



Turun yliopisto
University of Turku

OPEN INNOVATION IN COLLABORATIVE NETWORKS

The initial phase in industrial business

Master's Thesis
in International Business

Author:
Petteri Leppänen 14340

Supervisors:
Ph.D. Esa Stenberg
M.Sc. Hanni Candelin-Palmqvist

22.12.2010
Turku



Turun kauppakorkeakoulu • Turku School of Economics

Acknowledgements

I would like to thank everyone who has helped with this thesis and provided me with insightful comments and advise. I would like to express my appreciation to Turku School of Economics and the supervisors of my master's thesis Esa Stenberg and Hanni Candelin-Palmqvist. I am also very grateful to Niina Nummela for giving me valuable insights for conducting qualitative research.

I also owe a great deal for Åbo Akademi, FIMECC, VTT, especially Tiina Apilo, and the case companies who made it possible for me to conduct such a comprehensive research and to collect so much valuable data through workshops and interviews. I want to thank these organizations and the persons involved in the research process for understanding the importance of the information they provided me, and for also taking their time to share it with me.

Finally, I particularly want to thank my supervisors at PBI Research Institute Olga Perminova, Magnus Gustafsson and Richard Windischhofer for the excellent support and guidance. Furthermore, I want to thank all my colleagues working at PBI Research Institute for encouraging me and giving new aspects to the study.

Petteri Leppänen

December 22, 2010

Turku

Contents

1	INTRODUCTION	9
1.1	Innovation as a source of growth	9
1.2	From closed to open innovation	11
1.3	Purpose and structure of the study	14
2	LOGIC OF COLLABORATIVE NETWORKS	17
2.1	Resource-based motives for collaboration	17
2.2	Actors of innovation-oriented collaborative networks.....	21
2.2.1	Organizations	21
2.2.2	Individuals.....	26
3	INITIAL PHASE OF OPEN INNOVATION PROCESS.....	30
3.1	Product development.....	30
3.2	Contracting	36
3.3	Evaluating.....	40
3.3.1	Collaboration potential assessment.....	40
3.3.2	Post-project review	42
3.4	Theoretical framework of the study	44
4	RESEARCH DESIGN.....	49
4.1	Research approach.....	49
4.2	Collecting the data.....	51
4.3	Analyzing the data.....	58
4.4	Validity and reliability of the study.....	61
5	CASE STUDY ANALYSIS	64
5.1	Introduction	64
5.2	Actors of the collaborative network	66
5.2.1	Organizations	66
5.2.2	Individuals.....	70
5.3	Product development.....	75
5.4	Contracting	81
5.5	Evaluating.....	86
5.5.1	Collaboration potential.....	86
5.5.2	Post-project review	91

5.6	Main research findings	93
6	CONCLUSIONS	98
6.1	Theoretical implications.....	98
6.2	Managerial implications.....	105
6.3	Limitations and suggestions for further research	108
7	SUMMARY.....	110
	REFERENCES.....	113
	APPENDICES	124
Appendix 1	Themes and questions of the interviews	124

List of figures

Figure 1	The pursuit of growth for CEOs.....	10
Figure 2	Closed innovation.....	11
Figure 3	Open innovation	13
Figure 4	The key to innovation and growth.....	20
Figure 5	Innovation partners and their contributions.....	22
Figure 6	Benefit of collaboration.....	43
Figure 7	Theoretical framework of the study	45
Figure 8	Typology of participant observation researcher roles	53
Figure 9	Opportunities of the collaboration.....	87
Figure 10	Risks of the collaboration.....	89
Figure 11	Adapted model of the theoretical framework of the study.....	99

List of tables

Table 1	Promotor roles, their power base, and barriers.....	29
Table 2	The interviewees.....	54
Table 3	Operationalization table.....	57
Table 4	Main research findings	94
Table 5	Key success factors and main challenges.....	96

1 INTRODUCTION

Open innovation and collaborative networks are relatively new concepts in business studies. They are closely related but can both be applied in completely different contexts. This study combines them and shows what kinds of effects it may have. At first, this introductory chapter explains the fundamentals and origin of certain concepts so that the purpose of this study can be better understood before proceeding to the actual research.

1.1 Innovation as a source of growth

Managers face several challenges in their work today, but one of the most demanding is management of technological innovation. As firms seek to enhance their sustainable competitiveness by improving efficiency, successful innovations play a major role. (Dogson, Gann & Salter 2008, 1.) Innovativeness is vital regarding the success of any company since the only constant in today's world is change. Companies in every size and industry have for many years invested billions in their research and development (R&D) while striving to the top through innovations. (Trott 2005, 5.) Effective innovation performance can turn declining businesses into market leaders and regular organizations into thriving environment for employees (Dooley & O'Sullivan 2007, 398). Thus, even the smallest and weakest companies search for new opportunities and technologies (Chesbrough 2003). However, being innovative is not easy as most innovation attempts fail (Anthony, Johnson, Sinfield & Altman 2008, 39), which implies that innovation activities may be very costly and frustrating.

Since competitive environment is constantly changing, new opportunities and constraints derive for example from shifts in people's expectations and needs, changes in legislation or innovations by competitors (Tidd, Pessant and Pavitt 2005, 5–6). Increasing attention has been paid on shortening life cycles of products, services and processes, which create growing pressure on firms to replace products frequently and introduce novelties to markets (e.g. Ritter & Gemünden 2003, 746). This can also be seen in the annual CEO survey conducted by PricewaterhouseCoopers where innovations are regarded as the major source of business growth (PricewaterhouseCoopers 2007, 13). The results of the survey are illustrated in Figure 1.

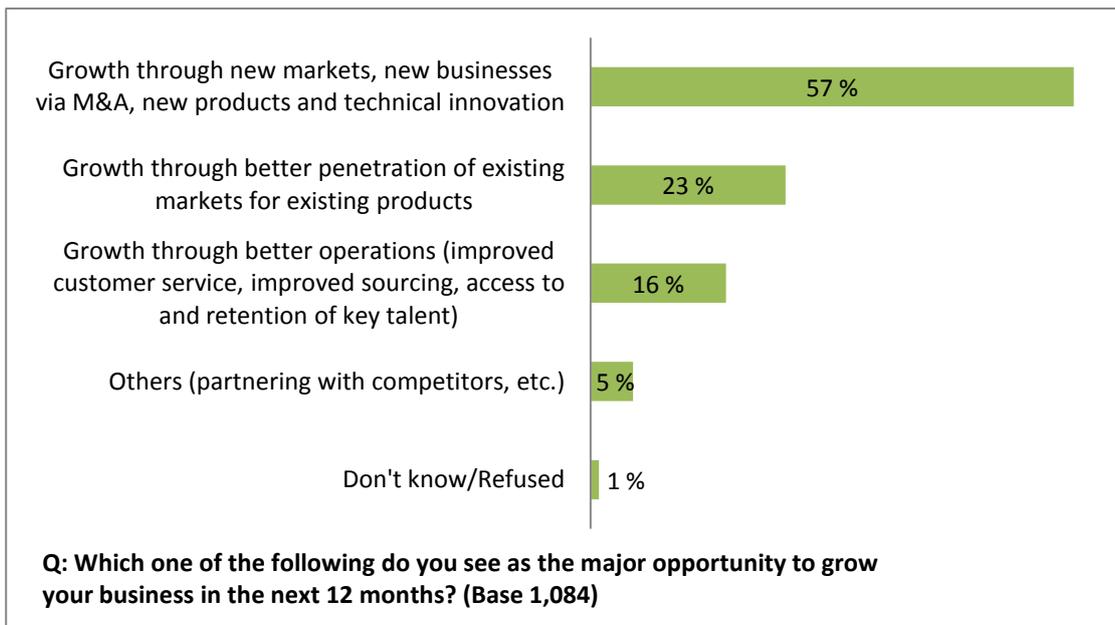


Figure 1 The pursuit of growth for CEOs (PricewaterhouseCoopers 2007, 13)

New markets, new businesses via mergers and acquisitions (M&A), new products and technical innovation were considered the major opportunity to grow business within the next 12 months by 57% of the 1,084 chief executive officers (CEO) who participated in the survey. Just under a quarter of the respondents regarded better penetration of existing markets for existing products as the major opportunity for growing their business, while for 16% of the CEOs the major opportunity was better operations. The rest of the respondents considered some other major opportunities of growth or refused to answer.

The word “*innovation*” originates from the Latin word “*innovare*”, which means “*renewal*”. To be innovative, it is necessary to have the ability to create something new. (Jenssen & Nybakk 2009, 443.) Innovation can be defined as “*successful commercial exploitation of new ideas*” (Dogson et al. 2008, 2–3). Successful implementation of an idea requires effective management of innovation processes, which in turn is subject to specialized know-how. Traditionally, innovative activities have taken place within companies’ own R&D function as they have utilized only their own specialized know-how. However, the nature of those activities has changed as companies have recently begun to actively perform them in collaboration within alliances and networks. (Dooley & O’Sullivan 2007, 398.)

1.2 From closed to open innovation

The traditional way to innovate implied that most, if not all, innovation activities took place within the company that was innovating. However, all R&D activities do not need to be performed by the focal company. Neither need all emerging ideas within that firm be implemented by the same firm. Some companies have realized this much earlier than others and have implemented this kind of practice in their business model to be better able to exploit external sources of innovation. (Grönlund, Rönnerberg Sjödin & Frishammar 2010, 106.) The new approach to collaborative R&D function has been conceptualized by Chesbrough (2003). He states that the old paradigm, *closed innovation*, has been left behind and companies have attempted to implement a new paradigm, *open innovation*. Open innovation is a clear trend in companies' business models today. Yet, before the concept of open innovation and its implications can be correctly understood the closed innovation paradigm needs to be taken a closer look at. It is presented in Figure 2.

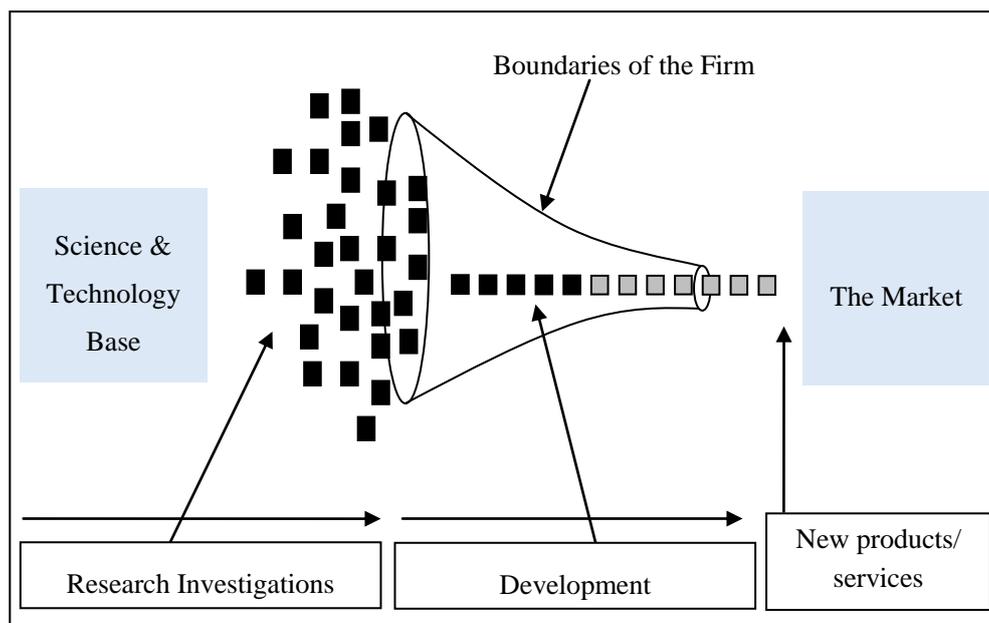


Figure 2 Closed innovation (adapted from Chesbrough 2003)

As can be seen in Figure 2, closed innovation implies that a firm takes only its own ideas into consideration and implements them only in the market where it operates. A firm's own science and technology base generates ideas that are investigated before further development or rejection. The development phase takes place within the firm's boundaries prior to commercialization. No external actors are involved in the process.

The closed innovation paradigm comprised implicit rules that companies have followed. These rules included (Chesbrough 2003):

- hiring the best and the smartest people in the relevant industries
- discovering new products and services before others
- developing new products and services before others
- winning by being the first to bring an innovation to market
- being the leader of the relevant industry in R&D
- controlling own intellectual property so that others cannot profit from it.

This logic suggested companies to invest in their internal R&D and allowed them to introduce their innovations to markets thereby realizing more sales and higher margins. Moreover, the revenues were then reinvested in internal R&D, which led to further breakthroughs. The intellectual property issues were so closely controlled that other companies could not exploit them. (ibid.) Closed innovation requires control, and companies must be strongly self-reliant in generating, building, marketing, distributing, financing and supporting ideas on their own as they cannot be sure of the quality, availability and capability of others' ideas (Chesbrough 2004, 23).

As companies are constantly subject to pressures to provide their customers with superior value, they are keen to improve and coordinate their critical resources and capabilities. It is argued that an increasingly large proportion of those resources and capabilities resides outside the boundaries of the focal firm. (Echtelt, Wynstra, Weele & Duysters 2008, 181.) Reasons for this are growing mobility of highly experienced and skilled people, which has led to information spill-outs, increasing presence of private venture capital, post-college training, and, shorter life cycle of products and services as well as technologies (Chesbrough 2003). Companies have thus opened up their business models. Management has a significant role in the transition where employees are encouraged to increase their external thinking and creating a more innovative business culture (Grönlund et al. 2010, 108). Companies may discover completely new combinations of products by opening their innovation systems for external partners (Almirall & Casadesus-Masanell 2010).

Although the term open innovation is relatively new, its fundamental ideas are not new, since external collaboration is at least as old as the first invention (Hippel 1988). However, open innovation is not just a term, but a broader concept of leveraging external sources of innovation to run internal growth (Grönlund et al. 2010). Open innovation can be defined as “*a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology*”. An open innovation system has both internal as well as external technology and science base which generate more ideas together than they would do alone. The ideas are subsequently explored in the system in conjunction with development. External ideas and technologies may also be adopted and developed through insourcing. (Chesbrough 2003.) The concept of open innovation is illustrated in Figure 3.

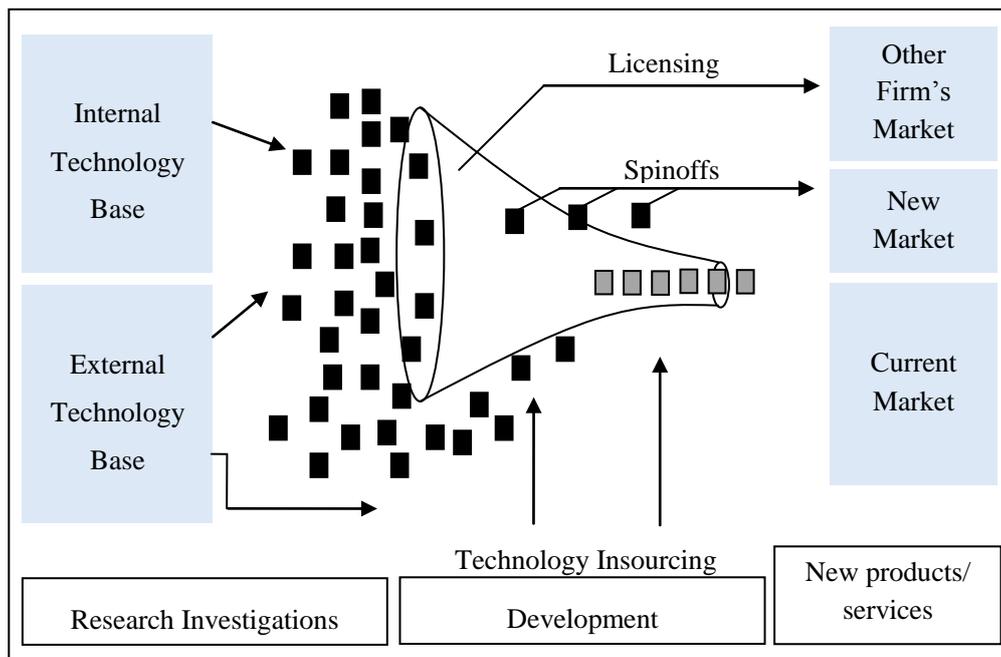


Figure 3 Open innovation (adapted from Chesbrough 2003)

The figure shows that there are three common ways how firms can create and capture value from their technologies. They can exploit them in the current market to improve their performance, they can utilize technologies through licensing to other firms, and, they can launch new ventures that deploy the technologies in new business arenas. (Chesbrough 2003, 63–64.) In the broadest sense, licensing refers to a market operation method where company A (licensor) sells company B (licensee) the rights to use its intellectual property (Peng 2006, 235). Open innovation enables a more efficient use of internally created intellectual property through licensing and spinoffs. IBM earned approximately 1.5 billion US dollars in one year by licensing its technologies and transferring its know-how. Owing intellectual property has become even more important than owning factories. To effectively exploit intellectual property, some companies have even created a dedicated function to optimize external commercialization of their technologies. (Gassmann 2006, 3.) However, licensing may also be subject to a considerable risk since it can enhance rivals' performance in a competition-relevant way (Lichtenthaler 2008, 45).

New ventures often derive from incumbent firms. Such start-ups are called spinoffs. Employees commonly leave their employer in order to start a new firm, where they can develop new ideas and technologies on their own. (Keppler 2005.) Spinoffs are philosophically and physically separated from major firms, because most of the innovative ideas are not accepted in the original organization. As innovations always present risks and uncertainty, major firms purposely send ideas to an external environment, which is more open and inviting for innovative people. Thus, the company's business stays un-

touched if the spinoffs fail, which prevents reducing the image of failure or negative reactions. (Desouza et al. 2008, 13.)

The concept of open innovation has its roots in software industry, where any actor is allowed to create an own user interface from or contribute to an existing software. However, there are many successful early adopters of open innovation paradigm also in other industries. Good examples from different industries include Toyota in automotive, Lucent in telecommunication, Intel in IT, and Procter & Gamble in fast moving consumer goods to mention but a few (Chesbrough 2003; Huston & Sakkab 2006). If the concept really is that superior, a good question would be why not all companies try to implement it. It is because of the business model. It has to be changed to more open and the internal transition can be very painful. To realize the actual benefits deriving from a more open business model and in particular from all innovation activities within a firm takes time. (Grönlund et al. 2010, 107.) Open innovation and its features vary in different industries; therefore it cannot be directly copied from an industry to another. However, a key issue in every industry is same: How to encourage people and companies to share their knowledge and capabilities with others? (Gassmann 2006, 4–5.)

Exploitation of external resources for innovation has led to increasing number of newly created networks (Cowan 2004, 32–33; Man 2004, 9). Collaborative networks have changed the nature of competition. Competition can no longer be defined by products and services. (Shuman & Twombly 2010, 3.) Companies are trying to create and sustain their competitive advantage through collaboration in the global environment by re-inventing their businesses. Concepts such as vertical collaboration, extended value chains, virtual companies and clusters are already in daily use of business people. Collaboration enables developing ideas and sharing knowledge as a team in a high confidence atmosphere. (Agüero & Sánchez 2010, 1.) However, internal and external exploitation of technological assets in creating value are not substitutes to each other but complements. Therefore, firms should perform both internal and external R&D activities, and the management of the two modes should be integrated. (Lichtenthaler 2008, 49.)

1.3 Purpose and structure of the study

This thesis was conducted within a nationwide research project “Innovation in Network Collaboration” (INC). The INC project involves large industrial case companies and research institutes for pilot implementation of created knowledge. The researcher’s role of this thesis was to study the phenomenon of open innovation in collaborative networks by participating in a pilot case of industrial companies and researchers and writing a thesis. In fact, working in an international research group at the Research Institute for Project Based Industry (PBI), which operates in close collaboration with Åbo Akademi

and Technical Research Centre of Finland (VTT), enabled access to comprehensive research data and many interesting, mind-opening academic discussions. The INC project in turn, is a part of an innovation program of the Finnish Metals and Engineering Competence Cluster (FIMECC). FIMECC, together with industry and research institutes, attempts to build competence through various research programs on strategic topics (FIMECC 2010). In 2010 FIMECC is the most funded client of the Finnish Funding Agency for Technology and Innovation (Tekes), the main funding organization for research, innovation and development in Finland (Tekes 2010).

The purpose of this thesis is *to understand how companies pursue open innovation at the initial phase in collaborative networks*. According to the definition of open innovation, it is a paradigm rather than just an outcome of an innovation process. Nevertheless, some researchers (e.g. Mehlman, Uribe-Saucedo, Taylor, Slowinski, Carreras, Arena & Chris 2010; Grönlund et al. 2010) have brought the concept to a lower level to describe open innovation for example in the context of product development in close collaboration with internal and external partners. Provoked by that, this thesis applies open innovation to collaborative product development.

In order to gain comprehensive understanding of the phenomenon, four sub questions need to be solved. The sub questions are:

1. *What actors and roles does the initial phase of open innovation in collaborative networks involve?*
2. *How do companies deal with product development at the initial phase of open innovation in collaborative networks?*
3. *How do companies deal with contracting at the initial phase of open innovation in collaborative networks?*
4. *How do companies deal with evaluations at the initial phase of open innovation in collaborative networks?*

The structure of the theory chapters proceeds in accordance with the research sub questions. Yet, at first theoretical reasoning on motives to collaborate is presented in Section 2.1. This is done from a resource-based view of the firm and its extensions, which are currently prevailing theories and paradigms and widely accepted by both scholars and practitioners. By examining the underlying logic for collaboration the subsequent theory sections can be better understood. Section 2.2 deals with the first sub question by presenting various organizational and individual actors as well as their roles and contribution to innovation process. By knowing and understanding where innovations come from is crucial since innovation efforts can thus be remarkably enhanced. New combinations of resources, knowledge and technologies call for collaboration with many different parts within the company as well as with various actors outside the company.

The last three sub questions are examined in Chapter 3 which deals with the initial phase of open innovation process. The process is considered in this thesis to comprise product development, contracting and evaluating, which are simultaneous and parallel processes and in complex interaction with each other. Thus, the second sub question is examined in Section 3.1. It is central to understand how companies attempt to discover new business opportunities by generating ideas in an organized way. The section deals with different features of innovations, different approaches to product development process and activity as well as communication methods during such a process. Section 3.2 highlights activities related to contracting and intellectual property rights, which are crucial for successful collaboration. Mutual trust and commitment among the collaborating actors are fundamental factors that may have a considerable facilitating or impeding effect on contracting process. Section 3.3 provides insights on the evaluation methods that can be utilized in assessing potential of the collaboration. Moreover, lessons learned is a post-project review where the learning outcomes and performance of the actors can be evaluated to improve similar projects in the future. The theory part of the thesis is summarized in Section 3.4, after which the methodological features of the research are discussed in Chapter 4. The research results including the main findings are presented in Chapter 5, and they are divided according to the research sub questions introduced above. Conclusions and implications based on the similarities and differences between theories and research results are highlighted in Chapter 6. Consequently, Chapter 7 summarizes the research.

To be able to gain comprehensive understanding of the phenomenon some related themes are left outside the research scope. Firstly, open innovation can take place in any industry or context involving any actors and roles. This study focuses on collaborative innovation activities taking place in business-to-business market. Therefore, individual consumers are left out of the scope thus enabling more precise examination of organizations that operate mainly with other organizations. Secondly, there are several industries that apply open innovation and some of them are mentioned in this thesis, but the main focus lies in industrial business since the studied case took place in metal engineering industry. Thirdly, since the studied case was terminated at its initial phase due to various reasons it was not possible to study the whole process empirically. Therefore, the initial phase is emphasized, while for example the phases of concrete development and commercialization of successful ideas are not researched. Consequently, the evaluations studied in this thesis do not cover financial and other objective measures of the output but subjective pondering regarding various outcomes. Furthermore, although the thesis takes also activities related to idea evaluation into account, they are not researched since there were no ideas systematically evaluated in the case study.

2 LOGIC OF COLLABORATIVE NETWORKS

Collaborative networks have become an increasingly important way for any organization or individual to enhance own performance through exploitation of others' resources. Each member of a collaborative network has its own reasons for collaboration. These reasons are examined in this chapter from a resource-based view, which has been extended by several scholars ever since it was first introduced. The members of collaborative networks are actors that possess distinct resources that can make them attractive partners. Consequently, various actors of such networks are presented in the second section by focusing on their innovative capabilities.

2.1 Resource-based motives for collaboration

It is difficult for any firm in today's turbulent market place to pursue innovations alone due to the lack of knowledge and technological resources. This has led to searching for partners for joint creation and transfer of knowledge through vertical and horizontal networking. By leveraging capabilities of the networking firms can hence have a significant impact on their financial and market performance. (Möller & Svahn 2006, 985-986; Dooley & O'Sullivan 2007, 400.) The promise of increased competitiveness through more efficient manufacturing processes and introduction of new products drives firms to invest considerable amounts in exploration of new technologies and processes (Sampson 2004, 486).

Basing on the fact that collaborative networks involve several actors that form alliances with each other, also such alliances have to be taken into account in attempt to obtain comprehensive understanding of larger alliance networks (see Man 2004, 40). Although networks are a commonly understood phenomenon by both practitioners and scholars, it is not always quite clear what is meant when the term is used. People may use other terms alike such as partnerships, strategic alliances, coalitions, cooperative arrangements, or collaborative agreements. Some theorists refer to dyads, which are relationships between two organizations. (Provan & Fish, 2007, 480–481.)

In this thesis such relationships between two organizations are referred to as strategic alliances. The fundamental purpose of a strategic alliance is to enhance the long-term competitiveness of the alliance participants. Alliances are formed when each partner has something unique to contribute, such as technological or managerial know-how, market access or simply some complementary resources. (Albaum & Duerr 2008, 375.) A strategic alliance is defined as "*a close, collaborative relationship between two, or more, firms with the intent of accomplishing mutually compatible goals that would be difficult for each to accomplish alone*". A strategic alliance can be regarded as a vehicle by

which firms can carry out experimental probes such as exploring a new market. (Spekman, Isabella & MacAvoy 2000, 37.) Strategic alliances are particularly important in industries that are facing uncertainty, discontinuity or rapid growth (Cools & Roos 2005, 28). Barney (1997, 286) takes a more economic approach: “*Firms have an incentive to cooperate in strategic alliances when the value of their resources and assets combined is greater than the value of their resources and assets separately.*” This definition of synergy gives an overall explanation why firms want to cooperate with each other. Collaboration can also apply as an entry barrier to potential competitors, if the collaborating organizations have combined their capabilities in a way that is extremely difficult to imitate (Powell 1998, 394).

As mentioned, networks are complex groups of several organizations that have entered alliances with each other. A collaborative network is defined as “*an alliance constituted by a variety of entities (e.g. organizations and people) that are largely autonomous, geographically distributed, and heterogeneous in terms of their operating environment, culture, social capital and goals, but that collaborate to better achieve common or compatible goals, and whose interactions are supported by a computer network*” (Camarinha-Matos & Afsarmanesh 2008, 2464). According to the definition of strategic alliances and collaborative networks, the purpose of collaboration is for the partners to be better able to achieve goals by building combinations of resources and know-how. Theoretical foundations for collaborative innovation activities can be found by taking a closer look at the resource-based view of the firm and its extensions.

The main concern of strategic management is how to gain and sustain competitive advantage (e.g. Porter 1985; Barney 1997; Teece, Pisano & Shuen 1997). *The resource-based view* and its more management-oriented derivative, the concept of *core competencies*, approach competitive advantage by explaining the internal resources and capabilities of firms. It is argued that only certain resources and capabilities, which are called strategic resources, can help firms to gain competitive advantage. (Duschek 2004, 54–55.) In 1990’s a *VRIO framework* (sometimes VRIN) was introduced to clarify how competitive advantage can actually be gained and sustained through resources. Firstly, resources have to create *value*. Only valuable resources can lead to competitive advantage. Secondly, they have to *rare*. Thirdly, if resources are *inimitable* they cannot be easily copied by others. And finally, the resources should be *organizationally embedded* and be well-organized for successful exploitation. (Barney 1997.) Whereas the resource-based view considers firms as bundles of firm-specific resources, the concept of core competence regards them as bundles of competencies (Wernerfelt 1984; Prahalad & Hamel 1990). According to the resource-based view of the firm, a resource can be considered as a strength or a weakness of an organization. They can be defined as intangible and tangible assets of a firm, such as brand names, skilled personnel, machinery and capital. (Wernerfelt 1984, 172.) In turn, capabilities refer to a combined utilization of

resources. All in all, capabilities and resources are in complex interaction with each other which often leads to improper use of these two concepts. (Amit & Schoemaker 1993, 35.)

The resource-based view considers all resources as generic assets. Recently however, knowledge has become one of the most significant resources from a strategic point of view. Thus, another extension of the resource-based view has been developed, which is known as *the knowledge-based view of the firm*. According to this view, knowledge-based resources are the major determinants of competitive advantage as they are complex and thus hard to imitate. (e.g. Nonaka & Takeuchi 1995; Grant 1996a; Grant 1996b; Spender 1996; Kogut 2000.) From this and afore-mentioned perspectives, networks can offer a great variety of benefits for each participant, such as access to material and immaterial resources, information and knowledge. (Gretzinger, Hinz & Matiaske 2010, 194.)

According to the *resource dependence theory* (Pfeffer & Salancik 1978), most resources actually originate from the external environment of firms. For example, information on customer needs is also a resource that companies have to rely on while pursuing successful innovations. Hence, collaboration with customers as well as with other partners is a strategy that provides this vital resource (Carbonell, Rodríguez-Escudero & Pujari 2009, 537–538). Resource dependence theory posits that organizations are dependent on other actors in terms of their critical resources such as capital, materials, know-how and reputation. These interdependencies create constraints for organizations, which in turn, increases bargaining power of the one whom others are dependent on. (Ylirenko & Janakiraman 2008, 134.) Thus, firms need superior capabilities for assimilating knowledge and information as much as possible from their external environment. This has been remarked by scholars and has led to the concept of *absorptive capacity*. The concept refers to the ability of firms to recognize the value of new, external information, embrace it and apply it to their innovation activities through new products and ways to produce them. The ability to utilize external knowledge is thus a crucial factor of innovative capabilities. (Cohen & Levinthal 1990.) A firm with a great absorptive capacity to learn is competent in both internal and external R&D environments, which allows the firm to make more contributions to collaboration and learn more extensively from its partners (Powell, Koput & Smith-Doerr 1996, 119).

As companies followed the resource-based strategy by developing accumulative base of resources and core competencies they found that there are still companies outperforming others in situations of rapid and unpredictable change (Eisenhardt & Martin 2000, 1106). Hence, there is increasing evidence that sustained competitive advantage cannot be supported enough by this strategy alone. Global winners have been proved to be demonstrating timely responsiveness and flexible production and simultaneously coordinating and developing internal and external competencies. Companies may have a

wide variety of valuable technological assets and still not have many useful capabilities. Consequently, this new approach highlighting flexibility and rapid reactivity has been referred to as *dynamic capabilities*. (see Teece & Pisano 1994.) The term dynamic refers to the rapidly changing environment, which leads to the importance of right timing in entering new markets, accelerating pace of innovation, nature of competition, and blurring market boundaries. By capabilities is meant that strategic management of firms plays a major role in adapting, integrating and reconfiguring internal and external organizational skills, resources and functional competencies in line with the changing environment. In other words, the paradigm of dynamic capabilities assumes that companies need to be innovative and collaborative to be able to respond quickly to the changing market requirements. (Teece et al. 1997.)

These theories and paradigms obviously emphasize the importance of innovation resulting from collaboration. Since innovation is a key success factor of competitive advantage, innovation management is considered one of the most important key drivers of sustainable business growth. (Igartua, Garrigós & Hervas-Oliver 2010, 41.) As seen above, the importance of collaboration with external sources of ideas, resources and capabilities has been affirmed by a variety of powerful directions. The relation between collaboration and growth through innovation is illustrated in Figure 4.

