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INTERACTION IN ASSET-BASED VALUE CREATION WITHIN INNOVATION NETWORKS

THE CASE OF SOFTWARE INDUSTRY
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Abstract

Knowledge management is a new academic discipline that has been growing during the past decade but is still in its embryonic stage with much potential left. What makes knowledge management an attractive research field is its multi-discipline perspective. In the knowledge management the context is important because the value of an organization’s knowledge is context-based. In this research the context are the innovation networks within the software industry and thus besides knowledge management the research contributes to the software business literature.

The aim of this study was to get an understanding about the interaction the in asset-based value creation within innovation networks. This was done by examining the effects of the interaction in asset development and deployment in innovation networks, where activities are related to research, development and innovation collaboration. This was studied against the theoretical framework that was developed in this research based on earlier studies.

This study shows that in the examined research context actors from outside of the software industry have a direct effect on both asset development and deployment based on their funding requirements and aims. The study shows that in this wider environment trust, openness and mutual benefits are important factors of the interaction atmosphere, regarding where funding is targeted and where the actual work is done.

This study shows the importance of the interaction framework as a motivator and an entity that enables direct benefits to participating actors from their interaction and collaboration. It also shows that some of the episodes where interactions occur need to be regular, on-going and have a certain rhythm.

As a result of this research a framework of interaction in the asset-based value creation in innovation networks was created. It shows how funding mechanisms affect the asset development and deployment, as well as that some episodes where interactions occur are especially important, because they limit or support value creation. Moreover, the role, contributions, aims and motivations of actors are seemingly different within these episodes.

Keywords: ecosystems, innovation networks, intellectual assets, interaction, R&D, software business, software industry, value creation
Koskela, Timo, Vuorovaikutus varantopohjaisessa arvontautanossa innovaatioverkostoissa. Tapaus ohjelmistoteollisuus

Oulun yliopiston tutkijakoulu; Oulun yliopisto, Tieto- ja sähkötekniikan tiedekunta, Tietojenkäsittelytieteiden laitos

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**Tiivistelmä**

Tietojohtaminen on uusi akateeminen tieteenala, joka on ollut kasvussa viimeisen vuosituhannen ajan, mutta on silti alkuvaiheessa ja omasta potentiaalista. Tietojohtamisesta tekee vetovoimaisen tutkimusalan sen monitieteinen perspektiivi. Tietojohtamisessa konteksti on tärkeää, koska organisaation tiedon arvo on kontekstipohjainen. Tässä tutkimuksessa tutkimuskontekstina ovat ohjelmistoteollisuuden innovaatioverkostot ja siispä tietojohtamisen lisäksi tutkimus myötävaikuttaa ohjelmistoliiketoiminnan kirjallisuutta.

Tutkimuksen tavoitteena oli ymmärtää vuorovaikutusta varantoihin pohjautuvassa arvonluonnossa innovaatioverkostoissa. Tämä tehtiin tutkimalla vuorovaikutusta varantojen kehittämisessä ja käyttöönotossa innovaatioverkostoissa, joissa aktiiviteetit liittyvät tutkimus-, kehittämis- ja innovointityöteistöihin. Tutkimus esittelee teoreettista kehikkoa vasten, joka kehitettiin tutkimuksen aikana aiempiin tutkimuksiin pohjautuen.

Tutkimus osoittaa, että tarkastelussa tutkimuskontekstissa ohjelmistoteollisuuden ulkopuolisilla toimijoilla on suora vaikutus, sekä varantojen kehittämiseen, että käyttöönottoon rahoitusvaatimustensa ja tavoitteidensa pohjalta. Tutkimus osoittaa, että tässä laajemmassa ympäröistä luotamussa, avoimuus ja molemminkin yleiset hyödyt ovat vuorovaikutusvalmiuden tärkeitä osatekijöitä sen suhteen mihin rahoitus ohjataan ja missä tosiasiallinen työ tehdään.

Tutkimus osoittaa vuorovaikutuskehikon tärkeyden motivaattorina ja kokonaisuutena, joka mahdollistaa suorat hyödyt osallistuville toimijoille heidän vuorovaikutuksestaan ja yhteistyöstään. Se myös osoittaa, että joitenkin niistä tapahtumista, joissa vuorovaikutus tapahtuu, täytyy olla säännöllisiä, jatkuvia ja mitäkin tietty rytmi.


**Asiasanat:** arvonluonti, ekosysteemit, innovaatioverkostot, ohjelmistoliiketoiminta, ohjelmistoteollisuus, T&K, tietopääoma, vuorovaikutus
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Abbreviations

ARA actors, resources, activities
GDP gross domestic product
ELY Centre Centre for Economic Development, Transport and the Environment (Elinkeino-, liikenne- ja ympäristökeskus)
ERDF European Regional Development Fund (EAKR = Euroopan aluekehitysrahasto)
EU European Union
ICT information and communication technologies
IMP Industrial Marketing and Purchasing
IPR intellectual property rights
IS information systems
IT information technology
ITEA Information Technology for European Advancement
KM knowledge management
MIS management information system
NDA non-disclosure agreement
PC personal computer
PhD Doctor of Philosophy
RDI research, development and innovation
R&D research and development
SECO software ecosystems
SHOK Strategic Centres for Science, Technology and Innovation (Strategisen huippuosaamisen keskittymä)
SME’s small and medium enterprises
Sitra Finnish Innovation Fund (Suomen itsenäisyysden juhlarahasto)
SRA strategic research agenda
Tekes Finnish Funding Agency for Technology and Innovation (teknologian ja innovaatioiden kehittämiskeskus)
TIVIT Strategic Centre for Science, Technology and Innovation in the Field of ICT (Tieto- ja viestintäteollisuuden tutkimus TIVIT Oy)
USA United States of America
VTT Technical Research Centre of Finland (Valtion teknillinen tutkimuskeskus)
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1 Introduction

Chapter 1 describes the background of this research as well as the research gap, research questions and the main contributions of this research. The introduction part is concluded with an overview of the structure of this dissertation.

1.1 Background and the research gaps

Knowledge management (KM) and intellectual capital is a new academic discipline which has been growing dramatically during the past decade (Bontis & Serenko 2009). Serenko et al. (2010) emphasize that although the core concepts of knowledge management and intellectual capital have existed for over a decade the multi-discipline perspectives within the discipline make it an attractive research field. Serenko et al. (2010) continue by arguing that as an academic field knowledge management and intellectual capital is still in an embryonic stage and thus it has much growing potential left. Peters et al. (2010: 243) note that “despite the growing body of KM literature, understanding the nature of knowledge is still problematic”.

Although the term intellectual capital was used for the first time already in 1969 by John Kenneth Galbraight (Bontis 1998), the term still lacks a widely accepted definition shared by different authors. A good example of this embryonic stage is that different scholars (e.g. Brooking 1997: 13, Nahapiet & Ghoshal 1998: 245, Sullivan 2000: 228, Harrison & Sullivan 2000: 34, Rastogi 2003: 239) have proposed numerous definitions of intellectual capital.

Beside the terms intellectual assets and intellectual capital, authors have used similar terms such as intangible assets (Hall 1992, Daum 2002), intangible resources (Hall 1992, Bontis et al. 1999), intangibles (Funk 2003), invisible assets (Itami 1991), immaterial values (Sveiby 1997) and intellectual property (Smith 1994, Granstrand 1999).

Further, according to Choong (2008), the literature consists of a wide range of definitions concerning intellectual assets and intellectual capital. Some authors identify intellectual assets as a subset of intellectual capital (Sullivan 1999, Harrison & Sullivan 2000) but according to Choong (2008) sometimes the term intellectual asset is used as a synonym to intellectual capital.

Several authors have identified intellectual capital as the company’s most valuable asset (Andreou et al. 2007, Dean & Kretschmer 2007, Khamseh & Jolly 2008) and the key source of competitive advantage (Nonaka 1991), but still most
of the companies cannot clearly define what intellectual assets actually are, after all (Andreou et al. 2007).

Different authors have argued that the value of an organization’s knowledge is context-based (Priem & Butler 2001, Helfat & Peteraf 2003, Lavie 2006, Sirmon et al. 2007, Uotila et al. 2009). In literature there is however a disagreement about definitions of value (Bowman & Ambrosini 2000) and value creation (Lepak et al. 2007). Some of the difficulties concerning the meaning of value refer to questions like “what is value/valuable, who values what, and where value resides” (Lepak et al. 2007: 181) and to the fact that the nature of value creation process differs in individual, organizational and societal levels. Further value creation, its sources and creators mean significantly different things for authors from different fields of management, sociology, psychology and economics. (Lepak et al. 2007).

The advantage of acquiring external knowledge is especially true in high-technology industries because of their dynamic environment which causes the obsolescence of company’s current knowledge and capabilities (Uotila et al. 2009), in knowledge intensive clusters (López-Sáez et al. 2010) and in dynamic environments (Van den Bosch et al. 1999, Lavie 2006, Sirmon et al. 2007, Teece 2007) which can all be seen as characteristics of the software industry.

Articles published in the Journal of Knowledge Management and in the Journal of Intellectual Assets suggest that future research in the field of knowledge management and intellectual assets should address 1) cases that include more than one or two case organizations (McNichols 2008, Holste & Fields 2010, Li 2010); 2) different industrial contexts (McNichols 2008, Goldoni & Oliveira 2010, Kong 2010); 3) different countries, cultures and/or ethnicities (Goldoni & Oliveira 2010, Holste & Fields 2010, Lam & Lambermont-Ford 2010, Li 2010); 4) full or partial knowledge sharing (Ford & Staples 2010); and/or 5) specialized groups of companies (e.g. information and communication intensive companies) (Yi & Davey 2010).

The specific context of developing intellectual assets in the software industry has not yet been sufficiently researched. This study seeks to fill this research gap.

### 1.2 Research questions

The focus of this research is on the interaction in the asset-based value creation within the innovation networks between and within private companies, universities, public research organizations and such mediator organizations as
public funding bodies and actors that coordinate research and development (R&D). The research interests are in how interaction between actors affects the creation of new intellectual assets and the effect of these intellectual assets on the value creation of individual actors and actors as a whole. In this value process different actors collaborate to co-create value while at the same time they might compete against each other in value co-capture. Within this collaboration, interaction and its nature are the key research interests.

Examples of research issues include: if there are specific elements, processes or features within interaction that support the creation of new intellectual assets and value creation or identification of value potential; if there are specific identifiable episodes within the interaction that support value creation or identification, and who interact in these episodes; and if there are specific features which are needed from the environment where actors interact.

The specific research questions to be addresses are:

1. How interaction affects the development of the intellectual assets in innovation networks?
2. How interaction affects the value creation based on intellectual assets in innovation networks?

1.3 Main contributions of the research

The main contribution of this research is that it provides a framework of the interaction in asset-based value creation within innovation networks. The focus is on the effect of the interaction in asset-based value creation within innovation networks that consist of companies, research organizations and facilitators. To investigate this an a priori analysis framework was build based on the literature.

This study contributes to knowledge management that is the research field of this study and to the software business literature, because of the context of this study is software industry’s innovation networks. The limitations related to these contributions are that the research data was collected only from Finland. At the same time this can be seen as a strength of this research as by gathering the data from Finland it was possible to investigate the research problem in more detail in Finnish software industry context including the role of the facilitator organizations and the wider environment in a specific geographical location.

It proposes new findings about the interaction in asset-based value creation within innovation networks. This was done by investigating interaction processes,
including episodes and relationships, within research, development and innovation (RDI) oriented innovation networks, projects and programs. It identified mechanisms and factors of the wider environment than the software industry that affect interaction, collaboration, asset development and value creation. Also interaction frameworks, episodes and their characteristics that potentially support and limit asset-based value creation were identified. Further it shows that facilitator organizations potentially have a big role in building and supporting interaction framework that fosters and also limits the interaction in asset-based value creation.

1.4 Outline of the study

Chapter 1 is the motivation to this research and presents research field, research gaps, research questions and contribution of this research.

In Chapter 2 evolution of the software industry, different software business types, software ecosystems and examples of software related value chains are discussed. Further the current state of the software industry will be discussed as well as the nature of R&D collaboration in general, especially in the information and communication technologies (ICT) sector. Related to this R&D collaboration the government based funding mechanism will be discussed. The Finnish software industry is used as a reference, as well as Finnish innovation networks. Finally the focus of this research relating to research context and actors within that context will be discussed.

Chapter 3 focuses on the reasons for networking and its disadvantages with a special focus on innovation networks. This is important as in this research the focus of innovation networks is on the innovation networks within the software industry context. Also the network relationships between actors will be discussed as the ARA (actors, resources, activities) model and the Model of Business Interaction, which will be discussed in Chapter 4 (Interaction in networks), focus on the main elements of the interaction and the interplay of these elements but not on the ties between the actors. The definitions of innovation networks and innovation that will be applied in this research will be presented in this chapter.

In Chapter 4 the existing research on interaction theories within the IMP (Industrial Marketing and Purchasing) tradition will be discussed. The focus is on the two core models, interaction model and ARA model, within IMP Group that form the theoretical basis for the Model of Business Interaction by Ford et al. (2010) which was applied in this research. All these three models will be
discussed to represent the evolution of the interaction models within IMP tradition. Further the main elements of business interaction and their interplay and the role of interaction in asset-based value creation will be discussed.

Chapter 5 discusses about knowledge as a source of value as well as concepts and definitions of intellectual assets, intellectual property, value, value creation and valuable assets. Further the resources and valuable assets parts of the a priori analysis framework will be discussed as well as how they link to each other via interaction. Finally the asset-based value proposition part of the a priori analysis framework will be discussed.

In Chapter 6 the conceptual framework of this research which was built based on the earlier literature is presented. This framework consists of network, valuable asset, interaction, intellectual asset-based value proposition and business value parts and it was used while analysing the empirical data and for answering to the research questions. Also the key terminology of this research was summarized as a reminder for the reader.

Chapter 7 describes the method and process of this research. The qualitative case study as a main research method of this research is discussed as well as ethnography and interpretive research as research methods. A justification for the question that why single case research can be generalizable is presented. Interpretative research was used as a supporting research method and thus criteria’s how to judge interpretative research in information systems (IS) research was discussed. The gathering of empirical data was conducted via semi-structured interviews. Last the initial, not all-inclusive, content of the interview themes are presented to the reader.

In chapter 8 the empirical data that was gathered during this research is analysed. Analysis is done with the help of the a priori analysis framework that was built in Chapter 6. This chapter presents the results of the data analysis in a structured way and this structure is based on the a priori analysis framework and the theoretical part of this research.

Chapter 9 presents the discussion part of this dissertation and starts from the changes that were made to the a priori analysis framework based on the data analysis. Based on these changes the posteriori framework is presented. Last the theoretical, managerial and empirical implications of this research are presented as well as the software industry related implications.

In chapter 10 the research questions that were presented in Chapter 1 will be answered. To conclude this research the limitations of the study, methodological implications and recommendations for future research will be presented.
2 Software industry

This chapter focuses first on the software industry in general and its development. After that software ecosystems and the value chains of the software businesses are addressed. The specific empirical context of this research is the innovation networks in the Finnish software industry, and thus the current state of it is discussed. Within the software industry this research focuses on the R&D related innovation networks and thus the R&D collaboration in Finland and in ICT are defined in more detail. Reason for defining R&D collaboration in ICT in more detail is that according to Rönkkö et al. (2008) half of the employees that work in the software development in Finland are not included in the software industry, because most of the internationally oriented companies categorize their main business as device manufactures that operate in the software business (Rönkkö 2010) and because currently hardware producers are relying more on software as a way to differentiate their solutions and adding new functionalities into them (Rönkkö et al. 2010a). Besides the actors carrying out actual research and development the public funding has its own role to play via funding mechanism and its requirements and thus this mechanism is also discussed. Finally the focus of this research is discussed.

Software industry, its actors and roles and the evolution of the software industry in general and especially in Finland and further R&D collaboration in the ICT sector are strictly defined in order to assess the credibility of the research results and to determine their generalizability (Benbasat et al. 1987, Yin 1994).

2.1 Software industry in general

Software industry is a relatively young industrial sector when compared to many other sectors (Väyrynen 2009: 15). Regardless of the young age there are several unique development eras which can be identified.

According to Hoch et al. (1999) the development of software industry involves five separate eras which consists of different types of software business and software business companies. These company types are independent software companies, professional services, enterprise solutions, packaged mass-market software, custom-made software solutions, customer specific software projects and Internet services. They are based on different types of software companies and software related offerings.
2.1.1 Eras of software industry

The first era lasted from 1949 until 1959. In the United States of America (USA) there were over 40 major software service companies whose main business was to offer custom-made solutions for one customer at a time including information technology (IT) consulting, programming and maintenance services. Some of these companies had over 100 employees but at that time those were considered as major companies. In addition there were smaller companies seeking their opportunities. During this era Europe was far behind USA because governments of European countries could not support software industry because of the World War II. (Hoch et al. 1999).

The second era (1959–1969) was characterised by the rise of independent software products. These products were sold independently without hardware (Hoch et al. 1999). Years between 1965 and 1969 were pivotal to the current structure of the software industry in USA (Steinmueller 1996). During the second era actors in the software industry thought that it was not possible to gain money by selling software product without hardware (Hoch et al. 1999) as the general belief was that money could only be made by developing customer specific software solutions or bundling software and hardware together.

When comparing the first two eras, in the second era software products were developed for multiple customers and thus it was possible to sell same software products several times, while in the first era the focus was on selling ‘projects’. As a result the software product business was born and customers had to realize that software was not given away for free with computers anymore. Later the software product business was further divided into enterprise solutions and packaged software for mass-markets. Foundations from this era that are still valid including software pricing, maintenance, patenting and licencing. (Hoch et al. 1999).

The third era (1969–1981) was characterised by enterprise solutions and companies such as IBM, Oracle and SAP. The basic idea behind enterprise solutions was to offer software solutions to customers faster by developing standard software solutions which were used in as many companies as possible (Hoch et al. 1999).

Common functions for enterprise solutions are for example human resource planning, plant management, inventory management, supply-chain management, decision support management and relationship management. As Hoch et al. (1999: 32) emphasize "enterprise solutions software literally runs many of the world's
During the third era software products were sold purely to other companies and in the eyes of public software was not an independent business but still a part of hardware (Hoch et al. 1999). During 1970’s companies started to show more interest in software development and maintenance issues than before because they had major problems while managing their own in-house developed software (Steinmueller 1996).

During the fourth era (1981–1994) software products started to be available to masses. One of the reasons which supported this development was the availability of personal computers (PC’s) when the development of IBM PC was launched in August 1981. (Hoch et al. 1999).

Although independent software products were available during the second era they did not gain growth because at that time computers were almost completely used by companies. Individuals did not buy computers because they were very expensive (Hoch et al. 1999). 1980’s was period of evolution and growth in data processing. During that time IBM was the only computer manufacturer which did not pull out from software and service businesses and other companies started to offer software applications for workstations as well (Steinmueller 1996).

A new aspect of the fifth era (1994–) was that opportunities were created by the emergence of Internet and Internet-based value-added services. Solution which made this business area available was Netscape’s browser software. Soon after that companies started to sell software solutions which utilized Internet for data exchange. Examples of these companies included Yahoo and Amazon.com. These companies no longer gained their revenue by selling software rather they established Web-services and profited money from Web-based advertisements and other sources. (Hoch et al. 1999).

\textbf{2.1.2 Distribution of software development}

Based on the five eras of software industry’s development Hoch et al. (1999) argue that during the last 50 years three different software industry segments have emerged in IT markets. These segments are: professional software services, enterprise solutions and packaged mass-market software. In this categorization enterprise solutions and packaged mass-market software represent software products. Hoch et al. (1999) continue by noting that companies which offer Internet based services are not software companies in the traditional sense and thus belong to a separate category. However these companies also pursue
software business and thus they are also identified as one software business type (Hoch et al. 1999).

Malerba & Torrisi (1996: 171) divide software producers and suppliers into three categories: first, to independent software houses which offer cross-industry software packages and industry-specific software packages; second, to suppliers of professional services which include providers of turnkey systems and system integration services; and third, to users who produce software in-house.

Tyrväinen et al. (2004) have identified four phases in the change of software development work in the Finnish software industry. In the first phase there are three main segments which are: enterprise internal automation of service processes, enterprise internal software development and implementation services for customer-specific software. Beside these three categories there is a small but growing segment of software (including products) embedded to services and also (hardware) embedded software products from the first phase to the fourth phase. The share of enterprise internal automation of service processes and enterprise internal software development decrease all the way from first phase to fourth phase. At the end of the first phase implementation services for customer-specific software is divided into two segments, services related to software product adoption and product development services. At the end of the first phase a completely new segment emerges. This segment is (stand-alone) software products. By the end of the fourth phase the latter has grown to be the biggest segment.

2.2 Software business types

In the literature authors have used a couple of slightly different classification models to identify different software business types. Next some of these classifications are briefly discussed.

The classification of IT markets by Hoch et al. (1999) is perhaps the most widely referred classification of hardware and software businesses. At its highest stage it divides IT markets into four segments, 1) Hardware products, 2) hardware maintenance services, 3) software products and services and 4) processing and Internet services.

Software products and services segment, which presents software companies, is further divided into three main categories which are: embedded software (including services), professional software services and software products. Latter is further divided into enterprise solutions and packaged mass-market software.
Hoch et al. (1999) identifies Internet and value-added services as the newest type of software business noting that these companies are not software companies in the traditional sense.

Other classifications of software business types include Cusumano’s (2004) model which divides software business types into three categories. 1) Software product companies, 2) software service companies and 3) hybrid solutions (mix of products and services).

In her doctoral dissertation Sallinen (2002) notes that authors typically classify software companies into two wide groups based on their business type. These groups are software project business (including software customization) and software product business. In her classification software suppliers are divided into four different types. First, to software suppliers that operate in customer organizations premises and exploit their facilities while producing customer-specific software. Second, to software suppliers that operate in their own premises and produce separately defined subproject(s) that are part of customer's larger products. In types three and four software suppliers independently produce either software modules or software products. (Sallinen 2002).

Authors of the annual Finnish Software Industry Survey classify professional software development, a subset of software industry, into four main categories which are: customer tailored software, software products, in-house systems and embedded software. The main weakness of this classification is that it does not fully consider companies that do not perform in all the stages of software development. These companies are included into the category of customer tailored software. (Rönkkö et al. 2009).

As a summary of software business types they can be divided into five main categories. 1) Software products, 2) enterprise solutions, 3) professional software services, 4) Internet-based services; and 5) embedded software. All of these can be found from Hoch et al. (1999) model of IT markets. Next these five software business types will be presented in more detail.

### 2.2.1 Software product business

Software product business includes software companies which develop generic software solutions to mass markets (Sallinen 2002). This kind of software is developed without customization and can be sold to large customer base without special installation support (Hoch et al. 1999, Cusumano 2004). Although software is a generic out of the box product it must comply with several technical
environments and thus it must include comprehensive documentation about its usage (Sallinen, 2002).

2.2.2 Enterprise solutions business

Enterprise solutions business includes software products that always need more or less customization (Hoch et al. 1999). Customers of these solutions are purely other companies (Väyrynen 2009) or organizations. Software is based on product core which is customized to support customer’s individual needs (Sallinen 2002). Because of customization it takes substantial time and effort to get enterprise solutions up and running. Installation and customization services can be offered by companies’ themselves or via professional software service companies (Hoch et al. 1999). Cusumano (2004) identifies situation where company sells both software and services as a ‘hybrid solutions’ model. In this model software is complex and thus it cannot be sold as an out of the box product. Instead companies sell solutions that require customization (typically 20–50% of total code) or special integration and installation work.

Packaged mass-market software products might sell millions of copies but the numbers in enterprise solution business is rather thousands. For example cost of enterprise resource planning licenses is usually 30% of total software investment and remaining 70% is implementation costs which are identified as professional software services (Hoch et al. 1999). According to Cusumano (2004) 70% or more of the total software investment costs consist of service and maintenance fees and only 30% or less are based on software license costs.

It is usually very difficult to change to competing product when switching costs are high and software runs critical functions of company. Customers end up easily in a situation where they are locked-in in a certain software or software vendor for a long period of time. The locked-in situation is more often technical than purely financial issue (Cusumano 2004).

2.2.3 Professional software services

Professional software services consist of companies which build one-to-one relationships with their customers and offer unique, customer specific software developed via customer projects (Sallinen 2002). Software developed in these projects includes services such as strategy advice, training, integration to other
software systems, maintenance, product enhancements and technical support. (Cusumano 2004).

2.2.4 Internet-based services

Internet-based services are the latest form of the software business. These companies offer for example advertising or sales services or using Internet for data exchange (Hoch et al. 1999.) Revenues do not come from selling software but from selling services that are based on software applications (Väyrynen 2009). Examples include location-based services like asset tracking, emergency information, advertisements and nearby information (OECD 2006).

Another example of new business model is application service provision which is also emerged from the Internet. Application service provider provides possibility to use software applications via Internet thus user does not need to install software on his own data terminal equipment. The application provider takes also care of applications maintenance and support. (Väyrynen 2009).

