **How long does it take?** |
|---|---|---|---|---|
| Community of practice | To develop members' capabilities; to build and exchange knowledge | Members who select themselves | Passion, commitment, and identification with the group's expertise | As long as there is interest in maintaining the group |
| Formal work group | To deliver a product or service | Everyone who reports to the group's manager | Job requirements and common goals | Until the next reorganization |
| Project team | To accomplish a specified task | Employees assigned by senior management | The project's milestones and goals | Until the project has been completed |
| Informal network | To collect and pass on business information | Friends and business acquaintances | Mutual needs | As long as people have a reason to connect |

In advance to the activity theory, it is convenient to remark that any initiative of open innovation collaboration, in the shape of a project team, can be considered an activity system (Boer, 2005) and with this affirmation lies another reason of why the activity theory suits the labor of defining a context for knowledge sharing, regarding the perspective aimed by this study.

## The components of the activity system

According to Boer (2005) the relationship between individuals and the activity in which they may be engaged in is represented by the concept of activity system (Engeström, 1987). Activity systems are used to describe organizational settings at different levels of analysis (Boer, 2005). In his words: "*the model features the processes through which both language and technologies mediate the relationship between a worker and his or her activity, social rules mediate the relationship between an individual and his or her work community, and the division of labor mediates the relationship between community members and their shared activity"* (Boer, 2005, p. 69). The following Figure 4 represents the six components of the activity system.

**Figure 4 :** *Components of the activity system (Boer, 2005), adapted version for this research*




The figure shows the six components that characterize the activity system according to Boer (2005). Arrows represent relations between components and the three dotted lines represent the relational nature of the connections between the subject, actors involved and the collective object. As it is indicated, the figure constitutes an adaptation of the model for the aim of this research. In comparison to Boer's adapted activity system of Engeström (1987) one minor change has been done in order to fit this study. While Boer (2005) is using one arrow to illustrate the achievement of a unique outcome, this study represents this situation with more than one arrow. This is based on the fact that a project of open innovation collaboration can be considered an activity system according to the model. Different organizations are engaged in the collaboration and each one has its own goals and strategies. Thus, the activity system that represents the collaboration is expected to bring more than one solution to its benefactors. For this reason, the simple fact of adding more than one arrow may look like an insignificant change in the figure but it is a very meaningful aspect from the perspective that is addressed in this research. In the following, the components are described in order to better explain the context for knowledge sharing and also to conceptualize collaborations upon the model. Although the model may look static in appearance Boer (2005) reminds that the components are in constant movement. Thereby, what constitutes the object can end turning into an outcome as well as the actors involved can become the subject at any moment.

**Collective object and outcome**

The collective object constitutes the initial goal at which the activity is directed (Boer, 2005). Eventually the collective object will lead to outcomes. The object may come from a specific need and is susceptible of giving place to new objects and new horizons (Boer, 2005). Different outcomes might be delivered from the collaboration within time that should contribute value to participant organizations, who are suppose to conduct this outcomes in line with their business models and objectives (Mashilo & Iyamu, 2012). However, the collective object is not always visible (Weick & Roberts, 1993) or easy to represent in the system (Blackler et al., 2000). Boer (2005) expresses this fact by citing Blackler et al (2009): *"They tend to be multiple, only loosely connected, emergent, abstract and contestable"* (Blackler et al., 2000, p. 282).

**Subject and actors involved**
Both the subject and the actors involved constitute the human component of the system. The subject is seen as the individual or group whose point of view predominates in the system. The actors involved are represented by those individuals or groups involved in the system who share the same object as the subject but with the particularity of being well differentiated from other groups (Boer, 2005). According to Uygun and Schmidt (2011) every actor takes on a certain role in the collaboration, which influences the system. Therefore and depending on the needs of the system at any moment, the people involved may change (Boer, 2005). Bringing multiple partners together in collaboration can enhance a creative environment (Yström et al., 2015) that helps knowledge sharing, that is, *"necessary means for achieving the collective outcome"* (Boer, 2005, p. 1).

**Social rules**
Social rules compose the regulations, norms and values that determine the interaction between the people in the system (subject and actors involved). This component of the activity system represents the social principles behind knowledge sharing, according to Boer (2005), who also states that knowledge sharing occurs at both organizational level and within relationships of people. Yström et al. (2015) support a similar insight about this relational perspective, by stating that to be successful, open innovation initiatives are dependent on the organizations and actors involved. Also Wikhamn (2013) sees knowledge as a social process that needs emphasis to be put on "trust, relations and legitimacy"

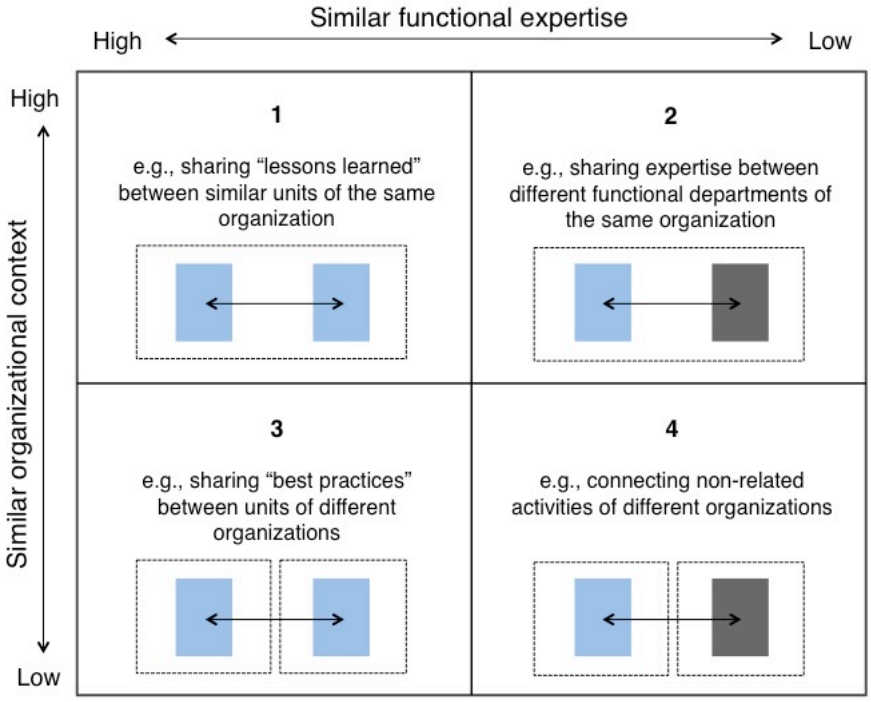
**Mediating artifacts**
Mediating artifacts are instruments that are used to perform the activities in the system, which could either be physical, symbolic, internal or external instruments (Boer, 2005). Examples of mediating artifacts are language, gestures, communication technologies or mental models (Boer, 2005). Mediating artifacts also represent ideas, tools and practices that are centered on the communication and exploitation of knowledge in the system, which coincides with the definition for knowledge management given by Scarbrough and Swan (2001). They could also be seen as mechanisms through which knowledge is incorporated in the system, such as rules, directives, routines, problem- solving or decision- making groups (Wallin & Krogh, 2010). The mediating artifacts may change during the activity and managers need to identify the best practices and processes that enhance the creation of new knowledge (Wallin & Krogh, 2010; Gassmann et al., 2010). On the other hand, Roth (2002) suggests that tacit knowledge should be shared more by experiencing and less by storing it and questions the effectiveness of some knowledge management tools for it. The mediating artifacts should represent the system that fits knowledge sharing for individuals (Nadler & Tushman, 1999).

**Division of labor**
The division of labor refers to the division of tasks and status, horizontally and vertically respectively (Boer, 2005). Horizontal integration has been described as difficult to achieve (Boer, 2005) since the need for shared understandings can act as a barrier in knowledge sharing.

In conclusion, the activity system has been used to establish a framework for knowledge sharing under the relational perspective in which knowledge is perceived as a social process that is dependent on people. The system has been described as representative of the relations between the people involved and the activity in which they are engaged in

(Engeström, 1987). The activity system constitutes a starting point for further studies on knowledge sharing, applicable for different organizational settings and different levels of analysis (Boer, 2005). Also, Boer suggests two additional contexts that are worth considering. Four different situations of knowledge sharing derive from two characterizations of the context: functional expertise and similarity of organizational context, as depicted in Figure 5.

**Figure 5:** *Four situations for knowledge sharing (Boer, 2005), adapted version*




The nature of these collaborations includes knowledge sharing between different organizations and eventually knowledge sharing between individuals within the same organization. Boer (2005) identifies organizational settings such as project teams and communities for practice as organizational arrangements where collective outcomes are created. Therefore, he suggests that knowledge sharing among the members of such settings should be investigated in the context of collaborations, since in practice the expectations for collaboration are not always fulfilled. Besides, as it was said before, people involved in collaborations are still not sufficiently covered in literature (Fredberg et al., 2011).

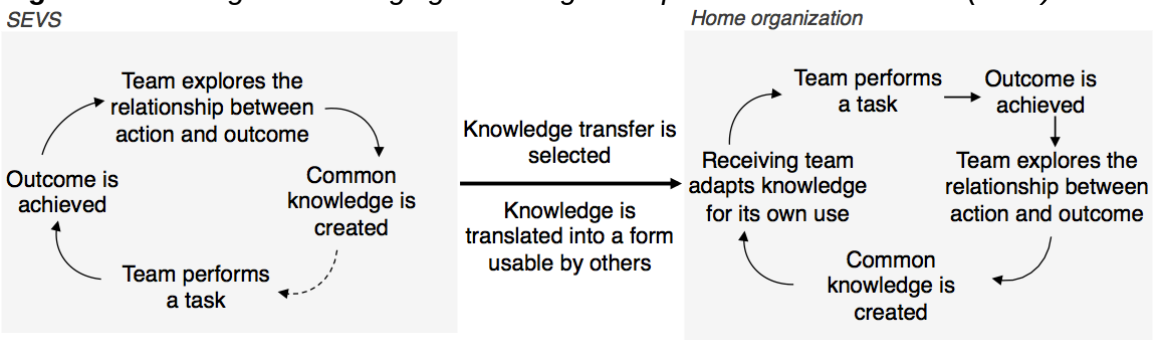
## Personalization and codification approach

Boer (2005) studied the activity system as a representation that can be applied to an open innovation collaboration. Besides, the activity theory also dedicates a great part to the exploration of what Boer calls the "tensions" existing between different activity systems that may be interrelated. According to Boer (2005), people from one activity system (actors from different organizations) can participate in another activity system simultaneously (the same actors involved in collaborations). This represents the exact situation where this research puts its focus and in which, according to Boer (2005), knowledge is shared from one system to another through the individuals' participation. In this context, the author describes two strategies of knowledge sharing: personalized

knowledge and codified knowledge. The first approach is a person-to-person approach, concerning knowledge that is shared by dialogue and relationship between individuals. The second one is a person-to-document approach, where knowledge is extracted by the person (Boer, 2005) enabling new uses of it by others.

Finally, as a complement, Roth (2002) proposes a representation of how organizations should leverage knowledge that is acquired outside boundaries, adapted from Dixon (2000). What Roth suggests in this case is that organizations that pursue the effective utilization of knowledge acquired from the outside, let say an external collaboration, need to engage in two principal activities that encourage the development of capabilities to leverage that knowledge. First the ongoing experiences and knowledge from the collaboration should need to be shared within the organization and second, it is that shared knowledge what needs to be spread to other groups and to be adapted to their context (Roth, 2002). Figure 6 represents the process of knowledge sharing proposed by the author.

**Figure 6:** *Creating and leveraging knowledge. Adapted version from Roth (2002)*




## 2.3.2 Factors affecting knowledge sharing in collaborations

Knowledge sharing has been seen as a social-relational process through which individuals make their knowledge available to others in order to yield performance (Boer, 2005; Ipe, 2003). As Ipe (2003, p. 338) put it: *"At the heart of the people perspective of knowledge management is the notion that individuals in organizations have knowledge (Spender & Grant, 1996) that must move to the level of groups and the organization as a whole so that it can be used to advance the goals of the organization (Nonaka, 1994)"*. Knowledge sharing in collaborations can be related to a cultural, social and physical context (Boer, 2005); a process of which people constitute an inseparable part (Howlett, 2010; Moustaghfir & Schiuma, 2013) and which acts as a means of achieving further outcomes from the innovation processes of those organizations engaged in collaboration. As an introductory manner to what follows, two main thoughts need to be considered. What is needed to happen so that knowledge is shared in collaborations? In which conditions knowledge sharing is enhanced or hindered?