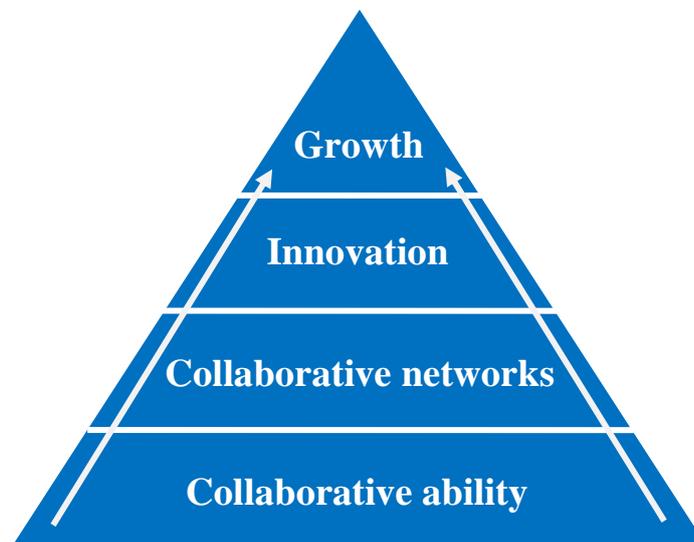


Figure 4 The key to innovation and growth (Shuman & Twombly 2010, 11)

Figure 4 suggests that growth can be obtained through innovations taking place in collaborative networks. However, without collaborative ability companies are not able to form efficient collaborative networks. Also Takeishi (2001, 404) argues that there is a great amount of evidence on the advantages gained through collaboration, and thus both researchers and practitioners have paid increasingly attention to networking, alliances

and inter-firm relations. Nevertheless, collaboration can be extremely challenging since managers often ignore complexity of internal collaboration and collaboration environment when they decide to collaborate in networks. Even if they took these into consideration, there is lack of reliable models and tools to manage collaborative networks, what may lead to insufficient outcomes. (Schuh, Sauer & Döring 2008, 2486.) Lacking the ability to collaborate, an organization cannot be very innovative and grow. Only collaborative networks have all that it takes – capital, capacity and expertise (Shuman & Twombly 2010, 11). Collaborative networks may involve several participants all of them having their own strengths and weaknesses. Thus, companies need to find out who has the resources they need. The actors of collaborative networks are taken a closer look at in the following section.

2.2 Actors of innovation-oriented collaborative networks

Earlier research on innovation has shown that companies rarely innovate alone. As the open innovation paradigm assumes that ideas come from inside as well as outside the firm, it is crucial to clarify who has the resources and competencies required for new innovative solutions. Contribution of the actors depends to a great extent on the resources and knowledge that the organization possesses.

2.2.1 Organizations

Håkansson and Johanson (1992, 28) define actors of a network as those *”who perform activities and/or control resources”*. These actors may be individuals, groups of individuals, various parts of firms, whole firms, and groups of firms. Consequently, there are actors at several organizational levels in an industrial network, who all perform different activities.

Actors are of key importance for innovation since they can influence the pace and direction of the development of technology with their innovation activities. Their innovative activities contribute partly to the innovation system and its functions, and the aggregated innovation activities of all actors determine the overall performance and final outcomes. (Markard & Truffer 2008, 446.) In addition to the focal company, organizational actors can be categorized into eight different groups: administrative actors, suppliers, co-suppliers, consultants, research and training institutes, competitors, distributors, and buyers (Gemünden, Ritter & Heyderbreck 1996, 450). These actors and their contributions are illustrated in Figure 5.

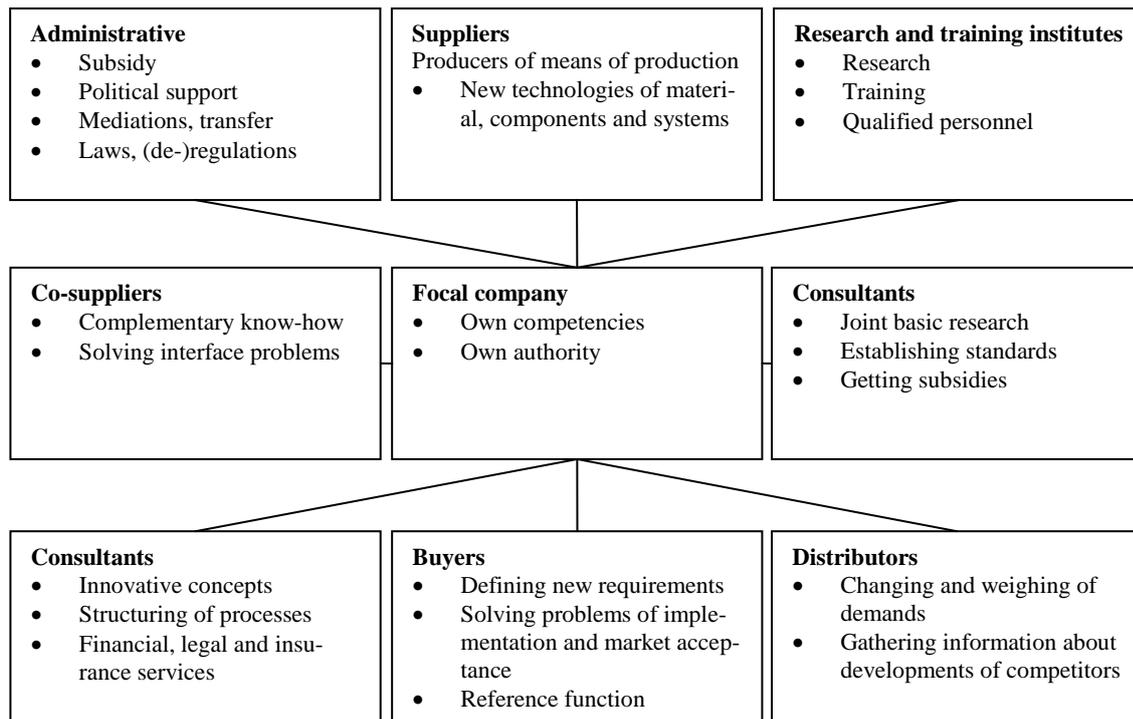


Figure 5 Innovation partners and their contributions (Gemünden et al. 1996, 450)

As can be seen, the actors contribute to the innovation process of the focal company in different ways. *Buyers*, that is, users and customers are those who actually buy the product or service. If they do not like the product or service, they will not buy it. They do not always know even themselves what they want, but they definitely provide the best positive and critical feedback. Therefore it is important to integrate customers as problem solvers in various phases of the innovation process (Bilgram, Brem & Voigt 2008, 420). In fact, companies are converting their innovation strategies from “*innovate for customers*” to “*innovate with customers*” (Desouza, Awazu, Jha, Dombrowski, Pappagari, Baloh & Kim 2008, 35). Rather than hard-selling unilaterally made products, close collaboration with users stimulates managers’ understanding of the world of their customers (Awa 2010, 50).

Customer involvement in the innovation process has been a source of inspiration for researchers for decades. One of the most well-known scholar in this field of study, Hippel (e.g. 1976; 1982; 1986; 1988; 1998;) presented the concept of *lead user*. These early users of innovations, also called *early adopters* in the theory of diffusion of innovations introduced by Rogers (1995)¹, are knowledgeable individuals or organizations that have needs that will become general in a marketplace months or years later in the future. They are ahead of the market and face the problems first. Thus, they serve as a need-

¹ Original source: Rogers, Everett (1962) *Diffusion of innovations*. Free Press, Glencoe, IL.

forecasting laboratory for the marketing research. Moreover, as they want to fill their perceived needs, they are also able to design data and to provide completely new product concepts. (Hippel 1986, 791.) Hippel developed a method for systematic identification of lead users for companies favor in analyzing the markets and their future requirements regarding products, services and processes. There is still an increasing interest in applying the method to new product and service development (Franke, Hippel & Schreier 2006, 302).

It is argued that customer involvement in the innovation process also decreases the level of uncertainty deriving from the change of technology and application of the new technologies to the new products and services (Carbonell et al. 2009, 537). In addition, the more customers are involved in the innovation process, the more confused competitors are about what has been done and developed and how (Selden & MacMillan 2006, 110). Some scholars even suggest that companies should carefully explore and map the job a customer is trying to get done, because in this way companies can discover opportunities for radical product and service innovations (see Bettencourt & Ulwick 2008). This also supports the fact that long lasting business relationships are mostly constituted between buyers and suppliers (see Håkansson & Snehota 1995, 2–3).

Suppliers are a great source of critical technologies and innovative ideas. Supplier involvement in innovation activities can enhance product development performance in terms of productivity, speed and product quality. (Echtelt et al. 2008, 181.) Suppliers in the innovation process allow the focal company to focus on its own competencies and thus to reduce its workload regarding other major activities. Consequently, outsourcing has become an increasingly important strategy for many firms while they pursue to realize positive advantages by building effective inter-firm relationships. (Takeishi 2001, 403–405.) A great number of companies offer their key suppliers joint strategic programs in order to involve them early in product development processes. Suppliers can thus contribute on a large scale to the firm's capabilities in innovation initiatives. (Jayaram 2008, 3719–3720.) A good example is automotive industry where systematic links are created between suppliers and users and then effectively managed to improve the performance of the whole supply chain by striving for better quality, lower costs and faster delivery on time. Suppliers tend to be essential especially in process innovations. (Dogson et al. 2008, 70.) *Co-suppliers* in turn, are those actors that provide suppliers and their customers with complementary know-how and solve interface problems (Gemünden et al. 1996, 450).

Competitors as innovation partners may involve potential high risks as they may be very interested in the know-how and other resources possessed by the partner, but partnerships with networks can also be very attractive to conduct joint basic research, establishing standards or getting subsidies (ibid.). For example standardization networks aim to set dominant technologies or processes for certain businesses. For one company alone

it is often impossible to set a standard. Standardization of a technology generates revenue for the companies through licensing and later through complementary products that are offered in conjunction with the new technology. (Man 2004, 34.)

Research and training institutes are an important source of knowledge for industrial businesses. Companies may have formal or informal common activities with universities and scientists. Research partnerships between an industry and a research institute is an inter-organizational arrangement for pursuing collaborative R&D, whereas some researchers also offer services such as contract research and academic consulting for their industrial clients. (Perkmann & Walsh 2007, 262.) The results of scientific publications are often implemented by industries, while the researchers are granted awards by scientific publication system, companies, universities and academic institutes. Thus, the system remains incredibly powerful in creating and transferring new knowledge and generating new research on current opportunities as well as problems around the world. For many, universities may not appear to be important, however, they are also a key source for radical innovations. DNA, animal cloning and the “big bang” theory are just a few examples of innovations that have been generated by universities. Currently, universities are more and more participating in creating new innovations and even new industries. Thus, relevant industry related research has gained much attention in the recent years as companies want theoretical knowledge to be translated into economic activity. (Dogson et al. 2008, 73–74, 136–137.)

Other innovation partners can be consultants, administrative actors and distributors. *Consultants* can provide companies with innovative concepts, structuring of processes as well as financial, legal and insurance services. *Administrative actors* are able to grant subsidies, offer political support and mediations, transfer, and create new laws or repeal them as well as initiate regulative or deregulative actions. *Distributors* contribute to the innovation process by observing the level of demand and changes in it and by reporting these shifts to the producer. Distributors also possess invaluable information about competitors’ activities. (Gemünden et al. 1996, 450.) Furthermore, they can offer their know-how in application development as well as efficiency in logistics support. The producer may also be able to gain stable business growth with the distributors’ help in customer service. (Johnson 2010, 36.)

There are three different positions the afore-described actors may occupy in a network; group member, bridge and orchestrator (Man 2004, 39)². Network orchestrator, also called choreographer, hub firm, triggering entity and flagship firm, is the key actor

² Original source: Man, Ard-Pieter, de (2002) Van ondernemingsstrategie naar netwerkstrategie? In: Strategievorming: De grote lijn, eds. A. Witteween, M. Zegveld and A. van Witteloostuijn, 245–262. Scriptum Publishers, Schiedam.

of a network, who coordinates, directs, influences, and manages other network members. Orchestrators have power and prominence over the members gained through individual characteristics and central network position. (Dhanaraj & Parkhe 2006, 659.) They need less capital and return higher revenue per employee than do conventionally run companies, because they exploit their partners' resources and have thus fewer fixed assets. Their employees may never even have touched a product. As a result, orchestrators are better able to cope with turbulent times. However, this also makes orchestrators vulnerable to their partners' financial or logistical problems. (Häcki & Lighton 2001, 38–39.)

Almost every network has some individual or entity that takes on a leadership role and organizes the whole network and is responsible for achieving the purpose of the network (Camarinha-Matos & Afsarmanesh 2008, 2464). In some networks, the leadership role may consist of representatives of all parties. However, the leader is mostly the company with the closest connection to the end customer. (Shuman & Twombly 2010, 6–8.) It is also argued that networks rarely have a formal leader although orchestrators have the most power in them. Even when unequal contracts are made in favor of the orchestrator, informal leadership usually emerges. Sometimes networks may have more than one orchestrator. They may also have no actor who performs the leading role, yet, such networks can be very unstable. (Man 2004, 46). Furthermore, networks are not always open to all comers. For example, some scholars state that companies are invited into the network by the orchestrator. (see Häcki & Lighton 2001, 33.) Orchestrators especially in supply and solution networks are constantly looking for new specialists and evaluating who could best contribute to the network and meet the network requirements (Brown, Durchslag & Hagel 2002, 65).

Group members do not occupy a special position in the network, but they collaborate with several other companies in the network. They contribute to the network by providing it with a specific service, component or technology and by performing at an acceptable level taking into account what they are expected to deliver for the network. The group membership brings along benefits deriving from the close collaboration. Such benefits can be for example early access to the latest information regarding new technologies and previous partners of the other parties, and savings in terms of costs and time. Experience from partnerships and networks makes it easier to learn jointly and set up new alliances with existing and potential partners. (Man 2004, 39–40.)

As the group members are specialized in providing customized solutions to their clients the best network effect can be achieved by increasing the number of participants in it. Presence of a greater number of participants in the network lowers transaction costs and increases productivity. New partners also bring in new information and capabilities as well as new customers. (Häcki & Lighton 2001, 33.) This increases the network's value for its customers as well as participants, as the group members have hence

more opportunity to specialize. However, Christensen, Olesen and Kjaer (2005) view coordination costs of an expanding network as a drawback of open innovation. Yet, coordination costs of loosely managed relationships do not rise exponentially as more providers join the network, because the benefits of the network expansion and specialization of its members outweigh the additional coordination costs. Moreover, also orchestrators specialize. They need more distinct skills though to be able to for example recruit the right members, to coordinate processes and to monitor the performance of the network. They also need a deep understanding of the processes and operations of the network. (Brown et al. 2002, 64–66.)

Not all partners in a network are having an alliance between them. Bridge is a company that bridges the gap between two other companies while self having an alliance with both of them. In other words, when company A has an alliance with companies X and Y, but X and Y have no alliance between them, then company A is the bridging tie for X and Y. (McEvily & Zaheer 1999, 1136–1137.) Company A can thus benefit by obtaining knowledge and information from two different sources while not being tied to only one company through alliance. This is particularly relevant for the research and development function of the bridging company since competing technologies are often developed simultaneously. The company has thus smaller chance to miss out on a successful technology. (Man 2004, 40.)

The actors of a network can be active or passive. This can be determined by analyzing the strategy and the resources of an actor which can be interpreted as the ability and interest to perform a role in the network. Often only a few actors carry out activities while others remain passive. The passive actors may intentionally stay outside the core of the network, but they may also observe the development carefully and decide to get involved at a later stage. Hence, they represent unexploited resources of the network, which can be mobilized in the future. (Markard & Truffer 2008.)

Organizational actors are those who are commonly mentioned to be involved in an innovation process. Ultimately the actors that do the concrete job and perform activities are individual people who work together and thus form entities. These individual actors and their roles are discussed next.

2.2.2 *Individuals*

In addition to the organizational actors, also individual persons have to be taken into account when the involved actors of open innovation in collaborative networks are examined. Ultimately, people are the source of any activity. Like organizations, individuals can possess distinct resources and knowledge that are needed to contribute to the

open innovation. By combining those resources and knowledge innovative performance of a company may be remarkably increased.

Scholars have increasingly paid attention for more than half a century on researching the role of key persons in innovation. Of course, the human factor plays a major role in creating new technologies and processes. (Fichter 2009, 357.) The ground-breaking theories in this field of study have been the *great-man theory of champion* (Schön 1963) and *promoter theory* (Witte 1977)³. The notion of champion is prevailing in Anglo-American research, whereas promoter theory has been developed and applied especially in Europe, particularly in Germany (Rost, Hölzle & Gemünden 2007, 340).

While promoter theory attempts to identify different roles of individuals with precise role attributes and contributions to the open innovation process, the champion research looks for generalists who perform multiple roles (Rost et al. 2007, 344–345). According to Schön (1963, 84), “*the champion must be a man willing to put himself on the line for an idea of doubtful success. He is willing to fail. But he is capable of using any and every means of informal sales and pressure in order to succeed*”. The theory of champion has been strongly affected by the theory of entrepreneur as the characteristics of the champion indicate.

The problem of this view is that no single theory can provide a solid foundation for explaining comprehensively the role of a champion (Jenssen and Jorgensen 2004, 63). In their study, Jenssen and Jorgensen used network theory, agency theory, and personal trait theory to explain certain elements of a champion’s behavior, but showed how resource dependence theory offers a theoretical framework in which champions can be better understood. This implies that champions are dependent on others and their resources. Consequently, even though it can be argued that there are fewer studies to support promoter theory than the theory of champion (see Jenssen & Jorgensen 2004, 65), this thesis will focus on promoter theory, because resource dependence theory and open innovation strongly emphasize collaboration among several actors. Furthermore, as the first research sub question asks what actors and roles the initial phase of open innovation in collaborative networks involves, it implies that more than one organizational and individual actor is considered. In addition to champions, many other roles have been recognized in the literature, for example gatekeepers, product champions, project champions, business innovators, and technical innovators (see Howell & Higgins 1990, 318). However, unlike promoters these roles have not been identified within the same context and thus do not form a coherent theory appropriate for this study.

³ Original source: Witte, Eberhard (1973) *Organisation für Innovationsentscheidungen – Das Promotorenmodell*. Schwartz, Göttingen.

Promoter theory provides the chance to explain cases that involve different types of specialized promoters. Hence, promoter theory assumes that innovative activities lead to division of labour. (Fichter 2009, 359.) Promoters are defined as “*individuals who actively and intensively support the innovation process*” (Rost et al. 2007, 340)⁴. This theory bases on the fact that before ideas become successful innovations they face several barriers that need to be overcome. First it was stated that there are two kinds of barriers: barriers of will and barriers of capability. It was further argued that the barriers of will could be eliminated through *promotor of power*, and that the barriers of capability could be eliminated through *promotor of know-how*. These barriers are best overcome when these promoters personally commit to solve arising problems by working together in tandem. This setting was referred to as the *two-center theory*. (Witte 1977, 74.) Power promoter uses hierarchical power to protect the innovation as it faces psychological opposition and resistance. He acts as an investor and has a wide access to material resources. Moreover, power promoter legitimizes projects and can influence personnel decisions while protecting promoters with know-how. (Tallqvist 2009, 105.) In turn, the promoter of know-how, in other words expert promoter, contributes specific technical expertise to the innovation process (Gemünden, Salomo & Hölzle 2007, 409). Expert promoter performs the role of an educator and a technologist in order to win over reluctant colleagues or customers. (Hauschildt & Kirchmann 2001, 41.)

Since Witte introduced the two-center theory it has been further developed by various scholars. The theory obtained considerable contribution as the *process promotor* was introduced to tackle administrative barriers that innovations also face. The theory evolved from the dyadic perspective into a “*troika*” constellation. (see Hauschildt & Chakrabarti 1989.) Process promoter is able to recognize organizational hurdles and often acts as a project leader (Rost et al. 2007, 344). This promoter is needed in particular when the innovation project takes place in a large, complex organization. To overcome the barriers of system complexity and problem complexity the process promoter influences the process by utilizing his organizational know-how and diplomatic skills. He translates the language of innovative technology into an understandable form and is able to create strong links to power and technology promoters. He is able and willing to turn the idea into a plan and action, because he knows the processes, rules and values, and identifies people with ideas and initiatives. (Hauschildt & Kirchmann 2001, 42; Tallqvist 2009, 105.)

The troika perspective was widely accepted by researchers and practitioners. However, it was later argued that the three roles were all dominated by an intra-organizational

⁴ Original source: Witte, Eberhard (1973) *Organisation für Innovationsentscheidungen – Das Promotorenmodell*. Schwartz, Göttingen.

perspective. New forms of barriers seemed to appear in inter-firm innovation process as firms were increasingly collaborating for innovation. These barriers can be overcome through a new promotor role; *relationship promotor*. Relationship promotor actively promotes the innovation process by means of business relationships inside and between the organization and its partners. (Gemünden & Walter 1995.) He has an extensive network competence and powerful relationships with other parties, and he facilitates knowledge transfer by connecting key persons, leading the process of interaction and dialogue between them, and by fostering social links among the partners and other important actors (Hauschildt & Gemünden 1999, 120–121; Fichter 2009, 359). As a review, the four promotor roles, their power base, and barriers are illustrated in Table 1.

Table 1 Promotor roles, their power base, and barriers (Fichter 2009, 360)

Promotor role	Power base	Barrier
Expert promotor	Knowledge specialty	Knowledge
Power promotor	Hierarchical potential, control of resources	Ignorance, opposition, resources
Process promotor	Organizational know-how, communication skills	Administrative
Relationship promotor	Networking competence, potential for interaction	Cooperation, dependency

Although promotor theory emphasizes different individual roles in all innovative activities, it also stresses that not all roles have to be performed by different persons. Hence, one person can simultaneously perform one or more promotor roles. In fact, a person playing all four specialized promotor roles is called universal promotor. (Fichter 2009, 359.) Universal promotor can thus be compared to the role of a champion.

As was shown in this chapter, various actors can form networks based on different motives and intentions. The actors are often considered organizational entities and individuals that work together towards common and individual goals. Next chapter shows what kinds of activities these actors perform while pursuing innovation through collaborative efforts.

3 INITIAL PHASE OF OPEN INNOVATION PROCESS

The open innovation process in collaborative networks in this thesis is understood to consist of multiple events taking place simultaneously and parallel to each other. The open innovation process comprises activities related to product development, contracting and evaluating, which are in complex interaction with each other. As a reminder it is worth of noting that this study focuses on the initial phase of open innovation in collaborative networks.

3.1 Product development

Innovations can be divided in various categories according to their type. *Product innovation* is a completely new or just an improved product whereas *process innovation* can be a new enhanced way to manufacture products. Sometimes the line between product and process innovation may be somewhat blurred. (Tidd et al. 2005, 10.) *Organizational innovation* can refer to a new internal communication system or a new, better organizational structure. *Management innovations* are for example Total Quality Management (TQM), Business Process Re-engineering (BPR) and SAP R/3 enterprise resource planning system. New production planning software and quality circles can be considered as *production innovation*. *Commercial and marketing innovations* are new financing arrangements and new sales approaches. Another type of innovation is *service innovation*, which emerges e.g. through new kinds of Internet-based financial services or travel booking systems. (Trott 2005, 17.) Furthermore, *value innovation* refers to the strategies of companies that have enabled them to create completely new markets by not having followed the common strategic logic where companies conduct benchmarking and try to outperform their competitors in intensively competed markets. On the contrary, they have created a leap in value for buyers by making competition irrelevant. (Kim and Mauborgne 2005, 12.) As can be seen, there are several possibilities for innovation. However, this thesis focuses on product innovation.

An essential question in innovating is whether the idea derives from the market referring to a need of new innovation, or as a result of a technological push developed by scientists and commercial organizations. A market need emerges when customers are seeking a solution to a particular problem. The problem is relatively easy to structure and solve even though R&D work is always required. A technology push in turn, emerges in playful environments, where acceptance of any kinds of innovative ideas is common. There are no specifically defined problems but imagination and research on future needs of customers and society. Communication and collaboration among scientists and organizations are encouraged and low hierarchies as well as technical toys and

mechanisms are considered to enhance productivity and innovative organization culture. (Desouza et al. 2009, 13.)

Innovations can be divided according to their degree of novelty as well: incremental and radical. Incremental innovation refers to minor, gradual optimization of processes and improvements to components or new versions (Junarsin 2009, 11). Looking back at history, there have been long periods during which incremental innovations have taken place in form of improvements in products and processes. Dramatic discontinuities occur occasionally resulting in substantial changes along the technological frontier and established markets. Some innovations may be so radical and far-reaching that they change the basis of society like steam power did in the industrial revolution. More recent examples include mobile phones, computers and the Internet, or all in one, the ICT revolution. Radical innovation is something new to the world, although it may also be an advanced material which significantly improves performance of a component. (Tidd et al. 2005, 12.) Mostly such radical innovations emerge from new combinations of existing technologies (Dogson et al. 2008, 3).

Managers may consider innovations disruptive to daily business operations if their organization has no standard procedures, rulebooks or guidelines. Without a well-defined innovation process organizations rely on serendipity, since they cannot effectively understand, stimulate and analyze their strengths and weaknesses around the innovation activities. (Desouza et al. 2009, 8.) Companies that innovate successfully perform innovation activities systematically. One innovation may drive a company to a momentary success, but thriving market leaders create new growth businesses repeatedly. (Anthony et al. 2008, 43.) The ability to manage development processes effectively represents a core competence for any company (Dooley & O'Sullivan 2007, 398).

Product development is a complex, iterative problem-solving process where experience plays a major role (Thomke & Fujimoto 2000, 129–130). It is one of the essential processes for success, survival, and renewal of organizations, especially for firms either in fast-paced or competitive markets (Brown & Eisenhardt 1995, 344). Presence of a defined and organized development process is the first sign of a successful innovation program in an organization. It can be regarded as a common language of the R&D employees, which in turn, encourages them to value and critically consider that process. People within the organization know their roles and they know how to search and select ideas and implement them successfully. The key people are better able to commit to a defined process, which displays a direction for all stakeholders towards innovation. (Desouza et al. 2009, 10, 31.)

Product development represents the process of generating and developing an idea before taking it to a physical form and marketing it (Cunha & Gomes 2003, 177). Earlier research has identified several different product development models that attempt to

illustrate the key characteristics of the process. Such models can be categorized in seven groups (Trott 2005, 399–404)⁵:

- departmental-stage models
- activity-stage models
- decision-stage models
- cross-functional models
- conversion-process models
- response models
- network models.

In *departmental-stage model* each department involved in the process is responsible for certain tasks. This model is criticized due to its “over-the-wall” phenomenon, which means that different departments do their job and pass the project on to the next department having nothing more to do with it. *Activity-stage models* provide a better representation of reality than departmental-stage models, because they emphasize the activities that are conducted. (ibid., 400–402.) A *decision-stage model* is a series of decisions that need to be made to be able to proceed in the process. This concept was based on experiences, suggestions, and observations of a number of managers as well as researchers. Their process was a set of stages consisting of parallel and multifunctional activities where each stage included a decision to continue or to terminate the process. (Cooper & Kleinschmidt 1993.) The stage models rely heavily on planning, anticipation and control. They are standardized step-by-step approaches what makes them appropriate for managing incremental innovations. (Cunha & Gomes 2003, 177.) Activity-based and decision-based models are closely related to each other. Moreover, stage models for product development processes are widely recognized and embraced by companies as a method of applying order into the sometimes very complex and chaotic process of product innovation (Grönlund et al. 2010, 109).

Cross-functional models suggest that problems regarding projects being passed back and forth between departments, especially R&D and marketing, can be removed by having a dedicated project team representing people from different functions. *Conversion-process models* view product development as a number of inputs that are put together and converted into an output. *Response models* emphasize an individual’s or an organization’s response to a proposal of a new idea or project. Such response factors may have a major influence on the decision to accept or reject the proposals, especially at the idea searching stage. The latter two models are not very common in innovation literature and represent rather a limited and ambiguous approach. (see Trott 2005, 402–403.)

⁵ Based on Saren, Michael (1984) A classification of review models of the intra-firm innovation process. *R&D Management*, Vol. 14(1), 11–24.

Finally, *network models* represent the most recent thinking on product development process (ibid. 403). According to this approach, knowledge is built up gradually through a variety of different inputs over time. The process is called “*the spiral of knowledge*”. Knowledge always begins with an individual whose knowledge is transformed into valuable information for the company. Each actor in the network contributes to the existing knowledge while the idea is developed. Thus, making personal knowledge available for others is essential at all levels of the organization. (Nonaka & Takeuchi 1995.) The actors of the network work simultaneously at different stages, which means that the stages overlap considerably. This leaves room for integration and does not necessarily lead to termination of the project in case problems occur at one stage. The actors are hence able to absorb knowledge from others throughout the process. Thus, the proceeding in this approach is not as predictable as in the stage-based models. Network models emphasize that in addition to the internal employees and functions, external links contribute to the process by bringing new knowledge into the organization. (Trott 2005, 403–404.)

However, network models in product development are describing the abstract accumulation of knowledge deriving from various actors of the network rather than giving a concrete answer on what is being done during the entire process. Therefore, this kind of process model would be difficult to apply in practice and unduly complex for innovation managers to proceed according to such a theoretical conclusion. Furthermore, there is not one best product innovation model. The development process depends on the product and the environment. Managers are encouraged to consider combining different process models and introducing freedom and flexibility in the process if necessary. Yet, most often product development process is described as subsequent stages. (Cunha & Gomes 2003, 177.)

As an example, one of the most successful activity-stage frameworks was developed in the 1970’s relying on previous research results and consisting of three partly overlapping stages, which were idea generation, problem solving, and implementation (see Utterback 1971). A recently developed framework presented by Tidd et al. (2005) is almost the same. Its stages are search, select and implementation. Even one of the latest frameworks was developed to describe the open innovation process from contracting point of view, also building upon three basic stages: exploration, joint development, and commercialization (see Mehlman et al. 2010). Hence, this thesis also applies an activity-stage model to the initial phase of a collaborative product development process, but the knowledge can still be considered to be created gradually through a variety of inputs by cross-functional teams. Thus, several product development process models can be combined.

An idea creation model fits well to the initial phase of product development process. It comprises four recognized stages that are definition of strategic direction, environmental scanning, identification of opportunities, and idea generation. When a company

defines its strategic direction it reviews its goals, strategy and measuring systems. This stage functions as the basis for further activity. (Flynn, Dooley, O'Sullivan & Cormican 2003.) In turn, environmental scanning includes searching the most potential opportunities that could be turned into successful innovations. Scanning refers to the activities where internal and external environment are carefully examined to detect threats and opportunities that occur occasionally. (Tidd et al. 2005.)

Opportunity identification requires entrepreneurial attitudes towards finding and initiating new businesses to drive economic growth of a company (Moreno 2008). The information gathered through environmental scanning is uncovered and more accurately explored to present it as inputs to the product development process. Various tools can be applied of which in particular mind-mapping and data-mining enable building of an opportunity portfolio for further analysis and development of opportunities to concrete ideas. (Flynn et al. 2003, 430.)

Idea generation stage, sometimes also called fuzzy front end stage of product development process (e.g. Alves, Marques, Saur & Marques 2007, 28), involves several initial undertakings for various projects. In fact, engineers and other employees can be given the freedom to try out different and diverse initial solutions for any problem they find interesting. Thus, in some companies engineers are encouraged to spend a certain amount of their working time with wide variety of their own creative development cases (Stanleigh 2008, 41). Flynn et al. (2003, 418) emphasize creativity in idea generation and that the greater the number of new ideas generated, the greater the possibility to discover new business opportunities. Idea generation includes activities such as spinning in and out ideas, knowledge and product concepts. Moreover, customer needs are established and roles defined, and the feasibility of the innovation should be initially evaluated. (Grönlund et al. 2010, 118.)