2.2.5 Embedded software

Embedded software is a part of other product or system that is not pure software solution. Examples include mobile phones, television sets and car software. Some of these can be upgraded after installation; some cannot (Hoch et al. 1999). Main product category within embedded software is ‘intelligent products’ (Sallinen, 2002). Embedded software category includes the development services of embedded software and the development of software products which are used in embedded products like operating systems (Hoch et al. 1999).

2.3 Software ecosystems

Manikas & Hansen’s (2013) literature review about software ecosystems was the first systematic literature review in software ecosystems research. They note that software ecosystems research is in its infancy stage and started from the Messerschmitt & Szyperski’s 2003 book about software ecosystems. Several research challenges about software ecosystems have been inspired by this book (Jansen et al. 2009b).

The oldest article in their literature review was from 2007. Although they initially collected 420 scientific articles from scientific libraries with the
keywords of ‘software ecosystem’ and ‘software ecosystems’, 90 of them were finally found relevant to their literature review. Based on this literature review they noted that little consensus existed on the conceptualization of software ecosystem. (Manikas & Hansen’s 2013)

However according to Kabbedijk & Jansen (2011) the clear definition of software ecosystems was formed by Jansen et al. (2009b: 187–188) where they defined a software ecosystem as ”a set of businesses functioning as a unit and interacting with a shared market for software and services, together with the relationships among them. These relationships are frequently underpinned by a common technological platform or market and operate through the exchange of information, resources and artifacts.” In contrast Bosch (2009:2) has defined software ecosystems in a solution centric way. ”A software ecosystem consists of the set of software solutions that enable, support and automate the activities and transaction by the actors in the associated social or business ecosystem and the organizations that provide these solutions.” These two definitions by Jansen et al. (2009b) and Bosch (2009) were used in 65% of the articles of the Manikas & Hansen’s (2013) literature review of software ecosystems that included definitions of them. Further definitions which do not include software solutions or platforms include Lungu et al.’s (2010: 265) definitions where ”A software ecosystem is a collection of software projects which are developed and evolve together in the same environment.”

Based on their literature review Manikas & Hansen (2013) have found that what is common to the software ecosystem definitions is that they include two things; first, some short of software, for example software platforms, systems, products or services; second, some kind of relationship which Manikas & Hansen (2013: 1297) describe as ‘symbiotic’, ‘common evolution’, ‘business’ or ‘technical’. Further Manikas & Hansen (2013) note that the definitions from Jansen et al. (2009b) and Bosch (2009) have three common elements that can be identified: common software, business and connecting relationships. By combining these three elements and the definitions of software ecosystems from Jansen et al. (2009b) and Bosch (2009) Manikas & Hansen (2013: 1297–1298) have defined software ecosystems as ”as the interaction of a set of actors on top of a common technological platform that results in a number of software solutions or services. Each actor is motivated by a set of interests or business models and connected to the rest of the actors and the ecosystem as a whole with symbiotic relationships, while, the technological platform is structured in a way that allows the involvement and contribution of the different actors.”
Based on their literature review the most common actor types in software ecosystems include orchestrators, niche players, external actors, vendors and customers or end-users. The orchestrator can be a single company or its department, a set of actors, community or other independent entity. Manikas & Hansen (2013: 1301) note that “This unit is typically managing the SECO [software ecosystems] by running the platform, creating and applying rules, processes, business procedures, setting and monitoring quality standards and/or orchestrating the SECO actor relationships.” These keystone organizations can be platform suppliers, standardization organization and other entities that define how the software ecosystem acts and develops itself. However their role can only be successful for a shorter time period but after the software ecosystem achieves critical mass their role narrows to a pure innovation provider. “Fundamentally, keystones aim to improve the overall health of their ecosystems by providing a stable and predictable set of common assets that other organizations use to build their own offerings.” (Jansen et al. (2009a: 39).

According to Manikas & Hansen (2013) the benefits that actors potentially get when participating in software ecosystems depend on the nature of the ecosystem and the actor itself and can include direct revenues and non-monetary benefits like fame and knowledge. The benefits actors get increase while software ecosystem is successful and the ecosystem benefits from actors increased activity. Bosch (2009) has emphasized that there are at least two reasons why companies are interested in participating software ecosystems. First, the amount of needed functionalities is much bigger than can be achieved via reasonable R&D investment. Second, the current mass customization trend fosters the need of significant R&D investment while developing successful software applications.

Although reasons for adapting the software ecosystem approach vary, some convincing reasons can be identified. These include increasing the value of the core offering, new users and application platform stickiness, fostering innovation via open innovation in the software ecosystem to share the costs of innovations and to platformize functionalities and decreasing the functionality related costs with ecosystem partners. As Bosch (2009: 6) notes “Software ecosystems are a logical next step for a company that has a successful platform and intra-organizational software product line.” Bosch (2009) has argued that there is no reason why organizational boundaries would have to stop the expansion of the scope of the software product lines. Further when company makes the decision to make its platform available outside its organizational boundaries it transforms from a software product line to software ecosystem (Bosch 2009).
2.4 Difference between business ecosystems and value chain

According to Porter (1985) it is necessary to define company’s value chain in order to competing in a certain industry to diagnose company’s competitive advantage. These diagnoses start from identifying individual value activities from the generic chain of activities by dividing them into separate activities. This means that for defining relevant value activities; activities with separate technologies and economics need to be separated. Further these value activities should be set into categories that represent their contribution to company’s competitive advantage in the best way. Value activities are the building blocks of competitive advantage but they are not independent activities but a system of interdependent activities (Porter 1985). Battistella et al. (2013) have noted that the focus of value chain is to create value while the focus of business ecosystems is to generate value and social capital that are the results of sustainable long-term relationships.

Gossain S & Kandiah G (1998) have noted that business ecosystem is similar to integrated value chain and that the business ecosystem builds upon the value chain concept. Further they have argued that for three main reasons value chain does not completely describe business ecosystems. First, value chain do not capture the close symbiotic relationships between company and its customers, suppliers and partners because in business ecosystems partners do not just add value to each stage of the value chain but instead they work together to create value for the customer. Second, relationships between actors are intimately linked and evolve constantly. Ecosystem provides more fluid relationships between these actors and ecosystem has a significant impact on economies that support the ecosystem. Third, value chains do not take into account the importance of brand while business ecosystems extend the relationships to competitors, complementors and other business actors to deliver service via a single brand.

Moore (1996: 26) has defined business ecosystems as “An economic community supported by a foundation of interacting organizations and individuals--the organisms of the business world. This economic community produces goods and services of value to customers, who are themselves members of the ecosystem. The member organizations also include suppliers, lead producers, competitors, and other stakeholders. Over time, they coevolve their capabilities and roles, and tend to align themselves with the directions set by one or more central companies. Those companies holding leadership roles may change over time, but the function of ecosystem leader is valued by the community
because it enables members to move toward shared visions to align their investments and to find mutually supportive roles.” (Moore 1996: 26). This means that the business ecosystem concept is wider than value chain concept and includes more diverse actors and wider perspective into value.

2.5 Software business value chain

One way of clarifying value chain in software business and different actors in it was represented by Messerschmitt & Szyperski (2003). This value chain (Figure 1) represents the major functions that need to be combined together in order to produce working software products to end users. Some companies in software business actively pursue and exploit synergies between several parts of the value chain. The weak couplings between actors in the value chain are described as grey arrows and strong cohesion as black arrows.

![Fig. 1. Organisations of the software business value chain (modified by the author, based on Messerschmitt & Szyperski 2003: 174).](image)

Messerschmitt & Szyperski (2003) state that there are eight business types in the value chain and one external business type. This external business type is the
information content supplier whose main business is to manipulate and present information gathered from different sources to multiple customers. Next the business types in the software business value chain are presented briefly.

Industry consultant’s role in the value chain is to analyse and transmit the needs of vertical industry segments or horizontal business functions. Application software suppliers develop software applications. Infrastructure software suppliers develop infrastructure for software application developers and operators. System integrator bundles software from application and infrastructure software suppliers into packages and ensures that these packages work and further offers supporting equipment infrastructure and testing and installation services for those packages. Business consultant’s role in the value chain is to use their knowledge related to commissioning and use of similar applications in other companies. Application service provider is an actor who licences and operates software applications for its customers (end-user organizations). Infrastructure service providers role is to purchase or license hardware and software infrastructure and operate that infrastructure. They can specialize in processing, storage and/or communications services. End-user organization is the final part of the value chain. It purchases and uses software applications (Messerschmitt & Szyperski 2003). Organisations in the value chain may operate in multiple business functions and they might seek to expand to new and more profitable business areas.

Tyrväinen et al. (2004) have also presented a model of the software business value chain and its main functions (Figure 2). This value chain consists of eight main functions of the software business value chain. Software & copyright box in Figure 2 do not present a function in the software business value chain but was put into the picture to clarify the point when software is complete and ready to be sold or licenced.
In Tyrväinen et al.’s (2004) model the starting point of the value chain is product marketing which consists of product requirements and marketing. Second step is product development which can be made in-house or bought via subcontracting. After software product is completed it can be offered as a service or sold as software licenses. Further software product can be embedded into service or infrastructure. If it is embedded into service software product can be sold as a service transaction. If software product is embedded into infrastructure it can be sold as a part of an equipment (Tyrväinen et al. 2004). This value chain model does not consider pure consulting (e.g. industry consulting, business consulting) or information suppliers as the main functions of the software value chain.
2.6 Overview of the Finnish software industry

The Finnish software industry is still relatively small and its growth rate is roughly the same as the worldwide growth rate in the same industry. Although Finnish software industry has succeeded in the international benchmarks it is still small industry. In 2010 its share of the Finnish gross domestic product (GDP) was estimated to be 2.1%. In euros the size of Finnish software industry was approximately 3.090 million euros in 2008 and 3.060 million euros in 2009 (Ylitalo & Rönkkö 2010). In Software Industry Survey 2012 Rönkkö & Peltonen (2012: 17) note that the “Estimates for the size of the software industry in Finland range between our estimate of around approximately 3€ to estimates of around 6 B€ that include all IT services as software business.”

Current state of the Finnish software industry is that only a couple of software product companies have succeeded internationally and there is only one large international IT service company which is originally from Finland. Most characteristic feature of Finnish software industry is that the majority of companies are small. Also home market is small and global industry mechanisms which favour consolidation do not favour Finnish companies. Finland lacks large companies which could consolidate with smaller ones via acquisitions. Industry trend towards maturing is leaving less space and possibilities for small and local software companies. (Ylitalo & Rönkkö 2010).

In Finland approximately 33,000–48,000 employees work in software development (Ylitalo & Rönkkö 2010). Half of them work in companies which are not included in the software industry (Rönkkö et al. 2008). Currently hardware producers are relying more on software as a way to differentiate their solutions and adding new functionalities into them. Sometimes the software part of the hardware product adds its value significantly (Rönkkö et al. 2010a).

Market of IT services is very concentrated because four largest IT service providers capture 50% of markets and ten largest IT service companies capture almost 75% of markets. Biggest IT service provider, Tieto Oyj, captures almost 25% of market.

Ylitalo & Rönkkö (2010) emphasize that the key problem in Finnish software industry is lack of financial resources. Also allocation of capital into software industry is ineffective. Although Finland invests heavily into software industry, international success has been very slight.

The majority of the Finnish software companies are small. In 2011 51% of companies gained less than 300,000 euros in revenue, 74% of companies gained
less than one million euros and only 4% of companies gained ten million euros or more (Rönkkö & Peltonen 2012).

Rönkkö & Peltonen (2012) note in the Software Industry Survey 2012 that more than half of the responding companies generated part of their revenue from international markets. For 23% of these companies this revenue was considered to be significant. Approximately half of the companies that generated international revenue reported that it was less than 20% (Rönkkö & Peltonen 2012). Finnish service oriented software companies are mainly local while most internationally oriented companies categorized their main business as device manufactures operating in software business. Companies with least international operations are project houses which are not keen to internationalize their business. (Rönkkö 2010).

According to Rönkkö & Peltonen (2012) the main geographical markets for Finnish software companies are Nordic countries & Western Europe with equal shares. Third most common market was North America where almost 50% less companies were operating than in Nordic countries or Western Europe. Fourth position went to Eastern Europe and Russia.

Most typical customer for 83% of Finnish software companies were companies. Public sector was the most typical customer for only 12% of the companies. Most typical revenue source for companies were development projects. (Rönkkö & Peltonen 2012).

In Finland software companies are heavily located in Helsinki metropolitan area (Table 1) which includes cities of Helsinki, Espoo and Vantaa. In 2009 approximately 48% of companies were located there. Over 60% of the companies with more than ten million euros revenue were located there. Other important cities for software companies are Tampere, Oulu and Jyväskylä. (Rönkkö et al. 2009).
Table 1. Cities with large number of software product companies by revenue (modified by the author, based on Rönkkö et al. 2009: 40).

<table>
<thead>
<tr>
<th>City</th>
<th>0&lt;0.3M</th>
<th>0.3&lt;1M</th>
<th>1M&lt;3M</th>
<th>3M&lt;10M</th>
<th>10M&lt;</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Helsinki</td>
<td>26.3%</td>
<td>34.5%</td>
<td>34.0%</td>
<td>27.8%</td>
<td>39.4%</td>
<td>30.3%</td>
</tr>
<tr>
<td>Espoo</td>
<td>12.6%</td>
<td>10.6%</td>
<td>12.6%</td>
<td>29.6%</td>
<td>15.2%</td>
<td>13.8%</td>
</tr>
<tr>
<td>Tampere</td>
<td>6.8%</td>
<td>5.6%</td>
<td>13.6%</td>
<td>9.3%</td>
<td>6.1%</td>
<td>7.9%</td>
</tr>
<tr>
<td>Oulu</td>
<td>5.4%</td>
<td>4.9%</td>
<td>4.9%</td>
<td>3.7%</td>
<td>3.0%</td>
<td>4.9%</td>
</tr>
<tr>
<td>Jyväskylä</td>
<td>4.7%</td>
<td>6.3%</td>
<td>2.9%</td>
<td>1.9%</td>
<td>0%</td>
<td>4.3%</td>
</tr>
<tr>
<td>Vantaa</td>
<td>4.3%</td>
<td>1.4%</td>
<td>3.9%</td>
<td>7.4%</td>
<td>6.1%</td>
<td>3.9%</td>
</tr>
<tr>
<td>Turku</td>
<td>4.3%</td>
<td>3.5%</td>
<td>3.9%</td>
<td>0%</td>
<td>0%</td>
<td>3.4%</td>
</tr>
<tr>
<td>Other</td>
<td>35.6%</td>
<td>33.1%</td>
<td>24.3%</td>
<td>20.4%</td>
<td>30.3%</td>
<td>31.5%</td>
</tr>
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<td>total</td>
<td>100.0%</td>
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2.7 R&D collaboration in Finland

Focus of this research was on R&D collaboration and the empirical data for this research was gathered from Finland and from Finnish actors. One of the most recent challenges for R&D activities in Finland are attractive R&D environments in developing economies which offer educated workforce and closeness of growth markets. Several Finnish companies have opened R&D units in countries like China and India. This multipolar model requires collaboration with several different actors outside company borders like partners, research organizations and customers and also with different units inside the company. The end product developed via collaboration is usually owned via several different partners. (Vasara et al. 2009).

Countries invest in R&D activities to foster them and to utilize and benefit from global R&D. In Finland partners of the national innovation system, which aim is to develop and utilize new technologies, are for example universities, research organizations, investors and mediator organizations. In this framework universities create the basis for innovative activities in companies via basic research and postgraduate education. R&D collaboration between universities and private companies is also a notable element and offers a channel for knowledge transfer. (Vasara et al. 2009).

Research which has a direct business impact is fostered via Strategic Centres for Science, Technology and Innovation (SHOK) which are funded for example via Finnish Funding Agency for Technology and Innovation (Tekes). SHOK’s are not always linked with the local universities, companies or funding. Their aim is to fund special research which fulfils the interests of funding organizations. This
research is conducted via networks of research organizations. In SHOK’s companies, universities and research organizations have shared research plan and the aim is to answer companies’ application-based needs in 5–10 years’ timeframe. SHOK’s strengthen the key areas of R&D by strategic competencies and increasing dialogue in cutting-edge research, testing and piloting of new research outcomes. (Vasara et al. 2009).

Previously the Finnish innovation policy model worked well but changing environment includes new challenges which need new solutions. These challenges include multipolar R&D, global networking, increase of company based R&D, development of university activities and creation of local dynamic and tempting ecosystems. Companies seek for ecosystems which offer them the possibility to knowledge transfer. Utilization of global knowledge requires a link to local networks thus knowledge is hard to absorb from distance. (Vasara et el. 2009).

One action toward the solution of this change is the significant increase in R&D funding in Finland. In 1995 Finland used 2.5% of its GDP in R&D but in 2000 this share was increased to 3.5% and in 2008 to 3.72%. Further the estimate for 2009 was 3.92%. For several years GDP share of R&D investments in Finland has been the second highest in the European Union (EU) and one of the highest in the world. In 2008 R&D investments in Finland were 6.900 million euros from which companies invest 5.100 million (74%), higher education 1.200 million (17%) and the public sector 600 million (9%). In recent years R&D funding in universities was directed mainly to technology oriented research not to basic research and thus there is a need to increase basic research funding. Only 26% (1.900 million euros) of R&D investments in Finland are state-based. In 2009 Academy of Finland’s R&D funding was 309 million euros and Tekes funding was 574 million (Hautamäki 2010).

According to Hautamäki (2010) the governmental structure of Finnish innovation system consists of the following actors which can be divided into government actors and funding actors.

Government actors include Research and Innovation Council, which is chaired by the prime minister and which is responsible for the strategic development and coordination of science and technology policy in Finland, its coordination and national innovation system. Ministry of Education and Culture develops for example education and science policies and international collaboration in education and science. The Ministry of Employment and Economy is responsible for example for entrepreneurship and innovation.
activities. Funding actors include The Academy of Finland which is the main funding agency for basic research. Tekes finance R&D and innovation activities while the Finnish Innovation Fund (Sitra) funds the welfare of the Finnish society (Hautamäki 2010). Vasara et al. (2009) also mention Aalto University and Nokia Corporation as important parts of the R&D activities in Finland.

2.8 R&D collaboration in ICT

Half of the employees that work in the software development in Finland are not included in the software industry. Further most of the internationally oriented companies categorize their main business as device manufactures that operate in the software business (Rönkkö 2010) and currently hardware producers are relying more on software as a way to differentiate their solutions and adding new functionalities into them (Rönkkö et al. 2010a). For these reasons R&D collaboration in ICT cannot be separated from the R&D collaboration in software industry as it can be argued that the actors are mainly the same and that they conduct software related R&D collaboration.

The ICT sector is characterized by rapid and discontinuous change, complex and complementary technologies, systematic innovation, standardization and dynamic environments where R&D costs are high and innovation pace is fast (Palmberg & Martikainen 2003) and thus companies success rarely relies only on their own R&D activities. R&D activities are important because they lead to new product offerings (Ketokivi & Ali-Yrkkö 2010). Companies execute R&D activities because of two main reasons, to improve current products and technologies; and to keep up with technological advance provided by other companies in the industry, and to be able to use that external knowledge internally (Leiponen 2000).

Exploitation of external knowledge and collaboration with parties outside company borders are vital but do not guarantee successful outcomes of R&D collaboration (Harison & Koski 2009). Nature of R&D collaboration can be make, buy, co-make, co-buy or a hybrid of the previously mentioned (Palmberg & Martikainen 2003).

Technological proximity of research partners has a positive impact on the outputs of R&D collaboration. If R&D partners operate in the same industry, it is easier for them to absorb knowledge spillovers and to understand both tacit and explicit knowledge that are shared by or delivered from other members of R&D collaboration (Harison & Koski 2009). Cohen & Levinthal (1990: 128) have
identified this absorptive capability as “the ability of a firm to recognise the value of new, external knowledge, assimilate it, and apply it to commercial aims”. Via intensive R&D collaboration some of the tacit knowledge can be shared and utilized jointly but this needs sufficient amount of absorptive capability (Leiponen 2000). If R&D partners function in the exactly same field it might increase technical opportunities for all collaboration partners. Although this can also lead to smaller variety of technological solutions when comparing to R&D done by companies from diverse fields (Harison & Koski 2009).

2.8.1 Characteristics

R&D collaboration is not a new phenomenon but its rapid increase in parallel with increasing competition since 1980s is (Palmberg & Martikainen 2003). It can be done with competitors, customers, supplier, universities and other research organizations. Collaboration with competitors is the rarest type of collaboration. Usually private companies collaborate with their customers, suppliers and universities. (Leiponen 2000).

The focus fields of Palmberg & Martikainen's (2003) study included alliances from the fields that they considered core to ICT field including microelectronics, software and telecom. Strategic R&D alliances can be considered highly important to companies in ICT sector because such alliances provide the access to complementary technologies and increase the possibility to manage standardization and technological change. They can never be unilateral where only one company receives knowledge assets. Strategic R&D alliances are the best when technology is new and uncertainties are high. (Palmberg & Martikainen 2003).

Also product market and geographical proximity of the R&D partners can foster the success of R&D collaboration. Geographical proximity and frequent face-to-face interaction establish the basis for knowledge sharing and trust building between R&D partners (Harison & Koski 2009).

Information and knowledge diffusion may partly be prevented when direct competitors perform R&D activities in the same R&D alliance but some of the less valuable knowledge becomes available also to competitors outside the alliance. One reason for R&D collaboration between competitors is to avoid or at least to mitigate patent races and cross-licensing negotiations which can be very costly. Other reasons include attempts to benefit from network effects, setting of standards and monopoly power. Previous may increase competing companies’
willingness to share knowledge between R&D partners and thus R&D collaboration between competitors can be as effective as other types of research consortia’s (Harison & Koski 2009).

According to Leiponen (2000) different competences are needed for different types of collaboration. When companies pursue R&D collaboration with universities, they need a great amount of research competencies and relatively high technical competences. However this collaboration is also characterized by large export share of collaborating companies. These research competencies increase the probability of outsourced R&D and thus are not an option for in-house R&D. R&D collaboration with the competitors is characterized by high research and technical competences.

Palmberg & Martikainen (2003: 15) have represented a typologisation of strategic R&D alliances. Such alliances are based on formal agreements and are long-term commitment by nature. In this typologisation private/public alliances are typically publicly funded ones which consist of private companies and public research organizations or universities. Private/private alliances cover more than half of the alliances. In ICT sector inter-industry alliances are especially interesting because ICT sector is characterized by overlapping technologies and convergence of different technologies.

2.8.2 Outputs of R&D collaboration

The amount of R&D expenses companies invest into R&D collaboration has the most significant impact into the quality of its outputs (Harison & Koski 2009), although the amount of R&D budget does not always express company’s innovation activities (Ketokivi & Ali-Yrkkö 2010).

R&D investments increase firm- and alliance specific capabilities which foster the exploitation of external knowledge sources and the accumulation of tacit knowledge. Participation in R&D collaboration increases organizational and individual learning. Palmberg & Martikainen (2003: 41) emphasize that strategic R&D alliances give companies a chance “to bet on different technological options and thus handle the uncertainties related to these developments”.

Harison & Koski (2009) have identified the following elements as the reasons for R&D collaboration, namely technical opportunities, network effects, standardization possibilities, monopoly power, access to external knowledge sources and external innovation.
Palmberg & Martikainen (2003) have identified the following elements as reasons for R&D collaboration: complementary technologies, possibility to manage standardization and technological change, inter-organizational learning, access to cumulative and tacit knowledge base of other companies, technology transfer, complementary technologies and distribution of intellectual property rights.

Leiponen (2000) emphasizes the following elements as reasons for R&D collaboration. Access to new knowledge assets and resources, new opportunities, access to complementarities, risk mitigation in R&D and access to tacit knowledge.


Finally, according to Penrose (1959) the different outcomes can be obtained via similar resources which are used in similar purposes if the organizational setting is different.

2.9 Government based funding mechanism

The main government funder in Finnish R&D activities is Tekes which funds both industrial R&D projects and projects in universities and other research organizations (Wallin et al. 2012). It aims to support the development of marketable innovations from new knowledge. From the company side Tekes’s role is especially important when innovations are developed based on companies’ core technologies and know-how. The longer it takes to develop an innovation the greater is the dependency into public sector and especially Tekes funding (Hyytinen et al. 2012).

During 1985–2007 Tekes was partially funding more than 60% of the innovations in Finland. According to the executers of these innovations, Tekes roles was significant in 80% of these innovations (Hyytinen et al. 2012). Further during 1985–2007 Tekes has been funding 94% of the generally known innovations in Finland that required scientific breakthroughs. In 90% of these innovations the role of Tekes funding has been significant. 69% of the generally known Finnish innovations which have generated novelty value into global markets have gained Tekes funding (Wallin et al. 2012). According to Hyytinen et
al. (2012) the different forms of interaction play an important role in the Finnish innovation system. The basic requirement to develop innovations is interaction as innovations are developed while combining multiple knowledge elements in interfaces (Tekes 2011).