Boer (2005, p. 1) identified a set of possible reasons for the lack of knowledge sharing: *"characteristics of knowledge such as its tacitness (Boisot, 1998; Szulanski, 1996), characteristics of the sender such as the workload of the sender (Huber, 1991), characteristics of the receiver such as one's absorptive capacity (Cohen & Levinthal,*

*1990; Lane & Lubatkin, 1998), characteristics of their relationship such as the level of trust (Andrew & Delahaye, 2000) and characteristics of the organizational context such as the communication infrastructure (Moenaert et al., 2000) and the media richness of the information and communication technologies (Daft & Lengel, 1984)"*. In his theory of activity system Boer (2005) identifies four levels of tensions:

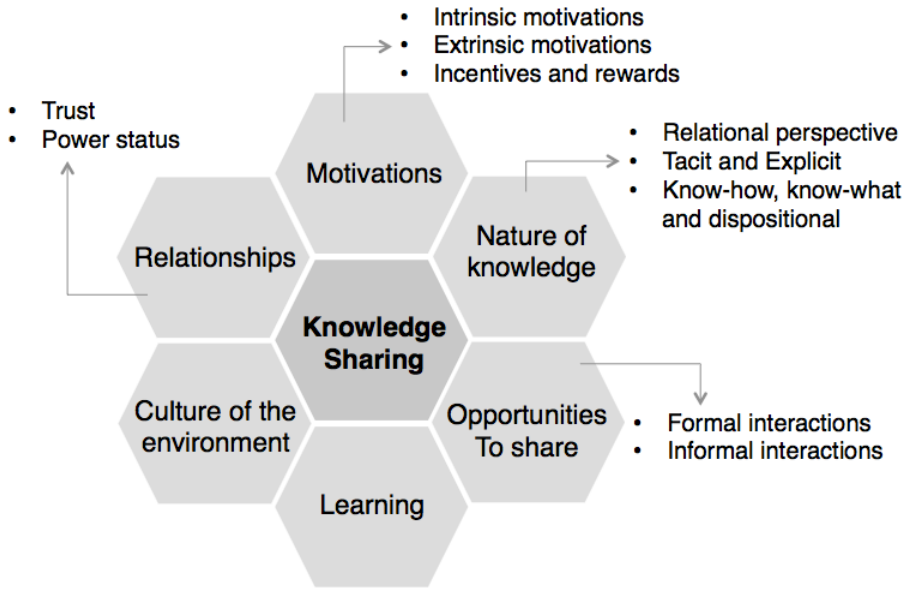
- **Primary level:** Different interpretations of different subjects, conflicts between the completion of components, disagreement about the object, identity conflicts, etc.
- **Secondary level:** Originated when new elements enter from the outside of the system, such as new technologies, new labors, new actors involved, etc.
- **Thirdly level:** Originated by new processes or new organizational structures *"when a culturally more advanced object and motive is introduced into the activity"* (Boer, 2005, p. 80).
- **Quaternary level:** Originated between the activity system and the environment, such as conflicts with partner organizations, disagreements, etc.

The challenges and tensions entailed in knowledge sharing represent integral elements of activity systems according to Boer (2005) and thus of open innovation collaborations. It must be accepted that continuous incoherencies, inconsistencies and contradictions are part of the performance. However, although the tensions and challenges seem to be a priori a negative part hindering knowledge sharing, there will be some aspects that rather than being convenient to eliminate, it will be later explained that in some cases the elimination of them will not be as favorable as can be thought. In words of Boer (2005, p. 82) *"the issue is not how can tensions be eradicated but how they should be treated"*.

On the other hand, Yström et al. (2015) distinguish uncertainty, trust and openness as important challenges that actors in collaborations have to face with. There are also challenges at an organizational level. This means, when organizations engage in open innovation collaborations the actual collaborating users of it are the employees of the firm (Wikhamn, 2013). The success of knowledge sharing does not only depend on these people; the success of the initiative is very dependent on their surrounding organizations (Yström et al., 2015). Bartol and Srivastava (2002) identify organizational learning as an important challenge for firms in open innovation. Boateng (2011) states that organizations should provide work environments in which employees feel free and open to share.

For the case of this research, under a more relational perspective of knowledge sharing, Ipe (2003) proposes a relational model that includes four main factors of influence: the nature of knowledge, motivation to share, opportunities to share and the culture of the work environment. The following Figure 7 represents an adapted version for this research of the relational model for knowledge sharing by Ipe (2003). To his four main categories of influence, others have been identified in the review of the literature on knowledge sharing. Figure 7 aims to serve as a map of knowledge sharing drivers, with the aim of being a useful tool to guide the reader during this section. It is advisable to remark that in this section the nature of knowledge is not addressed since it was presented in chapter 2.2.1.

**Figure 7:** *Factors in knowledge sharing*




## Motivations

Motivation constitutes the primary challenge not only to share knowledge but also to carry out any initiative by individuals. The literature about motivations and rewards concerning knowledge sharing is quite incomplete and still necessary to understand why and how knowledge is shared (Boer, 2005). Motivation is seen as the key factor to participate in any "open and social community" (Battistella & Nanino, 2012). One can be able to share knowledge and to know with whom knowledge should be shared but without an underlying motivation for it knowledge sharing will never happen (Boer, 2005). Battistella and Nanino (2012) say that motivation determines the success or failure of collective innovation processes. They state that the partners in collaboration should be motivated to participate through an active/reactive/proactive process of knowledge sharing.

Battistella and Nanino (2012) explored the motivations that may lead participants to engage in open innovation platforms. They propose an exploration of these motivations at two dimensions: intrinsic and extrinsic. Both levels are subdivided in an individual and a social category. Also, a third level regarding economical aspects is included in extrinsic motivations.

**Intrinsic motivations**

- At the **individual level** one can find the psychological- emotional reasons of why an individual should decide to engage in a project for his or her own knowledge exchange (von Hippel & von Krogh, 2003). Battistella and Nanino (2012) emphasize that intrinsic motivations may be: opportunity to express individual creativity (Roberts et al., 2006), sense of membership (Stallman, 1999), fun and entertainment (Lakhani & Wolf, 2005; Frey et al., 2011) or sense of efficacy and compensation (Kollock, 1999). Frey et al. (2011) say that intrinsic enjoyment and entertainment constitute one of the most important motivations in open innovation initiatives. They state that people participating in

open innovation platforms enjoy feeling competent and efficacy as well. This sense of enjoyment is what leads contributors to make their best.

- The **social level** of motivations includes, according to Battistella and Nanino (2012), the tendency of the individual to join a community. They propose different motivations in this group such as the aim of social influence and identity (Bagozzi & Dholakia, 2002), information exchange (Ridings & Gefen, 2004) or sense of cooperation (Antikainen et al., 2010). In their research of the tensions that influence the work of individuals in the open innovation arena, Fredberg et al. (2011) identified, among others, one factor known as role confusion that is worth including in this group. Different actors from different fields work together in the open innovation arena and this implies that individuals experience a duality in their roles: one connected to the arena and one connected to their organization. Role confusion represents a challenge rather than a motivation itself. It concerns the sense of duality that employees participating in open innovation collaborations may encounter at the boundary of what their role should represent in the collaboration and in their home organization. Yström et al. (2015) explain this fact as if employees had problems to identify themselves and others as well. This confusion leads them to question the motives for whom to share knowledge. They could even be more engaged in the collaboration than in their own organization and such duality could ultimately determine their effectiveness in the collaboration (Fredberg et al., 2011).

**Extrinsic motivations**

- The **individual level** of extrinsic motivations includes the aspects that result in advantages for who actually participates in the collaboration. Reputation for the contributor is included in this group (Kollock, 1999) as well as professional status (Lakhani & Wolf, 2005). Other tensions identified by Fredberg et al. (2011) are career benefits. They say, employees would not put their best efforts in collaboration if they did not believe it would benefit their career. Fredberg et al. (2011) consider this as an important factor that eventually determines the better or worse performance of the open innovation arena.

- When it comes to the **social level** of extrinsic motivations, it concerns the resulting influence and effects that participants may originate in the community. Examples are individual accountability and social capital (Gergen, 2000). Although role confusion (Fredberg et al., 2011) was described before as a challenge entailed in intrinsic motivation, one can thought about it as extrinsic as well, since role confusion not only affects the individual but also his or her home organization, in terms of how this tension enhances or hinders the expected value- creating process for firms through knowledge sharing in the collaboration.

- Battistella and Nanino (2012) include an **economic level** in the extrinsic motivations regarding all the economic advantages that are expected for the contributors. This level of exploring motivations will be seen in the following, where the chapter addresses, more deeply, incentives and rewards as another factor for knowledge sharing in collaborations.

Table 7 gathers the findings by Battistella and Nanino (2012). However, it has been more convenient to describe the findings in motivation in a more detailed and relevant manner for the aim of this research, which applies to open innovation collaboration. Despite this fact, the table invites the reader to have a more visual representation of it.

**Table 7:** *Intrinsic and extrinsic motivations in open innovation platforms (Battistella and Nanino, 2012), adapted version*

| **Motivation** | | **Main authors** |
|---|---|---|
| **Intrinsic** | | |
| **Individual** | Entrepreneurial mindset<br>Opportunity to express individual creativity<br><br>Attachment to the group, sense of membership, sense of caring about community<br>Enjoyment, fun and entertainment<br><br>Psychological compensation and sense of efficacy | Tapscott and Williams, 2006<br>Ryan and Deci, 2000; Roberts et al., 2006<br>Hertel et al., 2003; Stallman, 1999; Stewart and Gosain, 2006<br>Hars and Ou, 2002; Lakhani and Wolf, 2005<br>Bandura, 1995; Kollock, 1999 |
| **Social** | Sense of cooperation<br><br>Social search<br><br>** Role confusion | Antikainen et al., 2010; Antikainen and Vaataja, 2010<br>Evans and Chi, 2008<br><br>Fredberg et al., 2011 |
| **Extrinsic** | | |
| **Individual** | Reputation<br>Recognition of the company, growth of professional status, career benefits<br><br>Reciprocity | Jeppesen and Frederiksen, 2006<br>Wasko and Faraj, 2000; Lerner and Tirole, 2002; Bagozzi and Dholakia, 2002; Hargadon and Bechky, 2006; Lakhani and Wolf, 2005; Fredberg et al., 2011<br>Raymond, 1999 |
| **Social** | Individual accountability<br>Social capital | Antikainen et al., 2010<br>Gergen, 2000 |
| **Economic** | Monetary rewards<br><br>Free products<br><br>Free services | Wasko and Faraj, 2000; Antikainen et al., 2010; Tapscott and Williams, 2006; Anderson, 2009<br>Tapscott and Williams, 2006; Anderson, 2009 |

** Role confusion has been included in the table as a challenge

Osterloh and Frey (1999) say that knowledge to be shared between individuals or teams, when it comes to knowledge of tacit nature (Nonaka, 1994), needs intrinsic motivation.

In the context of collaborations, Battistella and Nanino (2012) not only agree with this statement but also add that no collaboration is possible if there is not, at least, an extrinsic motivation or incentive behind. Therefore, they conclude that intrinsic motivation is not enough when it comes to open collaborations, as the case of this study.

## Incentives and rewards

Economic motivations were seen as an example of incentives and rewards that may lead individuals to participate in collaborations. Davenport and Prusak (1998) doubt that knowledge may be shared if there is no economic reward for those who share. Besides, Frey et al. (2011) say that monetary incentives and rewards sometimes represent justice and fairness to employees who participate in collaborations, since it is not them who are supposed to benefit directly from it, but their home organizations. On the other hand Fredberg et al. (2011) noticed in their exploration of the open innovation arena a tendency among participants by which they were committed to their work at the same time that they felt insecure about whether they would be rewarded for it. Boer (2005) instead holds that people share their knowledge motivated by several reasons other than economic or monetary. He even suggests that employees do not always find links between economic incentives and their contribution to knowledge sharing. Rather, these act sometimes as *"disincentives such as losing control over valuable information"* (Boer, 2005, p. 2).

Battistella and Nanino (2012) find a shared perception among managers according to which incentives and rewards are often their preferred way to motivate employees. However, as they say about these practices "*they are also the least successful tools as people are most creative when they feel motivated primarily by interest, satisfaction, and the challenge of the work itself*" (Battistella & Nanino, 2012, p. 570). In this line, they find intrinsic motivations to be more successful for creative tasks; knowledge sharing in this case is more likely to occur as participants perceive such tasks as an important work that matters and where they are accountable.