Idea generation can be either reactive or proactive in nature. A reactive idea is an attempt to respond to a perceived change in the environment, while a proactive idea is generated to support the organization's strategic direction. (Flynn et al. 2003, 430.) Signals that predict potential change ought to be screened through to be able to proactively respond to the emerging market requirements. Such signals may derive from technological opportunities, legislative pressure or competitor actions. Poorly sourcing companies miss out these great opportunities and have thus lower innovation productivity. (Tidd et al. 2005, 89.)

A problem in idea generation is that most novel ideas are shut down in companies due to tight budgets, conventional thinking, and strict funding criteria. When employees get the message they get frustrated. Yet, managers in some companies are not strict enough. Many ideas without genuine potential are developed and even implemented although no one has a clear sense of how they actually fit into the overall corporate strategy. Therefore, it is essential for a successful innovation management to have well-

developed mechanisms for identifying, processing and selecting the relevant items of the information. (Hansen & Birkinshaw 2007, 123–124.) Nevertheless, such search patterns tend to become highly focused, which in turn, may later represent a barrier to radical innovation. Hence, innovation managers should obtain comprehensive understanding of the factors that shape the selection environment and influence common development of technological trends. (Tidd et al. 2005, 90.) However, not all ideas have to be created from scratch by oneself. Ideas can also be exchanged among partners and members of the same networks or alliances. By exploiting the external sources of knowledge and using the absorptive capacity companies are able to find the most promising ideas. (Desouza et al. 2009, 12.)

Based on the discussion above, the initial phase of product development can be called idea creation. This thesis focuses on that phase. However, as a clarification it is worth of mentioning that at the next phases successful ideas are further developed, which may require relatively large investments compared to the initial product development phase (see Utterback 1971; Tidd et al. 2005). If the partners complete idea creation and development successfully, they have accomplished a great deal. Implementation of an idea and its commercialization turn this success into value. (Mehlman et al. 2010, 61.)

The last phase of product development process is to sustain the innovation and pursue new innovations. Learning throughout the process is a major requirement for new innovation cycles within the organization. Innovations can always be refined as they become mature or even obsolete at some point. (Tidd et al. 2005, 96.) Also failures in innovation activities must be accepted and regarded as learning opportunities for other projects. As R&D is inherently risky and involves educated guesses, failures play a major part in discovering promising business opportunities. (Chee 2007, 4.) Moreover, a large part of the knowledge brought and created by all partners will be lost after the dissolution of the network. Thus, by mastering the project learning cycle companies could save considerable costs, which ultimately result from redundant work and repetition of mistakes (Schindler & Eppler 2003, 220).

Technology has enabled retrieval, sharing and processing of information through digital communication, thereby facilitating business-to-business knowledge sharing and virtual collaboration (Jenssen & Nybakk 2009, 444). The principles of open innovation and collaborative innovation activities have led to evolvement of platforms that connect people on the Internet and allow experts from various organizations to participate in developing new products or services (Bilgram et al. 2008, 422). Many executives expect technology to increase flexibility of large networks as for example communication becomes easier to conduct through utilization of the Internet (Brown et al. 2002, 65–66). Communication methods may present difficult impediments to successful collaboration. Physical meetings can be sometimes extremely exhausting and frustrating to organize as

networks consist of several actors that may be distributed in different cities, countries, or even continents. As mentioned above, geographic distance does not play a major role in networks anymore since development of information and communication technology including email, the Internet, intranets and e-groups, enable efficient communication for distributed networks. Of course, the significant advantage provided by physical face-to-face meetings must not be neglected, because effective exchange of knowledge sometimes also require experiments or demonstrations that facilitate knowledge transfers considerably. (Dooley & O'Sullivan 2007, 402.)

3.2 Contracting

As R&D alliances have become a popular vehicle for acquiring and exploiting technological capabilities, also more new kinds of challenges have arisen concerning protection of technological knowledge. Successful completion of alliance objectives requires participants' valuable inputs at risk of unwanted know-how transfers and loss of competitive advantage. (Oxley & Sampson 2004, 723; Enkel, Kausch & Gassmann 2005.) In particular companies that enter into R&D alliances face significant moral hazard problems since valuable knowledge and technologies may be exposed (Sampson 2004, 485). Possible free-ride and opportunistic behavior of other actors in a network implies barriers to collaboration. Access to valuable resources of the partners may alleviate these risks to a considerable extent. (Gulati 1999, 400.)

Moreover, depth and breadth of intellectual property disclosures increase considerably when firms move on in the process (Mehlman et al. 2010, 59). Therefore finding the right balance between maintaining open sharing of knowledge and controlling intellectual asset flows to avoid unintended leakages is essential in attempts to materialize best possible results (Kale, Singh & Perlmutter 2000, 217). Such leakages are called spillovers and can be described as involuntary transfers of knowledge that are difficult to avoid in close business relationships. Legal governance is thus essential in collaborative activities as such spillovers are one of the greatest concerns of companies. (Leiponen 2008, 1371.)

A key determinant regarding success of the collaboration is trust (Dooley & O'Sullivan 2007, 401). Trust between organizations is often described as the accumulation of trust among individuals in the collaborating organizations. Mutual trust is based upon close personal interaction and relationships. (Kale et al. 2000, 220–221.) Trust in an alliance means that partners act in a predictable way, keep their word and do not want to behave in a negatively affecting manner (Spekman et al. 2000, 44). Trust cannot be guaranteed before a relationship is established. Trust must be earned through a collaborative process. This is very difficult, especially in case of competitor alliances. (Doz

& Hamel 1998, 27–28.) Sharing sensitive information before the actual alliance signals commitment and trust and it may result in a similar response by the partner. Unilateral commitment of resources reflects risk-taking behavior which in turn increases trust. The resulted increase of commitment will help partners work together for common interests. (Spekman et al. 2000, 48.) Sometimes however, a company does not want to commit to a long-term relationship with another company and will try to take short-term advantage. Whether the potential partner will act in this way or commit to a long-term relationship and seek to obtain mutual advantage through collaboration is not easy to find out. (Ford, Gadde, Håkansson, Lundgren, Snehota, Turnbull & Wilson 1998, 28.)

As the level of trust among the employees of the collaborating companies may not be very good at the initial phase of the common activities, the need for well-defined contracts is an essential resource. Such a control-based reliance can thus be applied since it may have a significant positive influence on the outcomes of the collaboration. (Dooley & O’Sullivan 2007, 401.)

Contracts play a major role in collaboration that involves various actors. Diverse contracts are made at different phases of the process. Common contracts at the initial phase are for example non-disclosure agreement (NDA), memorandum of understanding and letter of intent. Later contracts may include for example material transfer agreement, exploratory research agreement, joint development agreement and alliance agreement. Commercialization stage may require license, buy, or supply agreement. (Mehlman et al. 2010, 55.) A letter of intent or memorandum of understanding helps the collaborating parties to determine whether they can reach agreement on the basic business terms of their collaboration before they move on to negotiating more formal agreements. Such a contract can be considered a time and cost-saving tool that can be compiled by the businessmen and given further to the lawyers to be complemented. (Brooks & Sykes 2000, 80.) It is crucial to clarify the objectives of own company before entering the contract negotiations with other parties. This creates a shared view for the company’s employees and prevents misunderstandings. Moreover, it is recommended that companies consider developing walk away points by securing alternative options. Hence, a compelling need to continue negotiations can be eliminated with reasonably good alternatives when the counterparty does not seem to assent to the terms of the contract. (Wanetick 2009, 11.)

An NDA is a confidentiality agreement and can be defined as an “*agreement restricting the use of information by prohibiting a contracting party from divulging data*” (Witman 2005, 261)⁶. NDAs are almost always different, because the information about

⁶ Original source: Beyer, G. W. (2001) *Modern dictionary for the legal profession*. 3rd ed. William S. Hein & Co., Inc., Buffalo, NY.

the ownership of the intellectual property rights (IPR) and the level of protection fully depend on the case. Hence, it is difficult to create a common NDA that could be used as a template for the negotiations with partners in future. However, many large companies do have their own standard NDA at least for attempts to facilitate the process. (Witman 2005, 261.)

Mehlman et al. (2010, 58) suggest that NDA is compiled after the initial discussions. It is argued that partners often rush to collaborative activities without properly considering and reviewing the NDA. In their haste, companies may sign the NDA just prior to the disclosure of the confidential information. This may lead to insufficient scope of protection and thus to unintended consequences. There are often many overlooked provisions such as the receiving party's rights to use the disclosing party's confidential information, and distinction between confidential information constituting a trade secret and confidential information not constituting a trade secret. (Coursey 2004.)

Even though networks are generally considered groups of organizations and individuals somehow informally linked to each other rather than having signed a collaborative agreement, contracts usually do exist between some pairs of members. Such contracts do not, however, define all relationships within the network. Collaboration contracts may be needed among some partners to ensure their commitment. In efficient network cooperation on shared tasks, functionality of activities bases on social coordination and control rather than on authority or legal recourse. Yet, in complex and multiple alliance networks contracts cannot be overlooked. Governance structures have to be carefully considered. (Jones, Hesterly & Borgatti 1997, 916.)

R&D alliances can have two different governance structures: equity joint venture and pooling contract. Equity joint venture is an alliance where a new separate legal entity is created by the partners. Pooling contract is a contractual arrangement where firms combine their resources and capabilities for the purposes of collaborative R&D, but do not create a separate legal entity for the alliance. (Sampson 2004.) Equity-based and non-equity-based agreements differ significantly in terms of cost, control, commitment, risk and return (Peng 2006, 231). An important question in establishing an R&D alliance is whether it is restricted to narrow pre-competitive R&D only or extended to include manufacturing and marketing as well. Narrow collaboration can be for example modularized activities conducted in relative isolation by the partners, only to be brought together at the final stages. On the contrary, the alliance may include an arrangement that involves close collaboration and knowledge exchange throughout the process. The extent of commonly performed activities and alliance structure is usually referred to as the scope of alliance. (Oxley & Sampson 2004, 724.)

A clear trend in today's networks is increasing flexibility. Whereas the networks of alliances used to be set up for a long period of time often involving an equity deal between the partners they nowadays are mostly contractual agreements. More than every

second partnership involved some kind of an equity-based arrangement in 1970 while the same number in 2000 was one out of ten. Moreover, today's industrial relationships are shorter since they are set up on the basis of a project rather than for the very long run. Even though instability of networks is sometimes seen as a disadvantage, it is essential in fast-moving turbulent markets as flexibility and adaptability are required. (Man 2004, 12.)

Creating and using IPR in collaborative relationships is a critical aspect (Mehlman et al. 2010, 55). As the open innovation paradigm assumes that companies exploit internal and external paths for generating and marketing ideas, IPR play a significant role in companies' business models. Open innovation views companies as active buyers and sellers of IPR in leveraging their own business, but also in profiting from others' use of the company's ideas. (Chesbrough 2003, 155.) IPR comprise old types of rights such as patents, trade secrets, copyrights, trademarks, and design rights as well as new types of rights such as breeding rights and database rights (Granstrand 2005, 266). IPR to resources include the right to use, consume, obtain income from, and alienate these resources. IPR matter from the strategic point of view because the resource owner's ability to create, appropriate and sustain value from resources to some extent depends on the property rights held by the owner. (Foss & Foss 2005, 542.) If the IPR deriving from the partners' collaboration are not clearly stated in a binding agreement, the collaboration is most likely to lead to disputes that may end up in court (Marsh 2001, 114).

Moreover, there is a crucial issue regarding the contracting process namely the timing of involving the lawyers in the negotiations. It depends on the experience of the primary business players involved; the more experienced they are, the longer they can wait to involve the lawyers. However, there are three good reasons to believe why lawyers should be involved already in initial negotiations. Firstly, lawyers represent legal validation and are able to understand opportunities and threats in dealing with contracts better than businessmen and technical experts. Secondly, by participating in the negotiations lawyers can better understand the positions and goals of the parties as well as translate the numbers from spreadsheet calculations and decision trees into contract language. Thirdly, inexperienced technical experts and businessmen can unknowingly place their company into jeopardy as there may be several pitfalls during the negotiations. Lawyers can act as consultants and share their views on legal issues. (Wanetick 2009, 12.) These reasons strongly indicate that lawyers should be involved in the initial negotiations. Furthermore, organizations become much more cooperative when the mutual benefits are clear (Witman 2005).

However, there is another point of view presented by Mehlman et al. (2010, 59). Either one or both parties may think that their collaborative efforts will yield significant results. Hence, much time can be used negotiating future IPR between the collaborators although it is probable that they will never materialize. This procedure can be replaced

and considerably shortened by preparing a simple one-page summary of each party's IPR strategy and needs for the collaboration agreement. In this way the expectations and goals can be clearly communicated to the other parties.

Although IPR, in particular patents, have a long history the topic has been devoted surprisingly little scholarly attention. Until recently, the role of IPR in corporate innovation systems has been relatively modest, with some exceptions. However, the new knowledge-based economy bases more and more on information, innovation and intellectual capital. IPR have recently become important to corporate strategy due to their economic value, while they have been developed and split into smaller pieces through extensions of old and creation of new types of rights. (Granstrand 2005, 285.) This of course, makes it even more complicated to lay out an optimal IPR structure in collaborative relationships.

To avoid, or at least to be aware of all kinds of possible conflicts and to be able to recognize possible synergies of the collaboration, the companies should evaluate each other and their common activities. Next section deals with collaboration potential assessment and post-project review.

3.3 Evaluating

Evaluation regarding both collaboration and innovation plays a significant role in innovation-oriented collaborative networks. This thesis covers evaluations that may be carried out with a focus on predictions and expectations of the outcomes or as reviews of the realized results. This section examines both kind of activity.

3.3.1 *Collaboration potential assessment*

During the past decades there has been much research on factors that influence partner selection in networks. Partner selection is considered one of the main issues in networking as newly formed alliances represent change and new shape of a network. (Beckman, Haunschild & Phillips 2004, 259.) Evaluation of possible synergies and threats of collaboration may be crucial for the success of a partnership. As companies constantly report high failure rates of their alliances (Man & Duysters 2002), this remains one of the most relevant issues at the initial phase of collaboration. Companies often select previous partners since they have already collaborated with them and know them, while completely new partners may represent negatively affecting attributes towards collaborative projects (Li & Rowley 2002). In addition, nature of the collaborative activities usually has a considerable impact on partner selection (Shah & Swaminathan 2008).

Participants of an alliance or a network have to share mutually achievable goals, but they do not have to be the same. The goals are good to make clear for the participants, because if the partners cannot achieve their own goals simultaneously with others' goals, it is likely that conflicts will emerge. (Spekman et al. 2000, 43.) Executives rank compatibility thus as number one of the most important factors influencing the success of an alliance. Partners have to be able to work together. (Cauley de la Sierra 1995, 12–13.)

Compatibility can be viewed from many perspectives including cultural fit, strategic symmetry, resource complementarities and alliance task-based factors. It is argued that the more culturally distant two firms are, the greater the differences between everyday business activities and employee expectations. Obviously, such an alliance is unlikely to be successful. (Inkpen 2001, 413.) Partner complementarity is often seen as one of the most critical factors to successful collaboration. In fact, complementary skills and resources are a minimum requirement for all kinds of collaborative projects. (Harrison, Hitt, Hoskisson & Ireland 2001, 681.) Even if the collaborative project was relatively easy to manage, complementarity is particularly important in undertakings where the outcomes of the project are ambiguous. This is typical in some alliances and almost predetermined in R&D alliances. However, resources that complement each other do not create any additional value for the partners if they are not exploited. Committing resources means dedicating specific assets to the collaborative project and making promises during the process that indicate constant support to the collaboration. (Shah & Swaminathan 2008, 474, 476, 488.)

Subsequent to the identification of a partner and compliant decision to collaborate, the firms should assess each other's technology. This is a delicate issue since the parties have not yet entered a common alliance, and they may not know each other at all. Therefore, the assessment has to be completed by analyzing publicly available information and by exchanging non-proprietary information in the meetings as much as possible. The goal here is to recognize that the use of only non-proprietary information is not in the interests of any party. (Mehlman et al. 2010, 57.) Moreover, when companies intend to acquire or develop new technological competencies through collaborative efforts, the companies' ability and potential to learn from collaboration is considered a crucial factor. Another dimension of collaboration potential assessment is whether the partners have the required capabilities to come up with a new technological solution. Companies may or may not have the skills needed for developing certain innovations. Therefore, such capabilities should also be evaluated before the actual collaboration. (Tyler & Steensma 1995, 46–47, 49.) Consequently, the common project of the partners should be known at least to some extent at this point to be able to link the already possessed resources to the requirements of the undertaking.

Other opportunities originating from collaboration can be pooling of resources, gaining economies of scale, and getting access to the partner's knowledge (Inkpen 2001, 405). When the partnering companies evaluate potential of the collaboration, and when the object of the collaboration is already known, they should also assess the maturity of the object. Great potential for collaborative activities is usually seen if the object is at an early stage of its life cycle, while collaboration is often less prevalent when the object has been developed and commercialized and its market demand is already declining. (Tyler & Steensma 1995, 47.)⁷

As collaboration always involves risks to some extent they should be carefully assessed before partnering with anyone. New partners of a network bring in new information that may be very valuable for the other parties. Since companies seek to expand their knowledge base through collaboration, the parties may always be exposed to spillovers. (Beckman et al. 2004, 261.) As was showed in the previous section dealing with contracting, knowledge and IPR spillovers are one of the main concerns of companies today. Spillovers are closely related to opportunistic behavior of partnering companies. Opportunism occurs when gained benefits through such behavior exceed the costs of acting opportunistically. Good reputation due to previous alliances helps partners to assess each other's behavior. In turn, opportunism and reputation have a great influence on trust and commitment, which should also be considered in evaluating potential partners. (Tyler & Steensma 1995, 48.)

3.3.2 *Post-project review*

After a collaborative innovation project has been finished, a review is required to facilitate learning of the involved actors. However, such reviews are relatively rarely conducted as only 20% of all R&D projects undergo a retrospective analysis. Post-project reviews are essential for organizational learning regardless of whether the project was successful or prematurely terminated. Sometimes such reviews are carried out after different phases of a process and can thus also be called phase reviews. (Zedtwitz 2002, 255.)

Collaborative networks bring clear intuitive advantages to their members and benefit all participants in many ways. However, measurement and evaluation are crucial in determining whether a collaborative network is successful and organizations should stay

⁷ Original source: Cairnarca, G. – Colombo, M. – Mariotti, S. (1992) Agreements between firms and the technological life cycle model: Evidence from information technologies. *Research Policy*, Vol. 21, 45–62.

in it. Lack of objective forms of evaluation may be an obstacle to prove the necessity of a network. What an organization benefits by participating in a network, and whether the benefits are large enough to cover all risks deriving from the collaboration are examples of subjects to be measured. (Camarinha-Matos & Abreu 2007, 592.) The benefit gained through collaboration can be obtained by applying the formula illustrated in Figure 6.

$$\text{Benefit of collaboration} = \frac{\text{Value of resources leveraged}}{\text{Time and effort to collaborate}}$$

Figure 6 Benefit of collaboration (Shuman & Twombly 2010, 4)

As presented in the figure above, if the value of the additional capabilities and resources obtained through collaboration is greater than the effort and time it takes to access and exploit them, collaboration is worthwhile and vice versa (Shuman & Twombly 2010, 4). This formula can be compared to a framework analysis of economic consequences of business relationships, where relationships can produce benefits deriving from cost sharing and increased revenues as well as costs originating from direct procurement and relationship handling (see Ford et al. 1998, 113). Hence, the costs and the benefits of the collaboration can be directly compared.

As innovative activities also generate costs and value for the involved actors, the formula can be used in evaluating the benefit of innovation as well. Value-adding indicators can be development lead time e.g. measures how quickly a product is moved from a concept to the market, or productivity which refers to the relation of resources required for accomplishing an objective. Yet, the actual output of the process is the product. Product quality is perceived by the customer and is thus difficult to measure. (Thomke & Fujimoto 2000, 130.) Consequently, this kind of analysis connected to the formula presented above is very difficult to carry out after the initial phase of a project, if most of the benefits materialize only after the innovation has been adapted (cf. Rogers 1995). Any activity has outcomes though, but they may be difficult to interpret, because they can be indirect perceptions such as learning, legitimization, or organizational control over industry and market evolution (Shah & Swaminathan 2008, 474). Thus, the outcomes can best be perceived by discussing them in a meeting involving the key persons of the process.

The main objective of post-project reviews is to maintain and facilitate continuous organizational learning and to improve project performance (Zedtwitz 2002, 256). Learning by doing and learning through various projects refers to a closely related concept of post-project reviews; lessons learned. Schindler and Eppler (2003) define lessons learned as “...*key project experiences which have a certain general business relevance for future projects. They have been validated by a project team and represent a consensus on a key insight that should be considered in future projects*”. Schindler and Eppler state that lessons learned is often a project debriefing workshop held at the end of the project and that it contains conclusions and recommendations in the sense of summarizing what can be done better in the future projects. Moreover, after the final lessons learned workshop has been held, feedback is requested by the partners to include the opinions of the external actors. However, especially in projects that have a long life cycle the gathering and documenting of knowledge and actions taken should take place continuously as it is possible that the procedural knowledge is forgotten due to a large time delay.

The experience and insight obtained through a collaborative project is dispersed among several people (Busby 1999, 23). Therefore, lessons learned need to be passed forward to other project teams, because if they are not shared, other project teams in the future will waste their time in solving problems that have been solved already by another team. Managers need to take specific steps in knowledge management activity since the knowledge generated during a project is to a large extent tacit, which means that it is difficult to share and express. (Goffin, Koners, Baxter and Hoven 2010, 40.) In this way organizational learning can be facilitated (cf. Zedtwitz 2002).

3.4 Theoretical framework of the study

This section summarizes the theory chapters and suggests a model for the theoretical framework of this study. The purpose of the model is to show how earlier research would propose companies to pursue open innovation at the initial phase in collaborative networks. The model is presented on next page in Figure 7.

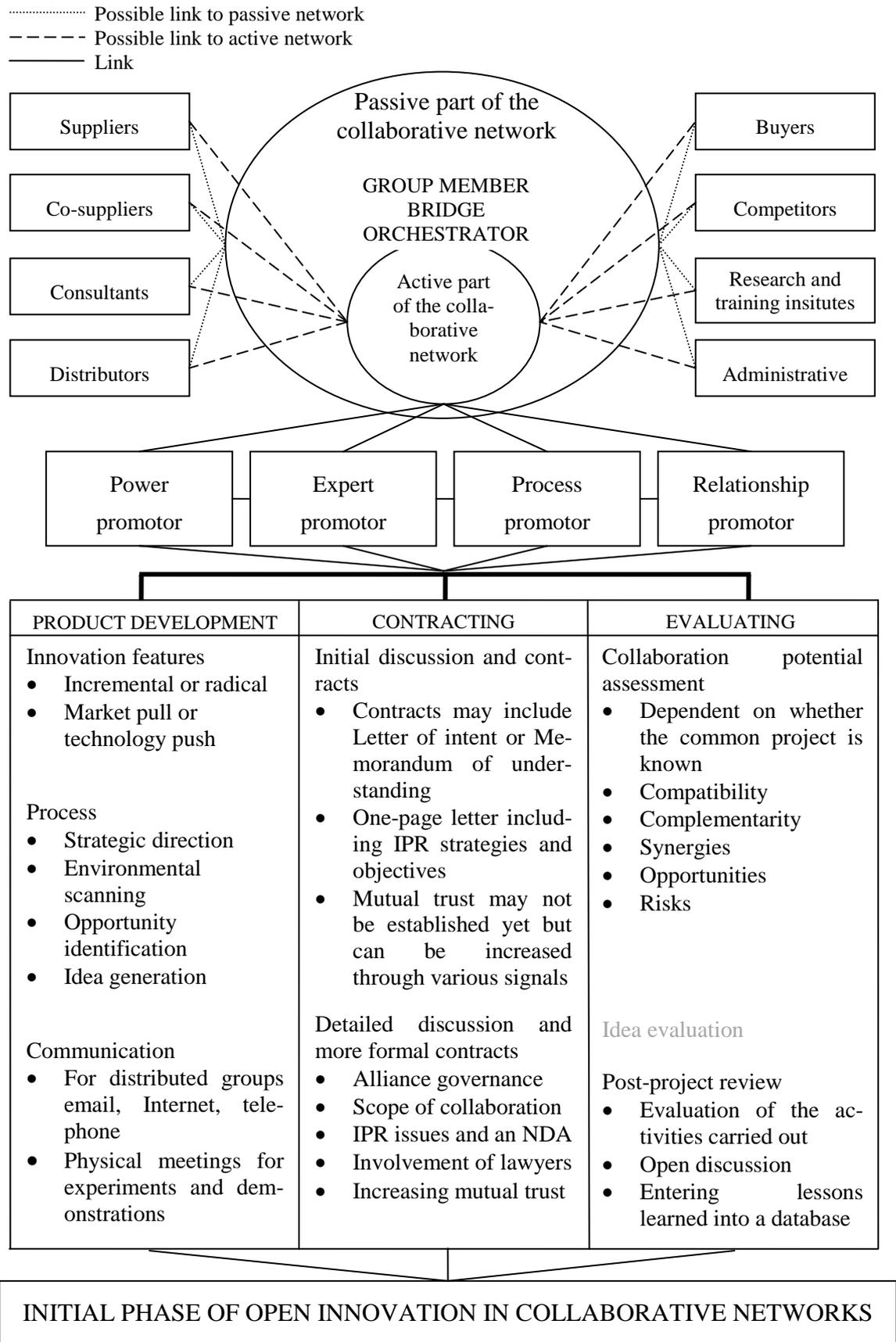


Figure 7 Theoretical framework of the study

Organizational actors, that is, the innovation partners are illustrated in the boxes on both sides. There are eight possible organizational actors that can contribute to the innovative activities. The focal company is left outside the model since the model can be well understood without it as well. Moreover, this study is not viewing open innovation in collaborative networks from a specific actor's perspective but from a neutral point of view.

The actors are connected with possible links to passive and active networks. The actors linked to the passive network are not performing any activities but are involved in the network through alliances or informal relationships and waiting that their resources and know-how are needed to contribute to the activities. The actors linked to the active network are those who are performing and contributing to the activities. The active network is smaller than the passive one, because only few actors are performing activities at a time. The links of an actor may change from passive to active network when it starts performing and contributing to the activities, or vice versa. Therefore, each organizational actor has a link to both passive and active network.

The organizational actors of the network are performing a network role which depends on their position among the other actors of the network. Their position in turn, depends on their resources and chances to contribute to the innovative activities. There are three kinds of roles that an actor can perform: group member, bridge and orchestrator. These roles may occur in both active and passive network, and they may change in the course of the process. It is noteworthy that these roles do not need to be performed by only one organizational actor, but there can be several actors that for example are orchestrating the network. Furthermore, the organizational actors do not need to perform only one role as they can be the leader of the network while connecting actors and specializing in a certain task thus performing all three network roles simultaneously.

The organizational actors consist of individuals who ultimately are the source of any activity. As the activities are performed by the active part of the network, the individuals of those actors also belong to it. Thus, each active organizational actor has four individual roles to overcome barriers to innovation: power promotor, expert promotor, process promotor, and relationship promotor. These promotors work together to contribute to the activities that are carried out to come up with a new innovation. A person may have more than one role and each role may be performed by more than one persons.

The activities that are carried out by the actors are related to product development, contracting and evaluating. Product development may involve different innovation features of which the most important are its degree of novelty i.e. incremental or radical, and whether the innovation originates from real market needs or technology push. Also the process of product development can be very differently planned depending on the company. However, most companies apply activity-stage models that consider the

process to comprise various steps to be taken. The steps at the initial phase are definition of strategic direction, environmental scanning, opportunity identification, and idea generation. The purpose of such activity-stage models is to apply order into sometimes very complex processes.

There are many ways to communicate with other actors during open innovation process. Email, telephone, Internet and other similar techniques can be effective especially if the participants of the network are geographically distributed. Today's technology is a great facilitator of knowledge transfers, but it also implies some considerable challenges. Thus, for example various experiments and demonstrations require physical meetings to ensure mutual understanding of the process.

Contract related activities are considered very difficult. As showed in the section dealing with contracting, there has been much debate about in what order and to what extent the activities should be carried out. However, at least it is usual for the conclusions of earlier research that the initial phase of the contracting process includes two stages, of which the first is initial discussion about the intentions, expectations and objectives of the collaborating partners. Different contracts at this point may include letter of intent or memorandum of understanding. Yet, it was pointed out that a contract of one page covering the parties' main objectives of their IPR strategy would be compiled. The purpose of that is to get to know to each other and to avoid spending too much valuable time for negotiating contracts that may prove to be useless due to unrealized outcomes of the collaboration. The level of mutual trust may not be established at this point yet, but it can be increased by sharing sensitive information and showing commitment to the collaboration.

The second stage at the initial contracting phase is a detailed discussion and more formal contract. The scope and governance of the collaboration as well as the sharing of IPR are all defined more accurately. These negotiations are time-consuming and the lawyers are involved in the process at this point. Mutual trust and understanding increase through collaborative efforts.

The third type of activity is illustrated on the right side in the model. Open innovation in collaborative networks includes evaluations considering the time before, during and after the project. Firstly, collaboration requires reciprocal assessments to ensure effective partner selection. These assessments can be carried out knowing or without knowing the common project for which the potential partners intend to collaborate. Partner compatibility is seen as one of the most important determinant in partner selection. It may refer for example to strategic and cultural fit of the partners. Compatibility does not necessarily mean similarity for example in resources but complementarity. In this way the partners complement each other's competencies and are able to create synergies by collaborating. Synergies in turn, can lead to outstanding outcomes and improvement in both partners' performance. Successful outcomes are referred to as oppor-

tunities before the actual collaboration takes place. Besides opportunities, collaboration also involves risks that need to be carefully evaluated before partnering.

There is at least one evaluation that should be done during the initial phase of open innovation process; idea evaluation. However, idea evaluation is outside the scope of this research as the empirical research data of this study did not include this activity. It is included in the model though, because it is usually done in conjunction with idea generation.

Post-project review is an evaluation carried out after a project or a phase to facilitate organizational learning. All the activities and their success factors and main challenges are taken into consideration. Open discussion takes place among the participants and lessons learned are established. Lessons learned should be entered into a database available for other teams and projects in the future to prevent the same mistakes made and solved already by other teams.

4 RESEARCH DESIGN

Conducting a research requires making choices between qualitative and quantitative approaches as well as among various research strategies and ways of data collection and analysis. If this decision making is done systematically the choices will lead to better results and verified conclusions. Thus, a scientific approach in solving any research problem is a systematic way to enhance quality of decisions that are based on common sense. (Ghuri, Gronhaug & Kristianslund 1995, 2, 6.) These decisions and choices made for the purpose of this study are presented in this chapter.

4.1 Research approach

There has been a great debate for years between qualitative and quantitative methods in scientific research. Even though quantitative methods have been considered better structured and thus more scientific (e.g. Berg 2004, 2), both quantitative and qualitative approaches are tools of which the utilities depend on the research questions asked. While qualitative approach attempts to answer questions such as how, why, and what kind of, quantitative approach attempts to find answers to questions that refer to the quantity of something for example how much, or how large. (Kvale 1996, 67–69.) Typical studies that require qualitative research approach are research problems focusing on understanding and uncovering a person's experience or behavior, or a phenomenon about which very little is known (Ghuri et al. 1995, 85).