To further speed up the development of innovations SHOK’s were decided to establish in 2006. Via SHOK’s Tekes’s aim is to reformulate the decisions of innovation activities and funding allocation (Wallin et al. 2012). The aim was to develop a new collaboration framework for collaboration between companies, universities, research organisations and funders (Hyytinen et al. 2012). One of the SHOK’s was established in the field of information and communication industry (Wallin et al. 2012).

Based on the previous the funding mechanism of Tekes potentially affects what kind of actors collaborate in innovation oriented R&D networks and what are the goals in the network and society level. Next these issues will be briefly discussed.

Tekes’s main function is to fund and support private and public sector R&D projects. This aims for example to increase networking between funded organizations and to increase and establish international networking and networks (Wallin et al. 2012). In national level this means networking between companies conducting R&D, higher education organizations and research organizations including knowledge transfer and information exchange from research organizations to small and medium enterprises (SME’s) (Hyytinen et al. 2012). From the ecosystem point of view, the aim is to create new kind of ecosystems (Lähteenmäki et al. (2011). The outputs should also have an effect on the entire network (Wallin et al. 2012). Tekes also supports the commercialization of the research results of emerging companies (Hyytinen et al. 2012).

Previous are also forced by the funding mechanism as large companies are only funded if the external effects on other actors are significant or if the companies’ business opportunities are essentially reinvented. The large companies also need to partner with the SME’s and public research organizations to get funding from Tekes and further direct major part of this funding to these partner organizations (Wallin et al. 2012). By partnering with larger companies SME’s develop as subcontractors and strategic partners of large companies. In 2009 especially the amount of subcontracting large companies acquired from SME’s increased. Further in 2010 61% of Tekes funding to companies went to SME’s (Tekes 2011). Also the ICT related challenges to fund start-ups and
commercialization via new kind of services (Hyytinen et al. 2012) is part of the Tekes activities.

In SHOK’s companies, universities and research organizations collaborate based on the jointly agreed research agenda. The aim of this agenda is to fulfil the application oriented needs of the companies in the next 5–10 years (Wallin et al. 2012). These needs include the needs of business and society (Hyytinen et al. 2012). This means that the leading companies within the field of single SHOK need to agree on a joint research agenda. By this way they can strongly influence on the decision making process where the selection of the government funded projects based on the joint research agenda are selected. (Wallin et al. 2012).

The main goal of SHOK’s is to renew industry clusters and to create radical innovations. They are new environments for knowledge creation. SHOK clusters speed up the innovation processes via developing new kinds of co-operation, co-creation and interaction methods. Actors in these clusters are meant to work within strong cooperation. Most of the funding and steering of SHOK’s is managed by Tekes. In SHOK cluster the top level science, technology and innovation activities are planned to be executed via constant interaction (Lähteenmäki-Smith et al. 2011).

Based on the previous, the funding requirements of Tekes might have effect on the formation of networks, ecosystems and interaction methods, participation of small companies, creation of star-ups, commercialization of research results, amount of subcontracting within a R&D network and the role of the university actors.

2.10 Focus of the research

The focus of this research is on the interaction in innovation networks between and within private companies, universities, public research organizations and such mediator organizations as public funding bodies and actors that coordinate research and development (R&D). The research interest is in how interaction between actors affects the creation of new intellectual assets and what the effect of these intellectual assets is in the value creation to individual actors and as a whole. In this value process different actors collaborate to co-create value while at the same time they might compete against each other in value co-capture. Within this collaboration interaction and its nature are the key research interests.

Mediator organizations like public funding organizations and coordinators of R&D networks are also part of this research as during 1985–2007 Tekes was
partially funding more than 60% of the innovations in Finland (Hyytinen et al. 2012) and as to further speed up the development of innovations SHOK’s were decided to establish in 2006 via which Tekes aims to reformulate the decisions of innovation activities and funding allocation (Wallin et al. 2012).

In Finland Tekes supports financially R&D networks where large and small companies, universities and research organizations collaborate in order to integrate large companies tighter into the local innovation networks. Bringing these different actors together to conduct joint innovation activities has a significant effect towards the effectiveness of those activities. Another important activity which supports joint innovation in network level is the rotation of research personnel between universities and private companies (Wallin et al. 2012).

This collaboration is further defined as interaction as for example the aim of SHOK’s is to create and apply new interaction, cooperation and co-creation methods to foster innovation processes via cooperation between private companies and universities by creating new technology- and research-based business opportunities and solutions (Lähteenmäki-Smith et al. 2011).

The research interest in this dissertation is on the interactions of actors in innovation networks where the aim is to co-create and co-develop valuable intellectual assets. While actors cooperate in the development of intellectual assets they, at the same time, compete against each other during value capturing and the utilization of intellectual assets. Wallin et al. (2012) have noted that the majority of private companies created value via networks where actors cooperate and compete against each other simultaneously.

According to Luoma et al. (2011) commonly used indicators of R&D outcomes include patents, licenses and registered trademarks but it is emphasized that outcomes of R&D and innovation activities include also other types of intangible assets which can potentially be highly important yet difficult to measure. In this dissertation the interest is on the latter as desired outcomes are narrowed to intellectual assets which by its definition exclude intellectual property rights. Besides the amount of intellectual property rights traditional innovation measures include for example revenue growth and the number of new products (Wallin et al. 2012).

The reason for focusing on the intellectual assets as a source of value is that in the past couple of decades the focus of Finnish innovation policy has been technology-driven whereas the current policy focuses more on the demand, customer and user needs. This demand-driven focus needs to be fostered via
interactive processes where developers, users and actors from public sector jointly innovate new solutions and innovations which can be both technical and service innovations. From the public sector point of view the strategic aim is to optimize and develop value-adding networking and knowledge transfer activities. (Lähteenmäki-Smith et al. 2011).

Sometimes the value of R&D activities do not emerge instantly as within certain R&D programs new business opportunities may emerge, new technology may succeed via different marketing strategy or after longer time period as current application technologies may not fully support new innovations. Effects of both basic- and business-oriented R&D can be long-term (Luoma et al. 2011). As Suomala ed (2009) notes intellectual capital do not develop profits as such but offers possibility to create profits via its use and utilization.

2.11 Summary

In this chapter the context of software industry and its evolution were first discussed in the general level but also the current state of the Finnish software industry was discussed. The R&D related innovation networks are partly funded by the public money and this R&D collaboration in Finland in general and in Finnish ICT were discussed as well as the government based funding mechanism in Finland.

Based on this R&D collaboration and the funding mechanism the focus of the interaction in this dissertation takes place between private companies, universities, public research organizations and mediator organizations like public funding organizations and coordinators of R&D networks.

In the next chapter the concepts of network collaboration, networks and more specifically innovation networks will be discussed. Nature of networks, reasons for networking, some of the desired outcomes as well as advantages and disadvantages of network collaboration will be presented.
3  Network collaboration

This chapter discusses about the reasons for networking and its disadvantages with a special focus on innovation networks, because innovation networks within the software industry form the context of this dissertation. Further the network relationships between actors will be discussed from the network related literature perspective as the ARA model and the Model of Business Interaction, which will be discussed in Chapter 4 (Interaction in networks), focus on the main elements of the interaction and the interplay of these elements but not on the ties between the actors.

Beside networks the innovation networks will be discussed in more detail including the definitions of innovation networks and innovation that will be applied in this research as well as the concept in spillovers. Networks, innovation networks and their characteristics will be discussed to get deeper understanding of the specific context of this research, namely innovation networks, based on the earlier literature.

3.1 Networks

Borgatti & Foster (2003) define network as a set of actors which are connected to each other via set of ties. Those actors (or nodes, or egos in a case of a single actor) can be for example individuals, teams, companies, organizations or even concepts. Ties which connect actors can be directed or undirected, one-directional or multi-directional, or valued. Nodes that an ego has are called alters and the entirety of an ego, its alters and all ties between them are called an ego-network. Networking can happen in a dyadic, actor, group and network levels.

According to Axelsson & Easton (1992: xiv) "A network is a model or metaphor which describes a number, usually a larger number, of entities, which are connected". Cook & Emerson (1978) note that networks consist of two or more exchange. Further Hall (1977) has emphasized that form of network is based on group of actors which act to achieve a common goal.

3.1.1 Classifications of networks

Authors have classified networks in several different ways in the earlier literature. Next some of those classifications are presented.
Achrol (1997) has classified networks into four categories which are: internal market networks, vertical market networks, intermarket networks and opportunity networks. *Internal market networks* are not inter-organizational business networks and thus they are not described in more detail.

*Vertical market networks* are industry-specific chains of suppliers and distributors which include a set of direct supply or distribution relationships that are typically organized around manufacturing company. This central-company performs only a limited set of manufacturing functions and acts as an integrator specializing, for example, in marketing or final assembling and outsources rest of its business functions (Achrol 1997).

*Intermarket networks* are alliances where companies represent different unrelated industries. Earlier these were typically organized around one major financial institution, trading company or manufacturing company. These networks are characterized by tight interconnections in decision making, resource sharing and regular collective actions. Nowadays these networks have become redundant and the major company is often replaced by an organization which controls the key technologies. (Achrol 1997).

*Opportunity networks* are temporary alignments which are usually established for a specific customer project. These are usually organized around a marketing company which collects market information and handles negotiation and coordination activities. Core competence of this marketing company is its worldwide network of marketing companies and information centres supported by modern technology which enable solutions for the needs of potential customers and directory of potential suppliers in real-time. (Achrol 1997).

In this categorization vertical market networks, intermarket networks and opportunity networks are organized around a central hub organization which acts as an integrator and controls key resources and value activities and enables vertical dimension (Achrol 1997). Möller & Rajala (2007) note that knowledge and technology intensive organizations cooperate in more horizontal networks where powerful hub companies do not exist.

Based on Castells’s (1996) work de Man (2004) has suggested classification of networks based on their goals. De Man (2004) divides networks into three groups which consist of five categories. First group is quasi-integration networks. Second group is supply (and demand or customer) oriented networks which are divided into vertical networks and solution networks. Third group is technology oriented networks which are divided into R&D networks and standardization networks.
Möller & Rajala (2007) have clarified network categories presented by de Man (2004) in more detail. Quasi-integration networks are mainly horizontal networks which aim is to gain market power and collect complementary resources from limited member organizations. Vertical networks, which consist of suppliers and producers, hold sequential places in value chain. The main purpose of vertical networks is to increase efficiency. Solution networks consist of producers of complementary goods and services. The purpose of solution networks is to solve broad customer-specific problems. The partners solving these problems can be horizontal or diagonal. R&D networks consist of organizations which shares risks, costs and/or competencies in R&D. These organizations can be horizontal or diagonal. Standardization networks consist of partners which aim is to set dominant technology around specific product or service field. These partners can be horizontal or diagonal and are often co-operative. (Möller & Rajala 2007).

Möller & Rajala (2007) note that when examining classifications of network types represented by Achrol (1997) and de Man (2004) a couple of basic dimensions can be found. First, network structure can be horizontal, vertical or diagonal. Second, the nature of networking is goal, resource and competence sharing (integrating or combining). Third, market competition can be market or pre-market competition. Further Möller & Rajala (2007: 898) have emphasized that "essential to any business net is the underlying system through which it produces value" and continued by defining this value as "a set of specific activities carried out by the actors constituting the net".

Graphic of Möller & Rajala’s (2007) classification of strategic business nets is presented in Table 2. Next the emerging business nets category will be presented in more detail as its sub-class, innovation network, is the network type which best describes the network which will be examined in the empirical part of this research.
Table 2. Business net classification framework (modified by the author, based on Möller & Rajala 2007: 899).

<table>
<thead>
<tr>
<th>Current business nets</th>
<th>Business renewal nets</th>
<th>Emerging business nets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stable, well-defined value systems</td>
<td>Established value system, incremental improvements</td>
<td>Emerging value system, radical changes</td>
</tr>
<tr>
<td>Well-known and specific value activities.</td>
<td>Well-known value systems.</td>
<td>Old and new actors.</td>
</tr>
<tr>
<td>Well-known actors.</td>
<td>Change through local and incremental modifications within the existing value system.</td>
<td>Radical changes in old value activities.</td>
</tr>
<tr>
<td>Well-known technologies.</td>
<td></td>
<td>Creation of new value activities and actors.</td>
</tr>
<tr>
<td>Well-known business processes.</td>
<td></td>
<td>Radical system-wide change.</td>
</tr>
<tr>
<td>Stable value systems.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vertical demand-supply nets</td>
<td>Business Renewal nets</td>
<td>Application nets</td>
</tr>
<tr>
<td>Like DELL, IKEA and Toyota.</td>
<td>Business process improvements.</td>
<td>Like flat panel displays.</td>
</tr>
<tr>
<td></td>
<td>Offer improvements.</td>
<td></td>
</tr>
<tr>
<td>Horizontal market nets</td>
<td>Customer solution nets</td>
<td>Dominant design nets</td>
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<tr>
<td></td>
<td>Software solutions.</td>
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<tr>
<td></td>
<td></td>
<td>Innovation networks</td>
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<td></td>
<td></td>
<td>Science-based networks.</td>
</tr>
</tbody>
</table>
Emerging business nets

Emerging business nets are divided into: application nets, dominant design nets and innovation networks (Möller & Rajala 2007). As reasons for adapting software ecosystem approach include fostering innovation via open innovation in the software ecosystem to share the costs of innovations (Bosch 2009) it is relevant to discuss about the emerging business nets and innovation networks. Further as the focus of this research is on R&D collaboration, it is especially relevant to discuss about science-based networks.

Their main function is to create new technologies, business concepts and business fields. In these networks change and uncertainty are constantly present and they can be described as radical, discontinuous and system wide. Actor’s challenges in emerging business nets differ significantly from those in stable business nets. In stable networks knowledge is primarily codifiable and firmly held but in emerging business nets tacit knowledge is widely dispersed, vague and uncertain. (Möller & Rajala 2007).

Möller & Rajala (2007: 904) describe innovation networks as “relatively loose science and technology-based research networks involving universities, research institutions, and research organizations of major corporations. These are characterized by professional and social relationships and are not primarily business networks but are guided by the ethos of scientific discovery”. This definition of innovation networks is also applied in this research. Major corporations are participating in these networks more often than previously through their own researchers and by sponsoring university laboratories and other research institutions (Lundgren 1995). CERN (European Organization for Nuclear Research) is a good example of innovation network with both science and technology-based professional networks and not-for-profit and for-profit organizations (Möller & Rajala 2007).

Dominant design nets are proactive networks where company’s goal in pre-market phase is to gain strong position and to speed up market construction. As single company cannot generally achieve dominant design, companies need networking to gain such market position. These networks are diagonal coalitions where actors are partially competing and partially complementing. Examples include Symbian and Bluetooth where companies share similar technological views. There are usually several networks in the market whose aim is to gain technological dominance. (Möller & Rajala 2007).
The aim of application nets is to achieve commercially viable business applications in specific field of evolving technologies. They are usually coordinated by a central hub company with several complementing components, software and technology providers and pilot customers. Application nets may overlap with dominant design nets. Examples include new mobile services. (Möller & Rajala 2007).

3.1.2 Expected benefits of networking


Saint-Paul (2003: 2) emphasizes the benefits of networking as “in an industry with, say, 10 firm in similar output and investment in R&D, each member of a nine-firm technology cartel [or network] can expect to obtain immediate access to nine times the number of innovations that the remaining enterprise can anticipate on average”.

Ahuja (2000) has argued that three aspects of network structure are relevant for benefit realization through network. These are: 1) number of direct ties maintained by actor (through knowledge sharing, complementarity and scale, 2) number of indirect ties maintained by actor (through complementary skills); and 3) degree to which actors alters are linked to each other (through scale of economies in research).

Borgatti & Foster (2003) have noted that from social capital perspective individual actor can gain benefits from networks mainly through two ways, by obtaining a central position in the network or by suitable ego-network. Further different ties have different capabilities of resources which can be extracted
Partners with equal roles in network may increase network flexibility, foster innovation and secure access to complementary assets. Start-up companies might be interested to establish alliance networks with their current or potential competitors because rivals are repositories of knowledge vital to organization builders and especially those rivals with leading-edge technology, competences, know-how and skilled innovators (Baum et al. 2000).

3.1.3 Potential disadvantages of networking

Some of the disadvantages of networking are reflections of network benefits, because other actors within the same network usually get same benefits from networking.

Ahuja (2000) emphasizes that in many networks also competitors are sharing same information and knowledge. According to Baum et al. (2000) participating in many alliance networks without evaluating the diversity of partnering organizations can lead to inefficient configurations that return less diverse information and capabilities for greater cost comparing to smaller non-redundant set of organizations. Network partners competing interests can lead to fragmentation and decreasing interest to invest in it. Inadequate contracts concerning the outputs and profits of alliance networks may also be a risk (Baum et al. 2000). Howells (2005) emphasizes knowledge spillovers as a negative feature of R&D investments. Inkpen (1998) also finds possible knowledge spillovers to current and potential competitors as a negative side of cooperation.

3.1.4 Network relationships

According to Ahuja (2000) both direct and indirect ties within network have positive effect on innovation but the effect of indirect ties is moderated by the number of organizations direct ties. Gulati (1999) has even described relationships within network as network resources. Network resources are vital as companies become part of complex inter-firm networks that can provide valuable information about new business opportunities. Shan et al. (1994) found that the number of companies’ collaboration relationships had a positive effect on its innovation output.

Burt (1992) argues that actor can maximize benefit of non-redundant contacts and information actor receives from his alters if those alters are not connected with each other. If those two alters are connected to each other they will share the
information they have. For an actor there is no reason to be directly connected to both alters. If alters have direct connection to each other they can coordinate against the actor. If not, actor can cooperate with them one by one or they can compete each other off. Large number of indirect ties may be an effective way for an actor to benefit from the networks size without paying any cost related to the direct ties which maintain the network. (Burt 1992). Also Gulati & Gargiulo (1999) emphasize that egos ties provide the access to its alters and its alters alters knowledge.

Ahuja (2000) has argued that if an actor has multiple direct ties, its ability to gain from indirect ties might be limited. Actors with a limited number of direct ties benefit more from their indirect ties because their access to network via direct ties is limited. Indirect ties are efficient and effective way of optimizing network benefits because their maintenance cost is low or free and thus they enhance network effectiveness (Ahuja 2000). If knowledge is distributed in different minds and actor wants to utilize it effectively, actor has to know who knows what (Borgatti & Foster 2003. The ability to establish relationships in network of companies is the key issue in developing organizations innovative capabilities (Calia et al. 2007).

According to Galunic & Rodan (1998) knowledge transfer via socialization is costly and time consuming because of its permanent nature. Knowledge transfer is difficult because people are less likely to invest needed time to share their competencies. Tacit knowledge is sometimes difficult to identify and thus it might be hard to be fully utilized.

Granovetter (1973) divides social ties within network into strong ties, weak ties and absent ties. Further he highlights the importance of a bridge which is the line in a network which provides only path between two points (actors). Bridge is the only path by which two alters can share information and influences and thus it is unlikely that bridge is a strong tie. In large networks it is rare that bridges even exist. In practice lot more people can be reached via weak ties than strong ties. Weak ties are important to ego because they deliver socially distance ideas, influences and information. They also link smaller groups together. Strong ties are more likely to appear within particular group. (Granovetten 1973).

According to Inkpen (1998) and Kelly et al. (2002) trust is an important element in collaboration networks. Kelly et al. (2002) emphasize that trust building is a long-term process and it can be extremely difficult to create and preserve trust between actors. Information sharing and commitments between
actors are unlikely to happen without trust. This is especially true when actors are competitors or potential competitors.

In closed networks deviant and unreliable behaviour is rarer than in open networks because of the threat of reputation lost (Ahuja 2000). Calia et al. (2007) and Galunic & Rodan (1998) emphasize that trust, motivation and knowledge exchange and combinations between actors are key factors in successful networking. Inkpen (1998) notes that previous ties can generate the initial base of interpartner trust.

### 3.2 Innovations Networks

The context of this research is R&D oriented innovation networks in software industry and thus next the innovation networks and the definitions of innovation networks and innovation will be presented. Also the characteristics of innovation networks and spillovers will be discussed.

According to Calia et al. (2007) innovation networks are natural effect of increasing complexity of innovative products and services and that the complexity demands a broad range of different specialized skills. Lampela (2009) has emphasized that innovation is one of the fields where co-operations enable positive network effects. Gassman et al. 2010 note that main drivers of internationalization in R&D are to gain access to resources which cannot be accessed in any other way.

Hagedoorn (1993) have found that partners with complementary resources which are needed for technology monitoring and development of innovations are important motives when establishing strategic alliances. Companies seek for cooperation which lowers expenses of individual partner. Cooperation between companies has a positive effect on a single company’s profitability. (Hagedoorn & Schakenraad 1994).

Currently major companies fund innovation networks more heavily and participate them via their own researchers. Especially in software development, open source and open innovation the non-profit motives are dominant (Möller & Rajala 2007).

As emphasized earlier in this chapter in this dissertation the author will apply Möller & Rajala’s (2007: 904) definition of innovation network in which they describe innovation networks as “relatively loose science and technology-based research networks involving universities, research institutions, and research organizations of major corporations. These are characterized by professional and
social relationships and are not primarily business networks but are guided by the ethos of scientific discovery”.

### 3.2.1 Innovation

In the earlier literature innovation has several slightly different definitions. For example Ahuja (2000) has described innovation as an information-intensive activity from information collection and processing points of view. Dosi (1988, 222) defines innovation as “the search for, and the discovery, experimentation, development, imitation, and adoption of new products, new production processes and new organisational set-ups”. Lambooy (2005, 1142) defines innovation as “the result of an iterative process of interaction between individuals, organizations, systems and institutions, using price signals and other signals to find the direction in which to develop”.

Howells (2002) notes that even if innovating, inventing and discovering use the existing knowledge, they often require generation and capturing of new knowledge. Calia et al. (2007) emphasize that incremental innovations utilize current technology in current market situation to strengthen current competences. Howells (2002) argues that there are under-investment in R&D because of the fear of knowledge spillovers, uncertainties and externalizes.

Bercovitz & Feldman (2007: 931) describe innovation as “the ability to create economic value from new ideas and the pursuit of innovation requires firms to define a strategy”. Feldman & Audretsch (1999) classifies innovations into four categories based on their significance:

1. the innovation that establishes an entirely new category of product
2. the innovation is the first of its type on the market in a product category already in existence
3. the innovation which represents a significant improvement in existing technology
4. the innovation which is a modest improvement designed to update an existing product

Feldman & Audretsch (1999) found that 87% of innovations belonged to the fourth category and the majority of the rest belonged to the third category. Further innovations seem to appear mostly in big cities.

This research applies Dosi’s (1988: 22) definition of innovation which is “the search for, and the discovery, experimentation, development, imitation, and
adoption of new products, new production processes and new organisational set-ups” to emphasize the network perspective of innovation process and utilization of external knowledge sources.

3.2.2 Spillovers

The term spillover has also been defined in several ways. For example Griliches (1992: 36) has defined spillovers as “working on similar things and hence benefiting much from each other’s research”. Feldman & Audretsch (1999: 410) note that “new economic knowledge may spill over, but the geographic extent of such knowledge spillovers is bounded” and further Feldman & Audretsch (1999: 412) note that “despite the general consensus that knowledge spillovers within a given location stimulate technological advance, there is little consensus as to exactly how this happens”. So authors agree with the benefits of knowledge spillovers but there is disagreement about their geographical distance.

Feldman & Audretsch (1999) emphasize that increased number of companies provide harder competition of new ideas than earlier but at the same time competition over a single company’s resources and assets accelerates, which provides the possibility for new companies to access specialized niches with new products or services. Specialized complementary inputs of knowledge and resources are often obtained by small specialized companies rather than major organizations which operate in vertical markets.

Feldman (1999) emphasizes that companies’ benefit from R&D activities done by other companies that operate in close technological proximity and the relationships between originating patents and citing patent are used to identify knowledge spillovers. Krugman (1991: 53) has the opposite opinion and states that “Knowledge flows, by contrast, are invisible; they leave no paper trail by which they may be measured and tracked”. However, knowledge flows sometimes leave paper trail for example in a form of patents or product manuals.

Activities around innovativeness tend to cluster in industries where knowledge spillovers play a crucial role. In such industries knowledge which generates innovative activity is carried forward as tacit knowledge through knowledge spillovers. Skilled workforce with the high level of human capital is a way to carry forward that knowledge. The importance of knowledge spillovers increases with the portion of skilled workforce within specific industry. (Audretsch & Feldman 1996).
Academic research does not always result in useful knowledge to all industry sectors. However some academic departments are expected to be more important to certain industries. Audretsch & Feldman (1996) note that industry R&D, skilled workforce and university research have a positive and statistically significant impact on knowledge generation. Innovation activity performs and knowledge is captured more often in nearness with its original source such as university research laboratory, company’s R&D unit or skilled workforce.

Feldman (1999) emphasizes that activities around innovativeness should cluster into regions where knowledge spillovers are most relevant. Clustering seems to be important especially in the industries where industry R&D, university research and skilled workforce are important inputs in innovation creation. Spillovers can be external to companies and at the same time internal to an industry within a city. Local cluster can increase innovativeness by offering industry specific complementary assets or other activities. These can lower the costs or enable greater specification in input and output markets. Clustering can also increase trustworthy behaviour and lower its costs. (Feldman 1999).