## Relationships

According to the relational perspective adhered in this study, knowledge exists with and within individuals (Ipe, 2003). New knowledge may be created through the interaction of individuals (Ipe, 2003; Carayannis et al., 2012) and therefore the development of relationships between the actors involved constitute a crucial factor that influence knowledge to be shared. Knowledge sharing is viewed as a relationship and a communication process between at least two individuals (Boer, 2005) but the challenge entailed behind this is that neither a relationship nor a communication process lead automatically to knowledge sharing (Boer, 2005). Applicable to collaborations, Ipe (2003) distinguish trust and power status as two critical elements when it comes to the relationship between the sender and the receiver.

- Collaboration involves the exposure of individuals' knowledge and thus, the development of **trust** is required (Storper, 1997; Lundvall, 1992; International Chamber of Commerce, 2015) as well as shared understandings (Herstad et al., 2008). For the case of open innovation collaborations, which pursue the development of collective knowledge, trust is seen as critical factor influencing

the way knowledge is shared (Kramer, 1999). In their research about the creative climate in an open innovation arena, Yström et al. (2015) also identified trust as one of the challenges that participants in the arena were facing with. In this line, different levels of trust between the different partner organizations of the arena were also a motive of tension for the participants (Fredberg et al., 2011). Andrews and Delahaye (2010) consider trust in collaborations as essential, since, as they say "*trust was more important than formal collaborative processes, because in the absence of trust, knowledge sharing would not have occurred"* (Andrews & Delahaye, 2010, p. 805). Also Yström et al. (2015) identifies difficulties for individuals to share knowledge when they have to face with differences in perspectives among them.

- The development of trust in collaborations over time leads to sustainable collaboration and encourages partners to share valuable know-how (International Chamber of Commerce, 2015). Trust, commitment and mutual understandings are serious enablers for knowledge sharing. Ipe (2003) also defines the concept of reciprocity regarding knowledge sharing, as the "give-and-take" that takes place when individuals realize that the more they share the more value-add to them is acquired (Weiss, 1999). Reciprocity enables individuals to share knowledge even if they feel uncertain about whether it will be rewarded (Nahapiet & Ghoshal, 1998). It also implies reciprocal flows of knowledge both horizontally and vertically within organizations (Ipe, 2003). Roth (2002) adds that both sender and receiver in the social process of knowledge sharing need to have a certain level of absorptive capacity (Cohen & Levinthal, 1990) that builds learning and reciprocity in exchange. Brown and Duguid (1991) on the other hand suggest that knowledge shared through experiences leads to contextual understandings of it and enhances tacit and explicit knowledge to become practical.

- **Power status** represents another factor of influence in the relationships around knowledge sharing. Ipe (2003) says that the differences between the status that the different individuals possess in their organizations have influence on how knowledge is shared in the end. According to Davenport and Prusak (1998) the way to effectively share knowledge consists on hiring "the smart people" and let them talk. Roth (2002) suggests that managers and people with influence in the organization should give support to the individuals sharing and also take initiatives. Knowledge sharing is not only being given with something but also eventually engaging and being interested in it (Roth, 2002). On the other hand Weiss (1999) suggests that in some cases individuals with low status may refrain from sharing what they consider could make them vulnerable in front of their superiors. Boateng (2011) holds that employees to share knowledge should work in a supportive environment of trust that allows a culture of creativity and openness. As it was said, knowledge sharing depends not only on the participants of the collaboration (seen as the senders of the knowledge sharing communication process) but also on their home organizations (seen as receivers). In this line Roth (2002) states that knowledge seen as collective action (Hatchuel, 2001) by both managers and employees lead to "organizational capabilities".

## Opportunities to share

Opportunities to share are seen as interactions, activities or techniques that are expected to enhance the process of knowledge sharing. Ipe (2003) says that such opportunities can be considered of formal or informal nature, depending on whether they are designed explicitly for providing knowledge sharing respectively. Thereby, formal interactions (Bartol & Srivastava, 2002) or purposive learning channels (Rulke & Zaheer, 2000) such as training programs or technology-based systems are designed with the objective of providing individuals with the tools that are necessary to share knowledge. Formal mechanisms are usually more suitable to share knowledge of explicit nature (Ipe, 2003). On the other hand, despite the availability of formal mechanisms to share knowledge, Stevenson and Gilly (1991) argue that individuals still tend to share what they know in other informal ways. Personal relationships and social networks that facilitate knowledge sharing constitute the informal interactions or relational learning channels (Rulke & Zaheer, 2000). Porschen (2008) argues that informal interactions can rarely be formalized and therefore should not be underestimated within organizations. Moreover, Roth (2002) acknowledged formal processes of knowledge sharing as part of knowledge management but he also suggests "spontaneous, unstructured exchanges between people of the organization" as essential in knowledge sharing. Conway (1995) stresses the importance of informal relationships since, by facilitating face-to-face communication and trust they enhance the sharing of knowledge, which is mostly of tacit nature. Communication and experiences represent a good way for companies to get access to tacit knowledge from their employees (Bougrain & Haudeville, 2002).

## Culture of work environment

The culture of the organization has a strong influence on how companies manage knowledge (McDermott & O'Dell, 2001). The culture of the work environment can be seen as a potential barrier to effective knowledge sharing (De Long & Fahey, 2000). Schein (1985) says that culture determines how individuals take actions and what is relevant for them. De Long and Fahey (2000) identify different levels of influence of organizational culture. They state that the culture establishes the norms and values of what is considered relevant and how it should be distributed. It also controls the relationships between individuals and groups and establishes the context in which these are developed (Gold et al., 2001).

## Organizational learning

D'Aveni (1994) says that the long term viability of companies eventually depends on their ability to innovate and learn. An appropriate communication environment may favor knowledge sharing as well as organizational learning (Cohen & Levinthal, 1990). Learning has been acknowledged as contributor for the innovation processes of firms (Sehested & Sonnenberg, 2010; Kang et al., 2007; Voronov, 2008) and Kim (1993) holds that individuals from organizations represent the means of learning for such companies. Also, Kim (1993) specifies that learning imply acquiring both know-how and know-what in order to further develop new skills and capabilities. Boer (2005) points out that knowledge sharing represents the connection between communication

and learning and adds that without learning attitudes, knowledge shared can be hindered by either one or both parties involved in the process. On the other hand, Boateng (2011) questions the affirmation that organizations learn when their employees learn but however, he supports the fact that when individuals share their knowledge within their organizations they enable the construction of collective knowledge.

It seems that organizations that decide to engage in open innovation collaborations should have learning capabilities in order to get the most out of it. Jimenez-Jiménez et al. (2008) suggest that when firms are oriented towards learning, it means they are interested in the acquisition of new ideas to assimilate and eventually it means competitive advantage (Liu, 2006). Organizational learning may lead to the development of new knowledge and insights derived from the knowledge shared in the collaboration, acquired through the experiences of people within the organization that has been engaged in such practices (Jimenez-Jiménez et al., 2008).

In their research of the creative climate in the open innovation arena, Yström et al. (2015) point that the partner organizations constitute an important influence on the work environment. Their study shows that it is not only important for create a creative and innovate climate, but also organizations should be in contact and committed to the work in the arena. There is a need for a flow of knowledge and ideas between both sides and trust takes an important role here as well.

# 3. Research methodology

*The aim of this chapter is to give an introduction to the methods used in this study. The chapter starts by introducing the philosophical orientation of this study. Furthermore, the research strategy, research design, research methods and process, quality of research, and ethical considerations are presented. Finally, a case description of the Open Innovation arena SAFER and the SEVS project will be provided.*

## 3.1 Philosophical orientation

As a basis for the research methodology some philosophical considerations have been deemed important to consider in order to set a path for conducting the study. Two of those considerations are the epistemological and the ontological philosophical orientations.

### 3.1.1 Epistemological considerations

Epistemology is the theory of knowledge, which questions what knowledge is and how it is acquired. Two major orientations in epistemology are positivism and interpretivism. Positivism emphasizes the utilization of methods related to natural science when studying social reality (Bryman & Bell, 2011). The doctrine of positivism advocates that knowledge must be verified by the senses to be warranted as knowledge (Bryman & Bell, 2011). When establishing new knowledge this orientation derives hypotheses based on already established facts that are supposed to be tested. Thus, positivism is often related to a deductive approach where a qualitative strategy is used.

In contrast to positivism, interpretivism emphasizes that there is a fundamental difference between the study of natural science and social science and that this has to be reflected on in the theory of epistemology. In a social context, according to an interpretivist point of view, the perceptions of reality is based on the researcher' meaning and understanding of the people studied. Thus, it is necessary for researchers to recognize that their experiences and background forms the interpretation of the situation studied (Creswell, 2003). Since this study aims at investigating the people's perception of factors that may affect the knowledge sharing in an open innovation collaboration, the researchers of this thesis therefore followed an interpretivist orientation where the interpretation of the participants' perception of the studied phenomena determined the outcome of this paper.

### 3.1.2 Ontological considerations

Ontology concerns the nature of social entities (Bryman & Bell, 2011). This implies questioning whether there are objective entities or social constructions developed from actors' perspectives and actions (Bryman & Bell, 2011). Moreover, those two positions can, at its extremes, be assigned to objectivism and constructivism. Objectivism is an ontological orientation that envisions the reality to something external for the individuals who reside in it. Contrary, constructivism advocates that the social

phenomenon is constructed through social interactions and their understanding of the world around them (Creswell, 2003).

Since this study investigates the SEVS members' perception of knowledge sharing in an open innovation environment it is necessary to look at this social phenomena in a constructionist way. This means that the researchers should, in the greatest extent possible, rely on the participants' perception of the situation and let the participant construct the meaning of the phenomena studied (Creswell, 2003).

## 3.2 Research strategy

It is common to categorize a research as a quantitative or a qualitative study due to simplicity (Bryman & Bell, 2011). The distinction is not always obvious and can sometimes be rather ambiguous. Basically, a quantitative research study entails analyzing quantitative data, which usually implies that the researcher uses numbers as measurements. Conversely, a qualitative research study is instead focusing on words when collecting and analyzing data. A research could also take a mixed method approach, which embeds both a qualitative and a quantitative strategy. Although the unclear disparity between the concepts of quantitative and qualitative research, a categorization of them embeds some advantages, such as it helps in choosing different methods for collecting and analyzing data.

Usually, an inductive orientation is related to a qualitative research (Bryman & Bell, 2011). This thesis mainly follows an inductive orientation where a qualitative research strategy has been employed. This follows the constructivist and interpretivist way of thinking about the study of this social phenomenon, where the researchers interpret the participant construction and perception of knowledge sharing in this open innovation collaboration. That means that rather emanate from existing theory about a research subject, this inquires to inductively establish new theory (Creswell, 2003). The reason for mainly following an inductive approach is due to the lack of existing research about knowledge sharing in open innovation arenas as well as that the research object entails high complexity that require qualitative research methods.

## 3.3 Research design

The research design of this study is a single case study of an open innovation collaboration project, called SEVS. In general, a case study concerns an investigation of a circumscribed system or situation (Bryman & Bell, 2011). Some of the benefits in using a case study according to Yin (2004) is that it facilitates when investigating, in-depth, a real life situation. However, one possible drawback of using a case study as a design is that the generalizability is limited (Bryman & Bell, 2011).

When performing a case study, the choice of case is important in order to assure a good quality in research (Bryman & Bell, 2011). As SEVS is a project where knowledge sharing is a central part in determining the success of the collaboration, a case study is assumed to be an appropriate design for this thesis.

## 3.4 Research methods and process

One major part of this study consists of a literature review, which has been performed continuously throughout the whole research period. In order to get a broad understanding of the topic and to provide a substantial basis for further analysis, literature that have been reviewed in this thesis have mainly been related to the research areas: Open Innovation, Knowledge Management and Knowledge Sharing. The majority of literature that was collected has been retrieved from the databases such as Summon and Google Scholar between the period of January 2015 and June 2015.

In addition to the literature review, and in order to answer the second and the third research question, interviews with the participants involved in the SEVS project were conducted between the dates May 4 and May 21 during the spring of 2015. This was done in order to collect data and insights from the participants' perception of knowledge sharing within the open innovation collaboration of SEVS. The following two subsections aims at describing the data collection and analysis more thoroughly.

### 3.4.1 Data collection

The collection of data was done by conducting semi-structured interviews with participants from the SEVS project. The semi-structured way of interviewing enabled the researchers to have a structure in the interview while maintaining the flexibility to follow up certain discussions. This way of interviewing is one of the most frequently used methods (Bryman & Bell, 2011).