The importance of qualitative research stems from the fact that it enables the researcher the opportunity to focus on the complexity of business related phenomena in their specific contexts and create new knowledge regarding the phenomenon. Qualitative business research is able to provide a critical and reflexive view about the social world of business and its core processes. (Eriksson & Kovalainen 2008, 3.) The fundamental starting point in qualitative research is the illustration of real-life events and as holistically executed research of the target as possible. *Qualitative approach was considered appropriate for this study, because the purpose of this research is to understand how companies pursue open innovation at the initial phase in collaborative networks.* It allows for a more flexible and comprehensive way of studying and describing the phenomenon as well as gaining understanding of complex dynamics of the topic. (Hirsjärvi, Remes & Sajavaara 2001, 152; Stake 1995, 37.)

A research can be divided in three different categories according to the purpose: exploratory, descriptive and explanatory. Exploratory research implies that the focus of the study initially is broad since the researcher is mapping the phenomenon prior to the concentration on a narrower research problem. The purpose of the study may change

over time as the researcher discovers unexpected issues and new characteristics of the object. It is a flexible way to conduct a study, but the researcher must be willing to change direction if new information emerges. (Saunders, Lewis & Thornhill 2007, 133.) *This study can be considered exploratory since the initial phase of the research indeed involved mapping the phenomenon and the research problem evolved in the course of the research process.*

According to its name, descriptive studies attempt to describe phenomena and processes for example what happens when a new product is developed and commercialized. However, a description as such should not be seen as a result, but the researcher aims to go beyond describing by evaluating the collected data and by synthesizing it. Thus, descriptive studies always include analysis and interpretation. (Gummesson 2000, 85; Saunders et al. 2007, 134.) *This study also aims to describe the chosen phenomenon by interpreting the data through systematic analysis.*

The purpose of explanatory studies in turn is to detect causal relationships between variables often by quantifying the collected data and subject it to statistical tests such as correlation. The study may also approach the research problem with qualitative data analysis while the research question thus often asks why. (Yin 2003, 6, 15; Saunders et al. 2007, 134.) This study approaches the research problem by applying qualitative methods thereby attempting to gain understanding by exploring and describing the phenomenon. Thus, systematic detection of causal relationships is not regarded as an objective of this research, although the analysis of the empirical data often seeks to explain why something happened.

The purpose of this research implies that obtaining comprehensive understanding of the phenomenon is the underlying motive for this research. In order to understand the phenomenon it needs to be explored. Thus, the researched phenomenon of this thesis needs to be studied through an appropriate method, which was decided to be a case study. A case study focuses on contemporary phenomena that take place in real-life context and of which the boundaries between phenomenon and context are not clearly evident (Yin 2003, 13). In fact, a case study is a research strategy highlighting the importance of understanding the dynamics present within a single setting (Eisenhardt 1989, 534).

Case study strategy can be considered appropriate when the research question is how, what or why to which this it has a remarkable ability to generate answers (Saunders, Lewis & Thornhill 2007, 139). Moreover, case study enables the researcher to gather comprehensive and intensive information on one specific case, and the objective is usually to describe the phenomenon. *The empirical research of this study is exploratory and descriptive in nature and thus case study strategy is a reasonable choice, as the main purpose of the study is to gain understanding of a phenomenon that is previously not well-known.* (cf. Hirsjärvi et al. 2001, 123, 128.) Berg (2004, 251) states that by ap-

plying case study strategy the researcher is also able to detect nuances, patterns and latent elements that other methods might fail to detect. This further improves the chances of this research to gain better understanding.

Case studies can be further classified into three types: intrinsic, instrumental, and collective. Intrinsic case study is carried out when the focus of the research is put on understanding a particular case. This type of case study is undertaken when the uniqueness of the case makes it interesting and it illustrates particular characteristics or problems. Thus, the case does not represent other cases, and it does not attempt to contribute to the existing theory within the context of the phenomenon as is the case when instrumental approach is applied. Instrumental case study aims to assist the researcher with help of a case to gain more understanding on another research or wider phenomenon, which makes the importance of the studied case secondary. It is noted that the line between intrinsic and instrumental case studies is somewhat blurred since researchers often have multiple interests. Collective case study is a research that applies an extensive study of several instrumental cases aiming to increase understanding of a broader context. (Stake 1995, 3–4.) *This research is considered an intrinsic case study as the interest lies on a single case and its complexity and uniqueness occurring in its specific context.* This study does not use the case as an instrument for other purposes and is thus neither instrumental nor collective case study.

Conducting a case study is often understood as collecting data from one or more cases. This is a crucial stage for any successful research and has to be prepared well to be able to gather relevant information. (Yin 2003, 57.) The following section describes what data was collected for the purpose of this research and how it was collected.

4.2 Collecting the data

Case study research consists of detailed investigation, often with data gathered over a period of time, of one or more organizations, or groups within organizations, with a view providing an analysis of the context and processes involved in the phenomenon under study (Hartley 1994, 208–209).

There are several ways for collecting research data. Ideally simultaneous use of different types of sources may provide a more complete picture of the research problem. Such use of different theories, methods or sources of data and exploration of the phenomenon from different positions and perspectives is called triangulation. (Eskola & Suoranta 1998, 69.) The data gathering of this study was executed in three parts. *The basis for the empirical data collection was constituted through academic literature review consisting mainly of innovation management and open innovation related theories as well as network and collaboration theories.* The literature review accomplishes sev-

eral purposes in a research. It provides for example an insight on the results of previous studies closely related to the one being reported. Moreover, it provides a framework for establishing the significance of the respective study as well as benchmarking for comparing the results with previous research findings. (Creswell 2003, 29–30.) *The empirical data itself was gathered partly by observing four workshops carried out during the case, and partly through 12 interviews that were conducted after the case was terminated.* The interview questions were based on the literature reviews and workshops in order to obtain as much diverse information from various perspectives as possible and to avoid overlaps. In this way, it was possible to observe common proceeding of the case and later ask the opinions and views of the participants (cf. Eriksson & Kovalainen 2008, 87). The results of the research are thus based partly on the workshops and partly on the interviews.

The greatest benefit of observation is that diverse, immediate and direct information can be obtained about the activities of individuals, groups and organizations. It enables the research to be conducted in the natural environment. (Hirsjärvi et al. 2001, 200.) Although observation can cover several areas, it is recommended that only a few features are observed at a time to ensure systematic gathering of data (Flick 2002, 140). Thus, the researcher has to decide what will be observed. There are many features that can be observed among others objects, actors, acts, activities, time, goals, and emotions. (Bailey 2007, 84.) *The features observed in the workshops for the purpose of this research were actors, activities, and goals.* Actors are those who were present in the workshops. Since the workshops were carried out over the Internet, the actors were not observed in terms of their gestures, facial expression, moves or presence, but speaking. Their speaking was linked to their own case-specific tasks and the activities carried out by the whole group, and the goals that were tried to be accomplished. In short, *the purpose of the observation was to understand the actions taken by the actors for accomplishing the goals.*

The role of the observer can be divided in four categories according to two dimensions. The roles are complete participant, complete observer, observer as participant, and participant as observer, while the two dimensions are activity and identity. A typology of these roles and dimensions are illustrated in Figure 8.

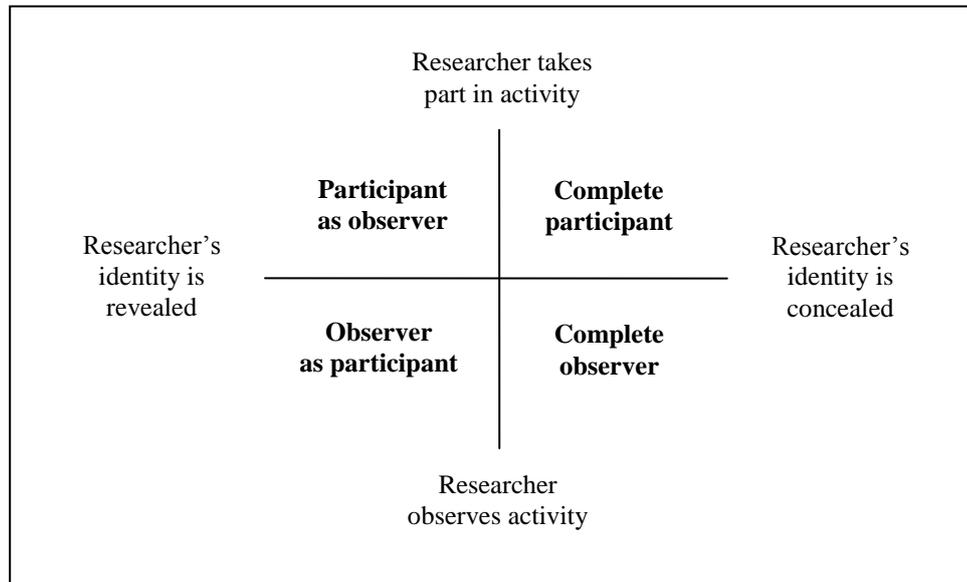


Figure 8 Typology of participant observation researcher roles (Saunders et al. 2007, 286)

When the researcher's role is *complete participant*, he observes his objects by taking part in the activities without revealing his identity. This kind of research can take place for example in a working community where the researcher observes employees. The role of *complete observer* in turn, is performed by a researcher who does neither take part in the activities nor reveals his identity. In this way, he is able to observe consumers for example at the checkout of a supermarket. When the researcher reveals his identity and participates in the activities, his role is *participant as observer*. Researching the daily work of policemen is an example of a research that may require this role. Finally, the researcher performs the role of an *observer as participant*, if he reveals his purpose but does not take part in the activities in the same way as the objects do. (Saunders et al. 2007, 286–288.)

The observation conducted for this research was based on the researcher's role as observer as participant. The aim was to obtain understanding of the activities that the case companies carry out as they would in a normal business case without researchers. Therefore, the role of the researcher of this study was to listen and observe as well as to make field notes and try to understand the phenomenon instead of trying to contribute to the open innovation process. As there were also other researchers present in the workshops, the researcher of this study was among them and not performing any additional roles. The other researchers seemed to be more active in trying to contribute to the process. Consequently, they were performing the role of participant as observer.

Interview as a method to gather data is very flexible, direct, and interactive. This implies that interviews can cover all issues and they also allow gathering of information that is not included in the theoretical framework. Interviews can be divided into four

categories according to their nature: they can be structured, open unstructured, semi-structured or theme interviews. (Ghauri et al. 1995, 64–65; Eskola & Suoranta 1998, 87.) Theme interviews seemed to be the most appropriate type for this research. In this type of interviews the main areas of interest are organized in themes which are set before the interviews, but the formation or their sequence may be freely decided during the interview. (Hirsjärvi et al. 2001, 195.) As finding unexpected issues about the case relationship was one of the main aims, structured and semi-structured interviews did not seem to follow the required freedom and flexibility (cf. Eskola & Suoranta 1998, 87). This requires a great ability from the interviewer to maintain control and coordinate the discussion. These challenges were recognized in advance by preparing a list of the main themes and their sub themes based on the theoretical framework and the workshops.

The interviews were theme interviews and only open questions were asked to obtain meaningful answers. The goal of a qualitative interview is to understand the research topic from the perspective of the interviewee and to understand how and why the interviewee has this particular perspective (King 1994, 14). Hence, the interviewees were encouraged to give wide-ranging answers based on their knowledge and experience. As it was important to obtain subjective information about the actors and roles, product development, contracting and evaluating, majority of the questions was not designed to be too specific in order to leave room for unexpected information to emerge. *In addition to the workshops, 12 key persons of the case were interviewed; one from PBI, two from VTT, four from Company X, and five from Company Y.* The interviewees are illustrated in Table 2.

Table 2 The interviewees

Field of work	Company X	Company Y	VTT	PBI
Research			2 x	x
R&D	x	x		
Business development	x	x		
Engineering	x	2 x		
Legal matters	x	x		

In selecting the interviewees it has to be taken into consideration that the people who happen to be involved in the case at the same time as the researcher are not necessarily the best source of data. The best interviewees are people able to help the researcher to understand the case. (Stake 1995, 56.) *Selection of the interviewees in this study was based on the key persons' workshop participation and the recommendations of the contact persons at the case companies.* The starting point is that the people involved in the

case have sufficient knowledge and experience and are thus able to contribute to the research. They should have the possibility to discuss the relevant aspects and dependencies, but they must also have the possibility to bring their own insight into play. Only one of the interviews was conducted in the interviewee's second language, which was English, while 11 interviewees were carried out in the interviewees' mother language, which was Finnish. This facilitated the sharing of their insights as expressions tend to be simpler and communication more straightforward when the interviewee has to rely on a second language (Ghauri 2004, 113). However, the one who had to speak his second language was an experienced and competent English speaker due to his educational background.

It was of a great advantage that so many key persons with different perspectives were interviewed, because a great amount of valuable and versatile information was obtained. Eskola and Suoranta (1998, 60) state that there is no one truth about the amount of the data that has to be gathered for a research, but that it depends on the context and the research problem. Saturation refers to the sufficiency of the collected data, and it has reached its full dimension when the interviewees' answers get repetitive and do not generate any additional value (Hirsjärvi et al. 2001, 169). In this study the 12 interviews enabled the researcher to perceive differences among the involved persons and their opinions. *It was important to interview several participants since they were all performing a specific role and different kinds of activities* as will be shown in the case analysis. It was also important to interview people from both case companies as well as from the research institutes to ensure a wide-ranging perspective of the research data.

Most cases include some kinds of documents, reports, memos of meetings, newspapers, and the like. These should be studied by pursuing the same logic than with observations and interviews. (Stake 1995, 68.) Some presentations were given during the workshops of the researched case where PowerPoint slides were shared on each participant's computer screen. The presentations mostly included project plans, initial definitions of roles, motives for collaboration and so forth. They offered interesting yet very little information since the slides were usually the same from workshop to workshop, as the purpose was to complement them in the course of the open innovation process.

Both the workshops and interviews, excluding the first workshop, were tape recorded with the consent of each participant. Also field notes were made during the workshops and interviews to write down the essential of the answers in case the tape recorder failed due to malfunction or poor sound quality. It was planned that the interviews would be conducted quickly after the last workshop so that the interviewees could remember the case as well as possible. Hence, 11 of the interviews were carried out within two weeks after the last common workshop, while the last interview was postponed four weeks ahead by the interviewee due to other liabilities.

As qualitative research takes place in the natural setting the qualitative researcher often gathers the data directly at the site, home, or office of the participant to carry out the research (Creswell 2003, 181). Also in this research the interviews took place in the interviewees' offices or meeting rooms where it was quiet and tranquil enough. The offices were located in different cities in Southern Finland so it was relatively costly and time-consuming to carry out the interviews (cf. Hirsjärvi et al. 2001, 193). Nevertheless, the interview circumstances were comfortable and pleasant and therefore all interviews were conducted with no trouble.

Tape recording helps the researcher to concentrate on the interview discussion and to find and elaborate unexpected issues. Tape recording did not seem to disturb or surprise the interviewees. Trust between the interviewer and interviewees was considered essential regarding the effectiveness of the interviews, since the situation ultimately is a social and interactive event (cf. Hart 1991, 196; Eskola & Suoranta 1998, 94). Also being present in the workshops and being part of a research institute that participated in the case seemed to increase the level of trust and create a mutually cooperative atmosphere between the researcher and the interviewed persons. It was also noted that the interviewer should not lead the interviewee to make preformatted or wanted assumptions (Hart 1991, 194). Instead, the role of the interviewer was rather to open the discussion to find out necessary pieces of information and to detect possibly unexpected nuances.

As mentioned earlier, data triangulation means that different sources of empirical data are utilized. The main advantage of triangulation is that it provides the researcher with a more complete, holistic and contextual picture of the researched phenomenon, which in turn enables the researcher to gain better understanding of the object (Ghauri et al. 1995, 94). Furthermore, the research findings and conclusions made by the researcher can be considered much more convincing and accurate if the data has been collected from several sources of information (Yin 2003, 99). However, there has to be a carefully defined role and purpose for the data collected from different sources to ensure that the information can be linked to theory and that the information is relevant for the purpose of the research. Operationalization means that each concept has two definitions: theoretical definition, which connects the concept to other concepts, and operational definition, which connects the concept to concrete perception of reality (Eskola & Suoranta 1998, 75). The link between theory and the empirical data of this study is presented in Table 3.

Table 3 Operationalization table

RESEARCH PROBLEM	SUB QUESTIONS	THEORETICAL FRAMEWORK	PRIMARY DATA / SECONDARY DATA
How do companies pursue open innovation at the initial phase in collaborative networks?	What <i>actors and roles</i> does the initial phase of open innovation in collaborative networks involve?	Innovation partners Network positions and roles of the organizations Promotor theory	I / Workshops II / Workshops III / Workshops
	How do companies deal with <i>product development</i> at the initial phase of open innovation in collaborative networks?	Innovation features Process Communication	Workshops / IV Workshops / V Workshops / VI
	How do companies deal with <i>contracting</i> at the initial phase of open innovation in collaborative networks?	Trust and commitment Contracts and IPR issues	VII / Workshops VIII / Workshops
	How do companies deal with <i>evaluating</i> at the initial phase of open innovation in collaborative networks?	Collaboration potential assessment Post-project review	Workshops / IX Workshops

The research problem is presented on the left side of the table. The column next to it comprises the sub questions that are considered items of the research problem and through which the research problem can be solved. The third column from left shows

the theories emphasized for each sub question. Finally, the column on the right side links the empirical data through theory to the sub questions and thus to the research problem. The data is illustrated as primary and secondary data deriving from either the interview themes or workshops, which indicates the role and importance of them in solving the respective sub question. Yet, it has to be noted that no sub question could have been solved by using only one of the sources of data, which were workshop meetings and theme interviews. Both data complemented each other. For example if the workshops, which were organized during the case i.e. before the interviews, provided sufficient information for being able to understand the sequence and nature of the activities, the interview questions were planned to acquire information more about the opinions and insights of the participants. This was the case for example in the last sub question that deals with evaluating. On the contrary, if the workshops did not offer direct or comprehensive information on a theme, the interview questions were planned so that the required information could be obtained. This was the case for example in the first sub question dealing with actors and roles. In turn, interview data was not collected for post-project review at all, because the workshops provided sufficiently information. The themes and questions of the interviews are listed in Appendix 1.

4.3 Analyzing the data

The purpose of data analysis in qualitative research is to clarify the research material and to provide new information about the phenomenon in question. Through the analysis data is compressed into a meaningful package without losing its precious informational value. (Eskola & Suoranta 1998, 138.)

A qualitative analysis consists of three parallel flows of activity, which were followed also in this research: data reduction, data display, and conclusion drawing and verification. Data reduction refers to the selection, simplification, abstraction and transformation of data appearing from the field notes or transcriptions. It is a continuous process that takes place throughout the research until the final report is completed. In turn, data display is an organized, compacted assembly of information that enables conclusion drawing and verification, which is the final stage of the analysis. (Miles & Huberman 1994, 10–11.) Development of data displays can be considered a component of the analysis process rather than a step to take (Berg 2004, 39). The analysis of this study was carried out with focus on both the workshops and the interviews (cf. Hart 1991, 198–199). Both sources of data included valuable information for solving the research problem. For two of the sub questions the workshops were regarded as primary data, and for the other two sub questions the interviews contained more relevant information. Thus, this was also taken into account in the analysis.

There are several ways to conduct data reduction of qualitative research data. It can be analyzed through quantification, through organization by themes, through classification by type and content, or through analysis of either the discourse or the conversation. Organization of the gathered data into themes enables selection of features that provide insight to the research questions. The objective of the data division is to detect latent conformities that may be of a great significance for the purpose of the research. (Eskola & Suoranta 1998, 161, 175–176.) The data division is referred to as thematic coding or thematization, and it may bring forward important underlying factors specific to the context (Miles & Huberman 1994, 131–133). In this research the data obtained through workshops and interviews was organized by themes.

The workshops were not too fast-paced thus enabling the researcher to take accurate field notes while listening and following the discussion. However, field notes may easily miss out relevant information. The workshops were thus recorded which enabled the researcher to repetitively return to a certain moment in the discussion to make sure that the conversation and speaking were correctly understood. (cf. Eriksson & Kovalainen 2008, 85.) In this manner the field notes were afterwards complemented with any relevant information, which made the field notes sufficient for further analysis. As mentioned earlier, the observation in the workshops was systematically conducted as the actors, activities and goals were the features to be observed (cf. Flick 2002, 140; Creswell 2007, 84). The relation among these features was considered so that the actors are present in the meetings and speak, which leads to certain activities to be carried out in order to achieve individual and common goals. This thinking goes hand in hand with the research problem as the goal is open innovation in collaborative networks, and the activities are product development, contracting and evaluating, which in turn are performed by the actors.

The preliminary schedule and project plan, agendas for upcoming workshops as well as presentations on the case product were illustrated on the screen during the workshops. They were also possible to be reviewed as they were saved in the memory. Consequently, the workshop discussions contained pieces of information that were put under the respective themes developed in accordance with the sub questions and theory. Thus, it was possible to collect data directly addressed to the sub questions and to observe after each workshop how much and what kind of data a theme already comprised. This enabled an accurate collecting and organizing of the entire research data of the case study and detection of the most central issues for the purpose of this research. (cf. Yin 2003, 111–112.) Also one new theme relevant for the research problem emerged through the workshops. In turn, one theme was removed since the case was terminated and hence did not provide any information on that theme. *Thus, analysis was carried out throughout the research process while simultaneously collecting new data.*

The interview data was first transcribed as a whole and then organized according to the developed themes for closer analysis. The interviews did not generate any new themes as they were strongly addressed to complement the themes based on theory and the workshops. Yet, some of the themes were considered so closely related that they were combined.

The data was analyzed also by examining the differences among the interviewees according to their company and field of work. The thematization allowed for a constant reflection of the results to the theory, which enabled discussion between these two in conclusion making and subsequent solving of the research problem. The data from different sources was relatively easy to control, since the organized data from the interviews was fitted together under the same themes with the data obtained through the workshops (cf. Eriksson & Kovalainen 2008, 129). This enabled effective working and relatively quick detection of central issues of the case. However, it is strongly recommended that this kind of thematization of data is repeated more than once to ensure sufficient systematic approach in the analysis (Eskola & Suoranta 1998, 152). Therefore, *the research data was read and thematized several times* and more clearly displayed before moving on to its interpretation and thus conclusion drawing and verification.

Interpretation means that the researcher ponders the results of the analysis and makes his own conclusions (Hirsjärvi et al. 2001, 211). As the quantitative researcher seeks repetitive instances expecting that relevant meanings will emerge from the aggregate, the qualitative researcher focuses on the instance trying to pull it apart and put it back together again for a more meaningful analysis and synthesis in direct interpretation. The more time the researcher devotes to formal aggregation of categorized data, the more likely he is to perceive specific features and make context related findings from the case. Consequently, the researcher is advised to dedicate more time for direct interpretation. Hence, when interest in generalizing from one case to a larger population is clearly secondary, formal aggregation of categorical data is likely to be overshadowed by direct interpretation. (Kvale 1996, 75–77.) Therefore, *after the research data gathered from workshops and interviews was organized by themes and abstracted for more precise display, the data was subjected to direct interpretation. Direct interpretation was conducted by comparing the developed themes to the theoretical framework of the study.* In this way it was possible to solve the research sub questions and thus the research problem itself.

Before presenting the research results and conclusions the researcher should evaluate the quality of the research. This is closely related to conclusion verification. There are several different methods for this of which validity and reliability are used in this thesis. These are evaluated in the following section.

4.4 Validity and reliability of the study

Generally applied tests for establishing the quality of any empirical research are construct validity, internal validity, external validity, and reliability. The concept of validity is considered the same in both quantitative and qualitative research. However, in quantitative research validity focuses on methods whereas the emphasis in qualitative research is on the validity interpretations. (Miles & Huberman 1994, 11.)

Validity refers to whether the researcher is studying what he is supposed to be studying (McKinnon 1988, 36). This can be tested from three different perspectives: construct validity, internal validity, and external validity. Firstly, construct validity can be gained by establishing correct operational measures for the concepts being studied. Secondly, internal validity refers to establishment of causal relationships in which certain phenomena are shown to lead to other phenomena. This perspective is applicable only to explanatory or causal case studies. Third, external validity can be accomplished through successful generalization of the research findings. (Yin 2003, 34–37.)

Internal validity of this study cannot be tested as this is neither explanatory nor causal study. Furthermore, a major problem for case studies is that they cannot be generalized to other populations, since they are based on a specific set of variables in a specific environmental context. This inhibits the tests related to external validity. However, it is possible to make analytical generalizations i.e. generalizations to theoretical propositions based on case studies. In other words, the theoretical framework of a research can be compared to the empirical results of the case study to be able to make analytical generalizations. While internal and external validity of this research are near to impossible to test, construct validity is an appropriate way to examine validity of this study. It can be improved at least in three different ways: by using multiple sources of evidence, by establishing chain of evidence, and by having the draft case study report reviewed by the key informants. (ibid. 32–36.)

It may be very difficult to describe the studied case extensively by using only one source of evidence (Eskola & Suoranta 1998, 69). Research data collected from several sources of evidence can be compared to see whether they support one another (Silverman 2001, 233). Thus, *construct validity of this study was enhanced through data triangulation by collecting the research data from four workshops and 12 interviews*. Even though the purpose of the data triangulation was not to check whether the information from different sources match to each other, it was observed that the data included overlaps that were corroborating each other.

The workshops and interviews were recorded and saved which permitted the verification of the data throughout the analyzing process. Anxiety and nervousness provoked in the respondent is a disadvantage of recording an interview, since the interviewee may then be more careful with the answers (Hart 1991, 196). However, many of the inter-

viewees had much experience of speaking in public, and some of them were even experienced interviewers themselves. Furthermore, all respondents were open-minded towards recording, as it was emphasized that the tapes are in exclusive use of the researcher. *Consequently, chain of evidence was established through tape recording of the workshops and interviews and transcription of the interviews and thus construct validity of the research was improved* (cf. Yin 2003, 34).

Construct validity can also be improved by having the draft case study report reviewed by the key informants. This means that the research findings are taken back to the studied objects, which were in this case the key persons involved in the research process. This method can also be called respondent validation (Silverman 2000, 233) and it was also used to enhance construct validity of this study. *The key informants read the thesis and focused especially on the case study analysis to verify whether the description is in line with reality.*

The validity of the instruments measuring the open innovation actors in this research has at least one additional enhancing factor. This research is based on two data sources namely workshops and interviews. Furthermore, managers with different perspectives were interviewed, which also improves validity. Yet, also few managers in this research can be referred to as elites in literature, and there have been various concerns about validity and reliability of the data collected from elite sources due to indications that there are problems regarding the openness of elite interview subjects (Welch, Marschan-Piekkari, Penttinen & Tahvanainen 2002, 613–614). Nevertheless, the interviews did not include strategy-specific but questions related to the case and actors. The problem of openness may have arisen here since some of the interview questions required answers containing information about other organizational and individual actors. Hence, people do not want to tell everything they think about other actors, in particular if they are negative things. Although only very little, this kind of prudence was sensed among few interviewees. This may have influenced the quality of the respondents' answers.

Reliability indicates whether the researcher can rely on the data he collects (McKinnon 1988, 36). Reliability represents the operational actions of the research such as the research data collection procedures and whether the research can be repeated with the same results (Yin 2003, 34). Total objectivity is challenging to obtain in qualitative research, because a relationship is established between the interviewer and the interviewee. It implies that the interviewer always sees the situation and the interviewees from a subjective view. This may be crucial to the research results. (King 1994, 30.) The conceptions of objectivity can take at least three forms: freedom of bias, inter-subjective knowledge, and reflecting the nature of the object. Objectivity as freedom of bias means reliable knowledge that is reviewed and controlled, free from personal bias and prejudice. *The freedom of bias has been ensured not only through careful preparations before the research data was collected but also through qualitative methods in data analy-*

sis. Inter-subjective knowledge refers to repeated observations of the same phenomenon by different observers resulting in the same data. *The research is also inter-subjectively testable since it is based on workshops and various interviews from the perspectives of the case companies as well as the research institutes.* Third, reflecting the nature of the object means reaching objectivity by letting the object speak, being adequate to the object investigated and expressing the real nature of the object studied. (Kvale 1996, 64–65.) *The data is reflecting the nature of the object due to the fact that the interviewees were encouraged to speak freely about the researched phenomenon (cf. ibid., 158).*

Accurate description of the research methods used increases reliability of the research (Hirsijärvi et al. 2001, 214). Furthermore, the purpose of the study was adequately answered with the research methods that were utilized. It should be possible to obtain the same research results if another researcher carried out the study again. In fact, it should be even probable that the same results would be obtained. Hence, this study should reach a good level of reliability and repeatability.

5 CASE STUDY ANALYSIS

This chapter deals with a case study of two large Finnish industrial companies collaborating for product development and development of management practices for open innovation. The case was a part of a nationwide project, Innovation in Network Collaboration (INC), which was started in 2009 and will last approximately three years. The INC project includes company cases for pilot implementation and is a part of the innovation program of the Finnish Metals and Engineering Competence Cluster (FIMECC). After the introductory section actors and roles as well as activities related to product development, contracting and evaluating are analyzed. The last section summarizes the analysis by presenting the main research findings of the study.

5.1 Introduction

The case companies participated in the INC project as both saw a chance for development of their innovation management methods as well as for learning to collaborate. They were thinking in the same way about future that more open collaboration is required and such open services should be utilized. A real business case was set up to foster the learning experience. In this way it was possible to start from a scratch and to practice the creation and implementation of such a case and network. This enabled the organizations and individuals to perform certain roles and to perceive how such collaboration for innovation actually works. The case itself was started in early 2010, but the first common workshop took place a couple of months later in April. Due to various reasons the case was terminated four months after the first common workshop. These reasons will be clarified in the next sections.

The case companies are operating in different industries, however, both of them deal with metals. The other manufactures and supplies metals while the other uses metals in its products. The companies had an established business relationship on a company level, but the people involved in the case had not had previous collaboration with each other. In this case one of the companies had a product for which it desired to find a new technological solution in terms of better materials, structural changes, or more efficient manufacturing process. Hence, the product could be faster and easier to manufacture, lighter, more durable, and thus cheaper. Hence, the end customer would prefer the new solution to those offered by competitors. The product owner, *Company X (X)*, is a publicly listed multinational corporation headquartered in Finland. It operates in business-to-business market and is broadly regarded as the leading company in the respective industry. The company has almost 10,000 employees worldwide. The other company, *Company Y (Y)*, was willing to offer its technologies and know-how for solving the

problem. It has over 10,000 employees operating in over 20 countries. Most of its business takes place in business-to-business market and its recently revised strategy is to become from a static manufacturer to a dynamic solution provider through close collaboration in particular with customers. The company is also traded on the stock exchange and its headquarter is located in Finland.

Since the primary objective of the INC project was to learn about and to study how to collaborate for innovation, the case also involved two research-oriented organizations; Technical Research Centre of Finland (VTT) and Research Institute for Project Based Industry (PBI). VTT is globally networked research centre that provides innovation services and new technological solutions for its clients (VTT 2010). PBI in turn, aspires to create new value-adding knowledge in collaboration with industry and implement it into practice in project-based business (PBI 2010). The main objective of VTT and PBI in this case was to conduct collaborative research and to create applied tools for innovation management while also performing the roles of facilitator and assistant.

The underlying strategic arguments for collaboration for both case companies were quite clear; to learn. The major common objective was to learn to pursue open innovation and see how it works in the respective context. This objective also implies other learning related aspects such as collaborating in networks, knowing each other, and knowing each other's business. A co-creation method was discussed in the first workshop, where it was noted that the focus is not to improve a single stand-alone product, but to learn how to continuously create new concepts through collaboration. The case companies also had own individual strategy-specific objective. *Company Y* attempted to pursue business growth by getting access to new markets. In turn, the objective of *Company X* was to develop a close partner relationship with a competent solution provider that would be able to make contributions to its offerings.