3.3 Summary

In this chapter the reasons for networking and its disadvantages were discussed as well as the network relationships. The definitions of innovations networks and innovation which were applied in this research were presented. The context of this research is R&D oriented innovation networks in the software industry so both of the previous definitions and the characteristics of networking and networks are important while examining R&D related activities within innovation networks.

The three main elements of the network part of the a priori analysis framework will be discussed in Chapter 4 (Interaction in networks). In this chapter factors of network collaboration that ARA model nor the Model of Business Interaction that will be discussed in Chapter 4 (Interaction in networks) do not focus on were discussed based on the earlier literature. These factors include reasons for networking and its disadvantages and network relationships. Further characteristics of innovations networks, innovations and spillovers were discussed to give more literature based information about the network relationships between actors, what the actors actually seek from the network collaboration and what they may try to avoid. Also these factors of network
collaboration are not covered in ARA model nor in the Model of Business Interaction which will be discussed in chapter 4 (Interaction in networks).

In their research Doz et al. (2000) examined the formation processes of 53 R&D consortia’s from various industries and found that pathways and formation processes of R&D consortia’s are various and there may not be a single best way for this formation process. For this reason this research does not choose a certain network formation or life cycle process but instead focuses on the main dimensions of business relationships within a network and their interplay. These dimensions will be presented in chapter 4 (Interaction in networks).
4 Interaction in networks

This chapter focuses on the elements of interaction, interaction processes and business relationships where interaction takes place.

Interactions are the building blocks of networks where organizations, companies and individual professionals interact. “Although some interactions in organizations may be idle, and formed by mandates or the happenstance or people meeting and liking one another, many other likely arise because parties interact to achieve plan, coordinate, or decide on their individual and collective activities.” (Salancik 1995: 346). While examining the role of networks, the existence of interactions cannot be ignored as they form the necessary starting point as interactions form the network. (Salancik 1995).

Interaction processes within business relationships always involve resources from a wider network outside participating actors. Although interaction has been examined related to its obvious outcomes and its implications to the business management, there is a limited number of researchers related to the characteristics and dimensions of interaction in an economic setting. Interdependencies between companies have led to more complex interactions than earlier and with wider variety of resources which have made the interaction more important than previously (Ford & Håkansson 2006). Companies should utilise its interactions to support learning about the link between its own resources and external resources activated via relationships (Håkansson & Ford 2002).

If certain interactions are easy to ignore, while examining networks, it is even easier to ignore the interactions that do not exist because reasons for non-existence could be more difficult to understand. Reasons for non-existence can be lack of advantage for one actor, institutional policies that prevent or limit certain interactions or that the target of certain interactions is predefined. Some of the observed interactions can be just observations and there is a need to understand how interactions support certain networks and vice versa in order to achieve the goals of organizations and individual professionals. (Salancik 1995).

In this research interaction is conceptualized based on the earlier research within IMP Group. According to Axelsson (2010) the core models of IMP tradition are interaction model (Håkansson 1982) which focuses on the relationships between organizations and ARA model (Håkansson & Snehota 1995, Axelsson & Easton 1992) for analysing business networks. Based on the earlier work within IMP Group, Ford et al. (2010) have developed conceptualization of business interaction. This Model of Business Interaction by Ford et al. (2010) will
be used in this research to examine the interactions within and between actors in intellectual asset development. Thus there is a continuum from interaction model to ARA model and finally to the model of business interaction. Although ARA model is an industrial marketing model, it is the first model that applies network approach while analysing business relationships in a global context (Håkansson & Snehota 1995).

The focus of this chapter is on interaction, elements of interaction and ARA model and its elements. In Chapter 5 the focus will be on value and intellectual assets as in this research the resource part of the ARA model is clarified to consist of valuable assets. In the previous chapter the network collaboration context of this research was discussed as the activities part of the ARA model in this research occur within the innovation networks in the software industry and more precisely in network collaboration. These activities are targeted toward valuable assets and their creation, although they do not necessarily include interaction.

Next the two core models of IMP tradition, ARA model by Håkansson & Snehota (1995) and Axelsson & Easton (1992) and interaction model by Håkansson (1982) are presented because the Model of Business Interaction by Ford et al. (2010) is based on the empirical work within IMP Group (Ford et al. 2010).

### 4.1 Interaction model

Next the interaction model presented by Håkansson (1982) will be discussed. Its focus is on the relationships between organizations. It sees organizations as part of a group of interacting organizations and concentrates on the interaction processes between those organizations. Although the main focus of the interaction model is on the relationships between two actors, it can be applied while examining the relationships between several actors (Håkansson 1982). Although it analyses the relationships between buyer- and seller organizations, it is useful while analysing systematically business relationships because interaction processes and relationships are the core of the interaction model. Sometimes episodes are escalated into higher levels of hierarchy, for example from operational to strategic level (Axelsson 2010).

According to Battistella et al. (2013) similarly value chains are based on the relationships between buyers and sellers, although they note that these relationships are volatile by nature. Further they note that the focus of business ecosystems is to generate value and social capital that are the results of
sustainable long-term relationships. For example Manikas & Hansen (2013: 1297–1298) have defined software ecosystems as “as the interaction of a set of actors on top of a common technological platform that results in a number of software solutions or services. Each actor is motivated by a set of interests or business models and connected to the rest of the actors and the ecosystem as a whole with symbiotic relationships, while, the technological platform is structured in a way that allows the involvement and contribution of the different actors.” Thus business, relationships and interactions are parts of software ecosystems and buyer and seller relationships are part of the value chain and part of the software ecosystems as Manikas & Hansen (2013: 1301) have listed most common actors based on the earlier literature and this list includes for example orchestrators (keystone actors, hubs and platform owners), niche players, external actors that provide indirect value to the ecosystem, vendors and customers (both companies and individuals). Further they have noted that software ecosystem offers possibilities for participating actors to benefit from their participation. As the focus of this research is on the interaction in asset-based value creation within innovation networks, both value chain and buyer and seller relationships can potentially be part of the R&D collaboration depending on the nature and actors of the innovation network and for example R&D programs.

Interaction model includes four main elements and their sub-features which describe and influence interactions between organizations. The main elements are: 1) interaction process, 2) participants within interaction process, 3) environment where interaction takes place; and 4) atmosphere that affects and is affected by interaction (Håkansson 1982, Axelsson 2010).

### 4.1.1 Interaction process

Interaction process consists of individual episodes within relationship (Håkansson 1982). Next the characteristics of episodes and relationships will be discussed.

**Episodes**

Episodes that occur within business relationships are characterized by the exchange between two actors. The exchange can be characterised as 1) product or service exchange, 2) information exchange, 3) financial exchange or 4) social exchange (Håkansson 1982, Axelsson 2010). Episodes of exchange take place in a context of previous episodes and experiences which cause expectations from all
involved participants. They can be part of several relationships. External context has an effect on episodes as well as the specific characteristics of involved participants. The situation of an episode relates to all four main elements of the interaction model. (Axelsson 2010).

Core of an exchange is often product or service and the characteristics of exchanged product or service has most probably significant effect to the relationship (Håkansson 1982).

Exchange can also include pure information with technical, economical or organizational aspects. When information is exchanged, its width and depth are important to consider from these aspects. The transfer of information can be personal (e.g. how to use a certain product) or impersonal (e.g. basic commercial or technical data). The formality of an information exchange is important as it might have an effect on the interaction process and relationship between organizations. (Håkansson 1982).

The third exchange element within the episodes is financial exchange and more precisely exchange of money. Two important aspects of financial exchange are the amount of money from economical perspective and possible need to exchange money from one currency to another and uncertainties related to such exchanges (Håkansson 1982).

The fourth element of episodes is social exchange. This element is important especially when previous experience of actors is limited or when there is spatial distance or cultural difference between them. The most important aspect of social exchange is the successful episodes of social exchange in a long-term process which aim is to interlock two actors. These successful episodes are also important when handling short-term difficulties within relationships while exchanges do not happen. Mutual trust is important part of social processes and its formation takes time and is based on personal experience. (Håkansson 1982).

Relationships

Episodes of social exchange are the critical part of long-term relationships, although three other elements of episodes can also lead to long-term relationships. These are 1) roles and responsibilities, 2) communication and information exchange and 3) adaptations (Håkansson 1982). Relationships are long-term and complex by nature and their current form is the result of previous interactions between actors. Shared activities and resources have either positive or negative effect on relationship and form expectations for future interactions (Håkansson &
In the course of time exchange episodes and their routinization will lead to clearer expectations of the roles and responsibilities between actors. The main reason for establishing relationships is to gain economic benefits and to control the environment where company operates in. In the Interaction model this is clarified as institutionalization (Håkansson 1982). Relationships also offer an opportunity for an actor to influence others and vice versa, to be influenced by others (Håkansson & Ford 2002).

Episodes with successful communication and information exchange build up contact patterns and relationships between organizations. According to Håkansson (1982: 17) “These contact patterns can consist of individuals and groups of people filling different roles, operating in different functional departments and transmitting different messages of a technical, commercial, or reputational nature.” Highly important aspect of information and social exchange is that the exchange can happen between actors for a long time without the involvement of financial or product exchange (Håkansson 1982).

The third aspect of relationships is adaptations that an actor or actors make in exchanged elements or exchange process. In general, adaptations can happen either over time in a relationship including several single transactions or within the process of single significant transaction. Relationship as a whole can be modified by adaptations in specific episodes. These adaptations can be conscious or unconscious. Problem related to adaptations is their manipulation (Håkansson 1982).

**4.1.2 Participants**

Participants are the second main element of the interaction model. Interaction model emphasizes that a relationship between two actors and the interaction process within it is not the only factor affecting the elements of interaction. The characteristics of those two actors and individual professionals representing them also have an effect on the elements of interaction. Major factors influencing interaction process are technology, organizational size, structure and strategy, individuals within organizations (Håkansson 1982, Axelsson 2010) and organizational experience (Håkansson 1982). Next these four factors are discussed.

Technology is characterized by the differences of technological systems between actors and the characteristics of these systems. This creates the basic
conditions for interaction and influences all the dimensions of interaction process including episodes and relationships. (Håkansson 1982).

Organizational size, structure and strategy belong to the second main factor that affects participants (Håkansson 1982, Axelsson 2010). Actors’ size and power form the basic position for their interaction and larger actors with significant resources have greater potential to dominate over smaller actors. Actors’ organizational structure and more precisely its centralization, specification and formalization influence interaction processes in several ways. For example via the amount and categories of involved individuals, exchange procedures, applied communication media’s, formality of interaction, nature of exchanged products or services as well as finance. The organizational structure of actors is the framework where interaction takes place in the short-term. In the long run organizational structures could be modified by interaction processes or by individual episodes. In general strategy potentially has an effect on short-term episodes as well as long-term relationships of an organization. (Håkansson 1982).

Organizational experience within certain relationship and activities outside that relationship, for example from similar relationships, will build up knowledge about the management of certain kind of relationships. Experience can also emphasize the importance of the single relationship and company’s commitment toward it. Organizations and its individual’s experience of certain market environments is also important for example in establishing international relationships. (Håkansson 1982).

Relationships need at least one individual from both organizations, usually several from different functional areas, levels of hierarchy and different roles. Individuals exchange information, develop relationships and form social bonds, which have an effect on decision making in each organization within business relationship. Reactions of individuals in single episodes have an effect how overall relationship is created. Relationships’ future development can be influenced by the level of interaction of key persons as well as their roles and functions. Episodes in an interaction process are affected by learning from experience on both individual and organizational level and further how that experience is communicated. Attitudes can be radically changed via experience from a single episode and that attitude can stick for a long time. (Håkansson 1982).
4.1.3 Environment

Interaction cannot be examined without the wider context within which interaction takes place. This wider context includes the aspects of market structure, dynamism, internationalization (Håkansson 1982, Axelsson 2010), position in manufacturing channel and social system (Håkansson 1982). For example Jansen et al. (2009) have presented, that from software vendors perspective there are three perspectives they have to focus on, which are software ecosystem level, software supply level and the software vendor level. In the software ecosystem level they have defined software ecosystems “as a set of businesses functioning as a unit and interacting with a shared market for software and services, together with the relationships among them. These relationships are frequently underpinned by a common technological platform or market and operate through the exchange of information, resources and artifacts.” (Jansen et al 2009b: 187–188). According to Manikas & Hansen (2013) the research in software ecosystems that started from Messerschmitt & Szypersky (2003) is in its infancy and thus the aspects of the wider environment in this research are discussed based on Håkansson (1982) and Axelsson (2010).

In general, relationships have to be considered as single relationships within the same national or international market where several similar relationships exist. Further the stability of the market and its internationality have an effect on the market structure. (Håkansson 1982).

Dynamism of relationship and market affect relationships in two ways. First, knowledge of an actor is increased by actions of other actors in close relationships which improve the ability to make future forecasts based on that information. Second, in a dynamic environment the cost of relying on a small amount of relationships can be high. (Håkansson 1982).

Market internationalization affects the motivation of actors to build international relationships. Position in manufacturing channel is also an aspect of the environment and further position of single relationship in supply chain. (Håkansson 1982).

Social system is the wider environment which surrounds certain environment and the characteristics of that environment. The role of social system is particularly important within international market environment and it is characterized by reliability, business regulations and constraints and the limited experience of customers in certain industries. (Håkansson 1982).
4.1.4 Atmosphere

The fourth element of interaction process is the overall atmosphere of relationship which can be affected by conscious planning (Håkansson 1982). Atmosphere is characterized by power and dependency of actors within relationship, actors mutual expectations (Håkansson 1982, Axelsson 2010), conflict or cooperation within it and relationships overall closeness or distance. Previous variables cannot be measured directly (Håkansson 1982). Håkansson (1982: 21) has described atmosphere as “a group of intervening variables, defined by various combinations of environmental, company specific, and interaction process characteristics”. The dimensions of atmosphere are economic dimension and control dimension (Håkansson 1982).

From the economic dimension perspective, close interaction can decrease several cost types of an organization and vice versa, close interaction can enable increased revenues. Both of these can be achieved via better utilization of competencies, facilities and resources of other organizations. This can happen via sharing technical or market information or via product development. (Håkansson 1982).

The control dimension is characterized by the ability to control relationships between two actors. One of the main reasons to restrict interaction is the dependence on single relationship. Power perceptions can be unclear at early stages of a relationship and thus initial episodes of exchanges are important to clarify and understand power relations between actors. Power relations can change over time and they are related to resources and actors’ dependence on resources within a single relationship. (Håkansson 1982).

4.1.5 Summary of the interaction model

A graphical presentation of interaction model shown in Figure 3. The model describes short-term and long-term aspects of interaction processes (Håkansson 1982). In interaction model, the short-term interaction consists of exchange episodes which involve product and/or service-, information-, financial- or social exchange (Håkansson 1982, Axelsson 2010). The long-term interaction is defined as relationships which are characterised by adaptations and institutionalization (Håkansson 1982). Both episodes and relationships are influenced by specific characteristics of involved organizations and individuals (Håkansson 1982, Axelsson 2010). Development of organizational relationships take place in the
atmosphere which is characterised by economical and control aspects which are further characterized by closeness (Håkansson 1982), cooperation, power/dependence and expectations. Environment describes the place where interaction and exchange processes take place (Håkansson 1982, Axelsson 2010).

Via interaction model, it is possible to examine the connections between variables in different levels or within certain variable group. It is also possible to examine the relations between variables within sub-groups (Håkansson 1982). Interaction model can be used to analyse and understand specific events in relationships, such as value creation, drivers behind interaction patterns and variables influencing them (Axelsson 2010). Axelsson (2010: 8) argues that “The model serves as a way to synthesize numerous potential situations and patterns of behaviour” which makes it unique. Interaction model is the most useful while examining exchange processes and analysing episodes and relationships (Axelsson 2010).

Fig. 3. Illustration of interaction model (modified by the author, based on Håkansson 1982: 23).
4.2 ARA model

The ARA model (actors, resources, activities) by Håkansson & Snehota (1995) and Axelsson & Easton (1992) for analysing business networks is one of the two core models in IMP tradition (Axelsson 2010). Although the focus of this research is on R&D collaboration and networks, earlier business network research and especially ARA model is applied in this research as the focus of this research is on creation of business value. The application of business networks and ARA models in this research are further justified by definitions of software ecosystems by Jansen et al. (2009b), Bosch (2009) and Manikas & Hansen (2013) as all these definitions include three common elements, common software, business and connecting relationships.

Håkansson & Johansson (1992) emphasize two purposes of the model what they call ‘a model of industrial networks’. First, offer the possibility to make integrated analysis about industry’s stability and development. Second, offer the basis to examine actors and their roles and sets of actors in industrial development processes. The basic variables of ARA model are actors, resources and activities (Håkansson & Johansson 1992). The ARA model is not an all-inclusive conceptualization of business relationships but offers a framework to define and analyse relationships between the key elements of business relationships (Håkansson 2009). However the ARA model recognizes the value creating aspect of business relationships and presents main dimensions of business relationships and their interplay in a simplified form. Further the ARA model can be used while examining non-business actors operating in industrial environment (Hatteland 2010).

For example Lenney & Easton (2009) have presented how the concept of ‘commitments’ can enrich the ARA model and how commitments are related to each of the three dimensions of the ARA model. They defined these commitments as “agreements between two or more social actors to carry out future actions” (Lenney & Easton 2009: 553). As a counterargument, Håkansson (2009) emphasized that while he partly agreed with the importance of commitments he noted that the ARA model should be seen as a basic model for business relationships and commitments are just one aspect of actors and their goals.

The main elements of the ARA model (Figure 4) will be discussed based on Håkansson & Johansson (1992) and their interplay based on Håkansson & Snehota (1995).
Fig. 4. The main elements of ARA Model (modified by the author, based on Håkansson & Johanson 1992: 29).

4.2.1 Actors

Actors can be companies, parts of companies, individuals (Håkansson & Johansson 1992, Axelsson 2010), groups of individuals and groups of companies, which control resources and perform activities (Håkansson & Johansson 1992, Axelsson 2010) for example to create value from knowledge (Axelsson 2010). In industrial networks actors can be found from several levels of an organization. In general actors have five features (Håkansson & Johanson 1992). Next these features will be briefly discussed.

First, actors control and perform activities either alone or jointly with other actors and utilize resources while performing activities. Second, they develop relationships with other actors via exchange processes. These relationships offer possibilities to obtain access to the resources of other actors. Third, activities of an actor are based on the control of resources. This control can be direct ownership or indirect when the control of utilized resources is based on relationships with other actors who own utilized resources. As actors exist in several levels of an organization, the control of certain resources can be unclear and actors may have different views toward their control. Fourth, actors are goal oriented and within a network their aim is to gain better control over the network as other goals can be achieved via the utilization of control. In network control is gained via control over resources, activities or both. The control of activities is related to the control of resources and knowledge. Fifth, knowledge about other actors, resources and activities vary between actors as it is developed via the experience of activities within the network. Further the amount of knowledge varies inside network as closer parts of network are more familiar to an actor. Control is achieved via the expense of control of other actors but the increased control of one actor can increase the control of other actors within the network as well and thus the interests of an actor can be both common and conflicting with
other actors. The previous phenomenon takes place between and within actors as actors exist in several levels within an organization. (Håkansson & Johansson 1992).

### 4.2.2 Resources

Resources are created, modified, transformed, transferred and used by actors while performing activities (Håkansson & Johansson 1992, Axelsson 2010). They can be controlled either by a single actor or jointly. Resources are heterogeneous and characterized by attributes in an unlimited number of dimensions. This means that the utilization of certain resources can never be fully specified and resources can always be utilized in different contexts and in new and better ways. Value and the use of certain resources are related to its combination with other resources. Experience and knowledge of resources are important because while combining resources, learning and adaptation increase their joint performance and because new knowledge is created via combining heterogeneous resources. (Håkansson & Johansson 1992).

### 4.2.3 Activities

Activities take place between or within actors (Håkansson & Johansson 1992, Ford et al. 2010) when resources are combined, developed, exchanged or created via resource utilization. The main activity types are transformation activities and transfer activities. The first refers to resource exchange which is controlled by one actor. The latter refers to the situation where direct control of certain resource is transferred from one actor to another. Transformation activities of different actors are linked together via transfer activities. Single activities form activity cycles. Complete activity cycles always include both transformation and transfer activities. The stability of activities is created via routines and informal rules which institutionalize activities. The changes and rearrangements in old activities and the emergence of new activities can make network more efficient. If specific activity disappears, nearby activities can take its place. (Håkansson & Johansson 1992).
4.2.4 Relationships

Relationships can be identified as mutually oriented interaction between two actors with reciprocal commitments and further as an outcome of interaction process between two actors (Håkansson & Snehota 1995). Anderson et al. (1994) have also emphasized that business relationships can be characterized by its three main components which are activities, actors and resources.

Interplay between actors, resources and activities is a force fostering the development of business relationships. These relationships offer an opportunity for an actor to develop its capabilities, resources, activities or several of them. Value creation is the main aim of dyadic business relationships and from a single actor perspective, value creation is the requirement for positive business effects (Håkansson & Snehota 1995) as actors perform activities to create value (Axelsson 2010).

Within networks two kinds of relationships emerge with different functions. Primary functions are dyad relationships where interaction has either positive or negative effect on the relationship. Secondary functions can be as important as or even more important than primary functions. They are also called ‘network functions’ and capture indirect effects of relationships via the connections to other relationships whether positive or negative (Anderson et al. 1994).

Relationship often results from the interdependence of outcomes and mutual commitments in relationship also create interdependence. The development of relationships takes place via the chain of interaction episodes. This interaction can take place via acts and counteracts which create interdependencies between actors. Over time these interdependencies may interlock activities and resources of two actors. The outcome of relationships is something that actors cannot create in isolation and which is not easily duplicated. The effects of relationships can be broadly categorized into two dimensions. First, to the function of relationship implying actor that is affected. This affect can take place in all three layers of ARA model. Second, to the substance of relationship implying what is affected. These effects can be different to actors in a dyad relationship either similarly or differently. They also affect other relationships outside the dyad (Håkansson & Snehota 1995). Next the interplay between three substance layers of ARA model will be briefly discussed as their interplay is a force fostering the development of business relationships as they are not independent and interaction between actors is evolving phenomena (Håkansson & Snehota 1995).
Activity links

Activities performed by two companies might be affected by the relationship between them. While comparing to relationships between individuals, relationships between companies are more complex because of the variety and amount of performed activities. Relationships between companies grow via flows of exchange episodes that include activities from one of the actors which further include several other activities performed by both actors. While performing these activities, actors may need to adapt internal activity structures of one actor. These activity structures can change and thus interaction activities which take place in relationships may need to be modified and adjusted later. (Håkansson & Snehota 1995).

Activity links need to reflect to both parallel and sequential interdependencies of activities. They affect the productivity of a single actor as well as to the network as a whole but are generally known only by actors which are directly involved. The previous is a problem to new network members as well as to actors outside the network as interdependencies between activities are not visible but their business effect is often clearly presented. In ARA model type and strength of activity links are one of its critical dimensions. (Håkansson & Snehota 1995).

Resource ties

Utilization of resources is affected by the relationship between two companies as via relationships, resources of two actors can be combined, accessed and acquired. Common to business relationships are the expectations to gain access to various resources by an actor. Relationship between actors develops new resource combinations which foster the constitutions of new resources as opportunities offered via wider availability of resources emerge. They also offer possibilities to utilize external resources for the purpose and advantage of a single actor and thus become valuable as such. (Håkansson & Snehota 1995).

Actors bonds

Bonds between actors arise while relationship between them is directed by mutual commitment toward shared interest and attention toward each other. They have an effect on what actors know about each other and what resources can be exchanged in a relationship. Identity of an actor is based on direct interaction
experience in the past, acts and counteracts in a relationship and what actors know or think they know about other actor and thus both present and future interactions are affected by the actor bonds. Activities between companies are carried out by several individuals with different goals and thus interaction is limited by their individual behaviours as interaction is based on their individual perceptions. (Håkansson & Snehota 1995).

4.3 Model of business interaction

Ford et al. (2010) have developed the conceptualization of business interaction based on the earlier work of IMP Group. The central observation within IMP Group is that interaction between actors is the main characteristic of business environment (e.g. Håkansson 1982, Håkansson & Snehota 1995). As the definitions of software ecosystems by Jansen et al. (2009b), Bosch (2009) and Manikas & Hansen (2013) include business and connecting relationships, it can be argued that business interaction is part of the interaction in software ecosystems. Further as Ford et al. (2010) Model of Business Interaction is based on the earlier work of the IMP group it is applied in this research to get revised view into the tradition of the IMP group.

The core of business is characterized by what happens between actors. In IMP tradition it is the interaction that forms and defines activities, actors and relationships in business. Interaction has a substance which means that it always has a cost to all involved actors and it always affects all involved people and things. Interaction is the main activity to combine resources and activities. Within a network of actors, benefits of distributed resources and activities flow via interaction. A single interaction might be less significant but collectively it can be valuable (Ford et al. 2010). Next the interaction process is presented based on Ford et al. (2010). This conceptualization will be used in this research while analysing the interaction of intellectual asset development.