In total, 12 interviews were held with people from 8 different organizations. The interviews took between a half an hour and two hours. The amount of interviews were considered enough and no additional interviews had to be held in order to gather further information or clarify certain aspects. The interviews were audio recorded in order to not miss out on important statement during the interview. The recording also reduced the risk of misinterpreting the interviewees. Thus, by recording the interviews higher reliability could be achieved in the analysis of the empirical data. During the interview, one researcher took the lead in order to facilitate the dialog between the researchers and the interviewee and keep track of the structure. The other researcher put the focus on writing down additional questions that were asked to clarify certain things or follow up on interesting insights from the interviewee. This approach where one researcher took the lead and the other one focused on writing down additional questions was considered a good way of conducting the interviews. The interviews were held in English, meaning that the interviews were not conducted in the native language of anyone that participated in the interview. Thus, some expressions and thoughts may have been emerging and elaborated on in a limited manner. However, this was not considered to be any problem since all the interviews were conducted fluently. Moreover, the researchers encouraged the interviewee to ask for clarifications of the question if the questions appeared to not be clear enough. At this point it was also important for the researchers to be aware of asking follow up questions if the interviewee's answer ended up too broad and thus left space for a lot of interpretations.

The interviews were scheduled in a time period of three weeks were the interviewees could choose a time and place that suited them. This was done by inviting people that had been involved in the, both for shorter time periods as well as throughout the whole project. By doing this, the participants could chose by themselves if they wanted to participate in the interview or not. The Table 8 shows an overview of the eleven interviewees in the data collection. They were named by "TM (team member)" followed by a number between 1 and 11 and their nature in the Triple Helix (industry, academia or society).

**Table 8:** *Participants in the interviewees*

| Team member (TM) | Home organization |
|---|---|
| TM1, I | Industry |
| TM2, I | Industry |
| TM3, A | Academia |
| TM4, I | Industry |
| TM5, A | Academia |
| TM6, A | Academia |
| TM7, A | Academia |
| TM8, I | Industry |
| TM9, I | Industry |
| TM10, I | Industry |
| TM11, S | Society |

## 3.4.2 Data analysis approach and method

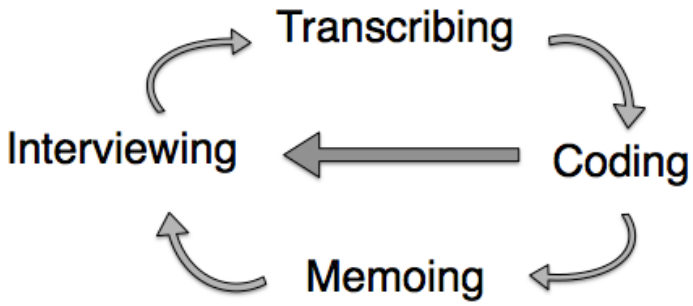
A data analysis strategy was used as a framework for giving guidance on the analysis. Two of the most frequently used approaches for analyzing qualitative data are analytic induction and grounded theory (Bryman & Bell, 2011). According to Bryman and Bell (2011) the relation between collecting data and analyzing data is often an iterative process. Since the analytic induction and grounded theory are iterative processes of analyzing data they could also be used as strategies for collecting data. Strauss (2003, p.6) state that grounded theory is not really a method but rather a *"style of doing qualitative analysis"* that involves aspects and guidelines such as theoretical sampling and coding.

Since the interviews were audio recorded, the first step in the analyzing phase was be to transcribe the audio files into text files. This was done by listening to the audio files and writing down the conversation word by word. The analysis was further performed by

coding, which is a process of analyzing qualitative data by categorizing and identifying themes of the transcripts into different areas.

Since the transcribing part of the analysis was time consuming the researchers divided this part. To ensure that the transcribing was done as correctly as possible the researchers also listened to each other's transcriptions. Even though the transcriptions of the interviews took much time, they were considered to be an important part of the analysis in order to make good interpretations of the interviewees and not miss out on important aspects. Coding is an important part in the analysis of qualitative data, and according to Strauss (2003), how good the research turns out to be highly depends on the excellence of the coding. He further emphasizes that coding is one of the most arduous activities to understand and manage for inexperienced researchers. Because of this, literature on what coding is and how it could be used in qualitative data analysis was studied. This helped the researchers to conduct a more thoroughly analysis than what otherwise would be possible. Another part of the analysis was the memoing where the researchers, based on the coding, wrote down notes about ideas regarding connections, contradictions and other interesting reflections gained from the data. The analysis was an iterative process between collect data from interviews, transcribing, coding and memoing. Figure 8 below provides a simple model of how the how the analysis was conducted.

**Figure 8:** *Processes in the analysis*




## 3.5 Quality of research

According to Bryman and Bell (2011) some researchers advocate that a qualitative study should be assessed in other criteria than for a quantitative research and that the terminology used in evaluating quantitative research will not be sufficiently applied in a qualitative setting. Instead of relating to the validity, reliability and replicability, as frequently used in quantitative studies, Lincoln and Guba (1985) propose an alternative terminology of assessing the quality of a qualitative study (Bryman & Bell, 2011). They provide two principal criteria for this kind of evaluation: authenticity and trustworthiness.

Authenticity concerns a broader impact on the research from a political point of view. In order for this research to attain authenticity it is important that different views from the participants are fairly represented. This was done by ensuring that through a thorough

analysis of the interviews the researcher conveys all differences obtained from the interviewees, such as disparities in insights, ideas and conflicts.

Trustworthiness can be described by the four areas credibility, transferability, dependability and confirmability (Bryman & Bell, 2011). In order to achieve credibility the research was conducted in accordance with good practices. Moreover, the research will present the findings to the participants of the study so that they can validate and confirm that the findings are aligned with their perception of the area studied. After the interpretation of the interviews a transcript will be sent to the participants so that they could validate the findings. Transferability is related to the external validity of the study. As stated before, the design of this study will be an in-depth research of a single case. With this said, the generalizability of the study and the application of findings can therefore be questioned. However, the aim of a case study should be on focusing on the uniqueness of the case and a more profound interpretation will therefore be needed (Bryman & Bell, 2011). The dependability is concerned with the reliability of the study. This is an area in which auditing plays a critical role. In this case, the study will be conducted by two researchers, which will make the interpretations of the participants more reliable. The study were also be supported by a supervisor that helped in assuring that the procedure of the study was followed in a decent way. When it comes to the confirmability of the study, the objectivity is a central part that the researcher needs to know how to relate to. As this study adheres to the interpretivist and constructivist orientations the interpretation of the findings are in some extent influenced by the experiences of the researchers. Thus, being entirely objective in a qualitative research is difficult and not always desirable.

## 3.6 Ethical considerations

In addition to authenticity and trustworthiness, ethical considerations are also of decisive importance in order to achieve good quality in research. Crandall and Diener (1978) argue that there are four main principles of ethical considerations when conducting a research: harm to participants; lack of informed consent; invasion of privacy; and deception (Bryman & Bell, 2011). This section aims at describing how this thesis will relate to each of those principles.

Harm to participants can take several different forms that is important as a researcher to take into consideration. According to Bryman and Bell (2011) harm may be: Physical harm; stress; harm to participant's personal development; and harm to their career advancement. Although it is not possible to pinpoint all areas where harm to participants can arise it is important for a researcher to envision how his or her study can affect the participants involvement in the research (Bryman & Bell, 2011). Bryman and Bell also emphasize two issues that are especially critical in a qualitative research are those related to confidentiality and anonymity. In a qualitative research strategy where researchers meet and interview participants the researchers have to be able to guarantee that information acquired only will be used in the way that the participants have consented to. Moreover, the researcher also has to ensure that the participants' anonymity is maintained if required.

Lack of informed consent becomes a problem when the participants are not informed thoroughly (Bryman & Bell, 2011). Hence, the participants must not only be asked if

they want to participate, but they should also be given further information about what the research is about and their role of participation. This is important because it makes them able to understand on what premises they can participate. Consequently, informed consent gives the participants the ability to decide whether they want to participate or not. The majority of discussions have seemed to focusing on so called disguised or covert observation (Bryman & Bell, 2011).

Invasion of privacy is related to in which level that the privacy of the participants can be overlooked (Bryman & Bell, 2011). Invasion of privacy is closely related to the lack of informed consent. In the case of holding interview it sometimes occurs that the interviewed participant does not want to answer the questions asked. In those cases it is important to be clear that it is up to the participants to decide on what thoughts they want to share.

Deception is a result of deluding those who are taking part of the study and manifesting the study as something that it is not. In business research it is quite common not to be fully open with what the research really is in order to not get biased results (Bryman & Bell, 2011). In this study there are no reasons for manifesting the study as something else. To achieve this, the participants in the research will be well informed what the study is about and what is expected from them.

## 3.7 Case description

Since the research design of this study is a case study of the SEVS project carried out at the Open Innovation arena SAFER, this arena deserves special attention and needs to be described more thoroughly. In this section a description of SAFER is provided, followed by a short introduction of the SEVS project.

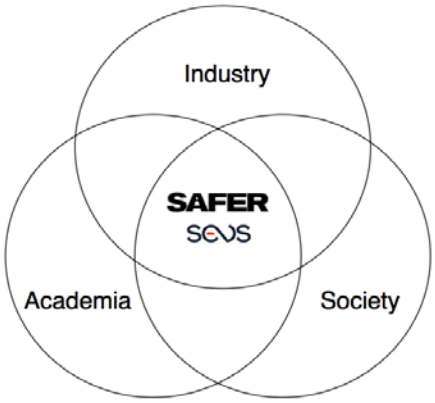
### 3.7.1 Description of the Open Innovation arena: SAFER

An open innovation arena is considered to be a new concept of collaboration (Ollila & Elmquist, 2001). It can be defined as *"an actor trying to enable open innovation within a specific field of expertise, while at the same time seeing itself as a key player in the field"* (Ollila & Elmquist, 2011, p. 274). Furthermore, Yström et al. (2015, p. 72) adds that an Open Innovation arena *"is a collaboration platform with its' own vision, strategy, proprietary goals and physical premises while at the same time being solely constituted by its partner organizations and not an organization in the juridical sense"*.

SAFER is an open innovation arena that involves research on traffic and vehicle safety. SAFER was formed in 2006 and have since then been hosted by Chalmers University of Technology. In this open innovation arena, actors from industry, academia and society are participating in several kinds of projects. In 2013, by the time that the second phase of SEVS had been finished SAFER connected approximately 170 people representing 22 companies (Agogué et.al., 2013). The vision of SAFER is: "SAFER provides excellent multidisciplinary research and collaboration to eliminate fatalities and serious injuries, making Swedish society, academy and industry a world leader in vehicle and traffic safety" (Chalmers). Thus, the SAFER arena connects people and organizations different backgrounds, which includes organizations that may be research institutes,

universities, competitors, supplier and customers and government among others. Moreover, the organizations can be divided into the categories industry, society and academia, which represent a Triple Helix nature as illustrated in Figure 9 below.

**Figure 9:** *The Triple Helix*




## 3.7.2 Description of the Open Innovation project: SEVS

SEVS is a strategic explorative project at the SAFER arena with the purpose of "strengthen the Swedish automotive industries ability to analyze and address complex global societal and technological challenges related to the transition to a sustainable mobility and transport system by 2030+" (Malmek, 2013). The SEVS project has involved several actors from different companies, academia and society. Thus, the project involved people with very different backgrounds such as experts, researchers, managers and other disciplines. The project was carried out in two phases. The first phase was run during 2009 and 2010 while the second phase of the project ran during 2012-2013.

The SEVS project decided in an early stage that the project should take a holistic approach where the vehicle appeared as a base for much larger transportation system that involved other environmental and social factors. This holistic view and multidisciplinary way of conducting the project distinguished SEVS from the majority of projects performed in the SAFER arena (Agogué et al., 2013).