The business case that was set up enabled all participants to pursue operational objectives as well. They were to a great extent also learning related. First of all, the companies wanted to learn to deal with contracts and IPR in an open collaboration context where there is no predictable output or solution. Another operational objective was to learn to master the practical processes of open innovation and product development. Third objective was, as already mentioned, that VTT would develop an assessment tool, which the companies wanted to learn to implement and use in evaluating potential of the collaborative relationship. Finally, as today's technology enables more efficient communication methods compared to the traditional ones, the companies decided to carry out the workshops by utilizing an Internet-based technology, which allows participants to speak, listen, and see presentations regardless of where they are as long as they have a computer and an Internet connection.

The amount of the interviewees' experience from similar projects varied to some extent. No one said to have been involved in exact similar project but some had much experience from collaborative R&D activities, while some had only a little bit of collaboration experience with other companies. Also the expectations from the project among the actors varied to a great extent, even among employees from the same company. This can be explained though since the employees were involved in the project at different stages. In addition, the expectations were to a great extent in line with the employees' own role, responsibilities and position within their company. However, a remarkable difference regarding expectations was perceived as the case proceeded. The reasons are analyzed in the following sections.

5.2 Actors of the collaborative network

The case involved various actors and roles of which some directly and some indirectly. This section discusses roles and contribution of the organizational as well as individual actors. Although this research focuses on the initial phase of open innovation, there were several actors and roles involved already and the later stages would have involved many more.

5.2.1 Organizations

The two initiating case companies had been discussing about this opportunity to practice and develop something from a new perspective. They had had some informal meetings within various research projects, which ultimately led to collaboration also fostered by the two research institutes. However, the initiative came from PBI rather than from the companies. A common project within the FIMECC program can thus be seen here as a crucial factor behind the collaboration.

The four organizations that formed the core network in this case were all participating in the INC project. Hence, they had had some discussions considering a collaborative innovation case during various meetings and presentations. However, there were several other companies as well and it was not clear at all that there would be a business case set up between *Company X* and *Company Y*. The R&D director at *Company X* was thus asked whether they would be interested to innovate with *Company Y*. The R&D director (*X*) indicated:

"I was given some presentations about the project and I thought we have the capacity and needs that we can go for it since also the costs of it were minimal."

As indicated by the R&D director (*X*) the costs were minimal, because the companies already participated in the FIMECC's program. Moreover, the costs were minimal compared to the opportunities that the case would present. Hence, the companies did not have to worry about the financing, but they were able to focus on learning and generating something new. It was decided that a collaborative innovation case would take place between the case companies simultaneously facilitated and studied by the research institutes as also VTT immediately joined the case. Consequently, the case challenge was suggested by *Company X* and taken up by *Company Y*.

Although the organizational roles were neither officially nor accurately defined, *Company X* was considered in this case the customer of *Company Y*. Thus, *Company Y* can be described as the supplier of a solution or component. However, *Company X* is not the end customer as it supplies its products to ship building companies and ship yards. As the closest supplier to the end customer in the value chain of this product, *Company X* can be thought of as the leader of the network. Nevertheless, leadership cannot be defined in only one way since it can be something for example in terms of process or content. These are different approaches, which do not have to be managed by the same organization or individual. This case also proves it. *Company X* namely gave the assignment for *Company Y* according to the anticipated needs of its own customers. Hence, it was obvious that *Company X* would determine the content of the case, at least at the case level. The product had to fulfill its purpose and enhance the performance of the end customer. Thus, the product had to be planned in accordance with that. The chief research scientist of VTT observed:

"They [Company X] were kind of in a leading role but I think they performed the role very well in the sense that they didn't control the case actively but acted as an equal partner in search for innovative solutions."

As a result, *Company X* was regarded as the leading organization of the case yet without an active role in controlling other issues besides the content. On the other hand, *Company X* would not have been able to control the whole case as it was the principal and in that sense just assigned *Company Y* to solve the problem. It did not know *Company Y*'s technologies and know-how and thus just had to answer *Company Y*'s questions and wait for something new to emerge.

The process was led by VTT. Its role in the case was to lead the process in terms of drawing up a timetable and chairing the meetings. VTT was also developing a collaboration potential assessment tool based on experience from previous and ongoing cases. Thus, VTT was facilitating the process and taking it forward, which could be easily seen during the common workshops. VTT presented the PowerPoint slides the process and roles as well as agenda and next steps described on them. This was well embraced by the case companies as they were thus able to concentrate on their own activities while still being able to give comments and advise on all issues discussed.

Some interviewees also regarded *Company Y* as the leader of the network, because it had made the initial move towards the collaborative scheme. Moreover, some indicated that PBI would be the leader because it was leading the INC project. As a result, it can be argued that all four organizations were leaders to some extent. In fact, many of the interviewees did not think that stronger leadership role would have been needed in any area. The project manager (*X*) explained:

“I didn’t really miss a stronger leadership role, because so far we were just the two business parties in the case. I think it was good in this way.”

Following this view it can be stated that if the network had been larger involving more actors in the process, the role of a coordinator and organizer would have become more relevant. Majority of the interviewees were thinking in the same way as many of them added that the role was not necessary at this point but later the need for stronger leadership would have been needed as the number of companies and persons in the network would have increased. Furthermore, the research companies were facilitating the process and translating information, but they did not want to be the leaders of the case. The reason was indicated by the chief research scientist of VTT:

“I think the facilitator can’t just go and tell the companies what to do, but the initiative must come from the companies themselves. As an outsider you shouldn’t actively interfere in the companies’ activities but perform the role of a facilitator when the companies expect you to do so.”

It seems that the facilitators, i.e. the research institutes, did not want to take the control of the project in order to encourage the case companies to take actions independently. The objective was to study open innovation carried out by companies, not by research institutes. However, the companies also wanted to learn about it at first and see what the main issues are, and thus left the process and management issues purposely a bit open.

Another reason why the role of a leader was not quite clear was that it was not really discussed in the beginning. It was agreed that VTT would chair the meetings and create preliminary timetables, but there was no discussion about the content. The reason is that *Company X* was an assigner who gave *Company Y* a challenge to solve. This implies that *Company X* automatically controls the content at least at the initial stage. If there had been a new solution provided by *Company Y*, the control of content could have been shared between two or more companies, but the last word would have remained at *Company X*, because the product is ultimately bought by its customers. This kind of reasoning was perceived also among the interviewees. The senior research scientist at VTT described:

“It [leadership structure] probably organized itself; it just took this shape automatically.”

This implies that no company alone set standards for the network in terms of communication methods, schedules, reporting, roles, deadlines or others. Everything was discussed and agreed upon together. This in turn created free and informal collaboration atmosphere required for successful knowledge transfers and continuous learning.

Company X can also be regarded as a bridge in the network. It had an alliance with *Company Y* as well as with its own contract manufacturers. It would have connected these two, because they should have planned the production methods together. However, *Company Y* can be thought of as a bridge in the same way since it also had a factory in China and would probably have had to utilize it if the case had gone further. The project manager (*X*) explained:

“We would definitely have involved other partners as well, but at first we should have explored what alternatives there are for the product. The idea was that Company Y would manufacture the product in its factory in China.”

As can be concluded from this statement, other partners had already been considered. However, it would have depended on to the final innovation idea applicable to the case product which partners would have been involved. It became clear during the project that not only existing partners were considered but new ones as well. If the new idea had required new manufacturing technologies or processes it is even probable that new partners would have been involved in one way or another.

Each organization involved in this case had an own specialization area. *Company Y* was the metal engineering solution provider. *Company X* was the designer of the product and the main contact to the end customers. VTT was leading the process and the workshops and developed a collaboration assessment tool, which is taken a closer look at later on. PBI in turn focused strongly on gathering information for research purposes as well as for upcoming similar projects.

In addition to the afore-mentioned direct or indirect partners in the network FIMECC can also be considered a kind of an innovation partner for the case companies, since the case was a part of its piloting program and thus it represented an administrative party in the project while sponsoring the undertaking as well. Yet, FIMECC as an organization did not affect the case to a considerable extent, but it can be regarded as a supporting actor. The case did not involve any competitors directly either. However, as IPR were discussed in the workshops *Company X* mentioned that competitors would definitely be interested in buying new IPR to keep up with rivalry. Hence, competitors can be regarded as passive resources for the case companies, at least for *Company X*.

The case was planned particularly for the purposes of the four involved organizations. It was built on the competencies and capabilities of *Company X* and *Company Y*. This strongly indicates that the case companies owned the case as the R&D director (*X*) explained:

“We found that it [open innovation] is for this kind of industrial environment where product development plays quite strong a role a little bit too modern method, or let’s say that companies are afraid of letting competitors to the same map or finding new competitors, because everything here bases pretty much on surprises on this sector so we thought maybe we could develop such open innovation in closed networks, that is, closed environment where the actors can be invited...”

The metal engineering industry obviously differs from industries where open collaboration on new kinds of development projects plays a major role. Hence, whereas some industries apply open collaborative networks it seems that metal engineering industry has not come that far yet and therefore applies closed collaborative networks, where participating organizations and individuals are carefully selected and invited to join the network. In this way companies are able to develop new products and IPR in a complex cross-industrial context that is hard to imitate by competitors. Thus, the undertaking presented an applied concept for the case companies’ innovation management.

5.2.2 Individuals

The workshops and other activities of the case involved many persons within the organizations of which about 15 participated in the common workshops. Majority of the people were R&D-oriented either working at their company’s R&D function or representing the research institutes. There were also technical experts and project managers, who were actually the key persons performing the most active roles in the case. The key persons of the case were interviewed. Their roles and activities are described next.

The individual actors and their roles can also be initially divided according to the objectives. Some of the individuals were trying to learn and study open innovation as a phenomenon, while others were focusing on co-creation of new technical solutions.

Both case companies involved persons that can be regarded as the initiators at the strategic level. At *Company X* it was the R&D director whereas at *Company Y* it was the director of business model development. As described in the previous section they decided to enter a collaborative innovation case. As soon as they had agreed on the concrete case they started to build a team of experts who would be available and able as well as motivated to contribute to the innovation process as well as collaboration. The R&D director (*X*) described his role:

“I was the one arranging the right persons to the place and checking if this method is manageable and possible to implement...I was kind of the godfather of the case.”

In turn, the director of business model development (*Y*) described her role:

“Conductor. I tried to find the right experts...It was difficult but when I found them the things began to roll. And I was then usually more in the background until we started to think what we had learned.”

The descriptions imply that the roles were relatively clear despite the fact that they were not very accurately defined at any stage. Another point is that the strategic learning and research approach can be easily detected as these persons were mostly speaking about developing new business models and learning from others and from various projects. They also initiated the case but retreated to the background, while the technical experts attempted to generate new solutions. These two persons did not participate in the technical meetings and discussions outside the workshops. They neither planned the project nor scheduled timetables. Instead, they acted as investors and took the ownership of the project for themselves. They communicated with each other as well as with other external partners such as the research institutes. They also contacted the IPR specialists of their companies and outlined the main contracting points. Obviously, they had great network positions and wide external networks as well as collaborative experience. They brought the experts together and supported the flow of information and knowledge transfer in order to foster the common learning experience and achievement of the objectives. Yet, the R&D director from *Company X* assigned only one person and it was the project manager. Consequently, it was the project manager who searched for the technical experts.

According to their characteristics and actions taken during the case, the project owners can be regarded as both relationship promoters and power promoters. However, they both represented more qualities that refer to relationship promoter.

Both companies also involved project managers for the concrete case at operational level. Their roles were relatively easy to identify since all interviewees had collaborated with them in one way or another. They were also the persons that spoke the most during the workshops and took most actions between them. At *Company X* it was the project manager and at *Company Y* it was the development manager. They were described by the other interviewees as the person who implements the plan and leads the concrete project. It was also obvious that they have social competence and good internal networks. They also knew much more of the case and about what had been done and discussed and what had happened. They were the connection links between the strategic and operational level of the case in the sense that they understood the objectives of both and operated with both technical experts and project owners. The project manager (*X*) described his role:

“I was kind of a front man there from our side and we agreed in the beginning with [the project manager of Company Y] that we are each oth-

er's contact persons and delegate the information to our own companies."

The project manager (*X*) was regarded also by many interviewees as the leader of the whole case network, because he was the project manager of the company next to the end customer. He recognized this himself as well. Interestingly, the project managers had immediately identified each other's role and hence agreed to form kind of a project manager pair. This can be considered clever since the amount of misunderstandings and time to find the relevant information can be decreased significantly by having fixed counterparts. The project managers obviously moderated change processes and solved conflicts. They can primarily be considered process promoters, but their characteristics also refer to relationship promotor and power promotor, and even expert promotor as they seemed to be deeply involved in developing technical solutions as well.

Another point in the comment of project manager (*X*) is that they planned to pass the information to the key persons of their own companies. Nevertheless, the project managers' information sharing and communication was slightly criticized by other participants. The case companies' other involved persons indicated not having been fully informed about the objectives and actors as well as their roles. This can be partly considered the project owners' task as well. On one hand, since the project managers communicated with all participants i.e. the technical experts, lawyers, researchers and project owners, they can be expected to have the most information about the ongoing processes, which they are supposed to share with the other key persons. On the other hand, some interviewees also indicated that not everyone needs to know all details of the case, if they are not relevant to their performance. One technical expert (*X*) indicated that he did not even know what actors and roles the case involved, but that it also was not important for him as he just focused on his own work. In particular the researchers also highlighted this fact, but added that this information would still be of a great significance for the actors of the case since it would help them to obtain better understanding of the big picture.

The technical experts at *Company Y* were relatively easy to identify since their roles were simply to generate ideas for a new technical solution considering the case product. Moreover, they were the persons who changed information about the technical details of the product during the workshops. They suggested different solutions and solved technical problems regarding the new potential solutions. They collaborated with the project managers and the technical expert of *Company X*, whose role was to present the case and the product to the technical experts of *Company Y* as well as answering their questions about the product features. Thus, the research manager and the technical expert of *Company Y* and the technical expert of *Company X* can all be exclusively regarded as expert promoters. They were to some extent aware of the strategic objectives of the project but naturally focused only on the technical part of the case.

In addition to the above-mentioned roles there was an IPR specialist from both case companies. They were involved in the case by the project owners and project managers after the second workshop, where the contracts and IPR issues were discussed. Their role was very clear to everyone; to write the contracts according to the project owner's and project managers' requirements. The IPR specialists were supposed to define the frames for the collaboration and write the contracts in line with the collaborative activities and expectations. Of course, the IPR specialists also had to consult the managers considering clever and safe actions to take regarding the IPR.

There was much discussion about the right moment to involve the lawyers in the case. Some indicated that it would be good if they knew the case better, because they would be then better able to compile the contracts. Some stated that lawyers cannot be involved at the very initial phase since the case would not proceed at all as they would just fight for the IPR. Hence, the lawyers did not participate in the workshops at all. However, at the end all interviewees remarked that the IPR specialists should have been involved earlier.

The rest of the involved individuals that were interviewed were employees of the research institutes. Their roles were not as precisely defined as were those of the case companies' employees. Two of the interviewed researchers were from VTT and one from PBI. The senior researcher from PBI indicated that he was involved only at the very initial stage of the process after which he left the case due to other liabilities. During his time in the case he was performing the role of a facilitator, or as he described:

“My responsibility in the beginning was just to get the project started...and to make sure that the involved parties are aware of the original intentions...that they keep in mind that it's about creating a new business solution...not just researching the phenomenon...”

The comment implies that in addition to learning the aim was indeed to create something new together which would help both companies to expand their business and spot new opportunities. Systematic research and learning would take place parallel to the innovative activities. After the senior researcher from PBI left the case, PBI was still involved as they had two other observing researchers in the case, including a master's thesis worker i.e. the author of this thesis. They did not have a significant effect on the case though as they did not actively participate in the activities.

On the contrary, the senior research scientist and chief research scientist from VTT had greater roles in the case although they were not too specifically defined either. The senior research scientist chaired the workshops in the sense that she presented most of the PowerPoint slides and kept the discussion on move. However, she did not control the meetings in any sense or shared floors for the participants thus leaving room for the companies' own wishes and actions. As a result, she was actually facilitating the process of knowledge exchange as she brought new issues forward and let the compa-

nies discuss them. Moreover, she designed the initial project plan and timetable which were discussed during the workshops.

The chief research scientist in turn focused most on the development of the collaboration potential assessment tool basing it on previous and ongoing projects. He developed the tool in close collaboration with his colleague, who also attended some of the workshops. Together with this colleague he also visited the case companies at their sites in order to go through the collaboration assessment.

The role of the researchers is relatively difficult to define since their primary objective was to study the phenomenon as well as to develop and apply new kinds of tools not having been used in the same context earlier. They conducted collaborative research, which means that in conjunction with studying and developing they also collaborated with the case companies and contributed to the innovation process as facilitators. Yet, promoters are facilitators too as they overcome certain barriers to innovation and thus facilitate the process by removing hurdles that preclude innovations. The difference is that they work for the companies exclusively and overcome the barriers occurring mostly in intra-organizational context. Nevertheless, the relationship promoter also brings together inter-organizational actors and facilitates the exchange of information and know-how by leading the discussion and initiative to innovation. Still, the primary goal for the researchers was to study the phenomenon and to create value for the case companies by assisting in the process and translating the activities into an understandable language for each party. Hence, the researchers can be considered assisting in filling in the gaps and providing the whole entity with expertise on various issues yet without performing a role of a promoter.

Absence of a manager from a higher management level was perceived by some of the interviewees. The development manager (Y) observed:

“It [a successful innovation process] requires rigorous commitment of the highest management level. The managers direct their organizations so that proceeding takes place and the contracts are agreed upon and that everything is clear in terms of schedule, plan and objectives.”

The logic of this observation is obvious. The key people involved in the innovation process have differing opinions on various themes, which results in conflicts that need to be resolved. This in turn is time-consuming and may even lead to termination of such a project. However, when the involved companies commit a manager from a higher hierarchy level the barriers of will can be better overcome. Involving a top manager also signals commitment and reflects risk-taking behavior which in turn increases the level of trust. This helps the partners work together towards common interests. Also the researchers and the IPR specialist of *Company X* indicated that none of the case companies involved someone who would aggressively have pushed the case forward. Now the

case missed a little bit of attention. The reason may be that there was no rush in this case as will be showed later in this case analysis.

The fact that the presence of more powerful managers would have been required became even stronger when the R&D director (*X*), who was one of the initiators of the case, changed employer and thus left the case after the third common workshop. Consequently, an inconvenient scene took place and the project manager (*X*) took the lead at *Company X*. After all, this incident cannot be considered one of the reasons that led to termination of the project since it happened at *Company X*, and *Company Y* was the one who decided to terminate the case. Furthermore, the interviewees and the project manager of *Company X* did not report any difficulties resulting from the change. Instead, the researchers indicated that the risk control for such situations worked surprisingly well as continuity at *Company X* did not seem to suffer at all. Of course, the project manager (*X*) had been involved from the very beginning and was thus able to continue the case without problems.

5.3 Product development

The case got started swiftly after the initial discussions and progressed relatively rapidly thanks to the virtually conducted workshops. The key persons of the case were able to participate in the common workshops as nobody had to travel. They could stay in their own offices or gather together in meeting rooms at their site and use loudspeakers to communicate with the participants of other organizations. It was agreed that the workshops would take place through Internet-based technology as long as possible. In addition to the virtual workshops the participants communicated via emails and phone calls. Consequently, the proceeding speed of the case was considered faster than that of some comparable projects. Still, *Company X* and especially its R&D director emphasized that there was no need to rush with the technical solution, because the case product was going to be a part of a modulation process taking place in one and a half years.

The product development process was the heart of the whole project as all other activities of the open innovation process were adjusted according to this. *Company X* had a product that it has been designing and selling for more than three decades. It is the leading company worldwide in providing this highly customized product solution. There have been many attempts to standardize the product and its manufacturing process more, but the company has not succeeded in that since the product features depend to a great extent on its operating environment. So far, only some components have been fully standardized.

Company X was intending to carry out a product modulation development process in the near future and the selected case product was going to be part of that process which

made it an attractive choice for this case. Although the product did not require an urgent innovation concerning the competitive situation, and it had been developed to a state-of-the-art product over the years, *Company X* hoped *Company Y* to be able to contribute to the product by providing a new material solution, improving the structure of the product, or enhancing the manufacturing process.

At the time of the second workshop the technical features of the product were discussed. *Company X* did not want to give all details of the product since it was hoping that *Company Y* would come up with a completely new solution, so it only gave the details of the product's operating environment. Consequently, the technical experts of *Company Y* needed more information. After having understood the product features they faced some motivational problems. The research manager (*Y*) described the product and his expectations:

"...so called gnawed bone. I didn't have great expectations when I heard about the product. I had a feeling that it's probably quite well optimized and that it would be difficult for us to contribute to it in any way."

Even though the expectations fell dramatically they decided to have a try. Also the other employees of *Company Y* indicated that the product is mature and therefore near to impossible to improve by companies not familiar with the business. This was also admitted by the employees of *Company X*, but they thought there might be a completely new solution that has never crossed their mind.

In addition to the engineers and project managers also the researchers perceived the fact that the case would be difficult. The chief research scientist of VTT indicated:

"The most fruitful innovation cases take place when something completely new is created by combining the competencies and know-how of such actors. Trying to create incremental improvements for mature business is not necessarily the best starting point for such joint innovation."

The comment is in obvious contradiction with the initial expectations. Some of the interviewees indicated expecting that with a little bit of luck and collaboration something new could be generated and successfully implemented. Everyone knew that the case would be difficult due to the state-of-the-art product and the maturity of it. Such observations and feelings at the initial phase do not necessarily promise anything good. Both companies decided to continue anyway as their primary objective was to learn by practicing the collaborative product development in the context of a real business case. It was still a great opportunity to pursue business growth and competitive advantage, and the companies remained very open-minded to the very end of the case as the potential benefits of the collaborative project were substantially greater than the costs of it.

However, as the case proceeded more problems emerged. The manufacturing function had recently been moved to China and Vietnam to decrease cost of materials, labor, and other. Vast majority of *Company X*'s customers for this product are also located in

Asia. The manufacturing function has been outsourced to contract manufacturers that have production plants at coast, directly at sea, because the buyers of the product are mainly shipbuilding companies and shipyards. Furthermore, the size and weight of the product preclude its transportation on roadways, so it has to be transported by ship. As the product is manufactured in Asia also materials are supplied from the near regions. The development manager (Y) observed the situation:

“...the business is far from our market area although we also have a factory in China, but it’s not at the sea. And when we do these kinds of products here in Nordic countries, where building and technologies are developed, the production methods are different from those when we go to Korea, China, Vietnam and others, because they have different steel qualities and they don’t utilize automation and everything differs. The concept then changes, it can’t be copied from here to there.”

While *Company Y*’s business takes mainly place in Northern Europe, a large proportion of *Company X*’s business is conducted in Asia. *Company X* manages its business in Finland, but the contract manufacturers and most customers are located in Asia. Therefore, it was even more difficult yet inevitable for *Company Y* to organize its activities according to this requirement. That the factory was not at the sea in China was another concern as the product requires ship transport to the customers who are also located at the sea. The locational issues entailed also other problems as the development manager (Y) observed. He indicated that modern production methods such as laser welding, other laser techniques, robotics and machine sight would not be possible to utilize in those countries. As a consequence, competencies that *Company Y* possesses do not exist in the Asian low-cost countries due to a lower level of technological development, which implies that considerable investments would be required. This needs to be taken into consideration in planning throughout the innovation process. The solution to the problem of sufficient competency would have been to manufacture the product or some of its parts in Finland and then to export those to Asia, but *Company Y* considered this option way too expensive. After all, commercial exploitation of the potential business benefits, in particular for *Company Y*, seemed extremely difficult to be realized.

After having decided to continue the case *Company Y*’s technical experts started to consider potential solutions that would contribute to the product in one of the three ways. They made a couple of suggestions which would have contributed to the product performance, but the suggestions would not have been profitable. *Company Y* first focused on improving the manufacturing process of the product, but it implied problems as well. The research manager (Y) indicated:

“Because the product was already highly optimized we saw more opportunities in production technology...the production technology was not in our hands but in the contract manufacturers’ hands so it would be diffi-

cult to go to them...difficult to imagine that they would use laser welding in automatic cells somewhere in Vietnam.”

According to this comment, improvements in the manufacturing process would have been very difficult to execute. Thus, *Company Y* had to shift the focus on the other two possible means to contribute to the product performance. They did not believe in improvements through new materials as the quality requirements of the product are carefully managed. However, the same issue applied to the possibility of improving the structure of the product. The ultimate suggestions related to the structure, and after having calculated and examined the suggestions the engineers of *Company X* noted that the suggestion would be a small improvement. Yet, the quality requirements impeded again. The engineers of *Company X* asked if it would have been possible to make a little change to the suggestion, but the next action *Company Y* suggested was to terminate the case as it did not find it reasonable to continue the process.

Company X still expected to get an answer to its last question or mutual collaboration between the companies, but *Company Y* did not believe to be able to solve this problem, or it could not accept the legal terms of the collaboration. Nevertheless, the collaboration was also more like customized outsourcing assigning a supplier to improve the performance of a product by renewing some of its features without and by having just the details and quality requirements for it. This kind of collaboration differs considerably from collaboration where two or more companies develop together something completely new like a new product.

Product development is an iterative process where companies make progress but also have to return to a certain point to fix or redo something that is important regarding the upcoming activities in the open innovation process. This process was also iterative as the case companies did turn back at times, but they did not iterate with the most important detail of the case, the product. The process was still at very initial phase, it would still have been easy to choose another product to improve or to develop.

Some of the interviewees were missing proper project features such as accurate time tables, rigorous project plan, and a manifest goal for the case, which drives the companies to strive for a common objective while performing precisely defined roles. As mentioned earlier, a project plan with some initial dates and milestones was prepared, but it was purposely left a bit open as there was no certainty about the characteristics of the emerging outcomes. The goal of the technical case was to come up with a new technical solution in terms of new materials, new structure of the product, or, new manufacturing methods. Thus, there was no exact outcome to expect or no exact goal for which to strive, which basically led to ambiguity of the purposes of the project. *Company Y* often wanted to discuss the issues related to the new business concept where it would act as a critical supplier for the product. However, the business concept did not exist yet and nobody knew what it was going to be like, because there was no concrete solution, or

even idea that would have been profitable. On the other hand, *Company Y* was interested in the new business concept, because it did not understand and see the shared benefit deriving from the new solution due to the reasons mentioned earlier. The employees of *Company X* may not have perceived the fact that any considered new solution to this case would have been severe to implement by *Company Y*.

As the case was started in early 2010 and the first three common workshops took place in April, May and June, there was going to be a pause of two months between the third and the fourth workshop due to summer vacations. Consequently, lots of scattered activity was carried out during the summer as in particular the technical experts were keen to come up with a new solution and thus worked on the problem while half of the other key persons were in vacation. On one hand, this caused confusion and unconsciousness among the people involved in the case since only some of the technical experts or project managers were aware of the prevailing status of the case. Moreover, as can be seen in the next section, the contracting process was noticeably behind the product development process, which could have led to an awkward dispute of IPR. In addition, as mentioned earlier the R&D director (*X*) changed employer in July, which in turn further increased confusion among the actors.

On the other hand, the activities carried out in the summer were technology related dealing with the technical solution. Hence, it is likely that the process would have been quite similar even if it had taken place after the summer vacations, though with the difference of the contracting issues having been taken more carefully into consideration. Furthermore, the action of the R&D director (*X*) certainly influenced the process to some extent, and it can be regarded as a critical incident for the case but not crucial, because the continuity at *Company X* remained and ultimately it was *Company Y* that decided not to carry on the project. A couple of weeks before the fourth workshop *Company Y* informed that it would not be able to contribute to the product, and that it would be pointless to continue the process with the current conditions. The decision surprised both *Company X* and the research institutes.

The technology exploited for conducting the workshops simplified the process remarkably. It enabled rapid, flexible proceeding by removing several obstacles that usually discourage participants to carry out such a project. The applied communication method implied a vision for the future activities as shared by the R&D director (*X*):

“...information and models would be transferred electronically on the net and there wouldn't be such normal methods that exist so that we discuss at the negotiation table and launch the next projects and objectives from there and put people working which is a very stiff way. It is actually no more present time so we should find more efficient ways to be able to shorten product development cycles.”

The vision refers to other industries where open or semi-open platforms for product development are already being exploited to some extent. The R&D director (*X*) mentioned automotive, aircraft and film industry as examples where development and co-creation are carried out by hundreds of different companies and users. He anticipated that this kind of method will presumably be applied in metal engineering industry as well.

In this case virtual workshops mostly worked well, but they also had some drawbacks perceived during the workshops. Firstly, communication failed a couple of times for a minute during a meeting due to a malfunction of the microphone of a participant. Hence, sometimes a participant was required once or twice to repeat what he said which can obviously be frustrating. However, this drawback can be considered user related as the quality of the communication is highly dependent on the equipment available for the users.

Secondly, the discussions about the technical features of the case product and its operating environment were considered difficult to carry out by telephone. Although virtual workshops allow for presentations, the technical experts found it stiff to explain and understand certain technical issues without having the possibility to draw and point the spots on the paper. In addition to this, the case product was novel for the experts of *Company Y*, and *Company X* presented it imprecisely hoping *Company Y* to come up with a radical new solution. This made it even more difficult for the technical experts of *Company Y* to understand the definite values, measures and purposes of the case product. Hence, a physical meeting was arranged after the second common workshop between the technical experts and project managers of both companies. The meeting took place at *Company Y*, and it had a significant positive influence on the understanding and collaboration as a whole since several technical obscurities were clarified and unraveled. There had also been another physical meeting where only the project managers and one technical expert (*X*) were present for presenting and discussing possible new technical solutions.

The third drawback of virtual workshops was that although the involved people collaborated repeatedly within the project, in addition to a couple of exceptions they did not get to see each other in face-to-face meetings. The two exceptions cover the above-mentioned technical meeting and the collaboration potential assessment discussions, in which the companies met only two VTT researchers, not each other's key people. A face-to-face meeting would create a common feeling of togetherness and mutual trust among participants thus fostering the exchange of knowledge and learning.

The product development process of this case was planned according to certain steps to take where activities were given the emphasis. However, product development activities as such were not separated in the project plan from the other activities such as contracting and evaluating, because all activities were in a complex interaction with each

other. All activities were discussed and carried out during the same workshops. The first workshop covered some initial discussions about open innovation process and collaborative projects. The case product was briefly presented and the interests of both case companies listed. In addition, the participants agreed on the initial project plan and communication method as well as the required individual persons to be involved in the case. The second workshop had three main themes: case product, collaboration assessment discussion, and contracting. The third workshop in turn, was kind of a review and a checkpoint on what had been and what will be done. Finally, the fourth workshop was going to deal with idea evaluation methods, but as the case was terminated before the workshop it was changed into a post-project review, which can be regarded in this case also as a post-phase review.

5.4 Contracting

Contracts and contract related issues are often major concerns in innovation collaboration and so were they in this case. Most of the problems were related to the fact that there was not yet a clear idea how to improve performance of the case product, but there were pure contractual disagreements as well. The contractual issues were discussed mostly during the second workshop, and the third one was more like a review.

Even though some problems arose regarding the contracts the level of trust among the organizations and individuals was considered excellent. The technical expert (X) described the reasons for the excellent level of trust between the case companies:

“We are not direct competitors and the starting point was that both companies benefit from the collaboration...sometimes it is so that, when a company helps another company it may try to demand a great amount of money for that, but there was nothing like that here. When technicians discuss with each other it’s just the common interest in technology.”