4.3.1 Conceptualization of business interaction

Interaction is a process that occurs between actors over time. This process is not fully controlled by involved actors and thus over time interaction changes what actors contribute to and receive from other actors. Interaction affects actors as a whole. (Ford et al. 2010).
Figure 5 represents two actors and interaction process between them. This process is fostered via mutual inputs from actors. Arrows from actor to actor via interaction process represents interpretation and assessment of what emerge from interaction as well as actor’s intentions and approach toward it. Interpretation and assessments of an interaction form the basis for the approach for further interactions. These approaches may be inconsistent or consistent and based on a clear intent or strategy and sometimes related to a single episode in a relationship like quality, product adaptation, negotiations, payments or commitment. (Ford et al. 2010).

![Interaction between two actors](image)

Interaction is an evolving process without identifiable outcome or end, as each output is also input to the process as a whole and current interaction is affected by actions in the past and expectations for future interactions as well as what activities and resources actors are willing to contribute and what approach they are willing to take within the interaction. Interaction or its outcomes cannot be controlled via a single actor. Interaction between actors is affected by approaches and intentions of all involved actors as well as the interaction process itself. Successful interaction can lead to transformation of actors as well as their activities and resources via interaction over time. (Ford et al. 2010).

Typical interaction is characterized by continuous problem solving involving several actors interacting in order to solve their individual problems (Ford et al. 2010). Each dyadic interaction is affected by other interactions to which it is connected (Ford et al. 2010, Axelsson 2010) (Figure 6). Based on previous Ford et al. (2010: 88) have conceptualized interaction in the following way. “Interaction is the substantive process that occurs between business actors through which all of the aspects of business: material, financial and human and all of the elements of business: actors, activities and resources take their form, are changed and are transformed.”
Ford et al. (2010) have argued that interaction should not be seen only as communication and negotiation activities as higher levels of involvement in a single interaction generate higher effect on actors’ own activities, resources and on actors as a whole. Previously discussed three elements of business relationships in ARA model by Håkansson & Snehota (1995) and Axelsson & Easton (1992) are both outcomes and inputs of interaction as interaction is a cumulative process and the three elements are defined by the interaction. (Ford et al. 2010).

4.3.2 Model of business interaction

The model of Business Interaction by Ford et al. (2010) links systematically time and space with the interaction. It aggregates the interaction into the three layers of ARA model. These three layers are involved with the interaction process and further shaped and modified in the following way:

“Each layer of each interaction process is inter-related in the space dimension. The form of each actor, activity and resource is defined by its position within the wider webs of actors, patterns of activities and constellations of resources that stretch across the network.” (Ford et al. 2010: 25).

“Each layer of each interaction process is inter-related in the time dimension. The form of each actor, activity and resource in the network is defined by its
interactions in which they are currently and have previously been involved.” (Ford et al. 2010: 26).

In the Model of Business Interaction, interaction between actors takes place within and between each of the three layers in the wider context of activity patterns, resource constellations and actor webs. Interaction in each of the three layers is related to time and space. Next these layers will be discussed in relation to time and space based on Ford et al. (2010). The graphical presentation of the Model of Business Interaction is presented in Figure 7.

**Fig. 7. Model of Business Interaction (modified by the author, based on Ford et al. 2010: 94).**

**Interaction in activity layer**

Activities evolve over time within specialization process. When interaction between actors develops, specialization is built into relative activities. Specialization is an important aspect while developing long-term business relationships and activity patterns. During specialization actors consciously back up some short-time rewards and commit themselves to certain actors instead of others. When relationship develops, actors’ interdependence increases and problems related to costs and benefits which must be assessed and re-assessed. When actor specializes toward certain single interaction process, it specializes away from another. (Ford et al. 2010).
Interdependent activities are related to space variable. Some interdependent activities may emerge as independent ones but are most likely connected to other activities so the level of interdependence can vary. Distribution of interdependence develops over time while gaining benefits from specialization. Interaction within interdependency is strongly affected by the opportunities and problems that arise from them. (Ford et al. 2010).

As interdependencies are important and complex and actors may not be aware of them the key characteristic of business interaction is to build, manage and exploit them efficiently. The essential characteristic of interaction is the dependence on activities of other actors as specialization can be exploited more extensively via seeking and accepting these dependences. Actors seek to develop dependencies from their activities to other actors’ activities to obtain stability and efficiencies. When actor relies on activities of other actors, it can more freely invest into its own resources within more productive business areas in that relationship or another although current relationships limits this. (Ford et al. 2010).

*Interaction in the resource layer*

Resource development often follows an identifiable path when the developments of both single and combined resources are examined from time perspective. Ford et al. (2010: 96) have argued that “The development of a resource along a path is closely connected to the interaction which can be observed in the use of that resource and in its combination with others in a resource constellation. This path can often be observed in the use of particular resources in different applications in sequence.”

There are two features that form the basis for developing both single resources and resource constellations. Resources development potential which is always unknown and how that potential is related to other resources. In both cases the path that resource follows is difficult to forecast as it might be addressed by wide variety of resources that are accessible by several actors. Evolving path makes development forecasting difficult as resource can be dependent on certain specialization activities and decisions related to them which can be difficult to reverse. (Ford et al. 2010).

In business networks usefulness and value of resource depend on which resources it is combined with and where it is located in a network space. Heterogeneous means that the aim of interaction is to foster value creation across
actors. Actors can increase value of single resources and resources as a whole via interaction. The value of resources is constantly affected by interaction as it moves related resources closer and has an impact on their embeddedness. (Ford et al. 2010).

**Interaction in actor layer**

Actors obtain their identities via their interactions with other actors. Relationship between two actors and its relation to other actors are characterized by jointness which means that there are no dyadic relationships at all as outcomes, intentions and content of interaction are not limited only to those actors within certain relationship. Jointness can take place via directive, collective or joint interaction between specific actors for example in joint technology development, and thus jointness can be identified as resource design, performance of activities or shared ideas related to interaction context. There are two aspects related to jointness. First aspect is mutuality when goal of an interaction is to achieve common goals. This means that actors need to compromise between short-term possibilities and long-term benefits. Second aspect is reciprocity when actors feel that they are obliged to interact based on previous interaction. The main idea behind jointness is that actors need to create joint, positive results with other actors. In short, interactions of certain actor determine its characteristics, capabilities, scope, freedom, obligations and restrictions. (Ford et al. 2010).

From the time perspective actors need to cope with problems and opportunities they face not alone but in relation with their counterparts. This is called co-evolution which is a multidimensional process that takes place between several actors in parallel when each single actor tries to relate its problems, resources and activities with other actors. (Ford et al. 2010).

**4.3.3 Summary of the model of business interaction**

As a summary, Ford et al.’s (2010) Model of Business Interaction emphasizes that the core process of business is the interaction which is unique and can involve several episodes. It also emphasizes that interaction has a key role in value creation from both intellectual and physical assets in specific situations.
4.4 Summary

In this chapter the two core models of IMP traditions, interaction model (Håkansson 1982) and ARA model (Håkansson & Snehota 1995, Axelsson & Easton 1992) were discussed as the Model of Business Interaction (Ford et al. 2010) is based on the empirical work of IMP Group.

The ARA model presents the three main elements of the business relationships and their linked interplay. These three elements and their linked interplay form the network part of the a priori analysis framework which will be developed in Chapter 6 (Conceptual framework of the study). As Ford et al. (2010) emphasize in their Model of Business Interaction that the interaction has a key role in the assets based value creation from both intellectual and physical assets.

In this research the focus is on the creation of intellectual assets and intellectual assets based value creation and thus in the next chapter the concepts of value and intellectual assets will be discussed to further clarify the resources part of the a priori analysis framework and also the assets parts of the same framework that consist of the valuable assets.
5 Value and intellectual assets

This chapter discusses first about knowledge as a source of value and second to intellectual assets. In this research the source of value is narrowed from knowledge to intellectual assets without intellectual property rights thus these concepts will be also discussed with some examples based on the earlier literature. This is important as most of the companies cannot clearly define what intellectual assets are (Andreou 2007). Third, the concepts of value creation, value generation via absorptive capacity, use and exchange value and value proposition will be presented. Fourth, the resources and valuable assets parts of the a priori analysis framework will be discussed as well as how they link to each other via interaction. Finally the asset-based value proposition part of the a priori analysis framework will be discussed.

5.1 Knowledge as a source of value

According to Grant (1996a) knowledge is a primary source of value and critical input of production. Kang et al. (2007) also identify knowledge as a source of value creation. When companies gain their profits by converting knowledge into value they are called knowledge companies (Sullivan 1999). However intellectual assets do not create value if they are not combined with other factors of production. On average investments into intellectual assets can generate large returns but value of many intellectual assets can be highly distorted (Bismuth & Tojo 2008).

The ability to create and retain value obtained through intellectual assets has become more important than ever. Management capabilities in value creation are especially true when value is created from intellectual assets. Although the primary role of company management is the efficient use of intellectual assets which results innovations and value, also public policy has its own important role in it. (Bismuth & Tojo 2008).

Lepak et al. (2007) have emphasized that when examining individuals and organizations as sources of value creation, target of value and exact actor who creates value and benefits from it must be clearly articulated because value creation varies depending on the selected perspective of the researcher.
5.2 Intellectual assets

Next common definitions of intellectual assets and their individual elements are discussed. Choong (2008) noted that the literature consists of a wide range of different definitions of intellectual assets. Only some of them are presented here. In this research the intellectual assets do not include intellectual property and thus the term intellectual property is also defined.

5.2.1 Definitions of intellectual assets

Sullivan (1998: 23) has defined intellectual assets as “codified, tangible, or physical descriptions of specific knowledge to which the company can assert ownership rights. Any piece of knowledge that becomes defined, usually being written down or entered into a computer, qualifies as an intellectual asset and can be protected” and continued by emphasizing that those intellectual assets “may be legally protected, although often the firm has not yet decided to do so”. Similarly Hall (1992) divides intellectual assets into intellectual property and knowledge assets.

Harrison & Sullivan (2000) have also defined intellectual assets as codified knowledge and noted that assets which are legally protected are called intellectual property. Such property includes patents, copyright, trademarks, trade secrets and semiconductor masks. Intellectual assets are intangible corporate assets which are either recorded or recordable (Watters et al. 2006).

On the empirical side Intellectual Assets Centre (2010: 7–8) has defined intellectual assets as “An item of knowledge that has some market value for a company. More specifically, the recorded or recordable and corporately owned intangible assets of a business.” and further emphasized that “knowledge only becomes an asset if it has some form of commercial value or market demand”. Thus intellectual assets, intellectual property and intellectual property rights are intellectual assets only if they possess some market value.

In this research Sullivan’s (1998: 23) definition of intellectual assets presented earlier will be applied because it was seen suitable for the purpose of this research as in Sullivan’s definition intellectual assets are not necessarily automatically protected by any law but are specific knowledge to which actors can assert ownership right which means that the actor can decide if intellectual assets will be legally protected or not.
5.2.2 Classifications of intellectual assets

Table 3 and Table 4 summarize examples of intellectual assets. Table 3 presents knowledge assets and Table 4 intellectual properties. Although some authors do not classify intellectual property into its own category, in this research Hall’s (1992) classification of intellectual capital is applied and thus intellectual assets are divided into two categories. These categories are knowledge assets and intellectual property.

This research applies the World Intellectual Property Organization’s (WIPO, 2011) definition of intellectual property. According to Sullivan (1998: 23) “Intellectual assets that receive legal protection are intellectual property.” and thus it essential to define what these intellectual properties are. WIPO has defined that “Intellectual property (IP) refers to creations of the mind: inventions, literary and artistic works, and symbols, names, images, and designs used in commerce. IP is divided into two categories: Industrial property, which includes inventions (patents), trademarks, industrial designs, and geographic indications of source; and Copyright, which includes literary and artistic works such as novels, poems and plays, films, musical works, artistic works such as drawings, paintings, photographs and sculptures, and architectural designs. Rights related to copyright include those of performing artists in their performances, producers of phonograms in their recordings, and those of broadcasters in their radio and television programs.”
Table 3. Examples of knowledge assets

<table>
<thead>
<tr>
<th>Classification</th>
<th>Author(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brand reputation</td>
<td>Bismuth &amp; Tojo (2008), Watters et al. (2006)</td>
</tr>
<tr>
<td>Organizational culture</td>
<td>OECD (2008)</td>
</tr>
<tr>
<td>Blueprints</td>
<td>Sullivan (1999)</td>
</tr>
<tr>
<td>Computer programs</td>
<td>Sullivan (1999)</td>
</tr>
<tr>
<td>Customer information</td>
<td>Watters et al. (2006)</td>
</tr>
<tr>
<td>Databases</td>
<td>Bismuth &amp; Tojo (2008), OECD (2008), Watters et al. (2006)</td>
</tr>
<tr>
<td>Drawings</td>
<td>Sullivan (1999)</td>
</tr>
<tr>
<td>Expertise</td>
<td>Intellectual Assets Centre (2004)</td>
</tr>
<tr>
<td>Goodwill</td>
<td>Watters et al. (2006)</td>
</tr>
<tr>
<td>Logistical systems and networks</td>
<td>Watters et al. (2006)</td>
</tr>
<tr>
<td>Memos</td>
<td>Sullivan (1999)</td>
</tr>
<tr>
<td>Networks of commercial contacts</td>
<td>Watters et al. (2006)</td>
</tr>
<tr>
<td>Plans</td>
<td>Sullivan (1999)</td>
</tr>
<tr>
<td>Procedures</td>
<td>Sullivan (1999)</td>
</tr>
<tr>
<td>Process quality</td>
<td>Bismuth &amp; Tojo (2008)</td>
</tr>
<tr>
<td>Research and development</td>
<td>Bismuth &amp; Tojo (2008), OECD (2008)</td>
</tr>
<tr>
<td>R&amp;D contacts</td>
<td>Watters et al. (2006)</td>
</tr>
<tr>
<td>Show-how</td>
<td>Watters et al. (2006)</td>
</tr>
<tr>
<td>Sketches</td>
<td>Sullivan (1999)</td>
</tr>
<tr>
<td>Specialist supply chains</td>
<td>Watters et al. (2006)</td>
</tr>
<tr>
<td>Staff skills</td>
<td>Bismuth &amp; Tojo (2008), OECD (2008)</td>
</tr>
<tr>
<td>Strategy</td>
<td>Bismuth &amp; Tojo (2008)</td>
</tr>
<tr>
<td>Supplier and customer relationships</td>
<td>Bismuth &amp; Tojo (2008)</td>
</tr>
</tbody>
</table>

Based on Table 3 basically all kinds and forms of knowledge can be defined as knowledge assets, although in some cases it might be difficult or impossible to fully put all the pieces of a certain knowledge into a certain formal format. Examples of first could include staff skills, strategies and routines. At the same time things like goodwill and brand reputation obviously need longer time to build and cannot be fully described in any formal format.
Table 4. Examples of intellectual properties.

<table>
<thead>
<tr>
<th>Classification</th>
<th>Author(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protection against improper use (e.g. industrial espionage)</td>
<td>Haarmann (2006), Haarmann &amp; Mansala (2007)</td>
</tr>
<tr>
<td>Service marks</td>
<td>Sonnier (2008), Sveiby (1997)</td>
</tr>
</tbody>
</table>

In Table 4 some of the intellectual property categories like plant breeder’s rights do not relate to software industry at all. As this research focuses on intellectual assets without intellectual property, this list of different intellectual property categories is used to identify things that the interviewees of this research find important, less important and/or not important at all when discussing about the creation of intellectual assets and intellectual assets based value creation via interaction in R&D oriented innovation networks.
5.3 Value and value creation

There is a disagreement about the definitions of value (Bowman & Ambrosini 2000) and value creation (Lepak et al. 2007) in the literature. Some of the difficulties concerning value content refer to questions like “what is value/valuable, who values what, and where value resides” (Lepak et al. 2007, 181) and to the fact that the nature of value creation process differs in individual, organizational and societal levels. Further value creation, its sources and creators mean significantly different things for authors from different fields of management, sociology, psychology and economics. Value creation has a central role in management and organizational literature in both micro and macro levels and its importance is generally accepted among management scholars. (Lepak et al. 2007).

There is no agreed consensus of what value creation is, how value creation can be achieved or what kind of mechanism allow actor who created value to capture it. Lepak et al. (2007: 181) emphasize this by noting that “Addressing all the points of disagreement in researchers’ understanding of value creation would, we believe, require a book-size contribution rather than an article.” Value creation and value capture should be viewed as separate processes because the actor who creates value may not be able to capture or retain that value for longer time periods. Situation where original value is captured by another actor or in other level is called as ‘value slippage’ (Lepak et al. 2007). Also Bowman & Ambrosini (2000) have emphasized similar problems by noting that value related literature includes definitional problems as authors from different fields use the term value to describe different phenomena’s.

Value creation means different things to business owners, customers and then stakeholders. They may have different and competing views of what is valuable. Disagreement about the targets of value creation and its sources makes it difficult for scholars to develop common definitions for them. Further value creation refers to both content and process of value creation. From process side difficulty is its usage as a synonym to value creation and further management’s role in this process. According to Lepak et al. (2007) these value creation processes include, for example, new company creation, innovation, R&D and knowledge creation and are subject and context-specific.

Bowman & Ambrosini (2007) argue that three types of activities can be identified related to current value creation processes, one activity related to the creation of future value and one related to general value maintenance activities.
Activities related to processes that support the creation of current value are the creation of products and/or services, realizing revenues from customers via marketing and selling, and minimization of supplier related costs.

Creation of future value includes for example R&D, market research, training and learning activities. These activities reduce current profit streams as they include costs without immediate profit streams. Via these activities companies try to adapt to new and changing market environments, expand their capital stock by creating new resources and generate future value streams. These value activities are distinct in value creation and the responses from these activities vary within context companies operate in. (Bowman & Ambrosini 2007).

Increasing distinction can foster specialization and motivation. Increasing this distinction should aim to increasing company’s value. According to Bowman & Ambrosini (2007) value can be increased in two ways, via improving efficiency, via improving effectiveness or both. In knowledge-intensive contexts, future resources can be developed via idea and insight sharing as well as learning and experience. Further Bowman & Ambrosini (2007: 369) have emphasized that the “Strategy for profit-seeking firms should be directed at the creation of value.”

**5.3.1 Value generation via absorptive capacity**

The concept of absorptive capacity by Cohen & Levinthal (1990) is presented as it addresses some important aspects of value creation and capture. The importance of absorptive capacity has been recognized for example in strategic management (Lane & Lubatkin 1998, Nahapiet & Ghoshal 1998), technology management (Schilling 1998), international business (Kedia & Bhagat 1988) and organizational economics (Glass & Saggi 1998).

Characteristics of absorptive capacity include for example 1) knowledge creation and knowledge utilization, 2) creation of value via its four dimensions, 3) acquisition and usage of external knowledge in value creation, 4) notion that actor may not be able to exploit profit from its knowledge, 5) actors’ capability to create value from their knowledge base varies; and 6) potential absorptive capacity is important when renewing actors’ current knowledge base (Zahra & George 2002).

According to Zahra & George (2002) the most widely used definition of absorptive capacity is Cohen & Levinthal’s (1990: 128) concept which emphasizes organizations R&D activities and absorptive capacity is identified as “an ability of recognize the value of new information, assimilate it, and apply it in
commercial ends”. On the other hand Zahra & George (2002: 187–188) have defined absorptive capacity “as a set of organizational routines and processes by which firms acquire, assimilate, transform, and exploit knowledge to produce a dynamic organizational capability.”

Learning is not defined as an individual dimension of absorptive capacity but for example in Zahra & George’s (2002) reconceptualization it is one aspect of acquisition and assimilation. Similarly Cohen & Levinthal (1990) note that while problem-solving is a capacity supporting creation of new knowledge, learning includes development capacity that assimilates current knowledge. In general absorptive capacity requires learning capabilities and further it develops problem-solving skills (Kim 1998) and thus learning and problem-solving are essential parts of acquiring and assimilating new knowledge.

Next the four dimensions of absorptive capacity are briefly presented. This is important because according to Zahra & George (1998: 128) absorptive capacity refers to firm's "ability to recognize the value of new information, assimilate it, and apply it to commercial ends". For example Cohen & Levinthal (1989) have presented that R&D do not only generate new information but it also enhances company's ability to assimilate and exploit existing information and that "absorptive capacity represents an important part of firm's ability to create new knowledge" and that "with absorptive capacity a firm may acquire outside knowledge that will permit it to do something quite different" (Cohen & Levinthal 1989: 570). Thus absorptive capacity is developed via R&D activities and is important part of recognizing the value of new information and while utilizing external information in actors own business.

**Acquisition**

Acquisition is identified as “firm's capability to identify and acquire externally generated knowledge that is critical to its operations” (Zahra & George 2002: 189). These are also the main flows between prior and external knowledge to acquisition. Attributes that can potentially have influence on acquisition are intensity, speed and direction. Company’s efforts towards intensity and speed to identify and collect knowledge can determine the quality of acquisition capabilities. The direction of the accumulation of knowledge can also influence the paths which company follows while obtaining external knowledge (Zahra & George 2002). Cohen & Levinthal (1990) also emphasized that the development of absorptive capacity is path- or history-dependent and domain-specific. Other
components that can potentially have influence on acquisition are prior investments and prior knowledge (Zahra & George 2002).

**Assimilation**

Assimilation is related to company’s routines and processes which determine the analysing, processing, interpreting and understanding of knowledge obtained outside company borders (Kim 1997, Szulanski 1996). The main component of assimilation is understanding. The dimensions of understanding external knowledge are learning, interpretation and comprehension (Zahra & George 2002).

**Transformation**

Transformation is referred to as a company’s capabilities to develop and refine routines which are related to combining prior knowledge with new knowledge acquired from external sources after its assimilation. Previous is obtained via adding, deleting or interpreting existing knowledge. Components of transformation include knowledge internalization and conversion. This can be done via synergy, recodification and bisociation. (Zahra & George 2002).

**Exploitation**

Exploitation is related to routines which allow companies to “refine, extend, and leverage existing competencies or create new ones by incorporating acquired and transformed knowledge into its operations” (Zahra & George 2002: 190). This can be achieved via use and implementation of knowledge that are the components of exploitation. Emphasis is on those routines that enable knowledge exploitation, although knowledge exploitation is possible without systematic routines when lucky. Structural, systematic and procedural routines enable sustainable knowledge exploitation for longer time periods. Via absorptive capacity companies can also create and exploit new knowledge. (Zahra & George 2002).
5.3.2 Use value and exchange value

At the organizational level two main types of value can be identified, use value and exchange value. Use value is subjective and perceived by the customer. It is the amount of money that customer is willing to pay. This price is the combination of price actually paid plus 'consumer surplus'. Customers choose goods with the greatest customer surplus. Customer surplus can be assessed at sales point only, not later or before. Customers can only value what they perceive and thus it is not possible to value most of the inputs (Bowman & Ambrosini 2000). Exchange value refers to price and is realized at sales point (Bowman & Ambrosini 2000, Lepak et al. 2007). Value slippage takes place when use value is high and exchange value low (Lepak et al. 2007).

5.3.3 Value proposition

Rastogi (2003) has argued that value is generated via intellectual or knowledge resources only via supportive combinations and cross-fertilization of such resources. Moran & Ghoshal (1996) have also noted that all new resources and new intellectual capital are generated via combination and exchange of such knowledge resources. If knowledge resources have been divided to several actors, exchange is needed before resource combinations can take place. As the creation of new intellectual capital often needs knowledge and experience from different sources to combine these knowledge resources, knowledge exchange is needed (Nahapiet & Ghoshal 1997).

According to Rastogi knowledge is a quintessential resource and a source for value creation. These knowledge or intellectual resources are often complementary, synergistic and integrative in their potential to create significant value and they only create value in and via their mutually supportive combinations and cross-fertilization’s. If they are not connected or attached to each other, the significance and worth of them tend to be lost. Sometimes organizations have knowledge that can create value via its effective use but organization is not capable to utilize knowledge to create value or knowledge may have become old dated or ossified (Rastogi 2003) as value of knowledge erodes in time and not all knowledge is valuable to all.

Customer-value proposition of a company defines the company’s attractiveness to potential customers. This value is created the via creative use of knowledge resources in either new ways or via new combinations via
collaboration of motivated individuals. The business environment in which the company operates can be seen as a testing ground for its capacity to create value. As Rastogi (2003: 237) has emphasized company needs to have a “broad arena within which the firm seeks to create value”. Companies have to analyze critically their business environment, its driving forces and uncertainties. Customer-value proposition can only be created via the development of in-depth analysis of industry insight and forecasts (Rastogi 2003).