# 4. Empirical findings

*The following chapter presents the findings and insights resulting from the exploration of knowledge sharing in the case study of this research, the SEVS project. The data collected is presented in different sections. First, the results show the perceptions that the participants seemed to have about open innovation and collaborations as enablers to new knowledge. Finally, the chapter ends with two sections that address the second and third research question.*

## 4.1 Collaboration in open innovation

In general, the participants in SEVS showed a similar attitude towards the collaboration and emphasized the importance of being part of such initiatives. A common viewpoint was that open innovation initiatives give the opportunity to solve complex issues that requires a system thinking beyond what is possible to achieve within the home organization itself. As some interviewees said:

*"I would say that open innovation is to me, opening up perspectives, either you do it by engaging other people who are not in your field within the company or completely outside it" (TM9, Industry)*

*"That lead you to think in completely new directions that you had not thought of before and probably you were not able to think of by yourself alone, and that I think is my main experience (…) more brains think more than just a few brains" (TM10, Industry)*

*"The group can make better conclusion and analysis compared to if you are alone" (TM4, Industry)*

*"You try to create something which is objective from your perspective but it's a huge risk that, it's really from your perspective and you let stuff go (…) It's almost impossible to create on your own all the knowledge that you could do together with other people" (TM9, Industry)*

## 4.2 The SEVS Project

SEVS explores and analyses complex societal, technological and environmental challenges regarding the future transport system. Many participants in SEVS expressed their awareness of why projects like SEVS are valuable for the organizations that are taking part in it. As some put it:

*"Nowadays to be an innovation partner you need to be on the same level of understanding as the industry builds from component to system of components and moves on to other systems and systems of systems… you have to understand this basis, otherwise you are lost somewhere in the value chain (…) The times are gone that to develop technical components you just require technical skills. You have to understand these technical components in its context, not just in its product or service context but also in their environmental context" (TM8, Industry)*

*"We gain a very industrial view of how things should be to make the most number of cars with highest profit… if you put it in the extreme, that's why we are here [in the market]… but we have to plan to do it in society so we have to work together" (TM2, Industry)*

*"It [SEVS] is an eye opening, a project for people involved in transportation from different perspectives: public sector, companies and also the research perspective" (TM5, Academia)*

*"There are many different stakeholders that need to work together and that is why these kinds of projects like SEVS are so important. You have to have time to explore and understand your role in this kind of development" (TM5, Academia)*

There seemed to be different opinions among the participants regarding the existence of a clear reason for the partner organizations to get involved in the project. There seem not to be a concrete objective or concrete expectations regarding what they want from SEVS when deciding to take part in it but rather different characteristics of SEVS make it attractive for the partners. As some interviewees said:

*"One of the drivers to be involved was really the frustration of having worked with a problem where I saw that within our organization, we were focusing on small parts and don't really had the whole picture. We were trying to solve technical problems where the boundary conditions for these conditions where extremely unclear, we didn't have the problem well defined" (TM7, Academia)*

*"These kind of Triple Helix projects are good, understanding different roles that each organization has and to get others' view about the future. If you don't do that you risk in the future to falter or miss the market expectation" (TM11, Society)*

*"Many of them I think they just wanted to double check and see how does this look from the outside. That's my guess, that they wanted a second opinion on 'have we understood this the right way?' I think that's very smart of them" (TM7, Academia)*

*"Our approach to this was to think, this sounds big and interesting, we probably should be there (…) But we didn't know what we would get out" (TM9, Industry)*

Regarding the benefits of taking part in the SEVS project, there were some participants who acknowledged uncertainties about whether the project mostly benefited the individuals or the organizations. Accordingly, some participants claimed that:

*"The main benefit from SEVS was the knowledge that the participants gained and the ideas that they brought back to their companies. I don't know if someone else has gained so much, but for the participants it was a successful project" (TM1, Industry)*

*"The biggest benefits of the project were for the people who were actively involved. They learned much more (…) But more important would be to see what the SEVS project could have done for our business model, that could be more interesting" (TM8, Industry)*

## 4.3 Knowledge sharing according to the participants in SEVS

The criticism showed by some interviewees regarding whether it is the participants or the partner organizations that actually gain and capture value from SEVS seem to be very dependent on how people manage to share knowledge created in SEVS within their organizations. According to some interviewees:

*"Of course it depends very much upon the people participating. You could have any organization, process or method but in the end it is about the people that counts" (TM10, Industry)*

*"The companies… they of course send a few people to take part in the project, but how they share this internally I'm not sure (…) The impact that it [SEVS] actually had internally, it is difficult for me to know (…) You must spread the knowledge within your organization, otherwise time and money you spend is not well spend in case you are a company" (TM3, Academia)*

*"It has basically all to do with the people who were there (...) it is the way that people who were there are able to put that knowledge into package or a format that would be comprehended by others at the company, creating even 'new newer' knowledge so to speak" (TM9, Industry)*

Moreover, the participants also acknowledged that it is necessary to disseminate and share what they have learned from SEVS within their organizations. Knowledge sharing was also seen as an enabler to leverage the outcomes from SEVS for those who were not part of the project. As some of them stated:

*"Getting external inspiration typically generates ideas… that you try to drive internally" (TM1, Industry)*

*"It's very much my role to put that knowledge that I have found outside [academia institute] back in the organization and actually also as manager it's still in my role (…) For me, [knowledge sharing is] letting other people do the work" (TM3, Academia)*

However, knowledge sharing according to the interviewees seemed to be viewed in two different contexts. They described knowledge sharing within the project itself in one way that differentiates it to how it is shared within their home organizations. Some participants emphasized that it was in many ways easier to share knowledge within the project than in the home organization. In this line some people said:

*"You share your own thoughts and your own thoughts are often based on your experience. By that you share with you some knowledge that other persons don't have and by that you get a bigger picture of the project or what you're discussing (…) Then, when you try to sort this in some kind of structure you say 'ok, this is the valid problem for us' and you have added something into that problem, then you are also part of the solution (…) You work with that problem into a solution with others and by that you share your own knowledge and you build your knowledge, you get knowledge from others. For me, that's the ultimate knowledge sharing really" (TM7, Academia)*

*"It is one thing to do it in the project, where all these people are really interested in the question. It is certainly different when it is you and your organization and you need a good support material to handle 'that situation'. From my experience, many of the people engaged in these projects, especially from companies, they were really enthusiastic about this project but they also struggled with getting the attention from their organizations (…)This was the kind of project very far out. I think in terms of challenges regarding knowledge sharing...that was more back in their home organizations"(TM5, Academia)*

*"Even though you have been in this project and you have a lot of ideas it's very difficult to make all that into a reality in your company" (TM1, Industry)*

## 4.4 Enablers and barriers to knowledge sharing in the SEVS project

The participants in SEVS show different opinions and insights regarding the key factors that influence knowledge sharing in the context of the project. The findings show that the personal characteristics of each participant, the mixture of people and the development of the relationships constitute three aspects that lead the participants to learn and to be motivated to contribute in the group.

### 4.4.1 The personal characteristics of the participants

One of the most important factors in the SEVS project was how the participants were as individuals. Their personal characteristics could sometimes act as potential enablers or barriers to share their knowledge with others. The interviewees pointed out some characteristics that were very favorable to the success of the collaboration:

*"It is very important that you have a mindset or a profile that is important to talk to others, if you want to do it by yourself it is difficult. If you have problems to talk then it is also difficult. If you are shy it is more difficult. It is not impossible, but difficult" (TM9, Industry)*

*"Ability to think in a holistic perspective, open minded, curious and eager to learn (…) You must be able to put that in a perspective to get a good value of it (…) Engaged, dedicated, positive" (TM11, Society)*

*"If you have very open minded person that are used to work in that kind of situations...then you can take a person from wherever in the company because they adapt to situation and they ask for information in their own organization if they don't know it themselves. But, if you have a person that is very narrow minded or secret or have a professional... situation in his home organization where he is requested to be very secret with the external context, then it's very hard for him to just go to a meeting and open up" (TM8, Industry)*

On the other hand, one of the interviewees also acknowledged that although these characteristics are suitable for knowledge sharing in SEVS it does not necessary imply that being different would be a barrier. The cited interviewee expressed it as follows:

*"The other way around is to replace the persons and put in persons in their place that are open and communicative but I don't think that's a rather idea because those persons who want to be secret they can have excellent competences" (TM8, Industry)*

### 4.4.2 Diversity and the mixture of people in SEVS

The interviewees remarked that the presence of different backgrounds and perspectives in SEVS were one key factor for knowledge sharing. They acknowledged the need for involving people from different industries and positions. According to some participants, the mixture of people should to be leveraged in the group and it was pointed out as fundamental in order to achieve better results for the challenges addressed in the project. According to some of these interviewees:

*"When you combine people from the same area to work together and of course you are not surprised very often, you hear what you already know and you build on your own group think (…) but here... you get perspectives from completely different persons and often the interesting thing is not anything revolutionary in that sense. For those people that's just daily facts...they don't think they contribute with something very important to me because they just tell things they have known for 20 years or so" (TM7, Academia)*

*"It was a meeting with people with different backgrounds and that was very interesting I think and very fruitful, and we were very open minded most of us I think" (TM10, Industry)*

### 4.4.3 Fun and entertainment in SEVS

One of the most conspicuous things that the participants argued for as a strong driver for knowledge sharing in the project was the fact that SEVS was fun and that they enjoyed the way they worked. SEVS was described to be a quite different project from what some of the participants were used to work in. It was also a matter of feeling comfortable in the group. Enjoying working with SEVS seemed to be crucial in order to get the most out of the participants. As some interviewees said:

*"It was fascinating to participate in these type of project"(TM10, Industry)*

*"It was a very wide scope [of the project] from our point of view. It was unusual that we go into a project like this, most of the projects that we do with other parts are much more concrete on a specific technology" (TM9, Industry)*

*"I strongly believe there must be a mental set up from the participants, they must like what they do. They should be convinced that there is a high value to do this and it takes time. Even if the results are not good, the process is the most valuable (…) You always learn a lot. You can use this in other areas" (TM4, Industry)*

*"One of the most fun projects I have ever been involved"* adding further reasons such as that the SEVS project is *"very cross functional...much more insights in other areas than you normally get as an engineer, many stakeholders you normally don't work with" (TM1, Industry)*

### 4.4.4 The good development of the relationships in SEVS

One key factor in SEVS was the development of a strong relationship between the participants. Moreover, building trust seemed to be essential for developing good relations, and hence, an important enabler for knowledge sharing. Many interviewees described trust in SEVS as a key to both contributing and gaining new insights from others. As some of them said:

*"We sat for many hours and worked together and that's very good in a sense because then you really get to know each other and you get that valuable time for discussions and knowledge sharing that you really need (…) however it takes a lot of time" (TM6, Academia)*

*"After a while you learn which people are best to talk to in different matters, some people you can rely completely on them" (TM4, Industry)*

*"The more details you bring the more others will bring as well"(TM1, Industry)*

*"It's good to get to know each other… I mean to have some after work together or something like that in the group (…) and to have lunch together. I mean not just the meetings all the time but talking about some other things, that good (…) I think that we really got to know each other when the time went by" (TM6, Academia)*

The development of trust is not the only enabler for knowledge sharing related to relationships. It is also the absence of secrecy that enhances trust among the participants according to many of them. Some interviewees explained that SEVS was a long term thinking project and because of that they did not have to worry about disclosing certain things. As some interviewees described it:

*"They have their company secrets...they are competitors, they cannot share everything maybe, it can be confidential in different ways...maybe they have to think about what they are saying when they meet people like in this project" (TM6, Academia)*

*"One big factor for cooperation to join is if there are competitors in the project. You are much more closed and you don't give so much details (...) when you are looking so far ahead it is not really risky to share (…) We don't have as many secrets as we think we do" (TM1, Industry)*

*"I didn't want to disclose what was really company secret things that could have connections to the project. But I think for most of the time I didn't have to bother about that question" (TM10, Industry)*

*"Something very good in SEVS is that people and participants came from different areas with different knowledge and everyone would listen to each other. There were no judgments about things" (TM4, Industry)*

### 4.4.5 The participants' motivations to share what they know

The previous characteristics of SEVS were described as enablers for knowledge sharing in the group according to the interviewees. Besides these aspects it is necessary to remark that the environment in SEVS was also an enabler for the motivations that the people had to remain in the project. Regarding these motivations the participants show different opinions on what is the reason for them to be part of SEVS and not decide to leave. There seem to be very intrinsic and personal reasons for some of them to take part in these kinds of projects. As some interviewees said:

*"It's really important for me to motivate me to be able to speak about my area and get others input on that area. It is a strong personal driver" (TM1, Industry)*

*"It's also sort of an egoistic thing. When I have to present and explain it I understand it better, by the questions I get back I improve the quality of my knowledge (…) It's really about that you build a lot of new knowledge, you understand things better on a deep level...in one sense it's egoistic, on the other hand I thought I contributed a lot to others as well but what makes me find the time to do it it's really the egoistic part of it" (TM7, Academia)*

*"That is of course a little selfish...I want something back" (TM3, Academia)*

*"For me it's easier because I'm a researcher, I'm supposed to share knowledge. It comes naturally; it's part of our work. We should spread what we know. I'm not in the same situation of those who come from companies" (TM6, Academia)*

*"Voluntary (…) I was a little upset about how other people had chosen to not participate" (TM4, Industry)*

### 4.4.6 Knowledge sharing in SEVS enhances learning for the participants

In general, the participants acknowledge that SEVS was an experience that made them learn from their partners. Besides they say that the mixture of people was one of the reasons that had made them think in new ways and in new perspectives. Learning in SEVS also became an extra motivation for many of those who acknowledge that they share their knowledge with others because they know they always learn. Also learning was described by many interviewees as the main benefit that SEVS had for its participants. Different insights concerning learning are compiled as follows:

*"I learnt a lot of new things which I didn't even understand that I should ever asked for. For me it really changed the way I look at the world view in this area, really" (TM7, Academia)*

*"I feel I get more ideas when I speak to people outside [Industry company] than inside it. If you have been in a company for a while, you know most of the plans, people and all the problems that have been discussed for 5 years. Then you meet people outside, they typically come in with some fresh angles and that gives you some energy" (TM1, Industry)*

*"I would say… since we were from so many different disciplines we could get the whole picture that was important for the purpose of the project. Not to look just at one very small part of transportation but also to economic, social, short and long term perspectives" (TM6, Academia)*

## 4.5 Enablers and barriers for knowledge sharing within the home organizations

The interviewees also described the situation of knowledge sharing between other colleagues, departments or units within their organizations. The results show that not only how the participants are as persons is important but also what their role is within their organizations seem to be challenging when sharing knowledge. Also the culture of the organization and how it influences the relationships and communication among people seem to be important to understand knowledge sharing in this context.