The first important factor was that the case companies operate in different industries. They are not competitors to each other although they operate in closely linked industries, which in turn may have an effect on the discussions and meetings carried out during the case. *Company Y* could be a supplier to *Company X*’s competitors as well, and it could try to help them in innovating as it would have learned with *Company X*. However, this is the reason why an NDA and other contracts are done; to prevent the involuntary knowledge transfers i.e. spillovers.

Of course, both companies were supposed to benefit from the collaboration. Both the common and the company-specific objectives for the project facilitated the realization of the golden rule of collaboration: I get something from you, you get something from me. Because *Company Y* aimed to expand its business and find new opportunities and

Company X wanted to find new partners and solution providers and practice to work with them, the golden rule of collaboration was feasible. None of the companies was expecting or believing to gain more from the collaboration than the other, at least not according to their own words. This further facilitates the level of mutual trust. Finally, many of the interviewees indicated the same the technical expert (*X*) did. The technicians and technology experts try to find a new solution without thinking too much of other issues that disturb their work. There are lawyers and business men for the other tasks. The technical experts were described open and solution-oriented. Thus, it could be thought that the level of trust would be different depending on the individual role of the person. However, also the project managers and project owners as well as the researchers considered the level of trust very good. Other trust-building factors were considered the same language and home country, good reputation of two large, listed companies, and, participation in the same FIMECC program in which a common consortium agreement was signed.

An interesting view was brought forward by the researchers, who noted that the level of trust could have been that good because of a partly existing network originating from the INC project. Not all the individuals participated in the INC project, in particular the technical experts among whom the trust was actually found to be the best. Anyway, the project owners and researchers as well as the project manager of *Company X* knew each other from the INC project. Hence, the partially existing network may have affected the case in a way that was explained by the senior researcher of PBI:

“Now it was relatively easy to start this, because you had an existing network, so you didn’t have to find such good reasons to get it started. If it hadn’t been that easy you could have prepared for the case even better.”

It implies that as a result of the partially existing network the level of trust was unusually good, which in turn made it too easy for the case companies to set up a business case without having an urgent need for that. The whole collaboration was hence an option for the companies rather than a compelling need. Thus, also the case product was chosen not according to the needs but to suitability. Although the case was well prepared and it involved a wide variety of innovation experts it could have been prepared even better by examining the product and its operating environment as well as the whole supply chain. This may be one of the ultimate reasons why the case did not go as was planned, although each of the interviewees considered this high level of trust one of the success factors.

Anyhow, the level of trust was considered unusually high but still everything did not go according to the plans. The reasons are related to the same observation as some of the problems in product development process, i.e. ambiguity of the outcomes. Thus, the scope and governance mode of the alliance or network were not yet discussed. Howev-

er, that is normal since the initial contracts and difficulties should be taken care before proceeding to the more advanced issues. Of course, as earlier mentioned, the key persons did have expectations of which one was the potential, common competence center. As it can now be seen such expectations are good to be brought forward, but more precise discussion can take place later after the initial issues have been resolved.

The companies had already signed a consortium contract regarding the FIMECC program thus being in effect also in the INC project and consequently in this case. However, the companies decided to conduct the case as a separate contractual project from the FIMECC program to collaborate and carry out the case like in a normal business situation, because they thought this case might have influence on their collaborative activities in the future.

Three different contracts were discussed during the case: letter of intent, NDA and supply or collaboration agreement. As the greatest problem at this point was the results of the development process the companies decided to draft a short letter of intent which would be complemented in the course of the process. The initial letter of intent was supposed to cover only the major milestones of the case. It was supposed to fit on one A4 page. The lawyers of *Company X* were then instructed after which they wrote an initial letter of intent. The result was a six-page contract, because the lawyers said it cannot be shorter since otherwise some relevant issues may not be covered. The IPR specialists of both companies were highlighting the importance of clear intentions and outcomes of the undertaking so that the contracts would be much easier to outline. In addition to this, it was also noted by the interviewees that the IPR specialists are professional lawyers, whose main task is to protect the resources and knowledge of their companies. Thus, they cannot expect the business people or engineers to know what is important when such contracts are made. Nevertheless, *Company Y* had an existing draft of such a contract which was modified according to the case and then proposed to be the initial letter of intent. *Company X*'s agreement proposal was not accepted by *Company Y* due to restrictions in using rights, because it was using the suggested solutions in some of its products already. The director of business model development (*Y*) described the situation:

“They [Company X] said they wouldn’t have accepted it [legal term] either, but they didn’t get their lawyers to understand...if we had developed something great together, we wouldn’t have been allowed to sell it anywhere else. That was too drastic a simplification.”

The restriction would have caused remarkable problems for *Company Y*'s business. Thus, the agreement would not have made any sense for it. According to the comment above, *Company X* had also understood the consequences. They would not have signed such a contract either if they had been in *Company Y*'s place. Yet, *Company X* did not want to let the potential new solution to leak out to its competitors, because it was plan-

ning to trade with them by selling or renting its IPR deriving from the collaboration. This conflict could have been resolved by agreeing on a period of collaboration where *Company Y* was supplier and *Company X* customer. This kind of supply agreement was briefly mentioned during one workshop. However, it would have implied new conflicts as the IPR specialist (*Y*) explained:

“Our concern was that they [Company X] will buy the product cheaper somewhere else after we have paid the development together. Their [Company Y] concern was that they have to buy the product expensive from us.”

The customer having its manufacturing function and customers in Far East and the supplier being a Finnish company with specific technological know-how implies that the new solution developed by the companies would presumably be expensive for the end customers. Therefore *Company Y* was concerned to invest in the joint development of the product which *Company X* could buy soon cheaper from other suppliers. In turn, *Company X* thought it would benefit from the development process of its product with *Company Y* and that the product could be later probably be bought cheaper from other suppliers. That is why *Company X* did not want to commit to an exclusive collaboration with *Company Y*.

After all, it was agreed that the contracts would be put aside to wait the case and its outcomes to become clear. The companies were still having the FIMECC consortium contract which implied that all IPR developed within the program belonged to all participants of it. Based on this fact the companies decided to continue without further contracts at this point. Even though the initial IPR negotiations were not too encouraging the companies still believed a fair agreement could be reached when it was really needed. In this case the companies emphasized possible extreme solutions too much in the initial phase which made it difficult to agree on IPR without seeing the real upcoming outcomes of the process. The chief research scientist of VTT commented on the process:

“I think this should be an issue for one meeting after which everything is clear and the papers are put forward. Now the contracting process got stuck early, because the lawyers didn’t have adequate insight about the case. They were not involved in the workshops and thus kind of outsiders but notwithstanding told to conclude an agreement while there were many middlemen in between. The process didn’t actually reach a deadlock but it just wasn’t finished.”

In his comment he did not mean that the contract would be done after one meeting but that it would be agreed upon and then outlined by the managers and IPR specialists together. An ideal case would be where the IPR was discussed and agreed in the very beginning after which the contract was written and signed before proceeding to generat-

ing ideas and sharing knowledge. In this case however, the companies moved on and exchanged critical thoughts about technological solutions before the contract was signed. In fact, the letter of intent was not signed at all as also the chief research scientist mentioned. Hence, the companies decided to outline a contract with only headings in it which would be later complemented. The companies understood though that they had therefore proceeded in false order in the open innovation process, but it was also noted by them that if they had collaborated with new partners from foreign countries for example from Asia they would have had to resolve the contracting issues before moving on to subsequent phases.

Another solution to the problems in contracting was highlighted by several participants, which was to involve the lawyers in the process already in the initial discussions, even though some said it would complicate and hamper the process. The advocates of this idea argued that in this way the IPR specialists would have better understanding of the product features and its operating environment as well as the intentions and expectations of the involved parties. The IPR specialist of *Company X* reminded though:

“Usually I prefer that lawyers take care of the contractual things and businessmen focus on business, that’s desirable and for the best of everyone involved...I don’t even know if the involvement of IPR specialists would have helped anything at this point, because the output of the collaboration was not yet quite clear.”

To be involved in the workshops or initial discussions where different business opportunities and various product solutions are examined requires commitment from the lawyers. In addition to the meetings they should outline the contracts and take care that they cover all issues subject to protection. Consequently, companies should have IPR specialists who have the time, resources and motivation to be involved in the initial discussions. The IPR specialist of *Company Y* embraced the idea but also noted that bringing lawyers to the meetings could hinder a swift proceeding to the next stages due to early conflicts in contracting. Moreover, when the outcomes of the collaboration are not clear yet involvement of the lawyers may turn out useless as the IPR specialist of *Company X* opined.

After all, the contracts were not needed anymore as the case was terminated due to reasons mainly related to the product and business issues. Although the letter of intent was not accepted by any party, the IPR issues were negotiable and both companies discussed the issues in a very open way. In fact, it was stated by some of the interviewees that without such a high level of trust they would not have proceeded to exchanging ideas before signing clear contracts defining the IPR. In this case even the NDA was signed only by one of the parties. The NDA was meant to prohibit the companies to disclose relevant information about the undertaking and the issues related to it. All in all, the contracting process did not go as well as was planned although everything was

still open and negotiable, but the evaluations were held in high esteem by the participants as the following section will show.

5.5 Evaluating

The evaluations were an important part of the open innovation and the learning process. There were two major evaluations carried out; collaboration potential assessment and post-project review i.e. lessons learned workshop. The participants of the case considered both evaluations successful and excellent ways to facilitate learning about the partners and the open innovation process.

5.5.1 *Collaboration potential*

Collaboration potential assessment was used to evaluate the opportunities and risks involved in the collaboration between *Company X* and *Company Y*. The assessment method was developed by VTT and it was based on experience and lessons learned from previous collaborative projects. VTT introduced the method in the first workshop after which the chief research scientist and another researcher from VTT visited both case companies to carry out the assessment with the key persons from *Company X* and *Company Y*. The assessment results were discussed in the second workshop and reviewed in the fourth one.

The method as such was quite simple. The assessment was an Excel-based sheet where opportunities and risks were evaluated from different perspectives. The risks and opportunities were assessed separately in a scale from one to ten where ten was indicating the greatest possible opportunity and the highest possible risk. The opportunity assessment is illustrated in Figure 9.

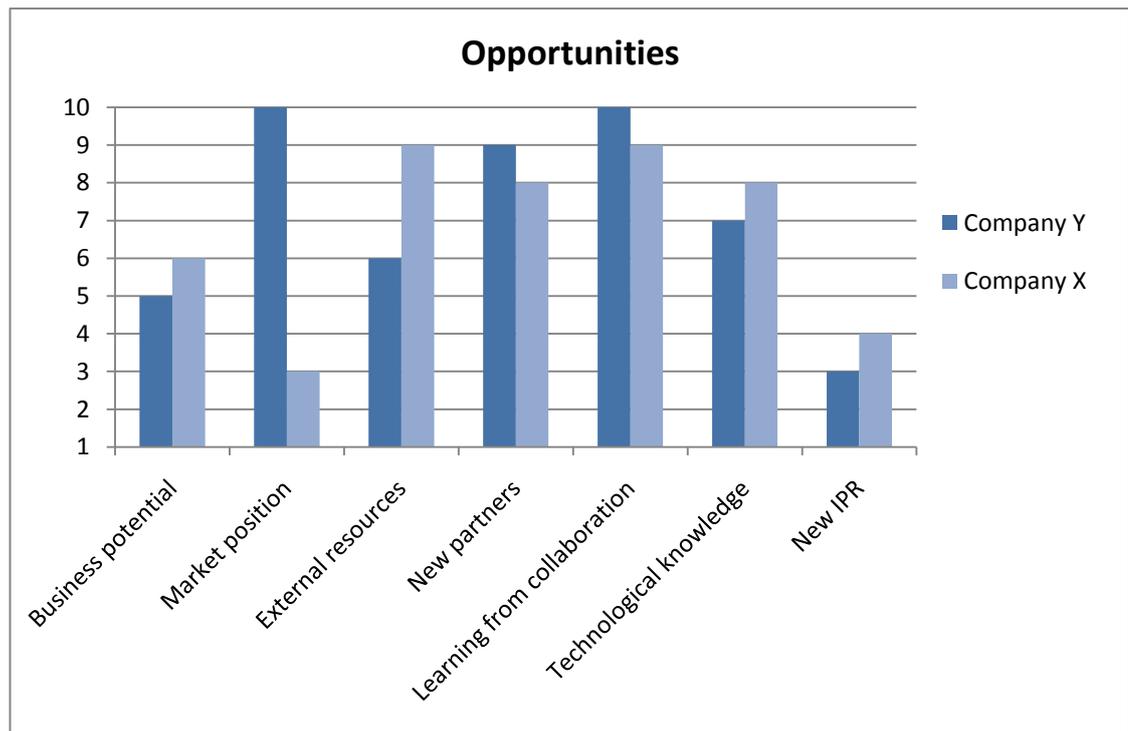


Figure 9 Opportunities of the collaboration

As can be seen in Figure 9, there were seven areas regarding the opportunities of the collaboration to be assessed. The first one was business potential, which means the opportunity for new or replacement business deriving from the project results. The companies assessed this point similarly with the difference though that *Company Y* justified its view by noting that there would not be a great business potential for it in China due to the earlier mentioned reasons. However, the second point was seen very differently as *Company Y* saw great potential to enhance its market position by strengthening the relationship to *Company X* and getting access to new markets. *Company X* in turn, was the market leader already in its respective industry and in this particular product environment. It explained that *Company Y* was one supplier among others at this point and it did not really believe that something completely new and superior would be developed. This point of view implies once again that the main objective of the project was to learn about open innovation and collaboration in this context. However, it also slightly signals lack of commitment and determination, which may have affected the opinions and minds of the employees of *Company Y*.

The next point to be assessed was the ability to utilize external resources in own business. Whereas *Company Y* evaluated the opportunity to six, *Company X* highlighted it to nine. The reason is clear; *Company Y* was supposed to solve a problem by using its resources and know-how. Thus, *Company X* was the company to benefit from those resources. It would be able to exploit the resources possessed by others and thus gain advantage by expanding its own competencies. Although *Company Y* was the one to

provide majority of the resources at this stage it wanted to learn from *Company X* and the others that would have been involved at later stages. Hence, *Company Y* also saw some opportunities from this point of view. Moreover, the external resources can be considered to include also business relationships, project skills and knowledge of other actors in the network.

Both companies highlighted the opportunities to get to know and possibly collaborate with new partners emerging through the collaboration if the case had gained progress. As seen earlier in this thesis, the case companies were planning to involve other actors in the network when the concrete development stage had taken place. Moreover, the learning aspect was emphasized in the assessment as well. While *Company Y* set the opportunity to learn from the collaboration to ten, *Company X* evaluated it to nine. Of course, as the main objective was to learn about open innovation and collaboration this view can be considered almost a foregone conclusion.

The last two points in the opportunity assessment were seen just a little bit differently. The opportunity to obtain new technological knowledge is similar to the ability to utilize external resources in own business except that this point applies only to technology. Interestingly, the gap between the case companies' assessments reached only one point due to partly same reasons as in external resources. *Company X* wanted to learn alternative technological solutions applicable to the case product. Therefore, it was interested in the technological capacity of *Company Y*, whereas *Company Y* was not able to see as good opportunity to acquire new technological knowledge through the collaboration. Finally, the opportunity to create new IPR for the case companies deriving from the project results was evaluated to four by *Company X* and to three by *Company Y*. As mentioned earlier, *Company X* noted that if something completely new was developed its competitors would certainly be interested. However, the company assessed this point only to four because it was not too optimistic about that the case companies would be able to come up with a novel solution. To contrast, at first *Company Y* did not see any kind of opportunities in IPR, but after a short discussion in the second workshop they revised their evaluation to three since they had misunderstood the point a little bit. After the revision they thought there was a little chance to obtain some kinds of IPR through the collaboration. At this point it was also agreed that IPR would be shared if something new was generated.

As a summary of the opportunities assessment it can be stated that the results were not very surprising. The only gaps differing more than one point from each other were market position and external resources. These two differences are quite obviously reflected to the organizational roles and strategic objectives of the companies. *Company X* wanted to improve one of its main products with the help of *Company Y*'s resources and know-how while aiming to develop a close partnership with a competent solution pro-

vider. In turn, *Company Y* wanted to improve its market position by getting access to new markets through collaboration with *Company X*.

The assessment of risks was carried out in conjunction with the assessment of opportunities. There were six points for the companies to evaluate the level of risk regarding their collaboration. The risks and the results are illustrated in Figure 10.

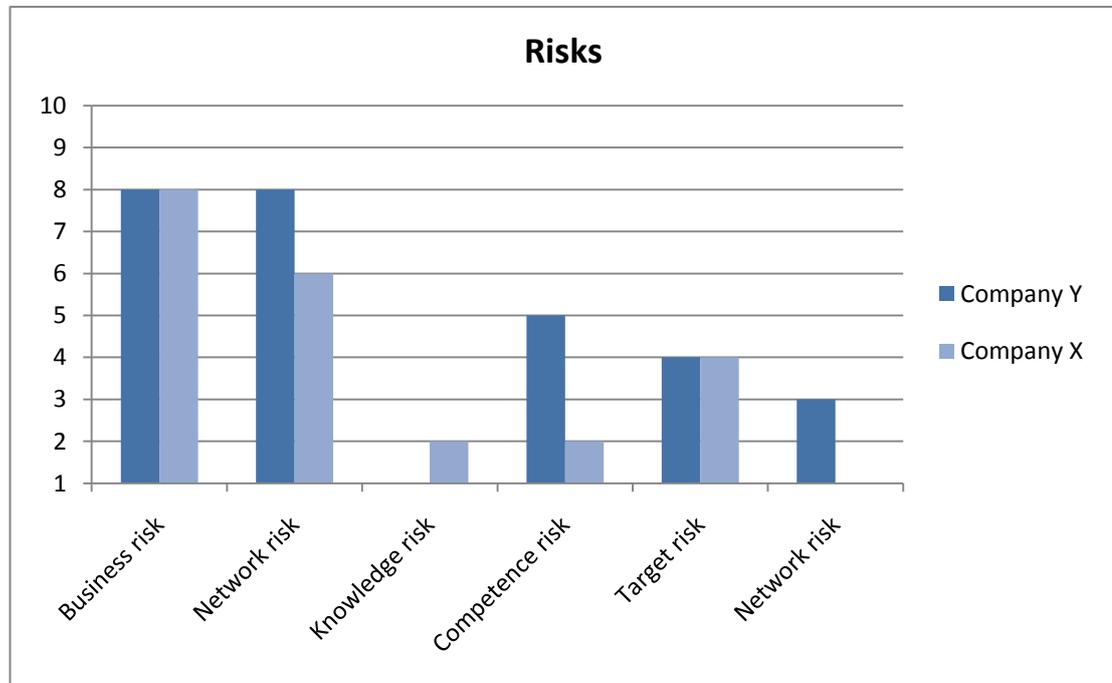


Figure 10 Risks of the collaboration

The first risk to be evaluated was business risk which derives from the uncertainty that the developed solution is not relevant for the target markets. Both case companies highlighted this to eight, which is understandable as innovations always involve this kind of risk. Furthermore, there was neither a developed solution nor feasible idea to develop yet which increased the level of this risk in the case companies' opinion. Network risk indicated changes in e.g. partner interests or ownership during the product life cycle. *Company Y* assessed the network risk to eight whereas *Company X* appraised it two points lower. *Company Y* was concerned about the changes in the interests of *Company X*. It knew that it would be too expensive a partner in the long run, because *Company X* would presumably have the chance to buy the solution cheaper from other suppliers in the future. On the contrary, *Company X* did not want to commit to regard *Company Y* as its priority solution provider for this product, because it also knew that it would have the chance to buy it cheaper from another supplier in the future. As seen earlier, this conflict was also perceived and discussed during the contracting process.

The risk of losing key knowledge or IPR to competitors during the development process was not considered high by any of the companies as it was set very low. The

companies trusted each other and there were no competitors present at the initial phase. As any other risk considered in the assessment this risk could have increased substantially in the course of the development process. Competence risk instead, was evaluated to five by *Company Y* and to two by *Company X*. It indicated the risk of not having adequate knowledge to reach the target during the development process. The difference can be explained by two reasons; the product and its operating environment were new to *Company Y* so it did not know whether it has the required competence to solve the problem, and the maturity of the product, which implied that such a state-of-the-art product would be extremely difficult to improve and thus requires adequate knowledge. *Company X* was familiar with the product as it has been refining it for decades and it did not have to think of applying its own competencies fully to this case yet as it was exploiting those of *Company Y*.

The risk of not reaching the objective due to e.g. technological challenges during the development process was indicated through target risk. Interestingly, it was evaluated to four by both companies. This risk can be considered partially the same as the competence risk and therefore the reasons to the assessed level of risk are also partially the same. Yet, whereas the competence risk includes all kind of knowledge the target risk takes only technological challenges into consideration. They were more product related.

The last type of risk was another kind of network risk, which comprises changes e.g. in partner interests or ownership during the development process. This was also set very low by both case companies with a gap of two points though. *Company Y* assessed it to three while *Company X* considered there was no risk of this type at all. This also signaled trust from both sides as the companies expected each other to commit to the case and do their best to realize equal benefits for both.

Like the assessment of the opportunities the risks were quite understandable and consistent as well. It can be seen that *Company Y* evaluated the risks somewhat higher than *Company X*. This was due to the afore-mentioned grounds of which the main ground was that *Company Y* was simply considered a solution provider to a problem that was relatively novel to its employees.

Since the assessment tool was still under development and it is also meant to be modified in accordance with the context, the employees of *Company Y* suggested that there could also be a point indicating the risks more related to the case product itself. In this case the product was very mature and highly optimized, which would have enabled the companies to set certain risks higher demonstrating the difficulty of the undertaking. However, now the companies applied that risk to business and network risks. It was also noted that the assessment tool was ultimately developed for a context where completely new products are created by the collaborating companies. Moreover, if the companies had decided to continue the process and had generated a satisfying solution to be developed, one of the next workshops would have dealt with idea evaluation where all kinds

of product related risks and opportunities would have been evaluated. After all, the case was terminated before too much valuable resources were invested in it.

As mentioned earlier the assessment of opportunities and risks was conducted between the first and the second workshop. The average point for risks and opportunities was calculated for both companies and compared in a coordination table directly displaying whether the risks or opportunities were higher. Although the companies were thus able to approach the collaboration systematically the results were not found the most important outcome of the assessments as the senior research scientist of VTT explained:

“From my point of view the valuation of the results is nothing compared to the discussion and the analysis that were carried out together, and both companies understood the method and appreciated it as a process rather than a result.”

The results were discussed during the second workshop in an open way which helped the companies to understand each other and each other's expectations. This approach to collaboration was praised by all participants and it was stated by many of the interviewees that the method further increased the level of trust between the companies. Yet, a pitfall regarding the assessments to bear in mind was also brought into question by one of the interviewees. The method can be a little bit naive sometimes in the sense that it cannot measure the truthfulness of the answers. If the companies really wanted to collaborate with each other the assessment results could be distorted in order to give a better impression for the counterpart. Hence, opportunistic behavior can be hidden which may lead to awkward conflicts at the later stages of the process. Open discussion about the motives, expectations and intentions is thus essential to secure successful collaboration potential assessment.

5.5.2 Post-project review

The fourth workshop was originally supposed to be an idea evaluation discussion, but since the case was terminated shortly before the workshop it was agreed that it will be a post-project review. The workshop covered more or less all themes and activities that were discussed and carried out during the case. The focus was on the factors that had facilitated successful performance or entailed major challenges during the project. Most of the key persons involved in the case were present or at least represented by colleagues which enabled versatile and extensive discussion. All four organizations i.e. the case companies and the research institutes were represented as well. The purpose of the workshop was to recall what had been done and to gather information for research purposes as well as for the companies' future activities. Financial or other objective meas-

ures were not used to evaluate performance of the undertaking. After the last workshop a summary of the open innovation process and related activities was compiled by the researchers and shared to all participants.

The technical features of the product and the potential solution were discussed at first, because the technical experts and the project managers had worked on the solution during the summer when many of the key persons were in vacation. Thus, everyone participating in the workshops did not yet have sufficient understanding of the product development process for being able to comprehend the main reasons for the termination of the project. The suggested solutions were reviewed and it was explained why they did not meet the requirements. The key challenges had been quality related which ultimately caused the mismatch of the proposals. However, *Company X* noted that the technological discussions could still be continued as the possibility to improve the case product remains.

The technical point of the case was seen extremely difficult not just due to the product features and its operating environment but also due to the need for so many different persons and experts with various skills. The researchers and business people were not involved in the product development discussions due to partial lack of understanding of the case product, which impaired the amount and the quality of information flows. Thus, it was noted that it is essential for people from different departments and with different background to understand each other. The case companies also operate in different industries which made it even more difficult to understand how the partner thinks. As a consequence, *Company Y*'s employees noted that they were willing to learn the specifics of *Company X*'s industry.

Communication methods were discussed in the last workshop as well. In both companies' opinion virtual workshops were an effective way to organize meetings for such a group of which the key individuals are distributed all over the country. Still, one or two face-to-face meetings should be arranged at the very initial stage of the whole open innovation process to facilitate in particular product development and contracting processes. *Company X* had not been actively using Internet-based workshop technology prior to this project, but it had learned to use it very quickly and was therefore satisfied.

Naturally the post-project review covered also with contracting and IPR. The initial discussions on IPR seemed easy and collaborative. The IPR were to be shared, but drafts of the letter of intent indicated something else. In fact, the IPR could have been shared without a doubt, but there were also restrictions to the use of the IPR which made it so difficult to agree on those terms. The companies tried to figure out better ways to lay out drafts of such contracts that would be equally beneficial for the partners. However, the primary reason why the contracts could not be outlined quickly and concisely was the ambiguity of the project outcomes. There were several possibilities to improve the case product and *Company Y* just had to find out the best feasible way. The

companies still supported the possibility to involve lawyers in the initial discussion to strengthen their understanding of the case. When the lawyers are not familiar with the case and its details they tend to compile the contracts to protect everything that will be generated in order to avoid loss of critical knowledge and IPR. Everyone agreed on the fact that collaborative activities are easier to perform when the rules are clear.

The collaboration assessments done in the beginning of the case were reviewed and checked in case the companies would evaluate some points differently after the case. However, they stated everything was in line with their current insights. Some of the key people were even surprised that the assessments had been done so well. Yet, there was one point that *Company Y* would have changed if the assessments were done again. They would have increased the level of business risk since they had learned new aspects from *Company X*'s business in the course of the process. As mentioned earlier, the expectations towards the case fell dramatically when the employees of *Company Y* learned about the case product and its operating environment.

Despite the case results the companies said they will continue to practice this kind of collaboration at least with other partners when not with each other. The project manager (*X*) noted:

“If and when similar cases take place where we need their [Company Y's] help we probably don't have VTT or PBI in the background not to mention a contract within FIMECC, but we are somewhat wiser now and would definitely like to collaborate with them in the future.”

Company X stated that it was not able to discover any contributions to the product through the efforts of this case but observed that *Company Y* is keen to innovate and create new knowledge and products in collaboration with *Company X*. Also *Company Y*'s employees had learned much about a new industry and open innovation although in particular the technical experts were somewhat disappointed due to the final results especially in product development. The involved researchers obtained valuable information as well, which can be utilized for further research purposes and similar projects. After all, many lessons were learned.

5.6 Main research findings

The findings of the empirical research were discussed from four perspectives: actors and roles of the network, product development, contracting, and evaluations. Based on the analysis the main research findings are illustrated in Table 4.

Table 4 Main research findings

Actors and roles
<p>Organizational actors and roles</p> <ul style="list-style-type: none"> • Core network comprised a supplier-customer setting complemented by two research institutes • Suppliers, co-suppliers, contract manufacturers, competitors, end customers and administrative actors indirectly involved • The concept of closed network was used to describe the network in this case • The roles of orchestrator, group member, and bridge were all more or less present although they cannot be regarded as clear examples due to yet small size of the network • Coordinating, governance, management and leading styles were appropriate • The case companies and research institutes were active actors whereas the actors not yet involved can be considered passive actors <p>Individual actors and roles</p> <ul style="list-style-type: none"> • Power promotor was partly missing from both companies • IPR specialists should have been involved earlier in the process • Researchers facilitated the process but did not perform a promotor role
Product development
<ul style="list-style-type: none"> • Mature and highly optimized product extremely difficult to improve • Business mainly in Asia, which caused several difficulties • Suggestions for technical solutions were given before contracts had been signed • Speed relatively fast in compare with previous cases • Summer vacations entangled the process • Virtual workshops were utilized for conducting meetings <ul style="list-style-type: none"> ➢ Effective way to organize regular meetings for distributed participants • Two face-to-face meetings organized for technical discussions • Email and telephone also utilized
Contracting
<ul style="list-style-type: none"> • High level of trust, no opportunistic behavior <ul style="list-style-type: none"> ➢ Originating from partly existing relationships as well as common language and culture • FIMECC consortium contract in background increased level of trust and enabled swift process • Letter of intent, NDA and Supply or Collaboration agreement were discussed <ul style="list-style-type: none"> ➢ <i>Company X</i> signed NDA but <i>Company Y</i> did not ➢ Other contracts were not signed mainly due to diverging views towards IPR • Lawyers' understanding of the case insufficient • Ambiguity of outcomes hampered contracting process • Commitment to long-term business relationship was considered too expensive
Evaluating
<p>Collaboration potential assessment</p> <ul style="list-style-type: none"> • Opportunities <ul style="list-style-type: none"> ➢ Differences in market position and external resources ➢ Learning aspect highlighted by both companies • Risks <ul style="list-style-type: none"> ➢ Differences in competence and network risks ➢ High business risks • Open discussion on results <p>Lessons learned</p> <ul style="list-style-type: none"> • Post-project review carried out in the last workshop • Open discussion with focus on key success factors and main challenges

The core network comprised two case companies, supplier (*Y*) and customer (*X*), which were supported by two research institutes, VTT and PBI. These actors were directly involved in the network whereas other suppliers, co-suppliers, contract manufacturers, competitors, end customers and administrative actors were involved indirectly, because they were did not yet perform any activities for the purposes of this network, but would have been involved at later stages of the process. These actors can be considered to form the passive part of the network while the core network formed the active part. The participants called this kind of network closed where the actors are selected and invited to join.

The organizational roles were all present, but due to the small size of the network and presence of collaborating research institutes they were not unambiguously distinguishable. Furthermore, all parties performed the three roles simultaneously which were orchestrator, bridge and specialized group member. Thus, coordination, governance, management and leading style of the whole case were found appropriate. The case naturally involved several individual persons as well who performed different roles of which process promotor, expert promotor and relationship promotor were present while power promotor was partly missing from both companies. Even though both case companies had persons to perform the role of process promotor, the researchers planned and knew the process in the sense that they can be considered facilitators of in particular the process.

The activities related to contracting were remarkably facilitated by high level of trust which originated from partly existing relationships among the key persons of the case as well as from the common language and culture. The FIMECC consortium contract in the background did not just increase mutual trust but also encouraged the companies to proceed to generating ideas. Other contracts that were dealt with were letter of intent, on which the companies could not agree due to diverging views towards IPR, NDA, which was signed only by *Company X*, and supplier or collaboration agreement that was only briefly mentioned but not yet further discussed. The lawyers' lack of understanding of the case details was considered one of the main reasons to the stiffness of the contracting process. Closely related to the latter reason however, it was found that the contracting process was hampered by the ambiguity of the upcoming outcomes of the undertaking. Thus, nobody actually knew what the companies were collaborating for. Moreover, *Company X* was not willing to commit to regard *Company Y* as its primary business partner for the case product, because it thought it could buy it cheaper from other suppliers.