Knowledge creates value for customers when it is installed into products or services. The ultimate test for value creation is the customer’s willingness to pay for products and services. Value promise is higher when available knowledge categories are richer, wider and more varied. This increases the amount of synergistic combinations of such knowledge resources (Rastogi 2003) and customer attractiveness. According to Rastogi (2003: 239) these categories or "The forms and modes of knowledge that create value (...) comprise a firm's skills, incremental innovation, expertise, capabilities/ competencies, streamlining of processes, non-linear innovation, cross-fertilisation of ideas, information technology-based knowledge assets, combinations of capabilities, creativity, and knowledge integration."

When the amount of promising knowledge combinations is higher, wider, more differentiated and/or unique the amount of value creation opportunities for company is also higher. As Rastogi (2003: 241) have emphasized “It is not resources by themselves, but the ability to access, combine, complement, coordinate and deploy them, that actualizes the process of value creation. Such an ability rests on creativity and flexibility.”

5.4 Valuable assets

In this research the term valuable assets include resources from the resource-based view of the firm and knowledge from the knowledge based view perspective.

The resource-based view examines the actor’s resource position and available resources for the actor, as the competitive advantage is based on the utilization of resources. Barney (1991: 99) has argued that resources which generate sustainable competitive advantage are characterized by their “value, rareness, imitability and substitutability”. Grant (1991) has emphasized that durability, transparency, transferability and replicability are important characteristics of resources and capabilities which, from the resource-based approach point of view,
are important determinants of sustainable competitive advantage. Resources and capabilities are considered as the main sources of company’s profits and further competitive advantage is based on company’s capabilities which are based on its resources (Grant 1991).

Amit & Schoemaker’s (1993: 35) sequent distinction makes a difference between resources and capabilities and defines resources as “stocks of available factors that are owned or controlled by the firm” which are “are converted into final products or services” and capabilities as “firm’s capability to deploy Resources, usually in combination, using organizational processes, to effect a desired end. They are information-based, tangible or intangible processes that are firm-specific and are developed over time through complex interactions among the firm's Resources.” Thus capabilities are company specific but resources are not (Makadok 2001). The main purpose of capabilities is to increase productivity of actor’s resources (Amit & Schoemaker 1993). Makadok (2001: 389) has defined capability as “a special type of resource—specifically, an organizationally embedded nontransferable firm-specific resource whose purpose is to improve the productivity of the other resources possessed by the firm”. Most important capabilities for companies are integrated sets of functional capabilities, not single capabilities, although single capability can be based on single resource (Grant 1991).

According to Leonard-Barton (1992: 111) "Capabilities are considered core if they differentiate a company strategically." In literature capabilities are also called as distinctive competences (Snow & Hrebinia 1980) and core competencies (Prahalad & Hamel 1990).

Central to knowledge-based view is that the primary goal of an organization is not knowledge creation but its application. The role of an organization is to integrate knowledge as knowledge resides in the heads of individuals and organizational knowledge is created via interactions of individuals. Specialized knowledge can be integrated via routines and directives, sequencing, routines and group-based problem solving and decision making. Strategically knowledge is the most important resource of companies as it is the most important input of production and the main source of value (Grant 1996b). According to Grant (1996a: 111) knowledge-based view is “an outgrowth of the research-based view”.

Actors perform activities to create value from knowledge (Axelsson 2010). Based on Grant’s (1991), Amit & Schoemaker’s (1993) and Makadok’s (2001) definitions of resources and capabilities and Grant’s (1996b) notion of
knowledge-based view this research includes resources, capabilities and knowledge into the resource element of ARA model (Håkansson & Snehota 1995, Axelsson & Easton 1992). This choice was made to emphasize value as the desired outcome of the a priori analyze framework used in this study.

5.5 Asset-based value proposition

Business model represents the core logic of a company (Ahokangas & Myllykoski 2011). It is “a representation of a firm’s core logic and strategic choices for creating and capturing value” (Shafer et al. 2005: 204). Every company possesses a business model explicitly or implicitly from their establishment (Teece 2010). Business model is a new unit of analysis which spans or bridges company and network levels of analysis together (Zott et al. 2011). For example Ahokangas & Myllykoski (2011) have emphasized the importance of company’s external network as a vital source for value creation and capture. Business model concept offers a systematic perspective to examine boundary-spanning activities related to value creation and capture (Zott et al. 2011). According to Ahokangas & Myllykoski (2011) the value network aspects of the business model are value co-creation, value co-capture and value co-opetition.

Value creation is called value co-creation when value is created jointly with the customer (Vargo & Lusch 2004). Ahokangas & Myllykoski (2011: 11) emphasize that when actors co-create value within a network, “they evidently should participate also in its capture” which is defined as value co-capture in the network context. Co-opetition includes both competition and cooperation at the same time in relation to value creation and value capture (Nalebuff & Brandenburger 1997). Companies can jointly co-create value to the customer and at the same time compete against each other in value capturing (Ahokangas & Myllykoski 2011).

In this research the activities element of ARA model (Håkansson & Snehota 1995, Axelsson & Easton 1992) is clarified to include partly overlapping value co-creation, value co-capture and value co-opetition (Ahokangas & Myllykoski 2011) activities (Figure 8) within the value level of the a priori analysis framework.
In this research these collaboration activities are further defined by interaction because for example the aim of SHOK’s is to create and apply new interaction, co-operation and co-creation methods to foster innovation processes via cooperation between private companies and universities by creating new technology- and research-based business opportunities and solutions (Lähteenmäki-Smith et al. 2011). Further while actors co-operate in the development of intellectual assets at the same time they compete against each other while value capture and the utilization of intellectual assets. For example Wallin et al. (2012) have noted that the majority of private companies create value via networks where actors co-operate and compete against each other simultaneously. The overlapping part of the Figure 8 can be identified as R&D collaboration within networks for example as a form of joint R&D programs or projects.

5.6 Summary

In this chapter first the knowledge as a source of value was discussed. Further the concepts of intellectual assets, intellectual property, value, value creation and valuable assets were clarified and discussed.

In this research the resources part of the network of part of the a priori analysis framework includes resources, knowledge and capabilities, as within ARA model relationships offer an opportunity for an actor to develop its resources and capabilities (Håkansson & Snehota 1995) and thus the resource element of ARA model (Håkansson & Snehota 1995, Axelsson & Easton 1992) is in line with the resource-based view (Wernerfelt 1984, Grant 1991) which draws
back to the seminal work of Penrose (1959). Further as Grant (1996a) has emphasized that knowledge is a primary source of value and critical input of production knowledge is also included into the resources part of the resources part of the a priori analysis framework.

As different actors may have different views about what is valuable and the source of the value (Lepak et al. 2007) in this research the assets part of the a priori analysis framework consists of potentially valuable assets. Further as interaction has a key role in value creation from both intellectual and physical assets (Ford et al.’s 2010), the valuable assets part of the a priori analysis framework is linked to resource part of the same framework via interaction. Thus the valuable assets include resources from the resource-based view of the firm and knowledge from the knowledge based view perspective.

Finally the asset-based value proposition part of the a priori analysis framework was presented. In this research the activities element of ARA model (Håkansson & Snehota 1995, Axelsson & Easton 1992) is clarified to include partly overlapping value co-creation, value co-capture and value co-opetition (Ahokangas & Myllykoski 2011) activities. These activities are linked to the network part of the a priori analysis framework via interaction as for example Ahokangas & Myllykoski (2011) have emphasized the importance of company’s external network as a vital source for value creation and capture.

In the next chapter the key definitions of conceptual terminology used in this research are presented as a reminder. Finally the a priori analysis framework which will be used while analysing the empirical data collected during this research will be developed.
6 Conceptual framework of the study

In this chapter the conceptual framework which will be used in this research will be built. This framework will be used while analysing the empirical data and for answering to the research questions. The aim of this research is to examine:

1. How interaction affects the creation of intellectual assets in innovation networks?
2. How interaction affects the intellectual assets based value creation in innovation networks?

This framework consists of network, valuable asset, interaction, intellectual asset-based value proposition and business value parts which are further combined to form the final a priori analysis framework of value creation from intellectual assets via interaction in innovation networks.

Before developing the final a priori analysis framework the key conceptual terminology used in this research is briefly presented as a reminder. This terminology includes terms like intellectual assets, intellectual property rights, innovation networks and innovation. The applied definitions were selected to support the aims of this research and desired outcomes of this research.

6.1 Conceptual terminology

Based on Sullivan (1998: 23) and further Intellectual Assets Centre (2004: 7–8) intellectual assets will be defined in the following way but where intellectual property rights are not included into intellectual assets based on WIPO’s (2011) definition of intellectual property.

Intellectual assets will be defined as in Sullivan (1998:23):

“(…) codified, tangible, or physical descriptions of specific knowledge to which the company can assert ownership rights. Any piece of knowledge that becomes defined, usually being written down or entered into a computer, qualifies as an intellectual asset and can be protected”

"An item of knowledge that has some market value for a company. More specifically, the recorded or recordable and corporately owned intangible assets of a business."

Intellectual property will be defined as in WIPO (2011):
“Intellectual property (IP) refers to creations of the mind: inventions, literary and artistic works, and symbols, names, images, and designs used in commerce. IP is divided into two categories: Industrial property, which includes inventions (patents), trademarks, industrial designs, and geographic indications of source; and Copyright, which includes literary and artistic works such as novels, poems and plays, films, musical works, artistic works such as drawings, paintings, photographs and sculptures, and architectural designs. Rights related to copyright include those of performing artists in their performances, producers of phonograms in their recordings, and those of broadcasters in their radio and television programs.”

Innovation networks will be defined as in Möller & Rajala (2007: 904):

“(...) relatively loose science and technology-based research networks involving universities, research institutions, and research organizations of major corporations. These are characterized by professional and social relationships and are not primarily business networks but are guided by the ethos of scientific discovery”.

Innovation will be defined as in Dosi (1988, 222) to emphasize the network perspective of innovation process and utilization of external knowledge sources:

“(...) the search for, and the discovery, experimentation, development, imitation, and adoption of new products, new production processes and new organisational set-ups”

6.2 Conceptual a priori framework

The conceptual a priori framework which will be used while analysing the empirical data will be developed next. This framework will be used while analysing the empirical data that was gathered during this research in chapter 8 (Intellectual assets based value creation). This framework consists of network, interaction, valuable assets, asset-based value proposition and business value parts. The center of this framework and the focus of this the research is the interaction part of the a priori analysis framework. This part links rest of the a priori analysis framework parts together. The elements within this framework, their interplay and links between them are based on the earlier literature which were presented in chapters 3, 4 and 5.
The **network** part of the a priori analysis framework consists of the three main elements of the business interaction based on the ARA model (Håkansson & Snehota 1995, Axelsson & Easton 1992) and their linked interplay. Further the resources part of the network of part of the a priori analysis framework include resources, knowledge and capabilities as within ARA model, relationships offer an opportunity for an actor to develop its resources and capabilities (Håkansson & Snehota 1995) and thus the resource element of ARA model (Håkansson & Snehota 1995, Axelsson & Easton 1992) is in line with the resource-based view (Wernerfelt 1984, Grant 1991) which draws back to the seminal work of Penrose (1959). Further as Grant (1996a) has emphasized that knowledge is a primary source of value and critical input of production, knowledge is also included into the resources part of the a priori analysis framework.

As different actors may have different views about what is valuable and the source of the value (Lepak *et al.* 2007), in this research the assets part of the a priori analysis framework consists of potentially **valuable assets**. Further as interaction has a key role in value creation from both intellectual and physical assets (Ford *et al.*’s 2010) the valuable assets part of the a priori analysis framework is linked to resource part of the same framework via **interaction**. Thus the valuable assets include resources from the resource-based view of the firm and knowledge from the knowledge based view perspective.

The **asset-based value proposition** part of the a priori analysis framework is clarified to include partly overlapping value co-creation, value co-capture and value co-opetition (Ahokangas & Myllykoski 2011) activities. They also form the activities element of the ARA model. These activities are linked to the network part of the a priori analysis framework via interaction as for example Ahokangas & Myllykoski (2011) have emphasized the importance of company’s external network as a vital source for value creation and capture.

**Business value** part of the a priori analysis framework is not strictly defined as discussed before in this chapter different actors may have different views about what is valuable and what is the source of the value (Lepak *et al.* 2007).

The graphical representation of the final a priori analysis framework of the value creation from intellectual assets via interaction in innovation networks is presented in Figure 9.
Fig. 9. Value creation from intellectual assets via interaction in innovation networks.

In this research the interaction between and within network, valuable assets, assets-based value proposition and business value is characterized by the earlier work within IMP Group as interactions are the building blocks of networks where organizations, companies and individual professionals interact (Salacik 1995).

6.2.1 Interaction

Interaction is a process that occurs between actors over time (Ford et al. 2010). Interaction process consists of individual episodes within relationships (Håkansson 1982). In this research interaction is characterized by joint problem solving, it combines activities and resources of actors, increases the value of actors resources and fosters value creation (Ford et al. 2010).

The main activity of interaction is to combine resources and activities. These interactions can take place as single interactions or larger sets of interactions and are typically characterized by joint and continuous problems solving, communication and negotiations (Ford et al. 2010). Interaction defines what actors contribute and receive from relationships.
The aim of an interaction is to foster value creation between actors. As previously discussed activities are characterized by common and conflicting interests; common goals and reciprocity as interaction develops interdependencies between activities in relationships and actors expect positive results from joint activities with other actors (Ford et al. 2010).

In the final a priori analysis framework, asset-based value proposition activities are clarified as partly overlapping value co-creation, value co-capture and value co-opetition activities based on Ahokangas & Myllykoski (2011).

**Relationships**

Relationships can be short-term or long-term relationships (Håkansson 1982). They are results of previous interactions and a critical part of it (Håkansson & Ford 2002). They enable economic benefits (Håkansson 1982), access to external resources (Håkansson & Ford 2002) and possibilities to control the business environment (Håkansson 1982). The strategy of an organization potentially has an effect on its short-term and long-term relationships (Håkansson 1982). Relationships enable actors to specialize on certain activities and gain short-term rewards based on that specialization (Ford et al. 2010). They also offer possibilities to exchange information via exchange episodes (Håkansson 1982).

In the final a priori analysis framework relationships are characterized by actor’s dependence on activities of other actors, specialization within those activities, interdependencies between activities and common and conflicting interest between and within actors (Ford et al. 2010).

Interdependencies between actors are an important and complex part of business relationships and the key characteristics of business interactions are to build, manage and exploit them efficiently. Specialization within activities is important while developing long-term relationships. (Ford et al. 2010).

Over time actors have certain roles and responsibilities in their relationships. They have either common or conflicting interests or both between each other as well as interdependencies. Both common and conflicting interest can take place both between and within actors. (Håkansson & Johansson 1992).

**Episodes**

Episodes can be characterized as single episodes, initial episodes, exchange episodes, specific episodes (Håkansson 1982) or chains of episodes (Håkansson
A single episode can be part of several relationships (Håkansson ed 1982). Over time chains of episodes can lead to relationships (Håkansson & Snehota 1995).

Exchange episodes can include the exchange of products or services, information, financial exchange or social exchange and are characterized by that exchange. In the initial episodes of exchange it is important to clarify and to understand power relations between actors (Håkansson 1982). Episodes are affected by learning from experience (Håkansson 1982) and external context and are characterized by the characteristics of the actors that participate in certain episodes (Axelsson 2010).

### 6.2.2 Interaction as a focus of the analysis

The focus of this research is on the different forms of interaction within and between actors in an innovation network context and further interactions related to assets, network and asset-based value propositions that support business value as a final outcome. In general this interaction consists of different kinds of relationships and episodes between and within actors in several levels of hierarchy and in different time periods. Business value as the desired outcome is not strictly defined in this research as value creation means different things to business owners, stakeholders and customers and they may have different and competing views of what is valuable (Lepak et al. 2007).

In this research the research context is an innovation network where private companies, research organizations and mediator organizations interact in joint R&D and innovation activities. In this kind of collaboration universities offer the basis for innovative activities via basic research. The collaboration between universities and private companies is also a notable element and offers a channel for knowledge transfer (Vasara et al. 2009). Collaboration with external parties is a vital part of R&D collaboration as it offers access to external knowledge (Harison & Koski 2009). This is important as knowledge is the primary source of value and critical input of production (Grant 1996a), although intellectual assets do not create value if they are not combined with other factors of production (Bismuth & Tojo 2008). Within a network, interaction is a mechanism that distributes resources and resource related benefits between actors as interaction is the main activity to combine resources and activities. Although a single interaction may be less important as a whole, single interactions can be valuable (Ford et al. 2010).
In a network context the usefulness and value of single resource depend on which resources it is combined to and where it is located in a network. Actors can increase the value of single resources and resources as a whole via interaction. Value of resources is constantly affected by interaction as it moves related resources closer and has an impact on their embeddedness (Ford et al. 2010).

Value is generated via intellectual or knowledge resources only via supportive combinations and cross-fertilization of such resources (Rastogi 2003). If knowledge resources have been divided to several actors, exchange is needed before resource combinations can take place. As the creation of new intellectual capital often needs knowledge and experience from different sources to combine these knowledge resources’ knowledge exchange is needed (Nahapiet & Ghoshal 1997).

If knowledge resources are not connected or attached to each other their significance and worth tend to be lost. Sometimes organizations have knowledge that can generate value via its effective use but the organization is not capable to utilize knowledge to generate value from it or knowledge asset may have become old dated or ossified (Rastogi 2003) as value of knowledge assets erodes in time and all knowledge is not valuable to all. Value promise is higher when available knowledge categories are richer, wider and more varied. This increases the amount of synergistic combinations of such knowledge resources (Rastogi 2003) and customer attractiveness.

The empirical environment of this research is software industry. As half of the employees that work in the software development in Finland are not included in the software industry it is possible that all individuals do not consider their work environment as software industry. Further most of the internationally oriented companies categorize their main business as device manufactures that operate in the software business (Rönkkö 2010), it is possible that some of the companies consider their main business more ICT related although currently hardware producers are relying more on software as a way to differentiate their solutions and adding new functionalities into them (Rönkkö et al. 2010a). For these reasons R&D collaboration in ICT cannot be completely separated from the R&D collaboration in software industry as it can be argued that the actors are mainly the same and that they conduct software related R&D collaboration. Further the facilitator actors like Tekes that is the main government funder in Finnish R&D activities that funds both industrial R&D projects and projects in universities and other research organizations (Wallin et al. 2012) are not mainly software industry actors.
6.3 Summary

In this chapter the final a priori analysis framework for analysing the value creation from intellectual assets via interaction in an innovation network was built. This network consists of network, interaction, valuable assets, asset-based value proposition and business value which were discussed already in chapters 2, 3 and 4 and combined together in this chapter. This framework will be used while analysing the empirical data which was gathered during this research. Also the key conceptual terminology used in this research was presented to the reader as a reminder as well as the concept of interaction including relationships and episodes. Finally the interaction as the focus of the analysis of this research was summarized to the reader.
7 Research methodology and process

Research methods are the basis of knowledge production in every scientific discipline (Pinsonneault & Kreamer 1993). In this chapter the research methods and research process used in this research are discussed. Criteria's by which the research is judged are identified and reasons why the research results can be generalizable are presented. Further some of the positive and negative sides of the research methods used in this research are presented.

This research applies qualitative research, case research, interpretive research and ethnography. The transparency of this research is strengthened by reporting the number interviewees, number of interviews, time period of interviews, types of interviews, recording technique, extensive identification of interview process, thick/thin descriptions (amount of verbatim quotations), anonymity of organizations/individuals/positions and style of feedback. These criterias were adopted and applied from Myers & Newman (2007).

7.1 Qualitative research

Qualitative research can be positivist, interpretive or critical (Orlikowski & Baroudi 1991). Positivist approach is more traditional than interpretive approach. They are also opposite approaches which can mutually support each other. In this research the interpretive approach will be applied (Lee 1991). Myers & Newman (2007) emphasize that one of the most important data gathering method in qualitative research is qualitative interview. Via qualitative interviews interviewers can see things which are not normally viewable and examine things which are rarely seen (Rubin & Rubin 2005).

Qualitative interview is a powerful technique for data gathering and it can be used in positivist, interpretive and critical approaches of qualitative research (Myers & Newman 2007). Further it can be used in action research, grounded theory and ethnographies (Myers 1997, Myers 1999, Northcutt & McCoy 2004, Hesse-Biber & Levy 2006).

Even if qualitative interviews seem to be straightforward in data gathering they also include some problems and pitfalls which are often neglected when writing research papers. In social science literature, there has been some discussion about the problems and difficulties related to the use of qualitative interviews but in the IS literature there has been very few discussion about these problems (Myers & Newman 2007). Based on the earlier literature some of those
problems will be presented later in this chapter as well as how this research tries to tackle those problems.

Qualitative interviews can be done in various ways. Examples include structured, unstructured, semi-structured and group interviews. This research applies semi-structured interviews. In semi-structures interviews interview script is incomplete. Researcher has to prepare some questions before interviews but improvisation during interviews is needed (Fontana & Frey 2000). Unstructured and semi-structured qualitative interviews are the most widely used qualitative research types in IS research (Myers & Newman 2007).

Webb et al. (1966) pointed out some of the basic problems related to qualitative interviews. These problems include artificiality of the interviews, lack of trust, lack of time, lack of entry, elite bias’s, Hawthorne effect, constructing knowledge, ambiguity of language and the fact that interviews can go wrong. Myers & Newman (2007) have also emphasized problems with time pressures and intrusive nature of qualitative interviews.

This research tried to tackle these problems by preparing well to each interview and fitting interview themes and questions to support not only the research but also to interviewees work. Good preparation was done to avoid lack of time problems while interviews. Interviews always started with short informal part when parties introduced themselves and the aim and importance of the research was shortly explained in community, organization and/or individual level if possible. Draft of the interview script was always sent to interviewee beforehand to give them possibility to think about themes and questions beforehand and for trust building purposes between the interviewer and the interviewee.

The aim of the interviewee selection was to select people who ‘speak same professional language’ with the interviewer to avoid unfamiliar terms. When needed crucial terms were clarified as effectively as possible.

**7.1.1 Case-based research**

Case study approach is useful especially when researched phenomenon is broad and complex and when comprehensive in-depth investigations are needed via researcher who operates inside research context (Yin 1994). Yin (1994: 13) has defined the scope of the case study in a following way: "A case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are
Case research can be positivist, interpretivist or critical (Dubé & Paré 2003). Dubé & Paré (2003) emphasize that the case research has gained respect in IS discipline because of five main reasons. First, interests has shifted from technical to organizational issues (Benbasat et al. 1987). Second, case researcher’s reports about real-life IT related experiences which gain interest from both academic and professional people. Third, comprehensive investigations suit well people’s needs to understand complex and ubiquitous interactions between organizations, technologies and people. A wide range of different research methods, both qualitative and quantitative, increases richness and flexibility of case research and allows well designed studies of complex phenomenons. Fourth, in-depth case studies open up ways for new ideas and new lines of reasoning and thus underline new opportunities, challenges and issues that professional people face (Dubé & Paré 2003). Fifth, case research is often used for exploration and hypotheses generation but case research is also used for providing explanations and testing previous hypotheses (Benbasat et al. 1987, Yin 1994).

Benbasat et al. (1987) have presented a list of key characteristics of case research. These include that phenomenon is examined in a real-life context or setting, that one or few entities have been examined, complexity of the setting is examined intensively, that phenomenon is not isolated from its context and that observation does not include manipulation or control over the observations.

In this research the research object was a network of several organizations which operate in the Finnish software industry or execute research in the same context. Dubé & Paré (2003) argue that the cases must be selected in a way that researcher can maximize what is learned within a case study’s time frame. Previous network of organizations constitutes the research case of this research. Although using just a single case is commonly critiqued (see e.g. Lee & Baskerville 2003: 223) because some authors have argued that no generalizations can be made based on single case (Markus 1983, Lee 1989). In contrast some authors argue that single case can be generalized (Walsham, 2006). Later in this chapter different dimensions of generalization will be presented and the reasons why single case research can be generalizable and justifiable will be presented.

In this research the amount of interviewees was 21. Each of them was interviewed once. This was justified based on Myers & Newman’s (2007) work of ‘The qualitative interview in IS research: Examining the craft’ where Myers & Newman examined articles from four top journals which used qualitative research method. These top journals included MIS Quarterly, Information Systems
Research, Journal of AIS and Information and Organization. These articles were published in 2001–2005. Myers & Newman (2007) randomly selected 22 articles. Eleven of those articles included more than 30 interviews and seven included more than 40 interviews. In those 22 articles 18 reported the number of interviewees and 12 of them included more than 20 interviewees.

Lee (1989) has identified four problems in research related to case research. These problems are: 1) making controlled observations, 2) making controlled deductions, 3) allowing for replicability and 4) allowing for generalizability.

Problems related to making controlled observations are that actor cannot make observations based on only two factors and remove or control all the other factors which might have influence on the end results. Case research cannot be done in laboratory conditions but in real-world settings and single case research usually needs more variables than data points (Yin 1981).

Making controlled deductions differs from natural sciences thus mathematical propositions are rare. Also quantitative case studies are rare but not undesirable. Usually case researcher has to deal with qualitative data and to generate verbal propositions as research results (Lee 1989). Miles (1979: 590) clarifies this problematic by noting that “For quantitative data, there are clear conventions the researcher can use, “such as the widely accepted and well-known rules of algebra through which the validity of mathematical deductions is known,” but the analysis faced with a bank of qualitative data has very few guidelines for protections against self-delusion”. As a result it is hard to justify findings of qualitative data as pure facts.