### 4.5.1 The role of the participants in their organizations

Some of the interviewees expressed that personal characteristics played an important role in knowledge sharing within SEVS and in the context of their organization. Being open minded and able to think holistically were also deemed important as it increases

the chances of finding opportunities where SEVS can be of great value for the home organization. Some interviewees stated:

*"I think you should have an idea of how knowledge from the project can be used in your organization. That is a reason for joining a project like that" (TM3, Academia)*

*"Certainly be somebody who is a strategic visionary, broad scope, who can catch opportunities and see the link between things and make it into a picture" (TM9, Industry)*

However, even though their personal characteristics matters there was something else that the participants identified within their organizations as an enabler for knowledge sharing which was not mentioned before in the project itself. That is, the role that they have in their organizations. The power of influence and decision making seem to be determinant for some participants when saying that there exists an important difference between having more or less influence in the organization. The extend to which knowledge can be spread is described as dependent on how those participants are able to enhance it. In this line some of the interviewees said:

*"If you have a position regarded as let's say very knowledgeable and very competent in your field, then it tells you a lot" (TM10, Industry)*

*"If you are an expert one thing happens. If you are a manager, another thing happens" (TM3, Academia)*

Moreover, one of the participants suggests that organizations should send people with this power of influence to projects like SEVS because that helps the organization to benefit from the collaboration. As this interviewee stated:

*"You really should have someone from [Industry company] for example who participate and who can actually influence that type of product within the [Industry company], you have some decision making power (…) getting participants with the right authorization is really important if you should benefit the most from this type of project" (TM1, Industry)*

However, not all of the participants agreed on having one unique profile of participant in SEVS. Some argued that different personalities are needed in order to get a broader perspective. As this interviewee put it:

*"If everybody was like me I guess there would be a lot of nice pictures [vision], but still there's a lot of people with a lot of experience in certain areas that are very important to create this picture" (TM9, I)*

*"It is the top management that sets the direction but if they do that without listening to their specialists it will go wrong. It's not a bad thing that specialists are working in a project like SEVS, but they need an internal process to get this knowledge to go up in the company. I don't think it works to have managers to go in the project. They don't have time, they will miss the meetings and they cannot be very active in a function way. I don't think it was wrong to send the kind of people that they send to SEVS. If they really used their knowledge… difficult to say" (TM3, Academia)*

Regarding the role of people in the home organization, some interviewees said that it is not only the person who needs to influence others. Sometimes it is the person's surroundings in the organization that needs to be influenced. In line with this, some interviewees claim that the support from the top management is necessary. Moreover, one of them called for the commitment of people with high influence, arguing that someone else apart from the participants should get involved in SEVS.

*"I think that we have many projects where we don't share knowledge in a good way because we cooperate too little. We solve a problem for a company but do we really transfer the knowledge that they need? But that means, to do that, they need to put an effort in taking part in the work. That could be difficult for them. That costs time and money, so they have a specialist working in developing something. Then that person has a specific problem, it is discussed in a research project and they get results back. But are they involved so they can continue and learn something for the next similar situation? Finding the opportunities to work together I think that is very important" (TM3, Academia)*

### 4.5.2 The culture of the organization

Many interviewees acknowledge that it is not only the participants but also their home organizations that influence how knowledge is shared within an organization. Some state that the culture is set from the top of the organization and can affect knowledge sharing. As some interviewees said:

*"The culture of a company is very important, and the culture is many times set from the top and then it drops down in the organization (…) If the very top person in the company is really interested about the future product, it could be physical products or services and really promote people to think about new things and consider that to be investment for the future, then really good things could happen in the company but if you have a guide in the top that just sees that as a cost for the company, that could kill the company in a couple of years" (TM10, Industry)*

*"It's the top management that sets the direction but if they do that without listening to their specialists it will go wrong. It is not a bad thing that specialists are working in a project like SEVS, but they need an internal process to get this knowledge to go up in the company" (TM3, Academia)*

*"I guess that to some persons depending on what kind of organizations that they are in it's a too big step (…) They may be more or less silenced by knowing that it's not interesting"* (TM7, Academia)

A concluding remark is that management support and an appropriate attitude towards such long term, explorative research projects is crucial in order for companies to successfully take part in it and enhance the probability to survive in the long run. As one participant put it:

*"It's difficult to get attention of top management for this type of long term research projects, there are so many immediate projects in production, sales and technical issues that have much higher priority so it's difficult to get their blessing and interest" (TM1, Industry)*

### 4.5.3 Aspects in communication that enable and hinder knowledge sharing

The participants in SEVS need to communicate with other people within their organizations in order to share knowledge from SEVS. For some of them it is communication that enables knowledge sharing. Moreover, the participants emphasized support and a good environment that facilitate communication, since it does not always happen by itself. As some suggested:

*"Knowledge sharing is probably communication (…) In most cases informal communication" (TM11, Society)*

*"Processes and structure is important if you have the feeling that this is not done by itself (…) The only way that you can really handle that is if you understand the competence the person has gained, in the project, and then you build or set up an structure around that competence in the home organization. Then you can get something out of it" (TM8, Industry)*

Some other interviewees identify knowledge as a challenge itself to be shared. They argue that knowledge is something else apart from give information and that there needs to happen something extra to create impact or interest others. Knowledge from SEVS seems to be very valuable by the participants. However many of them acknowledge that SEVS was a project in which one needs to be part in order to capture the value of it and they question whether many other people are able to understand it without being part of it. In this sense some of them said:

*"Knowledge is a process where… where you cannot separate knowledge from yourself, they are really integrated (…) Knowledge that you have influence your way of thinking and understanding completely new things, it takes time" (TM7, Academia)*

*"We had a hard time to really communicate the findings from SEVS to our organization is because SEVS was a different kind of project (…) You cannot just take pieces from it, that's hard. You have to take the full concept and adapt it to what you are doing, that's very important (…) I still claim that if you didn't take part in the SEVS process then you don't understand the full potential of it" (TM8, Industry)*

*"Knowledge is difficult, is not like information, it's keeping something else than just information as such (...) It's what you then do that creates new knowledge if you put it into new context" (TM9, Industry)*

*"You cannot just put it out as if you have a glass of milk, that you expect that everyone should take it. It's different, you need to press it up (...) Otherwise you can never have commitment with other people that it [being part of SEVS] was worth for them" (TM4, Industry)*

On the other hand, some interviewees also claimed that you need to find people within your organization that are appropriate to share knowledge with. They suggest that as a participant in the SEVS project you need to identify those people and then try to get

their attention on the subject. This is an aspect that, according to the interviewees, in a large extent depends on the size of the organization. As some participants described it:

*"It's really a huge company, it's almost impossible to inform everybody there (…) so you interest those more close to you that you think are interested and then you hope that they continue informing. Then you have some kind of distribution of knowledge in the company and you have something really good that could lead sometime to a new project, leading to a new product that comes out to the market" (TM10, Industry)*

*"In a very big corporation it's finding a time and availability of all the people you want to bring this information to (...) if you want to gather 20 people that has the correct influence on future products you need to book meetings several months in advance I guess (...) It's easier in small corporations" (TM1, Industry)*

*"Sometimes you feel you are not allowed to say anything, not allowed because you have a manager who is stopping all the information flow. They don't want to, that's also something you learn during years, to understand who belongs to that group [the group of right people with whom share knowledge]" (TM7, Academia)*

*"What we did wrong at [Industry company] is that we approached the technical organizations… we shouldn't have done that. We should have gone with the market guys or the strategic planning guys. I know that they were involved as well but we should have walked with them more" (TM8, Industry)*

Regarding the practices and mechanisms that are utilized to share knowledge there seem to be different opinions and preferences by the interviewees. One of the differences is whether they tend to be more formal or informal in their communication style. However, what they all seem to agree upon is that practices and mechanisms need to make impact on the receiving party. As some described it:

*"If you work within large organizations you actually want to have a big impact in these organizations and not only in the people who worked in the project. If you have that kind of perspective in the project you cannot just write academic papers or reports. Bigger impact needs thinking differently, doing things differently. You need to develop other kind of materials than just what is focusing on the project (…) so you try to build in action into the material, not just make a material that makes you think "yes, this is interesting" and then nothing happens. If you want action, you need to plan for that. You need to design your material in another way than just to stating facts. You need to put questions into their head and suggest ways of working with the material that engage people from different parts of the organization." (TM5, Academia)*

*"You can have a follow up workshop with more people internally involved afterwards that's more efficient than sending emails but it's bigger effort for you as well (...) we need sort of more involvement and follow on actions (...) it usually works but it needs preparation and it takes time. The risk with it taking time is that you sort of lose some of the energy (...) If you have a lot of energy and passion around something and you try to reach out but your email is only 1 of 100 emails they have, it takes weeks until you get response and that demotivates you quite a lot" (TM1, Industry)*

*"Sometimes you have a request to write something down and if you do it, why don't make it interesting at the same time? Make it so people you inform can feel they are special because they hear these things. Then it's more valuable for them" (TM4, Industry)*

## 4.6 Empirical findings summary

The results from the data collection have been summarized in Table 9. The table shows the main insights regarding open innovation and collaboration, the SEVS project and the factors affecting knowledge sharing both within SEVS and between participants and their home organizations. The table connects the results with the research questions of this thesis.

**Table 9:** *Summary of empirical findings*

| | |
|---|---|
| *RQ1* | **Collaboration in open innovation** |
| | • Increases the ability to think differently<br>• Enables firms to create more knowledge than what would be possible by themselves |
| | **The SEVS project** |
| | • Address the world outside the vehicle<br>• Address social and environmental transformations<br>• Establishes scenarios and a picture of the future and the role of organizations<br>• Enables and faciliates networking<br>• Involves industry, academia and society working together to understand future challenges |
| | **Knowledge sharing according to the participants** |
| | • Knowledge sharing differs depending on if it is happening within the project or back to the home organization<br>  o Knowledge sharing is oftentimes easier in the project<br>• The participants had the main resposibility to maintain the value creation loop by sharing knowledge.<br>• Is in a high extent a reciprocal process |
| *RQ2* | **Enablers and barriers in SEVS** |
| | • Personal characteristics of the participants<br>• Diversity and mixture of people<br>• Fun and entertainment<br>• Development of trust and relationships<br>• Intrinsic motivations to share knowledge<br>• SEVS as a learning project for the participants |
| *RQ3* | **Enablers and barriers within the partner organizations** |
| | • The role of people within the organization<br>• Getting the right support<br>• The culture of the organization<br>• Aspects of communication<br>  o Find the right people<br>  o Informal and formal ways of communication<br>  o Communicate with impact |

# 5. Analysis and discussion

*In this chapter the empirical results presented in chapter 4 are analyzed and connected with the theoretical framework in chapter 2, in order to give an understanding of the research questions addressed in this thesis. At this point a restatement of the purpose and research questions is necessary.*

## 5.1 Purpose and research questions

The purpose of this thesis was to explore an open innovation collaboration from a knowledge management point of view. Moreover, the aim was to explore critical aspects affecting knowledge sharing under the perspective of the people who are directly involved in the collaboration.

Three research questions were derived in order to set a path for this investigation. Those research question were formulated accordingly:

- RQ1: How can knowledge sharing be described in an open innovation collaboration?
- RQ2: Which aspects affect knowledge sharing in SEVS according to the participants' perspectives?
- RQ3: Which challenges do the participants experience when sharing knowledge that has been gained in the SEVS project to and their home organizations?

This chapter aims at presenting the analysis and discussion made from the findings relating to those research questions.

## 5.1 How knowledge sharing can be described in an open innovation collaboration

In order to answer the first research question two models are introduced in this section to describe knowledge sharing in the SEVS collaboration. The first model gives an overview of where value creation takes part in the SEVS collaboration. In addition to the first model, the second model establishes two contexts in which knowledge is shared. The two models complement each other and provide a basic understanding on how knowledge sharing can be described in an open innovation collaboration.