Collaboration potential assessments were carried out successfully in the beginning of the process. The assessments were held in high esteem by each participant as they further increased mutual trust and systematically indicated opportunities and risks of the collaboration from both case companies' perspectives. The largest differences were seen

in the risk of network interests and the risk of having adequate competence to reach the target as well as in the opportunities to improve market position and exploit external resources. The most highlighted points in the assessments by both companies were the opportunity to learn and general business risk. After the assessments were conducted they were openly discussed in the second workshop.

The last workshop was a post-project review where open discussion on the key success factors and main challenges of the case took place. It was regarded extremely useful, because the parties could share their views and make improvement proposals considering similar projects in the future. The discussion also covered issues that were neglected during the process.

Based on the discussion above key success factors and main challenges can be identified. These are illustrated in Table 5.

Table 5 Key success factors and main challenges

Key success factors	Main challenges
<ul style="list-style-type: none"> • Utilization of virtual workshops • High level of trust • Collaboration potential assessment • Open discussions • Motivation to learn 	<ul style="list-style-type: none"> • Commitment of top management • Belated involvement of lawyers • Ambiguity of outcomes • Maturity of case product • Business mainly in Asia • Too few physical meetings • IPR issues

Utilization of virtual meetings can be considered one of the success factors, because it facilitated communication and enabled swift arrangements of workshops with several key people involved. The process would have taken much longer without the possibility to carry out meetings over the Internet. Another success factor is high level of mutual trust as it increased inherent exchange of knowledge and thoughts. However, the high level of trust among the actors was considered even too high at times since it encouraged the parties to skip certain tasks.

One of the most valuable resources during the whole case was the collaboration potential assessment. The companies conducted an evaluation of opportunities and risks of the collaboration after which the results were discussed in an open way. The participants were thus able to learn about and from their counterpart, which considerably increased their understanding of the collaboration. The openness of the parties as such originated from the mutual trust and motivation of the participants to learn through collaboration.

The main challenges are factors that impeded successful implementation of the case. First of all, presence of a top manager signals commitment to the collaborative under-

taking. In this case, neither case company involved one which slowed down the open innovation process. The top manager would not have to be present in all meetings but act as an investor or project owner. What also slowed and hampered the process was the belated involvement of lawyers. They did not take part in the meetings which led to their lack of understanding of the collaborative project. Nevertheless, this was also due to the ambiguity of the outcomes to be realized. In fact, there was no person who knew what the final result of the collaboration would be.

A major challenge for the product development was that the case product was mature and highly optimized already so it was extremely difficult to make contributing improvements to it. A better starting point for such product development would be a less mature object to be upgraded. Another challenge closely related to the product and the business around it was that it is manufactured in Asia and that the customers are also located mainly in Far East. Moreover, although the virtual meetings enabled effective organization of workshops all details of the case were not able to be discussed over the Internet. Physical face-to-face meetings were not carried out so that all key persons would have been present. Two technical face-to-face meetings were arranged instead, involving only project managers and technicians though.

Finally, IPR issues implied one of the main challenges as the involved parties could not reach a satisfying agreement on how to share them. A facilitating factor was that the companies trusted each other and agreed that the IPR can be shared. The problem was thus who gets what rather than attempts to own all of the rights for oneself.

6 CONCLUSIONS

This chapter concludes the study by first considering theoretical and managerial implications after which limitations and suggestions for further research are presented. Whereas the theoretical implications compare earlier research to the results of this study by adapting the model of the theoretical framework of this study to the researched case, the managerial implications are recommendations that would be reasonable to apply in the world of practice.

6.1 Theoretical implications

The theoretical framework of this study comprises four main subjects: actors and roles involved as well as activities related to product development, contracting, and evaluating. Section 3.4 of this thesis presented a model of the theoretical framework of this study, which was based on earlier research results of various scholars and combined using several different theories. Based on the empirical analysis of this thesis an adapted model of the theoretical framework of the study is presented on next page in Figure 11.

The studied case took place between two companies that were considered supplier and customer. This has been referred to as the most common setting regarding any business relationships (cf. Håkansson & Snehota 1995). However, the setting was not stable but rather very dynamic, because the companies did not know what the final outcomes were going to be. The situation can be considered new for both case companies as they are operating in different industries. Thus, novel aspects and solutions were pursued. The case also involved two research institutes with central roles in affecting the process. These four organizational actors formed the core network of the case. The companies did not directly involve other actors in the case, because the nature of the common project remained ambiguous.

The network positions and roles of the organizations were relatively quickly detected as there were only two main business initiators and two research institutes. Each of the organizational actors was performing all roles at least to some extent. However, at the initial phase of the studied open *innovation there was no entity or individual who clearly would have taken the leadership role* (cf. Shuman & Twombly 2010). According to the research data and analysis, the reason for this was that there is no need for more coordination or control when the number of actors in the network remains small. Rather than having an apparent leader or orchestrator, the companies and research institutes coordinated, planned, scheduled, and led the process in close collaboration while each of them having particular tasks to do.

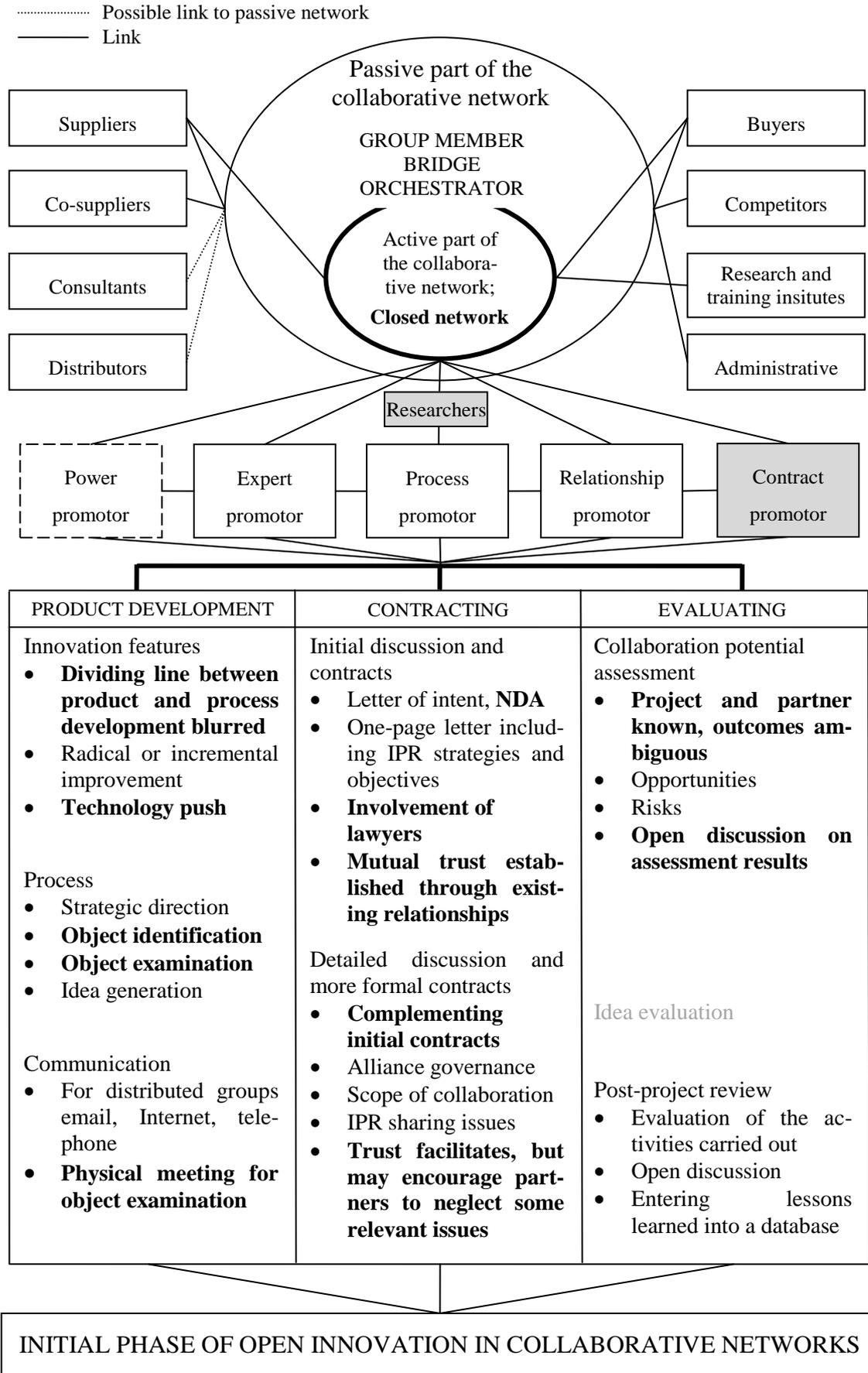


Figure 11 Adapted model of the theoretical framework of the study

As different characteristics of open innovation and collaborative networks cannot be copied from an industry to another, it is clear that the concept is more appropriate in some industries while it may be extremely difficult to implement in others. As this research and the case study shows, it seems that open innovation has not yet been very widely applied in industrial business. Collaborative networks are most likely to be vertically built with suppliers and their suppliers, while competition relies on surprises created within companies' own value chains. Of course, new products and production technologies in industrial business often require relatively large investments in comparison with those of emerging industries, where potential for new ideas is considered much greater than in more traditional industries. Consequently, industrial companies find it too risky to collaborate in open networks since it could cause remarkable losses to the company that has invested the most in an emerging product or technology.

As a result, the participants of the case considered the network closed from other actors besides them as long as new partners were needed and thus invited to join (cf. Häcki & Lighton 2001). Based on the definition of collaborative networks presented by Camarinho-Matos and Afsarmanesh (2008, 2464), *a closed network can be thought of as the active part of a collaborative network involving a variety of invited organizational and individual actors that are largely autonomous, geographically distributed, and heterogeneous in terms of their operating environment, culture, social capital and goals, but that collaborate to better achieve common or compatible goals, and whose interactions are supported by Internet-based technologies.*

The definition includes three points that require clarification. Firstly, a closed network is the active part of a collaborative network, where the involved actors perform activities in favor of the whole collaborative network (cf. Markard & Truffer 2008.). The passive part of a collaborative network involves several actors that perform activities not for the respective network but for themselves or other networks. Secondly, the passive actors remain passive as long as they are not invited to perform activities for this particular network. Each actor in the active part of a collaborative network has been either the initiator of the network or invited by the initiators. Thirdly, as the actors are geographically distributed they communicate to a great extent by utilizing Internet-based technologies. Hence, they are better able to organize meetings without anyone having to travel. It enables effective and fast-paced proceeding in collaborative projects.

Although such a closed network may be quite slow and rigid relative to open networks due to complex products and processes as well as contractual issues, it seems to be a reasonable way to collaborate in industrial business. It allows the initiating actors for an option to choose the most desirable partners with the right resources to contribute to the open innovation process. Moreover, a closed network enables the innovating companies to carefully plan and implement the open innovation process, which has been considered crucial for successful innovations (cf. Desouza et al. 2009).

As was showed in the case analysis, the *promotor roles* are very dynamic at the initial phase of the open innovation process. They cannot all be easily detected since such a process involves many persons whose roles are not precisely defined. However, technical experts and process promoters could be quickly found from both case companies although they had other promoters' attributes as well. In fact, no promotor role was performed by one person alone. It was also perceived that the promotor roles are partly overlapping and can be performed by several actors simultaneously. Also one person may perform several roles, or contribute to them to a varying extent (cf. Fichter 2009). The role of a universal promotor, or champion, could not be observed even though someone may have an active role in many areas.

Another interesting conclusion can be drawn as it was observed that the researchers involved in the network did not perform a promotor role but strongly facilitated the process. The process promoters are ultimately those project managers who know the specifics of their own company and actively support the open innovation process. However, researchers possess specific knowledge and the latest information about best practices regarding open innovation and collaborative networks as they may participate in several collaborative business cases simultaneously thus being able to observe the latest trends and emerging opportunities. Consequently, *researchers provide process promoters with significant support and guidance and may even take lead in such a process.*

Absence of power promotor and its effect on the process was perceived an impeding factor to a successful open innovation process. This is not unusual as earlier research has paid much attention to committing top managers in various projects. The dash-lined box of power promotor in Figure 11 indicates that power promotor is a crucial resource in collaborative innovation activities, but that it was partly missing in the studied case. However, even if such a case did involve top managers, it does not necessarily mean that they were committed.

As IPR issues obviously generate contract related juridical barriers the IPR specialist could be considered to tackle them in the context of open innovation and collaborative network activities. Moreover, as the open innovation paradigm stresses the importance of corporate IPR it can be argued that those issues will be of a great significance also in the future. Hence, *collaborative innovation projects call for a contract promotor to overcome inter-organizational barriers of legal matters.* Contract promotor works thus in close collaboration with power and process promoters to make sure that the contractual pledges made are feasible and reasonable. Hence, a fifth role for promotor theory is suggested to be applied especially in the context of open innovation.

The open innovation process of the case presented several differences and similarities compared to the results of earlier research. As the case study and the adapted theoretical framework show, when a product is developed it is not always clear whether the product itself or its manufacturing process is improved. *The product and its manufactur-*

ing process may be so closely related that the line between them is blurred (cf. Tidd et al. 2005). Furthermore, the same applies to the degree of the innovation's novelty as it may not be known yet whether the innovation will be radical or incremental, even though the case companies did not seriously expect any radical solutions to emerge as the purpose was to improve performance of the case product. A common factor for these features is that the outcomes of the open innovation process are not yet clear at the initial phase. However, these features may remain unclear even when the idea is commercialized, because they are always considered from subjective point of view. On the contrary, as the end customers of the case study had not expressed to have an urgent need for better products, and as the case companies were willing to come up with own contributing ideas, the product development can be regarded as a *technology push* (cf. Desouza 2009).

The product development process could be quite well explained by the earlier research (cf. Flynn et al. 2003), while few minor points need to be reconsidered due to the collaborative characteristics of the undertaking. First of all, the case companies had defined their strategic directions prior to the collaboration. *Company X* had planned to initiate a modulation process i.e. a common development process for several products. The case product was one of them and was hence an attractive choice in this case. *Company X* had identified and chosen the case product also, because it had to consider what kind of product would be appropriate for regarding *Company Y's* resources and know-how. Thus, in such a case where a company is invited to contribute to a product of another company, the inviting company performs the first two activities of the product development process. Consequently, *the product needs to be introduced to the contributing company which then examines it in detail and its operating environment as well as its whole business concept*. Only when this activity has taken place the company is able to make contributions to the object by generating ideas that are evaluated by both companies together. The stages of object examination and idea generation are not carried out by the contributing company alone since the product owner's requirements need to be taken into consideration throughout the process.

Different communication methods were used quite effectively in the case of this research. The findings of this study related to communication among the participants were in line with earlier research, which regards virtual workshops effective for distributed networks (cf. Dooley & O'Sullivan 2007). Also *the fact that physical meetings are required at some stages has been recognized, but based on this study it can be stated that they are of a great importance when the object is examined, because it allows the engineers to discuss the object more accurately while drawing and pointing certain details*. However, besides Internet-based virtual workshops, email, telephone and physical meetings, other methods remained unexploited. For example, common platforms (cf. Bilgram et al. 2008) for closed networks or inter-organizational online chats could be con-

sidered to be introduced to collaborating companies in industrial business. They are new ways of communication especially in traditional industrial business but could make communication even more effective and perhaps even minimize the great importance of physical meetings at some stages.

From the contracting point of view, the studied case offers interesting perspectives. *An NDA and a letter of intent were done already during the initial discussions* (cf. Mehlman et al. 2010), even though they were not accepted by both case companies. However, it was agreed that they would be complemented in the course of the case. Therefore, the letter of intent was supposed to be one-page agreement comprising only the main milestones regarding objectives of the collaboration and IPR strategies. This can be considered a great idea if it works. *The idea could be facilitated by introducing lawyers of the case companies already in the initial discussions* (cf. Wanetick 2009; Mehlman et al. 2010). The case companies of this research did not do it so, but it was afterwards strongly emphasized by themselves that they should have done that. It was not due to lack of trust but rather due to competition related legal terms that could not be agreed upon. In fact, *mutual trust had already been established through existing relationships before the case* (cf. Kale et al. 2000), and it was considered very high. Yet, this is rarely so if the companies collaborate together for the first time in such a context, but if the collaborating companies signal commitment to the common project, it may have a considerable positive effect on the collaboration (cf. Spekman et al. 2000).

As companies go through the contracting issues at the initial phase of open innovation, these activities can be classified into initial discussion, where preliminary contracts are made, and detailed discussion, where the contracts are complemented and made more formal. Hence, the initial phase of open innovation can be speeded up by not concentrating on the most difficult issues in the very beginning (cf. Mehlman et al. 2010). However, these cannot be directly divided into two separate stages or meetings as the discussion proceeds little by little due to the complex and iterative nature of the process. Like in every industry, alliance governance and scope of collaboration as well as IPR sharing issues present sometimes extremely difficult tasks for collaboration managers, which are undoubtedly facilitated by high level of trust among the participants. On one hand, earlier research has emphasized mainly the positive impact of trust, but *such high level of mutual trust also entails a pitfall of encouraging partners to neglect important contracts related to IPR sharing*, which may lead to awkward disputes or opportunistic behavior, especially if the outcomes of the collaboration are not yet clear. On the other hand, if the IPR sharing can be quickly agreed, mutual trust may form the basis for very successful collaboration. Both of these arguments apply not only to the studied case or industrial business but also to other industries in contexts where partners do not intentionally let their knowledge to leak out to other companies.

The evaluation related findings were subject to two separately conducted assessments namely collaboration potential assessment and post-project review. According to the case companies, similar collaboration potential assessment has never been done in the same context. From this point of view it provides new information for theories related to partner selection as well as for alliance managers in practice. *The assessment was carried out knowing the partner and the project while the outcomes of the collaboration remained ambiguous* (cf. Shah & Swaminathan 2008), *which is why they were presented in form of risks and opportunities*. This kind of assessment can be done in any industry prior to any collaborative project, also when the partners know each other well already. In fact, when the assessment is done, the partners should already have learned each other's business and skills. As the project was known, the opportunities and risks were specifically addressed to deal with the respective project. Therefore, the assessment is not designed to be the very first evaluation when completely new partners intend to collaborate.

An interesting finding was the subsequent open discussion about the assessment results. *Whereas the results of the assessment may give insights to the partners and encourage employees to discuss within the companies, open discussion with the counterpart's employees can be considered at least as useful*. It enhances participants' understanding of the partner's expectations, thoughts and skills as well as builds mutual trust by creating a collaborative atmosphere. A critical prerequisite for successful and useful collaboration potential assessment is sincerity. If partners do not share their thoughts frankly, their behavior can be interpreted opportunistic, although this may be difficult for the counterpart to observe.

Since idea evaluation is considered necessary before implementing any idea it remains as one part in the model. As this was not done in the case study however, it will not be analyzed here either. Instead, *a post-project review was carried out as final meeting implying that the studied case belongs to those 20% of all R&D projects that undergo a post-project review* (cf. Zedtwitz 2002). *The findings are in accordance with earlier research results with the difference though that this study focuses only on the initial phase of a project whereas earlier research has studied mainly reviews made after the project*. Unlike at later phases, numerical measures are near to impossible to use after the initial phase since the outcomes have not yet realized and can be very difficult to interpret due to their indirect and complex nature (cf. Camarinha-Matos & Abreu 2007). Yet, open discussion and subjective opinions also in this evaluation facilitate learning and make upcoming projects for other teams easier through lessons learned entered into a database.

It can be concluded that open innovation presents an opportunity to collaborate with attractive partners, while a real business case can be set up just to foster the learning experience. As in particular industrial businesses are trying to learn the basics of open

innovation and collaborative networks, a product may be just one little part of the common project where learning and knowledge transfers play the major role. The study proves that this kind of collaborative case may teach the participants valuable lessons, even if there were no urgent needs for new innovations.

6.2 Managerial implications

This section deals with managerial implications based on the empirical analysis of this study. As the analysis showed, the case presented several facilitating and impeding factors for successful implementation of initiating open innovation in collaborative networks. In addition to the implications to further enhance the facilitating factors and to turn the impeding factors into strengths, other considerations are highlighted for managers to be taken into account when their companies pursue open innovation in collaborative networks. At first it has to be kept in mind that *each collaborative relationship, network and open innovation process is a unique case*. The actors and roles, their interaction with each other, or the activities carried out by the actors during a case make it different from others. Consequently, there are no absolute measures that can be applied from one case to another. Thus, also the implications here are relative and should be carefully considered before applying to a specific context.

When companies decide to enter alliances and networks in industrial business markets to improve their innovative performance or collaborative ability, managers should be aware of how the network is managed and led. The studied case shows that *the initial phase of the open innovation process does not require one official leader but a shared organizing system that directs the network towards common goals of the participants*. A shared organizing system is a mode implying that open discussion takes place in and outside the meetings where each participant can contribute to the common activities. Stronger management styles or orchestration are rather undesirable at the initial phase of the process if the active part of the network is still relatively small comprising only a few organizational actors. It also has to be kept in mind that even though there were not many organizational actors in the network there may be dozens of key persons involved. In that case different and more concentrated management styles should be considered.

Even though the initial phase of the process does not necessarily require official leader or concentrated management system, *the participants of the undertaking should involve a top manager in the case to signal commitment and facilitate the process*. Such a manager has the ability and power required for swift proceeding and resolving conflicts. If both or all participants involve a top manager the alliance can indeed be regarded strategic. By having strategic objectives in a project but no promotor for them leaves an empty gap in the process which may turn out to be a major impediment for

successful implementation. Related to this, *another individual who should be involved in the process at the initial phase is lawyer i.e. IPR specialist*. By participating in the initial discussions IPR specialists of both companies could learn about the case and its purpose which would enable them to better compile the contracts. They would thus also be able to advise the engineers and business men on IPR and knowledge sharing issues as well as to bring forward issues required for the initial contracts. However, if the outcomes to be realized through the collaboration are unambiguous the IPR specialists may not be needed in the initial discussions as they can hence be informed by other participants.

Demand for mature products tends to decline over time which is why companies cannot just develop completely new products but also need to refine the old ones. Product refinements may be much more difficult to implement in collaboration than innovations created from scratch. Thus, *the parties may have better motivation towards joint development of new products and emerging business rather than mature and already highly optimized products*. In joint development of novel products the participants can better focus on their own competencies and apply them in the open innovation process and are thus better able to make contributions to it. In turn, competitive yet mature products may be subject to certain restrictions in exploiting those competencies.

Effective communication methods are critical to a successful implementation of a collaborative innovation project. Some things can be communicated by phone or email, while others require table negotiations or company visits. Through the case study it was learned that the Internet enables very effective organization of meetings realized through an Internet-based tool, which allows for listening, speaking and sharing of a computer screen where presentations can be given. In fact, it can be stated that the whole initial phase of such a project could be possible to conduct by using the Internet and the virtual workshops method for communication. However, at some stage the communication turns stiff and thus inefficient due to more complex themes in consideration. Hence, *virtual workshops are a valuable tool for communication in pursuing open innovation with external partners in particular if the key persons are geographically distributed, but certain activities such as IPR discussions and careful investigation of possible new solutions and concepts require physical face-to-face meetings*. Geographical distribution implies that meetings have to be organized mainly over the Internet. If the partners worked for example in the same building or even same city it would be natural to have more face-to-face meetings. Besides, the first meeting could also be carried out as a physical meeting, because it creates mutual trust and facilitates communication in later virtual workshops.

In the open innovation process many kinds of activities take place parallel while they are also in complex interaction with each other. Activities related to for example product development can proceed much faster than other activities which may create awk-

ward disputes regarding IPR issues. In the case researched in this study this did not happen, although the activities related to product development proceeded much faster, but *it is strongly recommended that the IPR sharing and related contracts are agreed upon before moving on to critical exchange of ideas*. If the core competencies and know-how of the companies are not properly protected they may leak out of the company and even reach the main competitors at some stage which in turn may lead to loss of competitive advantage. Even when the outcomes of the collaboration are not yet known, there should be a clear view of who owns what and who may use it. In the case study of this research there were no awkward disputes due to IPR issues, but knowledge spillovers may have occurred, which may be realized later.

Contracts and IPR questions are often the most difficult issues in collaboration related to innovating. *A common fair rule is that IPR are shared according to the contribution of the participants*. This means that the actor who comes up with or contributes the most to a certain part of the innovation may also have the ownership of and using right to that property. However, as it is usually not that simple when products and processes are developed in close collaboration and when the contributions cannot be measured accurately enough, *the parties need to conduct a meeting prior to extensive negotiations where open discussion takes place considering the expectations, wants and normal procedures of each party, and where the agreements would be viewed and commented by a third party as well*. In this way the participants are able to obtain an insight on each other's views, which in turn facilitates the initial contracting process. A third party is good to be present to balance the agreement so that it would be satisfyingly fair for each party. Such initial discussions also prevent the parties to proceed to more extensive and often resource-consuming negotiations before knowing whether the IPR issues can even be agreed on.

Prior to concrete collaboration for innovative activities the parties should have an insight on the potential partners' businesses. Potential synergies should be carefully evaluated, but collaboration, and in fact any activity in open innovation process involves risks that also need to be assessed. As the case study of this research showed, *it is highly recommended to carry out collaboration potential assessments that include at least risks and opportunities, and subsequently to discuss the results in an open way*. The assessments and open discussion on the results do not necessarily indicate any outcomes deriving from the collaboration, but they do increase the level of trust among the parties and enhance their understanding of possible risks and opportunities of the collaboration. The assessments can be reviewed and complemented in the course of the process. A third party present also in the assessment discussions may be a valuable resource.

Another *highly recommended evaluation to be conducted in the end of the initial phase of open innovation in collaborative networks is the post-project review*. In fact, it is recommended to review any project that has taken place involving the respective par-

ty. Hence, the participants of the project can discuss the mistakes made during the process and suggest better practices, while also identifying key success factors that facilitated their collaboration. Thus, the participants are able to create lessons learned, which they can enter into their databases to be utilized for similar projects in the future. A post-project review can also be done more than once during a project, for example after a certain period of time or amount of activity, to ensure that the participants still remember everything. Such a review carried out after each phase could be regarded as post-phase review.

While some of the above-mentioned implications may be critical to a successful implementation of a collaborative innovation project, some need to be further researched. Next section deals with limitations of this thesis and suggests further themes to be researched within this particular field of study.

6.3 Limitations and suggestions for further research

Although the research offers a comprehensive picture of the researched area, some limitations still remain. Firstly, this research is a qualitative case study covering only one particular case in its specific context. Therefore, the results cannot be fully generalized to other similar cases since open innovation in collaborative networks involves several organizational and individual actors and roles as well as a wide variety of different activities, and each case can be considered unique. Nevertheless, the purpose of the study was not to obtain generalizations but to gain comprehensive understanding of such a specific phenomenon through a single case study and to inspire more academic discussion in the field.

As only the initiative phase of open innovation in collaborative networks was studied in this research it would be interesting to study cases that gain further progress where more applied tools can be developed and tested. For example, a standardized method for idea evaluation and network assessment or new ways to compile standard contracts could be researched and developed. Moreover, as such a case proceeds to further phases of joint development and commercialization, the network evolves over time and changes its form. New partners are invited while existing and active partners may leave the network. New partners such as end customers, contract manufacturers and competitors would have a significant effect on the network. Thus, the roles of the actors may change as well, not only at the organizational but also at the individual level. Even new promotor roles might appear as new kinds of barriers to innovation would be perceived. Particularly interesting research regarding promotor roles would be how to best involve and commit a top manager in the open innovation process, whereas the role of the IPR specialists as such undeniably requires further research. All this would further increase

both researchers' and practitioners' understanding of the phenomenon, which would in turn improve collaborators' performance.

The studied case did not lead to a new business solution or even incremental improvement as it was terminated due to various reasons. Hence, it could be argued that the case cannot be considered completely optimal for such a study that attempts to form the basis for understanding the phenomenon. However, the purpose of this study was not to gain understanding of successful open innovation in collaborative networks, but to understand how companies pursue it. Thus, the outcomes of the case do not affect the quality of the research. Actually the outcomes of the case just verify the fact that companies and people are human and that nothing comes for free even if the best experts were present and their ideas and visions were applied. Everything must be learned and practiced before prosperous implementation. However, research on alike yet successful case from the same or another perspective would be beneficial for gaining further understanding.

Lastly, the final results and benefits gained through the case cannot all be perceived instantly after the operation. The learning and experience obtained will realize later on in other undertakings in the future. Therefore, the evaluation and assessment of the benefits and costs appeared can be better weighed and valued after months or even years. Also the impact of one or more such projects on innovation productivity and consequently on the strategy of an organization would be an interesting field of study.

7 SUMMARY

One of the greatest opportunities for pursuing business growth is to be innovative. Innovation means that new ideas are successfully commercialized. However, vast majority of all innovation attempts fail, which makes innovating inherently risky. Innovative capabilities can thus provide firms with a key to success. Traditionally, firms have utilized only their internal capabilities in research and development activities whereas they have recently started to form collaborative networks to be better able to exploit external sources of innovation.

This study was carried out within the INC research project, which is a part of a larger FIMECC program that involves industrial companies and research institutes for pilot implementation of created knowledge. PBI Research Institute worked as the base for conducting this research while VTT acted as a close partner. The purpose of this thesis was *to understand how companies pursue open innovation at the initial phase in collaborative networks*. Open innovation has been defined as a paradigm that emphasizes exploitation of internal and external sources of new ideas as well as internal and external paths to market those ideas. As open innovation has led to increasing number of collaborative networks, these two concepts were brought together in this thesis by applying open innovation to the context of collaborative product development. In order to gain comprehensive understanding of the phenomenon, four sub questions were presented. The sub questions were:

1. *What actors and roles does the initial phase of open innovation in collaborative networks involve?*
2. *How do companies deal with product development at the initial phase of open innovation in collaborative networks?*
3. *How do companies deal with contracting at the initial phase of open innovation in collaborative networks?*
4. *How do companies deal with evaluations at the initial phase of open innovation in collaborative networks?*

The sub questions were first researched through literature reviews by examining various theories. Yet, the theory part of the research was begun by presenting resource-based motives for collaboration. This was done by taking a closer look at the resource-based view of the firm and its extensions such as resource dependence theory and the paradigms of absorptive capacity and dynamic capabilities. This helped to gain understanding of the underlying basics for the shift from closed innovation paradigm to the concept of open innovation.

The first sub question dealt with theories related to organizational innovation partners, their network positions and roles as well as with individual actors and roles. These actors were considered to perform three kinds of activities at the initial phase of open

innovation process. The second sub question referred to the activities related to product development, which were examined by combining parts of theories that explain different features of innovations, various models for product development process, and more or less effective communication methods during the open innovation process. The third sub question presented contract related activities and issues which dealt with trust and commitment, various contracts that can be compiled, and IPR. The fourth sub question described what kinds of evaluations collaborating partners can carry out during the initial phase of open innovation process. A closer look was taken at collaboration potential assessments, which are closely related to partner selection theories, and a post-project review, which can also be applied as a post-phase review. Moreover, it was kept in mind that idea evaluation is an important part of the evaluation activities in open innovation process, but it was not examined because empirical research data on this was not available. Finally, the theory chapters were summarized and combined to build a model for the initial phase of open innovation in collaborative networks.

This study applied qualitative research approach through case study strategy. The case study was descriptive and exploratory in nature, and the research data was collected through four workshops and 12 interviews. The workshops were conducted as virtual meetings by exploiting an Internet-based technology, whereas the interviews were carried out according to developed themes closely related to the purpose of this study. Consequently, the analysis method of the research data followed the approach of data reduction, display, and conclusion drawing and verification.