The problem with allowing for replicability in case research is related to the fact that it is unlikely that researches will observe the same set of events (same configuration of individuals, groups, social structure, hardware and software) twice in exactly the same way. This is an obstacle for people who want to verify findings of a certain case study (Lee 1989).

Fourth problem of case research is allowing for generalizability. This is because research which is based on just one case study is vulnerable to charges that the findings are not generalizable or these findings cannot be extended to other settings. Previous is caused as a result of the unique and non-verbal events in particular case setting (Lee 1989).

Despite previous four problems Lee (1989: 37) notes that sometimes case study succeeds “in crafting a theory about MIS implementation that conforms to the requirements of falsifiability, logical consistency, predictive power exceeding

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that of competing theories, and survival of the empirical tests aimed at falsifying it” like with Markus (1983).

7.1.2 Interpretive approach

Interpretive research approach in IS discipline is currently a well-established part of the research field (Walsham 2006). It can be underpinned for example with phenomenological sociology, hermeneutics or ethnography (Lee 1991). This research applies ethnographic approach.

Walsham (2006) argues that interpretive approach does not actually equal to qualitative research. This means that also quantitative data, like data from surveys, can give valid inputs to interpretive research. One advantage of using interpretive approach is the ability to choose or change theory in different stages of the research. Interpretive research can be done for example as case research, ethnography or as an action research. It can also be critical (Walsham 2005). This research is executed as a case study.

Interpretive research starts from the position where research domain is social construction of human actors (Walsham 1995). Geertz (1973: 9) emphasizes that “What we call our data are really our own construction of people’s constructions of what they and their compatriots are up to”. Lee (1991: 347) emphasizes the difference between social sciences and natural sciences by noting that “This school of thought takes position that people, and the physical and social artifacts that they create, are fundamentally different from the physical reality examined by the natural science” and further “same physical artefact, the same institution, or the same human action, can have different meanings for different human subjects, as well as for the observing social scientist”. Taylor (1979: 27) clarifies successful interpretation as “one which makes clear the meaning originally present in a confused, fragmented, cloudy form”.

Fieldwork setting is a fundamental base of interpretive research thus fieldwork is context-based (Walsham 2006). Researcher executing interpretive approach is either ‘outside researcher’ or ‘involved researcher’. Outside researcher is a person who does research mainly via formal interviews with no direct field involvement or no significant feedback (Walsham 1995). Involved researcher can be identified “as a participant observer or action researcher” (Walsham 2006: 321). This research views researcher’s role more as an involved researcher although no action research is carried out. Research is characterised by direct field environment and several data gathering methods.
The advantages of close involvement are for example in-depth access to people, issues and data, observation and participation of action and showing commitment to persons working in the field (Walsham 2006). This high level of involvement is typical in action research (Baskerville & Myers 2004).

Disadvantages of close involvement include that it is time-consuming and thus it might be costly, subject on the field might be less open and honest, lack of fresh outlook on situations, lack of critical distance and thus representing contributions in too positive light. Time-consuming aspect applies to both ethnography and action research. In some cases close involvement is not possible because organizations do not allow it, and researcher can move from outside researcher to involved researcher. A person who is carrying out interpretive research needs good social skills and ability to accept ‘no’ as an answer and persistence to try elsewhere (Walsham 2006). The person should “be either liked or respected by the field personnel, and preferably both” (Walsham 2006: 322).

### 7.1.3 Ethnography

In anthropology interpretive approach is used as a synonym to ethnography. However, as mentioned earlier, interpretive approach can be underpinned with phenomenological sociology, hermeneutics and ethnography and thus it is not a synonym to ethnography in all disciplines (Lee 1991). Sanday (1979) has argued that ethnography can be divided into holistic, semiotic and behavioristic schools of thought. The semiotic school of thought can be further divided into thick description and ethnoscience. This research will not go to this level while clarifying which type of ethnography is applied. Ethnography usually requires long periods of time in the field or research context (Yin 1994).

Lee (1991: 350) argues that one way of testing the validity of interpretation in ethnography “is the extent to which the behaviour of the native does not, or no longer, strikes the ethnographer as absurd, peculiar, pointless, irrational, surprising, or confusing”. This means that the observer needs to read the meanings behind people’s actions in a similar way as they exist in the local culture and further understand that those people perform those actions for a reason. Another way of testing the validity of ethnography in interpretive approach was presented by Sanday (1979: 529) who argues that “If, after having completed the ethnography, the observer can communicate the rules for proper and predictable conduct as judged by the people studied, he or she has produced a successful product. The ethnographer is like the linguist who has studied and
recorded a foreign language so that others can learn the rules for producing intelligible speech in that language.” Both of these validity tests seem to be valid for this research. During the interviews both of these tests were achieved.

### 7.2 Criteria by which to judge

Next the three criteria’s by Golden-Biddle & Locke (1993) by which interpretive IS research can be judged are discussed. This research applies the criteria’s by Golden-Biddle & Locke (1993) because it seems that they are most suitable for ethnographic research. However, fulfilling all the criteria’s by Golden-Biddle & Locke (1993) does not mean that the research results are interesting as Walsham (2006) argued. However, as Klein & Myers (1999: 68) note, “it is better to have some principles than none at all, since the absence of any criteria increases the risk that interpretive work will continue to judged inappropriately”.

Criteria’s presented by Golden-Biddle & Locke (1993) include three dimensions authenticity, plausibility, and criticality. First two dimensions are essential, third is not essential when writing ethnographic texts. This underlines the importance of vital and uniqueness of the field context and further offers contribution of research results to fulfil common interest of a certain discipline area. Convincing aspect of ethnographic text is generated by suitable balance between novelty and familiarity.

#### 7.2.1 Authenticity

Authenticity means that readers accept, based on the text, that the researcher is in the field long enough and thus really knows and understands how members (in the field) understands their world. This means that the researcher should not only study certain field setting but study in the field setting. Gaining authenticity is done when research meets these two conditions. Pointing out that researcher has been in the field long enough and researcher has been genuine towards the field experience. (Golden-Biddle & Locke 1993).

Golden-Biddle & Locke (1993) do not describe how much field experience is enough but emphasize that researcher should understand as much as possible about the members world and note that it is not an easy task as there is no precise and correct clarifications of the members world. This can be done for example via “particularizing everyday life, delineating the relationship between the researcher and organization members, depicting the disciplined pursuit and
For management scholars it might be difficult to use ethnography when research context comes from their own culture. This is because they are familiar, at least in some sense, with members world and to challenge ones thinking actor needs to have unfamiliar aspect too. To gain and convince readers about this unfamiliar aspect the researcher needs to show that he or she finds something which differs from his original expectations. (Golden-Biddle & Locke 1993).

7.2.2 Plausibility

Via plausibility, ethnographic texts qualify that readers accept that the findings the researcher offers in text have prominent contribution to common concern issues. There are two components of plausibility. First, the text must deal with a common concern, personal and disciplinary backgrounds and experiences of a reader. Second, offer distinctive research contribution to disciplines academic community. In other words text must be targeted to academic members of the community, not professional ones (Golden-Biddle & Locke 1993).

According to Davis (1971) and Iser (1989) writer can fail to achieve plausibility in two main ways. Contribution can be too fantastic or irrelevant because researcher did not understood members world or research gap was too small and thus text only confirms something that was already known.

One way of solving this problem is to raise questions based on previous research which readers cannot answer and thus emphasize that the text deals with unaddressed issues. Plausibility can be “accomplished by strategies that normalize unorthodox methodologies, recruit the reader, legitimate atypical situations, smooth contestable assertions, build dramatic anticipation, and differentiate the findings” (Golden-Biddle & Locke 1993: 595). Another way of convincing the reader is to assert expert status of the author who executed research and wrote the text.

7.2.3 Criticality

Criticality in ethnographic texts means that the texts endeavour to probe readers to re-examine their previous, taken for granted, assumptions. This means that text must activate reader to re-examine reader’s prior assumptions or common sense about issues covered in the text. However criticality is not an essential part of
ethnographic texts. Some of this criticality can be gained via rhetorical writing. Criticality can be done via “carving out room to reflect, provoking the recognition and examination of differences, and enabling readers to imagine new possibilities” (Golden-Biddle & Locke 1993: 595).

### 7.3 Generalization

Next some generalization concepts with single case aspect are discussed. Especially Lee & Baskerville’s (2003) framework for generalization and its from theory to empirical approach. This approach will be used to justify the results of this research.

Lee & Baskerville (2003) emphasize that generalizability is a major concern to people who do research and use research results and continue by noting that common mistake is to expect that generalizations are proven statements rather than well-founded hypotheses which may be untested. There seems to be no prohibitions that increase in sample size leads to increase in generalizability. Lee & Baskerville (2003: 231) emphasize that "A typical and legitimate endeavour in interpretive research is the study of a single setting."

As Lee (1989) notes, mathematics is a subset of formal logic, and thus these logical deductions can be executed without using mathematics in case studies. Although the validity of deductions which involves mathematical propositions can be checked via rules of algebra, Lee & Baskerville (2003) emphasize that generalizability does not need quantitative or statistical dimensions. In specific instances single cases are useful (Dubé & Paré 2003).

Gregor (2006) notes that there are several different views on the degree to which generalization is required in theory and continues by stating that in fields of social sciences and IS, theory should include some degree of generalizations. Walsham (2006: 322) argues that “generalizations can take the form of concepts, theories, specific implication or rich insights”.

Exactly same setting rarely happens in MIS case studies but Lee (1989: 40–41) notes that there is at least one alternative way of allowing for replicability which Lee clarifies with the following example. “The independent investigator could apply the same theories as tested in the original case study to a different set of initial conditions (for example, the facts of the situation at AAA Corporation or XXX Corporation), thereby resulting in different predictions (for example, if the people-determined theory is true, then individuals who share the same people factors at XXX Corporation will display no difference in their level of resistance
to, or acceptance of, the computerized information system at XXX, regardless of the rank and location of their position in the organization.” Previous example by Lee (1989) is similar when examining generalization framework by Lee & Baskerville (2003) and its theory to empirical approach. Further Lee (1989: 41) emphasizes that “generalizability is quality describing a theory that has been tested and confirmed in a variety of situations, whether such testing is conducted through case research, laboratory experiments, statistical experiments, or natural experiments. As such, generalizability poses no more, and no less, of a problem for MIS case research than it does for the studies conducted in the natural sciences”.

In this dissertation the author tried to follow previous aspect of generalizability by representing some of the earlier research with similar conditions.

### 7.3.1 Framework for generalization

Lee & Baskerville (2003) have presented a generalizability framework with four components. By using this framework researchers may properly lay claim to generalizability. Further Lee & Baskerville (2003) wanted to make different types of generalizability clear and visible to researchers.

The framework argues that generalization can occur in four different ways. “From empirical statements to other empirical statements, from empirical statements to theoretical statements, from theoretical statements to empirical statements, and from theoretical statements to other theoretical statements” (Lee & Baskerville 2003: 232). The components of the generalizability framework are: 1) from data to description, 2) from description to theory, 3) from theory to description and 4) from concepts to theory. Walsham (2006: 322) emphasizes that all of these four components “are feasible from a single case study or a small set of case studies.”. Next the ‘generalizing from theory to description’ approach is presented as it is applied in this dissertation to justify the research results.

### 7.3.2 Theory – empirical approach

From theory to empirical approach includes generalizations from theory which is conformed in one setting to descriptions of other settings. This form of generalizability is the most important one in business schools and thus Lee & Baskerville’s (2003) framework seems to be the most suitable for this research.
Using this approach needs theory which is already developed, tested, confirmed and published in a journal article.

Lee & Baskerville (2003: 237) argue that “The empirical testing of a theory can involve applying the theory (as the major premise in a syllogism) to a set of initial conditions (i.e., the minor premise, consisting of empirical statements that describe the conditions observed in the experimental or field setting before the experimental treatment is administered), resulting in the conclusion (i.e., predictions, which are empirical statements describing what should be observed at the end of the experiment if the theory is true).” and continue by noting that “However, the validity of the theory in a new setting (e.g., a field setting other than the one[s] where the theory has been empirically tested) would remain an open question. On what basis may a researcher (or a practitioner reading about the researcher’s theory in a published journal article) justify the claim that a theory, already empirically tested and confirmed in one setting, is generalizable to the new setting?”

The only way for a researcher to justify generalizability of a theory into a new setting is to present that theory was already tested and confirmed in a new setting. As researchers do not usually have time or interest to test theories in a scientific way in their own organizations prior to their application it might be fair to ease the requirements of strict scientific procedures (Lee & Baskerville 2003).

7.4 Research process

During the interviews the author of this dissertation followed Walsham’s (2006: 323) advice that “it is crucial to try to reassure the interviewee at the start about your purpose and about confidentiality” and “if the interviewee appears nervous, is for the researcher to do most of the talking for the first few minutes”. By doing so some precious time might be lost but the data gathered from rest of the interviews are likely to be better.

Semi-structured interviews were used in this research. After each interview analysis was made about what could have been done in a better way and learned from the mistakes. This research prefers open question rather than closed ones as authors like Myers & Newman (2007) note that use of open questions and moving from general to specific questions are usually good practices.

All the interviews were recorded but in some cases the discussions before and after the interviews were not recorded. Similarly anonymity was offered to all participated organizations and individuals and their titles for ethical concerns,
although in some cases it might be impossible to offer full anonymity because insiders might still have a chance to search names of certain individuals or organizations as Walsham (2006: 327–328) pointed out.

Walsham (2006) notes that advantage of tape-recording is the possibility to go back and analyse interviews word to word and make direct quotations. The down side is that transcribing process is time-consuming, costly and does not capture non-verbal parts of the interviews. It may not be possible to do extensive notes during interviews and thus notes were written as soon as possible after the interviews as Dubé & Paré (2003) emphasize the importance of writing notes as soon as possible and writing down important aspects of the nonverbal communication and context of conversations as well.

During the empirical data gathering process other methods to gather data than formal interviews were also used. These complementary methods included informal discussions, internal documents, reports and other public information. The main idea of using and combining multiple data sources was to create richer picture of context, events and issues related to them (Ying 1994). This process of combining multiple data sources is called triangulation (Jick 1979).

This research tries to present sources of data as accurately as possible but at the same time respects anonymity of the individuals and organizations who wished anonymity. Benbasat et al. (1987: 381) have underlined the importance of transparency with data sources in case research by following statement: "a clear description of the data sources and the way they contribute to the findings of the research is an important aspect of the reliability and validity of the finding".

### 7.4.1 Data gathering

Interviews were the main data collection method in this research. Supporting materials included publicly published presentations, reports and articles which were used to familiarize with the research conducted within the innovation network and within specific target areas within the innovation network and within specific research groups. This data was not analyzed in an academic way. It was used to support the development of interview theme contents.

Using interviews as a main source of the empirical data collection was supported by Walsham's (1995) notion that in interpretative case studies interviews form the main source of empirical data.
These interviews were conducted as semi-structured interviews where only three interview themes and their short descriptions were handed to the interviewees before the interviews.

The more detailed list of questions for each interview theme was prepared before interviews based on the earlier research. All these questions included some potentially interesting sub-notions. These questions and sub-notions were not handed to the interviewees.

The questions and sub-notions were developed to support the chronological discussion within the themes, during the interviews, in a way that it was possible to change the focus within them based on the interviewees’ experience related to the interview themes, interview questions and research questions. The flexibility of the backup questions and sub-notions made it possible to learn from conducted interviews and to improve for the forthcoming interviews.

At the beginning of each interview the background of the interviewer, the research topic and the key terminology of the research were described to the interviewee. The interviewees were encouraged to speak freely about newly arising topics related to the interview themes, questions and discussions in general.

Data collection in general

In total the author conducted 24:34:53 hours of interviews which were transcribed into 714 pages of transcripts. Both interviews and transcribing were conducted by the author only. All interviews were conducted in Finnish and transcribed into Finnish. Only direct citations were translated into English.

The positions of interviewees ranked from project managers and specialists to managers, entrepreneurs and directors. This made it possible to gather insights from wide range of viewpoints from several levels. During the transcribing process the author wrote down newly arising additional questions and notions to ask them in the forthcoming interviews when necessary.

A completed list of interviews which were conducted during this research can be found in Appendix 1. Short descriptions of the organizations that interviewees represented can be found from Appendix 2.
7.4.2 Data analysis

The first step of the data analysis process was transcribing recorded interviews into text format. This was done in a conversational level. All transcriptions were done by the author of this research as soon after each interview as possible.

The second step of the data analysis process was coding the data. This was done with NVivo which is a software for qualitative data analysis. Data was coded into three levels of nodes. The coding tree was developed based on the a priori analysis framework which was developed in Chapter 6 (Conceptual framework of the study). The coding tree consisted of three parent level categories which were 1) Network, 2) Interaction and 3) Assets and their utilization. These were also three themes of the interviews. Data was codified in several rounds in order to get a better understanding of the data and to find suitable coding tree. The amount of data in nodes varied quite a lot and some of the data was included into several nodes.

In the third step the data was analyzed as a single case. This was done by one parent level node of the coding tree at a time.

Finally in the fourth step the results of the single case analysis were compared with the past research and the implications of the research results were discussed.

7.5 Interview themes

The interview themes of this research were network, interaction, and 3 assets and their utilization. Besides the interview themes the more detailed backup list of questions related to all three themes was built based on the theoretical part of this research. The backup questions were listed in a chronological order and in a way that while answering to those questions the interviewee actually told a story about the role of interaction in intellectual asset based value creation in innovation networks and further answers to the research questions of this research.

The backup list was built in a way that all themes included a couple of main issues which were covered in all interviews and further a couple of sub notions which were covered when it was relevant with that interviewee or when the interviewee did not cover those parts while answering to the main question.

Next some of the potentially interesting parts of the backup list will be presented in an informal format to familiarize the reader with the themes.
7.5.1 Network

The focus of the network theme started from the resources, activities and network actors that support the creation of intellectual assets in general and how they support the creation of value propositions and its identification. Further the importance of a wide variety different knowledge assets was discussed related to their identification and combining them to the network and to individual actors. Last part of the network theme included the possible aims related to other kind of benefits, which indirectly support both the creation of intellectual assets and intellectual assets based value creation, like capability development or building new relationships.

7.5.2 Interaction

The interaction theme started with the discussions related to the role and nature of interaction in relation to the creation of intellectual assets and intellectual asset based value creation and how the activities within the network support the interactions between organizations and between individual professionals from different organizations and how the network encourages such an interaction. Similarly it was discussed how the resources the network possesses support the interaction and what kind of resources have been transferred between actors and how that resource transfer affects the creation of intellectual assets and intellectual asset based value creation. The possible differences related to the interactions in a network as a whole and the interactions between certain actors were discussed. Here the focus was on the differences in certain time periods and levels of hierarchy and how these differences affect the value creation and value potential identification. Last the intensity of the interaction in different phases of the network collaboration was discussed.

7.5.3 Assets and their utilization

Asset and assets utilization was discussed from several point of views. Starting from the role of interaction while combining the resources from several actors and how the interaction potentially increases the value of single knowledge resources. Further the value potential of knowledge resources was discussed from several points of view, like how network and actors support it, or is value actually created within actors but not within the network and the possible effects of the location of
the knowledge resources inside the network and how it affects the value creation and value identification.

Also the value potential realization into business value was discussed. The interesting point here was to examine the nature of interactions in value co-creation, value co-capture and value co-opetition and their possible effects and differences between and within actors. Last the effects of interaction while embedding intellectual assets into products and/or services was discussed and further the possible differences between actors. Here it was potentially interesting to examine the differences between companies, research organization, universities, public funding actors and actors that coordinate the R&D networks as their reasons for research, development and innovation activities within innovation networks related to the creation of intellectual assets and intellectual asset based value creation is potentially different.

7.6 Summary

In this chapter the research methods and research process that were used in this research were discussed. Also the three criteria’s by Golden-Biddle & Locke (1993) by which interpretive research can be judged were discussed. This research applied qualitative research, case research, interpretive research and ethnography.

The data for this research was gathered via semi-structured interviews in two interview rounds. During autumn 2012 and during spring 2013. In total 21 interviews were conducted including interviewees from 15 organizations or organizational units. This data was analyzed as one case. This data was analyzed based on the a priori analysis framework which was described in Chapter 6.
8 Intellectual assets based value creation

This chapter focuses on analyzing the empirical data that was collected during this research via qualitative interviews and organizational documentations. These interviews were conducted and structured based on the theory-based a priori analysis framework that was developed in Chapter 6 (Conceptual framework of the study). To make these interviews chronological and smooth, the structure of the interviews differed slightly from the data analysis order and structure, although they include the same data and content. Data analysis is structured into five main parts based on the five main elements of the a priori analysis framework. These elements are interaction within the network, valuable assets, asset-based value proposition, business value and network. Some of these parts are further divided into sub-parts when needed.

In this dissertation interviewed actors were divided into three groups based on their role in Finland’s national innovation systems and especially R&D cooperation between universities and private companies. Based on the earlier literature these groups were identified as 1) facilitators, 2) companies and 3) research organizations. Facilitators include actors that coordinate research programs that receive public research funding, local public enterprises that support the development of local business environment, actors from public sector that fund RDI activities in national level and university units that support commercialization of research results. Companies include Finnish companies of all sized from start-ups and SME’s, to big multinational enterprises. Research organizations include universities research groups, departments, government owned non-for-profit research organizations and university affiliated research units.

8.1 Analysis of interaction within the network

Analysis of within the network interaction start from analyzing interaction processes. These processes occur over time between actors and consist of individual episodes within relationships. Analysis of assets based value creation start first from episodes and second from relationships. Third, the differences within the network interaction is analysed as empirical data that was collected during this research contains data from different kind of actors. Fourth, because the empirical research data was gathered from different kind of actors, also the interaction intensity is analyzed.
8.1.1 Episodes

The focus of episodes is first on what kind of episodes actors have within their networks. These episodes include both formal and informal episodes and further what episodes are most common for single actors and the most beneficial to them. The aim of this part is to identify what kind of episodes occurs within the network, what episodes are most typical in general, what kind of actors participate in those episodes and if the participation is limited, which episodes are the most beneficial to single actors and as a whole and what activities the episodes include. Second, the importance of prior exchange episodes and existing relationships between actors that relate to intellectual assets and value creation will be analysed. This is important as episodes of social exchange are critical part of long-term relationships and as relationships current form is the result of previous interactions between actors. Third, as external context and the characteristics of involved participants have an effect on episodes, the inter-network activities and episodes by network supports interaction will be analyzed. Fourth, the external context of episodes is also analyzed from the virtual collaboration tools perspective.

Episodes within the network

Episodes that occur within the programs that Facilitator A coordinates are good examples as most of the individuals that were interviewed during this research participate directly in Facilitator A’s biggest program. This program is the largest of its kind in Finland and evaluated by an international evaluation group as an ‘exceptional sample of collaboration and cooperation’ (RB-1, 2012). Most of the interaction that relate to these programs occurs as within the program interaction (FA-2, 2013). For this reason focus of this sub-section is first on the within the research program interaction and interaction that relates to program preparations and secondly on general interaction within the network.

Most of the interactions within the programs that are coordinated by Facilitator A occur within the research programs. These programs continuously have different kinds of meetings and gathering with different actors. Biggest interaction settings are so called sprints (FA-2, 2013) that are used in software industry (FA-1, 2013). All the programs do not use sprint method but all the actors that were interviewed during this research participate in programs that use sprints.
Another main interaction setting from Facilitator A’s point of view is program preparations. Amount of people that are involved in program preparations is smaller. For example during preparations of Facilitator A’s largest on-going program around twenty individuals from 13 companies, including Facilitator A, were involved. The aim of these preparations is to jointly prepare the program in a goal oriented way. Besides sprints and program preparations, consortiums also organize different kinds of internal gatherings on their own to foster their work (FA-2, 2013) although this kind of interaction differs between work packages (CA, 2012). Within programs that are similar to Facilitator A’s biggest program first there needs to be informal interaction and framework that helps to bring people together. For example in Facilitator A’s biggest program there are two day long quarterly reviews every three months where actors can present their results. These reviews also include demos and posters and there is time left for discussions. (RB-1, 2012).

At the program level of Facilitator A’s programs, management group has a key role when planning the main tasks and deliverables for programs next year. Management group is a small group of key members that has a key role in annual planning. It collects business cases from companies and compiles them into main tasks and deliverables. During the year the role of the management group is much smaller although it makes operational decisions during the year (FA-1, 2013). Although valuable assets will be discussed later in this chapter, it is important to emphasize in this point that according to RB-1 (2012) these deliverables are not always considered as results and the value of them can change significantly as:

“I separate the words results and deliverables in my speech just because I. Results are those concrete outcomes and they. I speak about them as assets. Deliverables can also be assets if it is very, very good. Top document that tells about certain things which everybody wants to read about. In practice nobody really read those deliverable documents that much.”