### 5.1.1 The loop of value creation in the SEVS collaboration

The SEVS project is an open innovation (Chesbrough, 2003a) initiative addressing social, technological and environmental future challenges (Gould, 2012; Hagedoorn, 2002) regarding the future of transportation. SEVS does not only represent an opportunity for its partners to explore new knowledge beyond their boundaries (Gassmann & Enkel, 2004) but it may also give the partners a feeling of whether their research investigations are heading in the right direction or not. The results show that different backgrounds of the external collaborators (Gould, 2012; Buganza & Verganti, 2009) in SEVS have been one of the most important reasons for companies to take part in it. Moreover, it is acknowledged among the participants that the Triple Helix (Giannopoulou et al., 2010) of the SEVS project have provided the collaboration with insights and contributions that otherwise would not be possible.

It is acknowledged that the partners involved in an open innovation collaboration should have a reason to remain and feel that there is something to gain from participating in the project (Johansson, 1997; Dodgson, 1993). To pursue that, each collaborator taking part in SEVS decides to send one or more participants to the project who will contribute with their knowledge. Furthermore, new knowledge is created in the project itself through collaboration. In order for this knowledge to be utilized in the home organization the participants need to share that knowledge back to other people in the organization. In this context, in which participants enable knowledge sharing between the SEVS project and the home organization a value creation loop is established. This is represented in Figure 10, which illustrates a rendering of how knowledge is shared and value created in the SEVS collaboration.

**Figure 10:** *loops of value creation for partner organizations in SEVS*

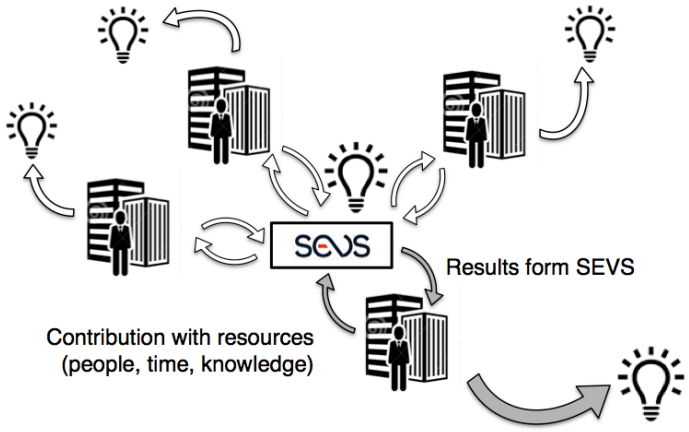



Figure 10 aims to represent the dynamics of the interface between the SEVS project and the home organizations. Basically, each one of the collaborators contributes with resources by sending one or more representatives to SEVS. Within the project group, knowledge is shared and new knowledge is created through cooperation, leading to the achievement of valuable results and learnings for the participants. Project outputs that the participants consider valuable for their home organization are further supposed to be shared within their home organization. As the participant is the central player in this value creation loop, he or she also has the main responsibility of maintaining an appropriate balance of it. This is also one of the reasons why the interviewees in the study argued for the importance that participants have this ability.

As recently emphasized, people need to share knowledge back to the home organization when necessary. This is supported by Jiménez et al. (2008) who said that people are needed in order for knowledge sharing to happen. Otherwise, knowledge and learning from SEVS would remain only in its tacit nature (Boisot, 1998; Szulanski, 1996; Nonaka, 1994) in the mind of the participants. This means that in the best of cases the people who work actively in SEVS must (in the future) have the capabilities to identify relevant knowledge from SEVS that can be connected to different units in their home organizations (Chesbrough, 2012) and be used in a way that adds value to their business and purposes. The actual value from SEVS was more or less a new way of thinking. In many other cases the results show that not only the success of the collaboration depends on knowledge sharing (Yström et al., 2015) but also the success of how people manage to share in their organization depends on different challenges that they have to face with.

### 5.1.2 The context of knowledge sharing

Two situations of knowledge sharing have been identified in the SEVS collaboration. The first situation concerns knowledge sharing between the participants within the SEVS project itself whereas the second one concerns knowledge sharing between the participants and their home organizations. Those two contexts of knowledge sharing can be identified as two activity systems described by Boer (2005).

The reason for describing two settings in which knowledge sharing can be contextualized is due to the fact that the participants acknowledge knowledge sharing to be different in those contexts. These contexts are connected to research questions two and three respectively. Thus, this model provides a basis for answering the last two research questions.

The following Figure 11 shows in detail the two activity systems identified along the loop of value creation from the SEVS project to its partner organizations through the participants.

**Figure 11:** *Knowledge sharing between SEVS and partner organizations. Two activity systems*

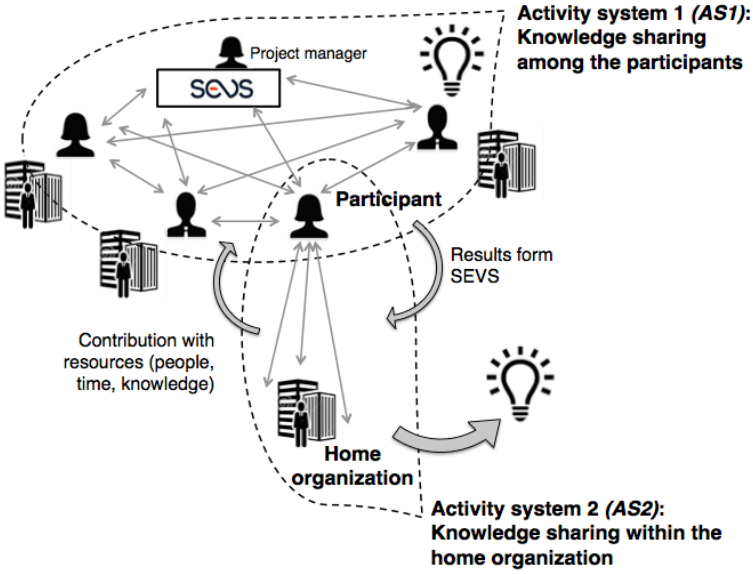



Figure 11 shows both contexts of knowledge sharing and how they are related to each other. What the figure illustrates is that the participants represent the link between the activity systems. The arrows within the activity systems represent knowledge sharing between people. Moreover, the participants are acting in two systems and the effectiveness of knowledge sharing in the boundary between SEVS and the partner organizations can be connected to the theory of Fredberg et al. (2011) that suggest that the effectiveness for the collaboration depends on the duality of participants' role in that boundary.

What could be concluded from the interviews was that knowledge sharing differs depending on if the home organization is industry, academia or society. For instance, academia did not experience the same difficulties as the industry in bringing ideas and sharing new knowledge back to the home organizations. One reason for this might be that researchers from academia utilize knowledge more on an individual level than on an organizational level. Thus, their perception of the topic differs from other partner representatives of private companies or public organizations.

## 5.2 Factors affecting knowledge sharing in AS1

The activity system one (AS1) represents the first setting in which the participants acknowledge knowledge sharing. What could be found was that the work environment and the people involved are two principal determinants of how successful knowledge sharing between the people in SEVS turns out to be. Moreover, the actual aspects in which factors influences knowledge sharing can be found in three components of the activity system: *subject and actors involved, social rules and mediating artifacts.* The factors affecting knowledge sharing in AS1 are analyzed under those subsections.

### 5.2.1 Subject and actors involved

The characteristics of the people that were involved in the project seemed to determine the success of knowledge sharing. A common perception among the interviewees were that they considered it important for a person to be open minded and willing to learn and adapt to new ways of thinking. Moreover, they should be interested in seeing the trends in different areas and able to think holistically. Thus, having the right mindset is something that is crucial when deciding to participate in such open innovation collaborations such as SEVS. Having a personality as being silent or not eager to share knowledge would complicate the collaboration according to the interviewees. However, people that have such personality may be very knowledgeable and deciding to not let them participate in open innovation collaborations may not be a good way of dealing with it. Some participants also claim, even though it may be arduous, that people can adapt to new ways of thinking and be more open minded when the environment promotes that.

When it comes to the motivation to share knowledge, Boer (2005) states that participants do not always find links between economic incentives and their contribution to knowledge sharing and that people share their knowledge due to several other reasons than economical or monetary. This seemed to be the case for the people in SEVS. The participants' motivation to share knowledge with other individuals in the project appeared to depend more on intrinsic motivations such as learning and personal development than on extrinsic motivations. Many interviewees said that meeting and working together with people with different background makes them willing to learn and share their experiences and knowledge in order to create synergy effects and build knowledge that would not be achievable by themselves.

It could also be concluded that the mixture of people with different backgrounds and experiences is an important aspect that positively affects knowledge sharing, since it encourage learning and thinking outside of the box. As some of the interviewees expressed, working with people that have quite the same background can result in a groupthink, but working in a Triple Helix environment enables the participants to gain a more broad and holistic view of the transportation system. Furthermore, knowledge sharing in a diverse group may be bigger than what is expected since the participants might share knowledge without knowing that it could be of interest for others. In other words, being an expert in one area and discussing around fundamental aspects might be eye openers for other participants with another background. Thus, being a diverse group may increase knowledge sharing. However it can also be more difficult to share specific knowledge, especially in the beginning of open innovation projects, because of the reason that people with different backgrounds speak more or less different languages.

### 5.2.2 Social rules

The social environment in SEVS was characterized by a very open environment that supported open and friendly discussions. Working closely together and building trust between the participants in SEVS were also deemed important in order to enhance knowledge sharing. This is aligned with Conway (1995) who stresses the importance of informal relationships since, by facilitating face-to-face communication and trust they enhance the sharing of knowledge, which is mostly of tacit nature. Another quite

common impression among the participants were that seeing others contributing with ideas and knowledge made them contribute even more. Thus, a positive cycle was established. This could also be connected to what Ipe (2003) emphasizes when defining reciprocity regarding knowledge sharing as a "give-and-take" that takes place when individuals realize that the more they share the more value-add to them is acquired (Weiss, 1999). However, some interviewees also asserted that they would not contribute less even if others did not contribute with enough knowledge. There was also a common feeling that if someone did not contribute they should not participate. Thus, knowledge sharing seems to be at the best when all the participants involved are willing to contribute.

There was also a matter of secrecy in the group, especially in the beginning of the project when some of the participants did not really know how to relate to their company secrets. However, as time went by, the participants with that dilemma realized that company secrets did not really matter in SEVS since it was an explorative project where they were looking so far ahead. Moreover, some interviewees also claimed that they did not really have that many secrets as they thought they had. Secrecy could hinder the development of trust among the participants, a challenge also identified in the SAFER arena by Fredberg et al. (2001). However, the findings show that eventually the long term thinking in SEVS did not give place to such secrecy.

Knowledge sharing in the SEVS project was favored by the development of trust and the open, friendly and creative environment (Boateng, 2011) and lead to the creation of new knowledge for the participants.

## 5.3 Factors affecting knowledge sharing in AS2

The activity system two (AS2) represents the context for knowledge sharing when participants bring knowledge back to their home organizations. In this case they seemed to confront more challenges compared to AS1. The most palpable differences seemed to depend on the characteristics of the home organizations. Moreover, the actual aspects in which factors influence knowledge sharing back to the home organization can be assigned to five components of the activity model: *collective object and outcome, subject and actors involved, social rules, mediating artifacts and division of labor.* The factors affecting knowledge sharing in AS2 are analyzed under those subsections.

### 5.3.1 Collective object and outcome

Some of the interviewees stated that participants in the SEVS project are supposed to bring new knowledge back into their organizations. As many of the participants explained it is not possible to inform about everything in SEVS. Rather, they must be able to pick what may be considered relevant in order to meet the needs and expectations of the organization. This is in line with Boer (2005) who stated that the collective outcome should come from a need. Also, Mashilo and Iyamu (2012) suggested that the outcome, resulting from such need, should be conducted in line with

the organization's objective. And in the case of the SEVS project that is in some extent a hardship due to the nature and characteristics of its results. The fact that SEVS did not have a clear objective when it started made the partner organizations' expectations unclear as well. Thus, the purpose or expectations could not be specified in many cases and it is difficult for some collaborators to say whether knowledge sharing helped achieving something or not.

The objective in the activity system two seems not to be visible or representable in this case but rather abstract (Weick & Roberts, 1993; Blackler et al., 2000). It is not possible to define the expectations of the partner organizations in SEVS about the project, as was acknowledged by some of the participants. Some of the home organizations were not able to know what they could get from SEVS. The participants have acknowledged the benefits of the SEVS project at the individual level, though it seems like some organizations still wonder what the SEVS project could have done for them.