The case was a part of the INC project and involved two large industrial companies, which remained anonymous throughout the thesis, and two research institutes that conducted collaborative research with the case companies while contributing to the open innovation process. Other partners were indirectly involved through existing relationships and would have been involved at later phases of the open innovation process. The case was built around a product of *Company X* which acted mainly as a customer for *Company Y* that was considered a supplier or more precisely, a solution provider. Parallel to the product development process activities also related to contracting and evaluating were carried out. The case was terminated after the initial phase by the case companies due to various reasons that were examined in the empirical analysis.

It was found that the network was relatively small at the initial phase, which implied that the network roles of the organizational actors were very dynamic. Each organizational actor was considered to orchestrate the network to some extent. Yet, the companies did not miss official leader or more concentrated management, but implemented a shared coordinating and governance system, where each actor could act as an equal member. Same kinds of nuances were perceived concerning the individual actors and their roles. Promotor roles were performed not just by one person, but they were constituted through the actions taken by several involved persons. A top manager, who

represents power promotor, was more or less partly missing from both companies, whereas involvement of lawyers, that is, IPR specialists was done too late.

Further findings were related to the open innovation process. The workshops of the case were carried out by exploiting an Internet-based technology. It enabled swift proceeding but hindered effective communication among the engineers. The product was found very difficult to improve by the contributing company, since it was already highly optimized and the business of it takes place mainly in Asia. Contracting activities were perceived very difficult in a case where the outcomes of the collaboration are ambiguous. Also lack of commitment to a long-term relationship led to disagreements.

While product development and contracting generated several problems, evaluating activity was considered successfully implemented. The case companies conducted a collaboration potential assessment in the very beginning of the case and discussed the results in a very open way. The assessment covered risks and opportunities which were classified in different categories. Another successful evaluation was the post-project review. It was carried out as the last workshop of the case before dissolution of the network. The purpose of the post-project review was to discuss the outcomes and establish lessons learned by pondering the key success factors and main challenges.

The research findings presented several success factors and main challenges in the implementation of the open innovation in collaborative networks. The key success factors were mainly related to open discussions and the high level of mutual trust among the actors even though it was also found that the high level of trust may have led to neglect of certain contractual necessities. The main challenges in turn, included issues such as too few physical meetings, maturity of the case product, and IPR sharing. Ambiguity of the outcomes led to further ambiguities especially in contracting but also in role definitions.

As a conclusion, open innovation and collaborative networks have not yet been widely applied in industrial business. Companies are now testing best practices to manage collaborative R&D activities and to search for new partners able to contribute to the open innovation process. Learning and exchange of knowledge are significant dimensions of collaboration. As a real business case is set up to foster the learning experience, products may play only a minor role. Also in the studied case the product innovation was not considered the most important part of the project but learning and gaining better understanding of the phenomenon. From this point of view it can be stated that the purpose of this thesis has been well accomplished.

REFERENCES

- Agüero, Carmen – Sánchez, Paloma (2010) Intellectual knowledge capital and knowledge management in collaborative networks. *Proceedings of the European Conference on Intellectual Capital*, 1–9.
- Albaum, Gerald – Duerr, Edwin (2008) *International marketing and export management*. 6th ed. Pearson Education, Harlow.
- Almirall, Esteve – Casadesus-Masanell, Ramon (2010) Open versus closed innovation: A model of discovery and divergence. *Academy of Management Review*, Vol. 35(1), 27–47.
- Alves, Jorge – Marques, Maria José – Saur, Irina – Marques, Pedro (2007) Creativity and innovation through multidisciplinary and multisectoral cooperation. *Creativity & Innovation Management*, Vol. 16(1), 27–34.
- Amit, Raphael – Schoemaker, Paul J.H. (1993) Strategic assets and organizational rent. *Strategic Management Journal*, Vol. 14(1), 33–46.
- Anthony, Scott D. – Johnson, Mark W. – Sinfield, Joseph V. – Altman, Elisabeth (2008) Driving growth through innovation. *Financial Executive*, Vol. 24(8), 38–43.
- Awa, Hart O. (2010) Democratizing the new product development process: A new dimension of value creation and marketing concept. *International Business Research*, Vol. 3(2), 49–59.
- Bailey, Carol A. (2007) *A guide to qualitative field research*. 2nd ed. Sage Publications, Thousand Oaks, CA.
- Barney, Jay B. (1997) *Gaining and sustaining competitive advantage*. Addison-Wesley, Reading, MA.
- Beckman, Christine M. – Haunschild, Pamela R. – Phillips, Damon J. (2004) Friends or strangers? Firm-specific uncertainty, market uncertainty, and network partner selection. *Organization Science*, Vol. 15(3), 259–275.
- Berg, Bruce L. (2004) *Qualitative research methods for the social sciences*. 5th ed. Pearson Education, Boston, MA.
- Bettencourt, Lance A. – Ulwick, Anthony E. (2008) The customer-centered innovation map. *Harvard Business Review*, Vol. 86(5), 109–114.
- Bilgram, Volker – Brem, Alexander – Voigt, Kai-Ingo (2008) User-centric innovations in new product development – Systematic identification of lead users harnessing interactive and collaborative online-tools. *International Journal of Innovation Management*, Vol.12(3), 419–458.
- Brooks, Scott D. – Sykes, Robert J. (2000) A practical guide to using letters of intent. *Journal of Property Management*, Vol. 65(2), 80–86.

- Brown, John Seely – Durchslag, Scott – Hagel, John III (2002) Loosening up: How process networks unlock the power of specialization. *McKinsey Quarterly*, Issue 2, 58–69.
- Brown, Shona L. – Eisenhardt, Kathleen M. (1995) Product development: Past research, present findings, and future directions. *Academy of Management Review*, Vol. 20(2), 343–378.
- Busby, Jerry S. (1999) An assessment of post-project reviews. *Project Management Journal*, Vol. 30(3), 23–29.
- Camarinha-Matos, Luis M. – Abreu, António (2007) Performance indicators for collaborative networks based on collaboration benefits. *Production Planning & Control*, Vol. 18(7), 592–609.
- Camarinha-Matos, Luis M. – Afsarmanesh, Hamideh (2008) On reference models for collaborative networked organizations. *International Journal of Production Research*, Vol. 46(9), 2453–2469.
- Carbonell, Pilar – Rodríguez-Escudero Ana I. – Pujari, Devashish (2009) Customer involvement in new service development: An examination of antecedents and outcomes. *Journal of Product Innovation Management*, Vol. 26(5), 536–550.
- Cauley de la Sierra, Margaret (1995) *Managing global alliances: Key steps for successful collaboration*. Addison-Wesley, Wokingham.
- Chee, Sing Chan (2007) Innovation begins with failure. *Enterprise Innovation*, Vol. 3(6), 4.
- Chesbrough, Henry W. (2003) *Open innovation: The new imperative for creating and profiting from technology*. Harvard Business School Press, Boston, MA.
- Chesbrough, Henry W. (2004) Managing open innovation. *Research Technology Management*, Vol. 47(1), 23–26.
- Christensen, Jens F. – Olesen, Michael H. – Kjaer, Jonas S. (2005) The industrial dynamics of open innovation: Evidence from the transformation of consumer electronics. *Research Policy*, Vol. 34(10), 1533–1549.
- Cohen, Wesley M. – Levinthal, Daniel A. (1990) Absorptive capacity: A new perspective on learning and innovation. *Administrative Science Quarterly*, Vol. 35(1), 128–152.
- Cools, Kees – Roos, Alexander (2005) *The role of alliances in corporate strategy*. The Boston Consulting Group, Boston, MA.
- Cooper, Robert G. – Kleinschmidt, Elko J. (1993) Stage gate systems for new product success. *Marketing Management*, Vol. 1(4), 20–29.
- Coursey, Stevan R. (2004) Haste makes waste. *Venulex Legal Summaries*, 2004, Q2, 1–2.

- Cowan, Robin (2005) Network models of innovation and knowledge diffusion. In: *Clusters, networks, and innovation*, eds. Stefano Breschi – Franco Malebra, 29–53. Oxford University Press, New York, NY.
- Creswell, John W. (2003) *Research design: Qualitative, quantitative, and mixed methods approaches*. 2nd ed. Sage Publications, Thousand Oaks, CA.
- Cunha, Miguel Pina E. – Gomes, Jorge E. (2003) Order and disorder in product innovation models. *Creativity & Innovation Management*, Vol. 12(3), 174–187.
- Desouza, Kevin C. – Awazu, Yukika – Jha, Sanjeev – Dombrowski, Caroline – Papagari, Sridhar – Baloh, Peter – Kim, Jeffrey Y. (2008) Customer-driven innovation. *Research Technology Management*, Vol. 51(3), 35–44.
- Desouza, Kevin C. – Dombrowski, Caroline – Awazu, Yukika – Baloh, Peter – Papagari, Sridhar – Jha, Sanjeev – Kim, Jeffrey Y. (2009) Crafting organizational innovation processes. *Innovation: Management, Policy & Practice*, Vol. 11(1), 6–33.
- Dhanaraj, Charles – Parkhe, Arvind (2006) Orchestrating innovation networks. *Academy of Management Review*, Vol. 31(3), 659–669.
- Dogson, Mark – Gann, David – Salter, Ammon (2008) *The management of technological innovation: Strategy and practice*. Oxford University Press, New York, NY.
- Dooley, Lawrence – O’Sullivan, David (2007) Managing within distributed innovation networks. *International Journal of Innovation Management*, Vol. 11(3), 397–416.
- Doz, Yves L. – Hamel, Gary (1998) *Alliance advantage: The art of creating value through partnering*. Harvard Business School Press, Boston, MA.
- Duschek, Stephan (2004) Inter-firm resources and sustained competitive advantage. *Management Review*, Vol. 15(1), 53–73.
- Echtelt, Ferrie E. A., van – Wynstra, Finn – Weele, Arjan J., van – Duysters, Geert (2008) Managing supplier involvement in new product development: A multiple case study. *Journal of Product Innovation Management*, Vol. 25(2), 180–201.
- Eisenhardt, Kathleen M. (1989) Building theories from case study research. *Academy of Management Review*, Vol. 14(4), 532–550.
- Eisenhardt, Kathleen M. – Martin, Jeffrey A. (2000) Dynamic capabilities: What are they? *Strategic Management Journal*, Vol. 21(10/11), 1105–1121.
- Enkel, Ellen – Kausch, Christoph – Gassmann, Oliver (2005) Managing the risk of customer integration. *European Management Journal*, Vol. 23(2), 203–213.
- Eriksson, Päivi – Kovalainen, Anne (2008) *Qualitative methods in business research*. Sage Publications, London.

- Eskola, Jari – Suoranta, Juha (1998) *Johdatus laadulliseen tutkimukseen*. Vastapaino, Jyväskylä.
- Fichter, Klaus (2009) Innovation communities: The role of networks of promoters in open innovation. *R&D Management*, Vol. 39(4), 357–371.
- FIMECC (2010) Homepage. <<http://www.fimecc.com>>, retrieved 10.8.2010.
- Flick, Uwe (2002) *An introduction to qualitative research*. 2nd ed. Sage Publications, London.
- Flynn, Michael – Dooley, Lawrence – O’Sullivan David – Cormican, Kathryn (2003) Idea management for organizational innovation. *International Journal of Innovation Management*, Vol. 7(4), 417–442.
- Ford, David – Gadde, Lars-Erik – Håkansson, Håkan – Lundgren, Anders – Snehota, Ivan – Turnbull, Peter – Wilson, David (1998) *Managing business relationships*. John Wiley & Sons, Chichester, West Sussex.
- Foss, Kirsten – Foss, Nicolai J. (2005) Resources and transaction costs: How property rights economics furthers the resource-based view. *Strategic Management Journal*, Vol. 26(6), 541–553.
- Franke, Nikolaus – Hippel, Eric, von – Schreier, Martin (2006) Finding commercially attractive user innovations: A test of lead-user theory. *Journal of Product Innovation Management*, Vol. 23(4), 301–315.
- Gassmann, Oliver (2006) Opening up the innovation process: Towards and agenda. *R&D Management*, Vol. 36(3), 223–228.
- Gemünden, Hans Georg – Ritter, Thomas – Heyderbreck, Peter (1996) Network configuration and innovation success: An empirical analysis in German high-tech industries. *International Journal of Research in Marketing*, Vol. 13(5), 449–462.
- Gemünden, Hans Georg – Salomo, Sören – Hölzle, Katharina (2007) Role models for radical innovations in times of open innovation. *Creativity & Innovation Management*, Vol. 16(4), 408–421.
- Gemünden, Hans Georg – Walter, Achim (1995) Der Beziehungspromoter - Schlüsselperson für interorganisationale Innovationsprozesse. *Zeitschrift für Betriebswirtschaft*, Nr. 65, 971–986.
- Ghauri, Pervez (2004) Designing and conducting case studies in international business research. In: *Handbook of qualitative research methods for international business*, eds. Rebecca Marschan-Piekkari – Catherine Welch, 109–124. Edward Elgar, Northampton, MA.
- Ghauri, Pervez – Gronhaug, Kjell – Kristianslund, Ivar (1995) *Research methods in business studies: A practical guide*. Prentice Hall, Hemel Hempstead.

- Goffin, Keith – Koners, Ursula – Baxter, David – Hoven, Chris, van der (2010) Managing lessons learned and tacit knowledge in new product development. *Research Technology Management*, Vol. 53(4), 39–51.
- Granstrand, Ove (2005) Innovation and intellectual property rights. In: *The Oxford Handbook of Innovation*, eds. Jan Fagerberg – David C. Mowery – Richard R. Nelson, 266–290. Oxford University Press, New York, NY.
- Grant, Robert M. (1996a) Prospering in dynamically competitive environments: Organizational capability as knowledge integration. *Organization Science*, Vol. 7(4), 375–387.
- Grant, Robert M. (1996b) Toward a knowledge-based theory of the firm. *Strategic Management Journal*, Vol. 17, Special Issue, 109–122.
- Gretzinger, Susanne – Hinz, Holger – Matiaske, Wenzel (2010) Cooperation in innovation networks: The case of Danish and German SMEs. *Management Review*, Vol. 21(2), 193–219.
- Grönlund, Johan – Sjödin, David Rönnerberg – Frishammar, Johan (2010) Open innovation and the stage-gate process: A revised model for new product development. *California Management Review*, Vol. 52(3), 106–131.
- Gulati, Ranjay (1999) Network location and learning: The influence of network resources and firm capabilities. *Strategic Management Journal*, Vol. 20(5), 397–420.
- Gummesson, Evert (2000) *Qualitative methods in management research*. 2nd ed. Sage Publications, Thousand Oaks, CA.
- Hansen, Morten T. – Birkinshaw, Julian (2007) The innovation value chain. *Harvard Business Review*, Vol. 85(6), 121–130.
- Harrison, Jeffrey S. – Hitt, Michael A. – Hoskisson, Robert E. – Ireland, Duane R. (2001) Resource complementarity in business combinations: Extending the logic to organizational alliances. *Journal of Management*, Vol. 27(6), 679–690.
- Hart, Susan J. (1991) A first time user's guide to the collection and analysis of interview data from senior managers. In: *Management research handbook*, eds. Craig Smith – Paul Dainty, 190–203. Routledge, London.
- Hartley, Jean F. (1994) Case studies in organizational research. In: *Qualitative methods in organizational research*, eds. Cassel Catherine – Symon Gillian, 208–229. Sage Publications, Thousand Oaks, CA.
- Hauschildt, Jürgen – Chakrabarti, Alok K. (1989) The division of labour in innovation management. *R&D Management*, Vol. 19(2), 161–171.
- Hauschildt, Jürgen – Gemünden, Hans Georg (1999) *Promotoren: Champions der Innovation*. 2nd ed. Gabler, Wiesbaden.

- Hauschildt, Jürgen – Kirchmann, Edgar (2001) Teamwork for innovation – the “troika” of promoters. *R&D Management*, Vol. 31(1), 41–49.
- Hippel, Eric, von (1976) The dominant role of users in the scientific instrument innovations process. *Research Policy*, Vol. 6(3), 212–239.
- Hippel, Eric, von (1982) Get new products for customers. *Harvard Business Review*, Vol. 60(2), 117–122.
- Hippel, Eric, von (1986) Lead users: A source of novel product concepts. *Management Science*, Vol. 32(7), 791–805.
- Hippel, Eric, von (1988) *The sources of innovation*. Oxford University Press, Oxford.
- Hippel, Eric, von (1998) Economics of product development by users: The impact of “sticky” local information. *Management Science*, Vol. 44(5), 629–644.
- Hirsjärvi, Sirkka – Remes, Pirkko – Sajavaara, Paula (2001) *Tutki ja kirjoita*. 6th–7th ed. Kustannusyhtiö Tammi, Helsinki.
- Howell, Jane M. – Higgins, Christopher A. (1990) Champions of technological innovations. *Administrative Science Quarterly*, Vol. 35(2), 317–341.
- Huston, Larry – Sakkab, Nabil (2006) Connect and develop. *Harvard Business Review*, Vol. 84(3), 58–66.
- Håkansson, Håkan – Johanson, Jan (1992) A model of industrial networks. In: *Industrial networks: A new view of reality*, eds. Björn Axelsson – Geoffrey Easton, 28–34. Routledge, London.
- Håkansson, Håkan – Snehota, Ivan (1995) *Developing relationships in business networks*. Routledge, London.
- Häcki, Remo – Lighton, Julian (2001) The future of the networked company. *McKinsey Quarterly*, Issue 3, 26–39.
- Igartua, Juan Ignacio – Garrigós, Jose Albors – Hervas-Oliver, Jose Luis (2010) How innovation management techniques support an open innovation strategy. *Research Technology Management*, Vol. 53(3), 41–52.
- Inkpen, Andrew C. (2001) Strategic alliances. In: *Oxford Handbook of International Business*, eds. Alan M. Rugman – Thomas L. Brewer, 402–430. Oxford University Press, New York.
- Jayaram, Jayanth (2008) Supplier involvement in new product development projects: Dimensionality and contingency effects. *International Journal of Production Research*, Vol. 46(13), 3717–3735.
- Jenssen, Jan Inge & Jorgensen, Geir (2004) How do corporate champions promote innovations? *International Journal of Innovation Management*, Vol. 8(1), 63–86.

- Jenssen, Jan Inge – Nybakk, Erlend (2009) Inter-organizational innovation promoters in small, knowledge-intensive firms. *International Journal of Innovation Management*, Vol. 13(3), 441–466.
- Johnson, Dave (2010) The changing role of the chemical distributor. *Adhesives & Sealants Industry*, Vol. 17(8), 36–37.
- Jones, Candace – Hesterly, William S. – Borgatti, Stephen P. (1997) A general theory of network governance: Exchange conditions and social mechanisms. *Academy of Management Review*, Vol. 22(4), 911–945.
- Junarsin, Eddy (2009) Managing discontinuous innovation. *International Management Review*, Vol. 5(2), 10–18.
- Kale, Prashant – Singh, Harbir – Perlmutter, Howard (2000) Learning and protection of proprietary assets in strategic alliances: Building relational capital. *Strategic Management Journal*, Vol. 21(3), 217–237.
- Keppeler, Steven (2005) Employee start-ups in high-tech industries. In: *Clusters, networks, and innovation*, eds. Stefano Breschi – Franco Malebra, 199–231. Oxford University Press, New York, NY.
- Kim, Chan W. – Mauborgne, Renée (2005) *Blue ocean strategy: How to create uncontested market space and make the competition irrelevant*. Harvard Business School Press, Boston, MA.
- King, Nigel (1994) The qualitative research interview. In: *Qualitative methods in organizational research: A practical guide*, eds. Catherine Cassel – Gillian Symon, 14–36. Sage Publications, London.
- Kogut, Bruce (2000) The network as knowledge: Generative rules and the emergence of structure. *Strategic Management Journal*, Vol. 21(3), 405–425.
- Kvale, Steinar (1996) *Interviews: An introduction to qualitative research interviewing*. Sage Publications, Thousand Oaks, CA.
- Leiponen, Aija (2008) Control of intellectual assets in client relationships: Implications for innovation. *Strategic Management Journal*, Vol. 29(13), 1371–1394.
- Li, Xiao Stan – Rowley, Timothy J. (2002) Inertia and evaluation mechanisms in inter-organizational partner selection: Syndicate formation among U.S. investment banks. *Academy of Management Journal*, Vol. 45(6), 1104–1118.
- Lichtenthaler, Ulrich (2008) Integrated roadmaps for open innovation. *Research Technology Management*, Vol. 51(3), 45–49.
- Man, Ard-Pieter, de (2004) *The network economy: Strategy, structure and management*. Edward Elgar, Cheltenham, UK.

- Man, Ard-Pieter, de – Duysters, Geert (2002) The state of alliance management: The effect of alliance management tools and processes on alliance success. *ASAP Summit Chicago, 11-13 March 2002*. <<http://www.duysters.com/downloads%20presentations/ASAPpresentation02.pdf>>, retrieved 15.11.2009.
- Markard, Jochen – Truffer, Bernhard (2008) Actor-oriented analysis of innovation systems: Exploring micro-meso level linkages in the case of stationary fuel cells. *Technology Analysis & Strategic Management*, Vol. 20(4), 443–464.
- Marsh, Peter D. W. (2001) *Contract negotiation handbook*. 3rd ed. Gower Publishing Ltd., Hampshire, England.
- McEvily, Bill – Zaheer, Akbar (1999) Bridging ties: A source of firm heterogeneity in competitive capabilities. *Strategic Management Journal*, Vol. 20(12), 1133–1156.
- McKinnon, Jill (1988) Reliability and validity in field research: Some strategies and tactics. *Accounting, Auditing and Accountability Journal*, Vol. 1(1), 34–54.
- Mehlman, Stewart K. – Uribe-Saucedo, Silvia – Taylor, Ronald P. – Slowinski, Gene – Carreras, Ed – Arena, Chris (2010) Better practices for managing intellectual assets in collaborations. *Research Technology Management*, Vol. 53(1), 55–66.
- Miles, Matthew B. – Huberman, Michael A. (1994) *Qualitative data analysis: An expanded sourcebook*. 2nd ed. Sage Publications, Thousand Oaks, CA.
- Moreno, Justo de Jorge (2008) An empirical analysis of entrepreneurial opportunity identification and their decisive factors: The case of new Spanish firms. *International Journal of Entrepreneurship*, Vol. 12, 11–37.
- Möller, Kristian – Svahn, Senja (2006) Role of knowledge in value creation in business nets. *Journal of Management Studies*, Vol. 43(5), 985–1007.
- Nonaka, Ikujiro – Takeuchi, Hirotaka (1995) *The knowledge-creating company: How Japanese companies create the dynamics of innovation*. Oxford University Press, New York, NY.
- Oxley, Joanne E. – Sampson, Rachelle C. (2004) The scope and governance of international R&D alliances. *Strategic Management Journal*, Vol. 25(8/9), 723–749.
- PBI (2010) Homepage. <<http://www.pbi-institute.com>>, retrieved 1.9.2010.
- Peng, Mike W. (2006) *Global strategy*. Thomson - South-Western, Taunton, MA.
- Perkmann, Markus – Walsh, Kathryn (2007) University-industry relationships and open innovation: Towards a research agenda. *International Journal of Management Reviews*, Vol. 9(4), 259–280.

- Pfeffer, Jeffrey – Salancik, Gerald R. (1978) *External control of organizations: A resource dependence perspective*. Harper & Row, New York, NY.
- Porter, Michael E. (1985) *Competitive advantage: Creating and sustaining superior performance*. Free Press, New York, NY.
- Powell, Walter W. (1998) Learning from collaboration: Knowledge and networks in the biotechnology and pharmaceutical industries. In: *Managing strategic innovation and change: A collection of readings*, 2nd ed., eds. Michael L. Tushman – Philip Anderson, 393–401. Oxford University Press, New York, NY.
- Powell, Walter W. – Koput, Kenneth W. – Smith-Doerr, Lauren (1996) Interorganizational collaboration and the locus of innovation: Networks of learning in biotechnology. *Administrative Science Quarterly*, Vol. 41(1), 116–145.
- Prahalad, C.K. – Hamel, Gary (1990) The core competence of the corporation. *Harvard Business Review*, Vol. 68(3), 79–91.
- PricewaterhouseCoopers (2007) *10th Global CEO Survey*. PricewaterhouseCoopers.
- Provan, Keith G. – Fish, Amy (2007) Interorganizational networks at the network level: A review of the empirical literature on whole networks. *Journal of Management*, Vol. 33(3), 479–516.
- Ritter, Thomas – Gemünden, Hans Georg (2003) Network competence: Its impact on innovation success and its antecedents. *Journal of Business Research*, Vol. 56(9), 745–755.
- Rogers, Everett M. (1995) *Diffusion of innovations*. 4th ed. The Free Press, New York, NY.
- Rost, Katja – Hölzle, Katharina – Gemünden, Hans Georg (2007) Promotors or champions? Pros and cons of role specialization for economic process. *Schmalenbach Business Review*, Vol. 59(4), 340–363.
- Sampson, Rachele C. (2004) The cost of misaligned governance in R&D alliances. *Journal of Law, Economics & Organization*, Vol. 20(2), 484–526.
- Saunders, Mark – Lewis, Philip – Thornhill, Adrian (2007) *Research methods for business students*. 4th ed. Pearson Education, Harlow, England.
- Schindler, Martin – Eppler, Martin J (2003) Harvesting project knowledge: A review of project learning methods and success factors. *International Journal of Project Management*, Vol. 21(3), 219–228.
- Schuh, Günther – Sauer, Alexander – Döring, Sebastian (2008) Managing complexity in industrial collaborations. *International Journal of Production Research*, Vol. 46(9), 2485–2498.
- Schön, Donald A. (1963) Champions for radical new inventions. *Harvard Business Review*, Vol. 41(2), 77–86.

- Selden, Larry – MacMillan, Ian C. (2006) Manage customer-centric innovation – systematically. *Harvard Business Review*, Vol. 84(4), 108–116.
- Shah, Reshma H. – Swaminathan, Vanitha (2008) Factors influencing partner selection in strategic alliances: The moderating role of alliance context. *Strategic Management Journal*, Vol. 29(5), 471–494.
- Shuman, Jeffrey – Twombly, Janice (2010) Collaborative networks are the organization: An innovation in organization design and management. *The Journal for Decision Makers*, Vol. 35(1), 1–13.
- Silverman, David (2001) *Interpreting qualitative data: Methods for analysing talk, text and interaction*. 2nd ed. Sage Publications, London.
- Spekman, Robert E. – Isabella, Lynn A. – MacAvoy, Thomas C. (2000) *Alliance competence: Maximizing the value of your partnerships*. John Wiley & Sons, New York, NY.
- Spender, Jeffrey C. (1996) Making knowledge the basis of a dynamic theory of the firm. *Strategic Management Journal*, Vol. 17, Special Issue, 45–62.
- Stake, Robert E. (1995) *The art of case study research*. Sage Publications, Thousand Oaks, CA.
- Stanleigh, Michael (2008) Guide to innovation. *Industrial Engineer*, Vol. 40(6), 38–41.
- Takeishi, Akira (2001) Bridging inter- and intra-firm boundaries: Management of supplier involvement in automobile product development. *Strategic Management Journal*, Vol. 22(5), 403–433.
- Tallqvist, Torkel (2009) *Leadership in repetitively innovative mature companies*. Doctoral thesis, Åbo Akademi University, Turku.
- Teece, David – Pisano, Gary (1994) The dynamic capabilities of firms: An introduction. Working paper.
- Teece, David – Pisano, Gary – Shuen, Amy (1997) Dynamic capabilities and strategic management. *Strategic Management Journal*, Vol. 18(7), 509–533.
- Tekes (2010) Lehdistöiedote 31.5.2010. <http://www.fimecc.com/fi/images/0/0f/Tekes_FIMECC_Oy_ille_merkitt%C3%A4v%C3%A4_rahointusp%C3%A4%C3%A4t%C3%B6s_2_.pdf>, retrieved 10.8.2010.
- Thomke, Stefan – Fujimoto, Takahiro (2000) The effect of “front-loading” problem-solving on product development performance. *Journal of Product Innovation Management*, Vol. 17(2), 128–142.
- Tidd, Joe – Bessant, John – Pavitt, Keith (2005) *Managing innovation: Integrating technological, market and organizational change*. 3rd ed. John Wiley & Sons, Chichester, West Sussex.

- Trott, Paul (2005) *Innovation management and new product development*. 3rd ed. Pearson Education, Harlow, England.
- Tyler, Beverly B. – Steensma, Kevin H. (1995) Evaluating technological collaborative opportunities: A cognitive modeling perspective. *Strategic Management Journal*, Vol. 16, 43–70.
- Utterback, James M. (1971) The process of technological innovation within the firm. *Academy of Management Journal*, Vol. 14(1), 75–88.
- VTT (2010) Homepage. <<http://www.vtt.fi>>, retrieved 1.9.2010.
- Wanetick, David (2009) Strategies for negotiating licenses. *Licensing Journal*, Vol. 29(7), 10–17.
- Welch, Catherine – Marschan-Piekkari, Rebecca – Penttinen, Heli – Tahvanainen, Marja (2002) Corporate elites as informants in qualitative international business research. *International Business Review*, Vol. 11(5), 611–628.
- Wernerfelt, Birger (1984) A resource-based view of the firm. *Strategic Management Journal*, Vol. 5(2), 171–180.
- Witman, Paul (2005) The art and science of non-disclosure agreements. *Communications of AIS*, Vol. 2006(16), 260–268.
- Witte, Eberhard (1977) Power and innovation: A two-center theory. *International Studies of Management & Organization*, Vol. 7(1), 47–70.
- Yin, Robert K. (2003) *Case study research: Design and methods*. Sage Publications, Thousand Oaks, CA.
- Ylirenko, Helena – Janakiraman, Ramkumar (2008) How customer portfolio affects new product development in technology based entrepreneurial firms. *Journal of Marketing*, Vol. 72(5), 131–148.
- Zedtwitz, Maximilian, von (2002) Organizational learning through post-project reviews in R&D. *R&D Management*, Vol. 32(3), 255–268.

APPENDICES

Appendix 1 Themes and questions of the interviews

General

- Please describe your position and main tasks of your current job?
- Please describe you previous experience from similar cases?
- Please describe your expectations for the case?

I. Organizational actors

- Please describe the organizational actors involved in this case?
- Please describe the objectives of your organization in the case?
- Please describe the objectives of the other organizations involved?
- Please describe the missing organizational actors, if there were any?

II. Network positions and roles of the organizational actors

- Please describe the role of your organization in the case?
- Please describe the role of other organizations in the case?
- Please describe the missing organizational roles, if there were any?
- Please describe the management of the network in the case?

III. Individual actors and roles

- Please describe how and why you got involved in the project?
- Please describe the other individual actors in the case?
- Please describe your role in the case?
- Please describe the roles of other individuals in the case?
- Please describe the missing individual roles, if there were any?

IV. Innovation features

- Please describe the product?
- Please describe the product development idea?

V. Product development process

- Please describe the proceeding order of the process?
- Please describe the proceeding speed of the process?

VI. Communication

- Please describe the communication methods used in this case?

- Please describe your communication with other involved actors between the meetings?

VII. Trust and commitment

- Please describe the level of trust among the actors in the case?
- Please describe the reasons for the level of trust among the actors in the case?
- Please describe your commitment to the case?
- Please describe commitment of other actors to the case?

VIII. Contracts and IPR issues

- Please describe the objectives of the contracts in the case?
- Please describe the problems occurred considering the contracts of the case?
- Please describe the reasons for the problems considering the contracts?
- Please describe possible solutions for the problems considering the contracts?

IX. Collaboration potential assessment

- Please describe the usefulness of the collaboration potential assessment?
- Please describe the adequacy of the collaboration potential assessment?
- Please describe the results of the collaboration potential assessment?
- Please describe the information you received through the collaboration potential assessment?