### 5.2.1 Subject and actors involved

Knowledge sharing does not only depend on those who are expected to share (the participants) but also on those who are expected to receive that knowledge (other people within the organization). In contradiction to AS1, in which knowledge sharing was a reciprocal process where every actor should listen to the others, the case of AS2 seemed to be more challenging. One of the factors concerning people deals with the question of who should be sent to SEVS by the organization. Similarly to AS1, there are some personal characteristics of the participants that the organizations may want to take into account when sending people to the collaboration. According to the interviewees, people should be open minded, eager to learn and willing to take initiatives. However, these aspects that were important within SEVS did not seem to be enough to achieve successful results in knowledge sharing within their home organizations. In this setting the participants did not just have to be open minded and eager to learn, but they also had to have the ability to influence and make a certain impact on their home organization.

Again, economic incentives (Boer, 2005) did not seem to be a motivation expressed by the participants when asked about why they had become involved in SEVS. Career promotion was not a priority either. Rather, they expressed opinions such as the creation of a rich a network and the possibility to work in a diverse group setting.

Boateng (2011) emphasizes that a supportive environment enhances trust, creativity and openness for employees to share knowledge within organizations. People within organizations also need to have the attitude of listening and be willing to learn from what others have learnt. This is in line with Roth (2002), who holds that both sender and receiver need to have a certain level of absorptive capacity (Cohen & Levinthal, 1990).

### 5.2.2 Social rules

One of the most important factors concerning social rules in the organization is the culture of the organization. The culture determines the rules and sets the criteria for what is relevant or not (De Long & Fahey, 2000). This means that the culture of the organization will determine in great manner what type of information is susceptible to

be listened to or distributed, and how (De Long & Fahey, 2000). Also, the culture of an organization might set the context in which relationships are developed (Gold et al., 2001). The culture is often set from the top management and determines in a large extent the firm's absorptive capacity, its ability to learn and hence the level of knowledge sharing. Knowledge sharing is not perceived among industry, academia or society in the same way. It was part of their daily days for many participants from universities or research institutes whereas in some other cases knowledge sharing was still a challenging process in their organizations.

The culture and in some cases the top management of some organizations seemed to determine more or less the flow of information within the organization. Some participants identified that situation as an obstacle in order for some people to share knowledge, leading to situations where one can end up thinking that what he or she wanted to share is not "usable or relevant". Relating to this, Jia and Xia (2008), emphasize an environment of openness in order to facilitate knowledge sharing. Openness will enhance trust among people and that is a critical element of the relationships that must be developed according to the literature (Storper, 1997; Andrew & Delahaye, 2000; International Chamber of Commerce, 2015). Trust and shared understandings (Herstad et al., 2008) in the relationships are needed in order to build collective knowledge (Kramer, 1999) and that is seen as a critical factor for knowledge sharing.

On the other hand, some of the participants in SEVS acknowledged that they have learnt a lot of things that might be valuable for people in their home organizations and therefore they expressed the importance of sharing that knowledge with them. The spirit of learning and willingness of sharing what was learnt was common among the participants in the project. As suggested by some authors, learning contributes to innovation for firms (Sehested & Sonnenberg, 2010; Kang et al., 2007; Voronov, 2008) and further Kim (1993) says that people are the means of organizational learning.

Not only learning seemed to be an important enabler for knowledge sharing regarding social aspects in the partner organizations, but also communication between the participants and other people within their home organization. In fact, Boer (2005) says that knowledge sharing is the connection between learning and communication. But Boer also states that it is not a fact that organizations learn when their employees learn, which seemed to be the case in SEVS. Cohen and Levinthal (1990) suggest a communication environment that favors both learning and knowledge sharing. More about the communication environment within the partner organizations in SEVS is explained in the following section.

### 5.2.3 Mediating artifacts

Knowledge sharing in AS2 is not possible without mediating artifacts, which is described by Boer (2005) as ideas, tools or practices that enable communication of knowledge in the system. Communication is one of the most important factors influencing knowledge sharing within organizations.

The participants in SEVS show a variety of opinions regarding the success or challenge of the mechanisms and tools utilized when bringing new knowledge back home, since the mediating artifacts are also mechanisms such as directives, routines or rules through

which new knowledge is incorporated in the system (Wallin & Krogh, 2010). In line with Nadler and Tushman (1999) knowledge sharing requires that the individual's knowledge is shared as well as an appropriate system that encourages it. In this line, it is to be supposed that organizations will learn something from SEVS if they managed to have processes and practices that enhance the creation of new knowledge from it. Wallin and Krogh (2010) suggest that managers need to identify those practices. In some cases the empirical findings show that the participants were able to introduce and apply some of the methods and scenarios that had been developed in SEVS. This was also a good way of sharing knowledge since it engaged other people in the learning process.

One common mechanism for knowledge sharing among the participants in SEVS was through formal mechanisms and formal communication. In the case of academia, researchers were more likely to write a report or publication about what has been treated in SEVS, making it available for whoever could be interested. In other cases, reports are not seen as the best way to create impact on others. This was often the case for some of the participants from industry. As said before, the culture of an organization sets the direction for how communication happens in the firm. The results showed that the formal way of sharing knowledge from SEVS could be done by sending emails to people who could be interested in it but with the acknowledgement that those emails would eventually be just one of a hundred and would not lead to anything. This is in line with Roth (2002) when saying that some knowledge management tools are poor when it comes to somehow "store" tacit knowledge, as it seems to be the case of SEVS. In addition, the fact that sending emails with low or none attention in exchange represents an example of what Roth (2002) means when stating that knowledge sharing is not only to give people information but also to eventually making them feel interesting in it.

Bureaucracy issues and the several filters that in some cases the participants find when trying to get access to the "right people" are also a challenge in knowledge sharing in AS2. Tacit knowledge is difficult to formulate (Nonaka, 1994) and most of the learnings from the SEVS project were of tacit nature for the participants. Another case of formal communication could be the presentations that some participants arranged within their home organizations. Again, in some cases just a presentation of what had been done in SEVS was not enough to create the desirable value. Rather, the results show a trend among many participants claiming for more visual and informal communication. According to Bougrain and Haudeville (2002) one way for companies to get access to tacit knowledge from their employees is through better communication, which also many interviewees agreed on. Accordingly, Conway (1995) suggested "face to face" communication to enable the sharing of tacit knowledge. Porschen (2008) holds that organizations should not underestimate these kind of informal interactions, categorized by Roth (2002) as essential in knowledge sharing.

More workshops and informal meetings regarding any topic from SEVS, with people that had not been part of the project were also examples of how SEVS could have been done in some cases. It was acknowledged by many interviewees that when things are done differently, involving people from outside or creating more visual presentations (and here an example of another organization doing it was given) it is easier to get the attention of other units within the organization. However, although there is a general acknowledgement that informal mechanisms are sometimes more effective than others,

some participants also agreed on the fact that in order to achieve that they need to put an extra effort, which sometimes would might lead to a loss of motivation or energy.

### 5.2.3 Division of labor

The division of tasks and status both horizontally and vertically in AS2 constitutes the division of labor (Boer, 2005). For this analysis the division of labor includes the existence of different levels of power status within organizations, different departments and units specialized (or not) in issues regarding SEVS, different projects, initiatives and other purposes carried out at the different organizations, among others.

It has been found that the level of influence or power status (Ipe, 2003) that the participant has within the organization seemed to be more important within the organization than within the project. Knowledge sharing within SEVS can be enhanced by the presence of several managers not because of their role as managers but because their contribution to diversity in the group. On the other hand, as the findings showed, not everybody listens to a manager in the same way as to other people with lower status or position within the organization. Thus, the role of participants might be more important there. Huber (1982) states that individuals are likely to share knowledge with people of higher status than them. AS2 does not only concern people with high status with whom to share, but also people that are aware of that knowledge from a project like SEVS is not shared by itself and hence it needs a channel and support to be spread.

The participants call for a need of finding “the right people” within their organizations. The size of the organization plays an important role in searching for the right people to share knowledge within the home organization. Bigger companies often have more people, more knowledge and more extensive flows of information and thus more difficulties in accessing the “right people” compared to smaller firms. Many interviewees agreed on the fact that the smaller the organization, the faster information flows and the easier it is to find the right people.

Horizontal integration needs shared understandings according to Boer (2005), who also states that functional boundaries can act as a barrier in knowledge sharing. This might be the case of organizations such as universities, where the results have shown that they are not so cross functional. For that case, knowledge sharing seems to ultimately occur in an explicit way in the form of reports and publications, according to some interviews.

# 6. Conclusions

*The aim of this master thesis has been to investigate knowledge sharing in an open innovation collaboration. This chapter aims to present the conclusions and main contributions to the topic of this research.*

The research object for this thesis has been a case study on the SEVS project carried out at the open innovation arena SAFER. A review in the literature on open innovation, collaborations, knowledge management and knowledge sharing has been conducted in order to increase the researchers' understanding of the research subject and to establish a theoretical framework for the study. The empirical investigation was carried out by interviewing 11 participants from the SEVS project.

The main contribution that this research adds to the field is that knowledge sharing in open innovation collaboration depends on the participants and the organizations that are taking part in the collaboration. Moreover, the factors that affect knowledge sharing differs depending on if knowledge is shared within the project or within the home organization. Knowledge sharing in the project itself did not seem challenging at all. Rather it was favored by the characteristics of people working together in an environment of diversity and trust that resulted in the creation of valuable knowledge for them. Contrary, the same participants found several challenges regarding knowledge sharing within their organizations. The creation of impact on other people to engage them and achieve support and commitment seems to be difficult due to both the type of project that SEVS represents (with the difficulties that it entails) and also to organizational aspects such as the culture or the communication that act as barriers.

In this thesis a relational perspective for knowledge has been adopted. However in the findings there have been found a few insights from the participants in which knowledge was seen more under a transactional perspective, specially when suggesting that knowledge sharing has to do with a process within organizations in which one actor is a sender and the other one a receiver. This is something that does not occur in the project itself, where knowledge seems to be more of a relational nature.

# 7. Limitations of the study

Some limitations can be concluded at this point. First, as this is a case study, the applicability of the results can be questioned. However, some of the results may be applicable in similar open innovation projects to SEVS. What is important to have in mind is that the SEVS project is a strategic explorative open innovation project that tries to find solutions on future transport system. This means that SEVS does not really provide short term results. Thus, it could be questioned how applicable the results of this study are to other open innovation projects that are not directly addressing future or strategic issues.

Moreover, the generalizability of the results regarding society in the Triple Helix could also be questioned since it was only one interviewee from this sector that participated in the study. Also, it is advisable to clarify that some interviewees took a small part in SEVS some time ago and thus they could have let behind and forgotten some valuable insights as well.

Since this study has chosen to explore knowledge sharing from the participants' perspective it should be stated that it is their point of view that applies to how they described knowledge sharing within their organization. This means that the study has not taken insights of other actors that have been indirectly involved in SEVS into account. This has not been done due to time constraint. Interviewing actors from the home organizations that have been indirectly involved in SEVS could have given a broader perspective on what affects knowledge sharing within the home organizations.

# 8. Reflections and future research

This thesis was conducted to explore knowledge sharing in the context of the SEVS collaboration. Not only it has provided interesting findings regarding the research questions that were addressed but also it invites future researchers to complement and build upon those findings.

Knowledge sharing was described in its context and challenges under the perspective of eleven participants in SEVS. They represent only one part of the total number of people who worked in SEVS and thus there are still many participants that can add their insights and complement the perspective of the people in SEVS. Also, to build a more holistic perspective of knowledge sharing around SEVS, it could be recommendable to consider other points of view in the collaboration. Among the many partner organizations that were involved in SEVS it could be advisable to also interview people from those who were not active in the project. Their opinion regarding knowledge sharing can be valuable for future understanding on how the partner collaborators perceive SEVS.

This thesis may help to understand the topic in collaborations of strategic nature where knowledge creation constitutes the main outcome, similar to SEVS. Moreover, this research proposes more studies regarding the relational and transactional perspective of knowledge that are worth considering in these kinds of projects. Knowledge sharing has ended up to be dependent on the individuals who share and also on the processes and mechanisms that are utilized to share it. The researchers propose more research on whether there can exist tools, models or specific systems to enhance the sharing of knowledge among individuals.

The insights of the participants in SEVS has provided this thesis with an important reflection regarding the reasons of why the partner organizations remain in SEVS. There seemed to be some uncertainty for some participants concerning what the SEVS project had actually done for their home organizations. For some of these situations the researchers wonder what is the value that the partner organizations perceive from SEVS that makes them remain in the collaboration. This thesis invites to future reflection on this paradox.

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