Further although management group compiles business cases into tasks and deliverables, according to FA-1 (2013) it does not decide which actors contribute to which deliverables as:

“(…) these [work packages] are not attached in anyway. Only thing that is attached is that big goal where we are going to. Those deliverables where we are going to. But we don’t attach who is going to do those deliverables. I don’t know at the moment when program’s is. I don’t have a clue. So that I
Within business cases every participating company has their own contact networks that include at least research partners that are part of that business case, but those contact networks can also include other companies. What will be done and within what schedule are agreed within a single business case. (CA, 2012).

One level up from the program level within programs that are coordinated by Facilitator A is stockowners interaction. Their channel of influence occurs via board of directors. The main task of board of directors is to choose the strategic research agenda’s (SRA) that are invested. They also make decisions about money allocations. Facilitator A is a company so stockowners have quicker access to information it produces than other actors as certain things are first discussed with stockowners. Most of the companies, research organizations and universities that annually participate Facilitator A’s programs are not stockowners. Stockholders channels of influence are stakeholders meetings and board of director’s. Being a stockowner does not guarantee that the actor will be selected to any of the programs because Facilitator A has over 20 stockowners who have not been selected to any of them. Stockowners that have not been selected to any of the programs include also universities. According to FA-1 maintaining the motivation of actors that have not been selected to programs is challenging so that they would contribute via legal board of directors activities. (FA-1, 2012).

As mentioned earlier the biggest setting for within the program interaction in programs that Facilitator A coordinates are sprints (FA-2, 2013). Typical length of these sprints is three months (FA-1, 2013). This means that the entire program and all the participating actors gather together three or four times a year for a couple of days to go through what have been done and what will be done during the next sprint (FA-2, 2013). These couple of day events are called quarterly reviews (RB-1, 2012) although some actors call them sprints. Exploitation of sprints has increased within the program interaction significantly as FA-1 emphasized that they are very proud of the use of sprint model that was taken from the software industry as it has genuinely increased interaction a lot and it is an innovation in an innovation activity. (FA-1, 2013).

During quarterly reviews actors can present their results for example via demos and posters (RB-1). These are dynamic activities where all the participants met. In principle they are planned and prepared but still quite informal in a way that they include lot of informal interaction where people can discuss and chat

know that those deliverables will come from there but I don’t have a clue which companies contribute to them. To main portion of them.”
and where new openings and business ideas are found. During these reviews for example FA-2 from Facilitator A tries to discuss with different people and seek what kind of business ideas they might have (FA-2, 2013). According to RB-1 when this kind of activity and other activities have been rolled long enough people will learn each other and make friends. In this setting informal contacts are created while going to eat together and while sitting a night because in this way it is easier to understand what happens in other organizations and what they do. Further in RB-1’s opinion that kind of informal association and chatting require a framework from where it can be started as people just do not come to chat. (RB-1, 2012).

Although the entire research consortium gathers together during the quarterly reviews under a predefined agenda, workshops and presentations, there is a time slot that offers opportunities for interaction and to meet all the partners and to create actors own sub-agendas in a balanced way. These reviews are one regular episode’s that creates the big infrastructure for the entire program and all the participants know that at least there it is possible to create new contacts and new openings or develop and increase collaboration (CA, 2012). During these reviews a lot of other things besides the formal schedule are done. This is possible as many times certain actors plan beforehand to use some time during these reviews to advance their own activities. (CF, 2013).

For example CC from Company C has found it very fruitful that every three months all the participants gather together to show what they have done as new value is created to the participants based on those results as because of this three month cycle it is possible to incrementally share and show possible end-results beforehand and get comments from others. In this way the additional value proposition is much higher compared to traditional methods where there is annual plan and results are presented after one year. In three month cycle it is possible to get feedback from network and actors more frequently. Similarly actors expect to get feedback because if certain activities are not fruitful they are not continued and thus focus is shifted to things that are considered beneficial. These feedback loops also make it possible to get rid of unnecessary things quicker and to foster value creation as in CC’s opinion these feedback loops are particularly important in value creation. Similarly when collaboration is started it is important to start as fast as possible by bringing all the things actors can to the table and to hope that value can be created based on those things (CC, 2012).

Programs that are coordinated by Facilitator A are company driven. This is because initially SHOK’s were defined so that they are company driven and
according to FA-1 this has worked. Initially companies wanted to create the work packages that are developed by exploiting sprint method in a different way, because according to FA-1 people from the industry were used to act in that way. So companies prepared work packages in a different way but Facilitator A forced them to act in a different way and also to break up the work packages in a different way. From Facilitator A’s point of view interaction within sprints have so far been sufficient enough. (FA-1, 2013).

Within different work packages actors have their own more or less regular meetings. This varies between different work packages but according to CA from Company A they have a meeting every two weeks with a predefined agenda. This interaction takes place at Otaniemi or via videoconferencing or phone to Oulu. People that gather together at Otaniemi form their own tight group as they are physically at the same place and can share things also before and after the meeting. Group at Oulu that attends via videoconferencing is a second step away from this closeness and there is less interaction than if they would be around the same table physically. A third step away from this closeness are those who sit in front of their own terminal and attend via phone. In CA’s opinion videoconferencing is always a step away from that closeness and limits the opportunities to share idea. The amount of people that attend these bi-weekly meetings is smaller than in quarterly meeting and workshops. CA from Company A has identified three main interaction episodes which are quarterly reviews, episodes within work packages and contact networks in business cases within Facilitator A’s coordinated program that Company A participates. (CA, 2012).

It is situation dependent which people attend which interaction episodes as interaction can take place in all levels from small entities within a single project to work packages and consortium level. According to CB from Company B there are two important levels of interaction; project management and technical meetings from which latter is more important. CB emphasize that from the frequency of technical meetings it is possible to see if there is interaction or not as immediately after technical meetings things starts to happen. (CB, 2012).

Bi-weekly workshops that CA attends are very informal gatherings where quite informal discussions have been executed. In this kind of setting lot of informal discussions take place although they do not leave a formal track. It is clearly visible within these gatherings that company representatives have found those partners who speak the same language with them and with whom it is possible to throw ideas as their problem field is similar and comparative. (CA, 2012).
However, CB does not put much weight on informal interaction. At international level some networking happens via social media tools but not significantly. Most of these social media driven contacts come from EU projects. According to CB informal interaction is not needed as things can be done during the meetings because participants are experts. Further CB emphasized that informality does not lead things and there is no point to invest much into it. Although all the possibilities to travel and serve have been taken away, work has not changed in any way. Instead they have become more productive and the focus has stayed clearer. He also noted that around a glass of beer, a couple of good ideas feel amazing and stay in peoples mind, it is not pivotal although it can be starting point to something. (CB, 2012).

From Research organization A’s point of view, result related interaction is quite formal as they usually deliver a report or organize a seminar where they tell about the results. At a practical level interaction mostly occur when they visit other actors and vice versa. This means that Research organization A either visits companies or company representatives visit them to go through things as normal interaction. According to RA-1 this might even be more efficient than those formal meetings although those formal meetings also need to be done. Further RA-1 notes that interaction on the research side is a mix of formal and informal interaction and informal information channelling that are partly public and partly less public (RA-1, 2012). Reporting to funding bodies is something that does not forward research but it is a necessary thing as funding requires that its usage is reported. (RA-3, 2012).

Facilitator A has public seminars where participants are invited to gather together around different themes. During these seminars different kinds of discussions occur. Typically these public seminars are organized in a problem level to present their results. Besides these seminars Facilitator A also organizes annually a couple of public events that cover all their theme areas or programs. Facilitator A’s aim is to be present all the time in several levels to ensure opportunities to catch up with companies. (FA-2, 2013).

FC from Facilitator C works in a public utility company with a focus on venture capital and building venture capital funds. Within this setting they have had different kind of programs which aims export companies from the region to Silicon Valley. First focus of these programs is to create connections to certain strategic places like Silicon Valley, East Coast of the United States and Tel Aviv if those connections have not yet existed. After the connections have been created, Facilitator C invited people from these regions to give workshops, trainings,
coaching and lectures for example at Yritystakomo, Business Kitchen and Business Oulu. Other interaction episodes Facilitator C utilizes include meetings, gatherings, conferences and videoconferencing. FC (2013) described the aim of making these relationships and their role in it by noting that when they are in the ecosystems creation phase they need to persuade actors to come to the region and hope that companies like Rovio would be created in the region but after they have created this infrastructure and when things start to look interesting those actors would come from outside. (FC, 2013).

Facilitator C’s aim is to go to these strategic places and bring actors from there to the region and create facilities where they meet companies and entrepreneurs. As this kind of relationships die if they are not maintained actively, those activities need to be continuing as actors drift to those activities that are beneficial to them. (FC, 2013).

At a local level there are big and small co-working spaces that have been developed by private funding that have collaboration between companies in the form of mentoring. According to FC finding ideas and sharing experiences together in the early phases of company’s lifecycle is not as efficient as it can be even though these co-working spaces enable this kind of interaction. However after company has developed to a certain point it does not socialize with its competitors anymore as it gets along on its own. At the local level there are actors that offer this kind of co-working spaces where actors can gather to search for new ideas together and to harness university resources. (FC, 2013).

FB from Facilitator B works in a public funding position with the focus on RDI funding. They know regional actors well and their aim is in very close activities. Although they are a government office, they have a reputation that they are easy to come closer to and they are not too formal and bureaucratic. This is highlighted in a regional level where they know companies better as they are closer to them and thus know certain persons better. Besides these regional and national connections Facilitator B has offices abroad and has close collaboration with the leading universities in the US. They have offices in Washington and Silicon Valley and currently they have started to build similar connections and networks in Asia stronger than earlier. FB emphasize the importance of this kind of international network and connections by noting that as they have a network and they see global business and research activities from very close and lot, they try to bring that network to Finland as it is one of the tasks that were given to them. (FB, 2013).
Typical interaction episodes for university’s innovation unit include trainings and courses where interaction is tried to make closer via different kinds of practical assignments and learning diaries. The aim is that participants would come with their own problems and specific questions. Second interaction types are laboratory visits where Facilitator D meets research groups. Via these visits Facilitator D tries to bring different kinds of information to these groups. Third interaction episodes are so called ‘invention hunting’ where Facilitator D tries to drive ideas that the research groups have into invention disclosures and refine them further. Especially within the collaboration programs with companies, Facilitator D’s aim is to drive up the amount of invention disclosures as companies measure the success of research programs via their amount. This interaction is two-directional because Facilitator D has existed so long that the research groups know them and thus both parties are in contact with each other on situational basis. (FD, 2013).

Research organization A has weekly meetings where all the group members attend (RA-1, 2012), although according to RA-2 and RA-3 from the same research group whole research group meets every two weeks. Each Research organization A’s research projects have also their own weekly meetings. They have also joint events with other research groups several times a year that include informal parts. Important informal interaction also occurs when senior researchers supervise their Doctor of Philosophy (PhD) students. (RA-1, 2012).

Bigger events take place within a certain theme and also PhD students gather together by themselves. All the group members participate in program preparations. Research organization A has tried to make this systematic so that also PhD students can influence on what kind of programs will come in the future. In this way it is also possible to combine experiences and knowledge from all the group members (RA-2, 2013).

Within research projects there are weekly meetings where work packages’ proceeding is monitored. This interaction can take place for example via teleconferencing. During workshops where research results are presented it is possible to interact with other actors from projects that carry on similar research to seek collaboration possibilities. Industrial partners can also attend these workshops to hear about research groups research results. (RA-3, 2012).

From intellectual assets commercialization point of view, sooner or later face to face interaction is needed as otherwise no progress can be achieved. RB-2 from Research organization B emphasizes that interaction without intellectual assets do not have any meaning when actor seeks new business opportunities based on
existing intellectual assets because then there is a need to have something meaningful to show. According to RB-2 when collaboration starts it takes one to three years to get to concreteness level. For example Research organization B uses trade shows to demonstrate their solutions, to build their conspicuousness and to get in touch with potential collaboration partners. These demos need to be concrete because demos that can be found from Internet do not work. Via trade shows Research organization B markets their offerings to potential new partners and builds their conspicuousness. Research organization B has organized two industry driven seminars where industrial representatives have demonstrated their solutions and researchers have presented their research via posters. Besides these two seminars Research organization B has not organized smaller events within RB-2’s job description. They plan to organize next seminar in 2014. These seminars have been industry driven because according to RB-2 industrial actors need to be listened to when focus is on commercialization. (RB-2, 2012).

If interaction is regular, on-going and occurs within a certain rhythm the form or tool of interaction is not essential. Form of this interaction can be for example a workshop (CD, 2013). According to RC from Research organization C a considerable amount of interaction occurs in a physical form as for example the amount of social media related interaction is quite small. Some interaction takes place via social media but it is more informal and relates to idea generation. In company driven research informal interaction relates to finding out if actors own research interest match with research interest of companies and other research organizations and if common interfaces could be found. (RC, 2012).

According to RC in general interaction purpose can be divided into two. First, to interaction that relates to operative research activities where the aim is to achieve the predefined goal. Within this interaction people discuss about what the research field looks like and what problems within that field are so interesting that companies would like to invest their time, resources and energy to them and if those problems match with the areas that research groups are interested to research further. Second, to informal discussions that can occur for example via idea generation sessions. This interaction is more informal than interaction that relates to operational research activities. (RC, 2012).

Network develops and lives all the time. When people are met and discussed with, network expands naturally if something interesting is found. If something interesting is found the person is easier to ask to join certain program or propose certain program. Second model with new collaboration actors is that if actor has certain program idea and actor starts to ponder about required organizations
Research organization C simply contacts that kind of organization that could be potential and which seems to fit with the purpose to seek for the right person to discuss with. In latter case Research organization C tells what academic research is like, what kind of research group there is, what it researchers, what it has researched and with whom and what references and outcomes they have. The aim of this interaction is to form quick and clear picture about what kind of organization is in question and to give that organization gripping surface so that things can be verified and risks of both actors minimized. (RC, 2012).

Research organization D’s interaction episodes from administrative perspective include administrative meetings and management group meetings of local innovation alliance. According to RD-2 there is also a lot of events organized by other actors where people from Research organization D attend. A lot of interaction occurs all the time although Research organization D does not organize big events by themselves as it is difficult because of the big amount of actors. As interaction occurs all the time interaction is created naturally and smoothly for example during seminars. Further because different kinds of more or less informal events take place it is not always possible to attend even if people would like to do so and thus prioritization is needed. One way to do this is to coordinate these activities via local innovation alliance. This alliance includes five centres and Research organization D is one of them. These centres discuss regularly about the content of different kinds of program entities. In that way information sharing is quite tight. (RD-2, 2012).

Research organization D’s interaction with companies is bi-directional as companies actively contact them to make proposals and to discuss about things that relate to collaboration possibilities. Their collaboration with companies commonly starts in this way. According to RD-2 their interaction with companies and public sector actors in the regional level does not differ as via local innovation alliance actors sit around the same table including actors from public sector and key companies. This innovation alliance enables that knowledge moves faster between companies (RD-2, 2012).

In this regional setting the city is actively supporting the creation of new business sectors by supporting business environment and infrastructure via Facilitator C. The city also actively organizes networking possibilities for example in the form of business breakfasts. Research organization D has also been involved with business accelerator and turning ideas into business concepts when they were initially started but now other regional actors take care of those activities. Via these networking events network supports interaction and
According to RD-2 those events are important for interaction creation. Further RD-2 emphasizes that interaction needs to be built actively. Creating good collaboration environment requires technological and business know-how but also social aspects are required. As there are competing actors within Research organization D’s networks it is also important to create additional value expectations that exceed competition situations. (RD-2, 2012).

Because Research organization D is a project organization within projects formal interaction occurs in many forms. In this setting one aim is to publicly present research results in seminars and conferences and via publications. From university’s point of view the success of research and other activities is measured via how well research is published in high ranked publications and conferences. This means that those channels are naturally utilized as part of scientific publishing and conference activities. Informal interaction is part of networking within formal collaboration and all the discussions around this are essential. For example during the coffee table discussions it is easy to bring up needs and opportunities. (RD-1, 2012).

According to CE from Company E informal interaction within Facilitator A’s program that they participate is quite coincidence driven. For example during seminars opportunities may arise during coffee table discussions while discussing what other actors do. During these kinds of informal discussions similarities can be found although actors work on similar things from different perspectives. CE found one this kind of similar interest during one seminar that was organized by the research program coordinated by Facilitator A in Oulu where they met business researcher with similar interest while sitting around the same table. After that CE went to watch their presentation in that seminar so the collaboration started via informal dinner table discussion. (CE, 2012).

Company E is a small company so according to CE they do not know people, organizations and opportunities as well as bigger companies. This means that contacts come via networking during events that are organized around certain themes. For Company E informal networking is extremely important and contacts are made via networking. Further as Company E is a small company they do networking partly within different arenas than big companies. For example via investor speeches and networking that include face to face interactions that are organized by certain organizing actor to force networking. From this kind of wider network perspective Company E’s network includes Facilitator B and Facilitator C in a different way than big companies. (CE, 2012).
Although Company G is also a small company its interaction occurs mostly via old contacts as they are active actor in several communities and they also actively create these communities. Company G’s networks expand all the time as they combine their old networks into new ones. In this way they expand and grow their networks as a whole all the time. According to CG he has never met a person that could not be contacted. Company G’s partners within these networks include for example one international technology oriented non-for-profit organization, Facilitator B, public funding bodies, venture capitalists, universities and companies. Other organizations regularly invite CG to speak to their events but according to CG nowadays he rarely goes to events where companies gather together because their experience and know-how is at a that level that they do not need external help in technology development, sales, marketing or legal issues and as via his current contacts he can contact all the needed venture capitalists. (CG, 2013).

According to CA Facilitator A’s program where CA participates have created ground and cooperation practices that have not existed earlier. Before this program Company A did not have discussions about things that are discussed in this program, especially with their competitors. Earlier they have had discussions about ways of working with one specific company but not even near the detail level and intensity that they now have within this program. Especially with the university world earlier discussions have been quite minor although single researchers have come to talk about certain things that relate to same things that they focus on also within Facilitator A’s program. This lack of interaction with external actors is related to the fact that Company A mainly conducts discussions and collaboration around how to develop ways of working internally and thus one of the biggest value from this kind of program for them is that it has brought together people from different companies to ponder around the same problem field and live daily around similar challenges and ponder how things can be developed in that setting. CA further notes that he cannot evaluate from where the very open discussions in this program stem from but estimate that they might stem from the programs nature as it is neither technology nor product focused but the focus is on ways of working that ease the discussions. (CA, 2012).

Prior exchange episodes and relationships

Episodes that occur between two actors are characterised by what is exchanged. This exchange can relate to product or service, information, financial exchange or
social exchange. As in time chains of episodes can lead to relationships, next the importance of prior exchange episodes and existing relationships between actors that relate to intellectual assets and value creation will be analyzed.

Prior social relationships are not required while attending programs that are coordinated by Facilitator A. Prior relationships are not a requirement for collaboration although typically actors find their way to Facilitator A’s network via existing social relationships. Besides existing social relationships actors from abroad make inquiries about collaboration. In these situations these actors are evaluated to investigate if they have know-how that is currently lacked and if they are suitable partners. After this evaluation these actors are networked with certain key actors within Facilitator A’s program network so that they can seek together what kind of know-how each of them has and if the combination of that know-how are sensible. After these actors are networked together, Facilitator A leaves them on their own, although Facilitator A can make this networking again with other actors if the first networking does not create collaboration. Because this networking is made with research networks the key actors that have participated program preparations and strategy formation benefit more than other actors as they know what the research programs are about and can seek for suitable partners. This is because active partners have a big role and have been succeed within Facilitator A’s programs. (FA-1, 2012).

Also FA-2 noted that probably all the collaborating companies in their programs have constant discussions with other companies where information is shared although Facilitator A does not know about it. Facilitator A’s view on their programs is that they know what kind of programs they have, which actors participate them, what kind of things actors do, what results will be made and what rights actors have to those results but Facilitator A does not have access to see what actors do with those results. Therefore Facilitator A does not monitor the success of these programs in any way because they only develop the environment where companies can create collaborative work. (FA-2 2013).

In order to make information transfer while people communicate network is needed. This requires that someone has perceived elements that relate to a bigger challenge and has collected different kind of actors around this topic as it is possible that these actors have never met each other. According to RB-1 people do not necessarily go and talk with other people even if they know that they are from a certain company and they would like to talk with them. If people know these people and know that they should talk together it is possible to force them to talk with each other while putting them in that kind of situation, for example in a
workshop. If this situation is positive it creates discussion and interaction bond between them even though that bond has not existed before. Similarly even if an actor thinks that certain actors should collaborate that bond may not develop as those actors does not find that red string between them. (RB-1, 2012).

From venture capital perspective even if companies do not have similar core technologies there is no competitive positioning as such during sparring and coaching that Facilitator C has. As venture capitalist can have several similar companies in its portfolio FC notes that the entrepreneur should always check if they are suitable for the venture capitalist or not. Per se during trainings and investing there is no competitive relationship between actors. (FC, 2013).

From university’s innovation unit perspective inner determination of actors need to be on paper when there is a commercialization case between two organizations. This inner determination is not a contract and includes things like goals and if the goal is for example start-up or selling technology via project research. When the team that established a company has been built it is time to make contracts. That team agrees about rules on how they act in relation with that company and about company’s agenda. According to FD this point needs to be free as it is about seeking for opportunities and contracts just limit those activities. (FD, 2013).

As Research organization A focuses on empirical software engineering it needs to have access to see what happens within companies and to interview company employees and thus Research organization A needs to have interaction with company representatives in order to create intellectual assets. To do so Research organization A needs to know that company will let them too see and hear things because it is not always simple for companies to let external actors to examine their own core processes. Interaction that makes it possible to gather this kind of research data leads to value creation and is very important part of it for both actors as companies very rarely get external feedback about their internal development activities as usually they do not let external actors to examine them close enough (RA-1, 2012). On the other hand RA-3 from the same organization was not sure if social relationships with certain actors are needed before intellectual assets can be created. Instead RA-3 emphasized that both collaborating actors need to benefit from the collaboration as if actor seeks fast benefits without contributing to other actors in any way, collaboration will end quite fast. Further RA-3 noted that researches need good social skills. (RA-2, 2012). As Research organization A is a neutral partner they can give this kind of feedback so that companies can develop their internal development activities
For this kind of information transfer that is essential for the creation of intellectual assets knowing people create trust and thus sharing things becomes easier. According to RA-2 in research the case many times is that actors do not necessary want to release all the results before they has been published within confidential networks. Thus mutual information sharing works lot better if actors know people as individual’s not just officially within official collaboration. (RA-2, 2012).

According to RC discussions are needed to map the usefulness and usability of intellectual assets in certain purposes. Via these discussions actors get more precise information about the usability of intellectual assets in different purposes. Within research programs these discussions can take place between companies and research organizations that conduct business research about how business could be made based on utilizing certain knowledge assets. This happens in two ways: via intellectual assets by themselves and via trusted evaluation from those who created those intellectual assets. Within these discussions between companies and business researchers role of business researchers is consultative while bringing his understanding about both latest literature and research and about other companies within similar industrial setting. Because company representatives’ view point differs from researchers’ view point, researchers role is to increase company representatives understanding about the value of those intellectual assets. During these discussions it is possible to increase company representatives’ understanding so that they can make better decisions about their intellectual assets after their understanding about possible changes in operational models and ways how other companies act has increased. According to RC the idea of this kind of basic consultation is that it brings research community’s assets available. These assets are based on academic literature and they are not owned by those researches but are located somewhere in the network. As these assets are quite largely available to all actors they need to market themselves and in a way researcher’s expertise is related to finding the right information to certain purpose. (RC, 2012).

RD-2 also notes that the creation of social situations supports information sharing. For example Research organization D has work concept that includes open office environment with a large coffee space. They invite their collaboration partners to this open space where interaction takes place flexible. RD-2 emphasizes the importance of coffee as part of their social framework. It can be as easy as inviting people to their premises and discussing while drinking coffee. This kind of informal interaction has an extremely important role while creating
intellectual assets. More random informal events include events that are organized by their partners and informal festive occasions that are similar to informal coffee drinking. Further this kind of informal keeping in touch is extremely important in trust building and deepening and creating collaboration. This kind of informal social interaction generates and ensures trust and good collaboration environment. (RD-2, 2012).

From value creation perspective Research organization D has the ability to make drafts of applications and tools to test them with the users. In this way they can extend their part of the value chain further although as an organization Research organization D is not the one who starts to sell products. Latest stage for them in value chain is the point where it starts to seem that they have ‘a good thing’. At this point their aim is to start discussions about how to commercialize them. So their role is limited to creation of intellectual assets and value potential that is based on those assets but it is other actors that start to utilize those assets and value potential. In this way Research organization D can show that they have done things that have effect on regional economics because they can show that based on their work amount of jobs and income in the region have increased. (RD-1, 2012).

According to RD-3 discussion connections, discussion relationships or trust are not necessary preconditions before collaboration can start although they make it easier. If both actors have similar interest and goal the collaboration starts quite fast even if actors have not been in contact before. During program preparations Research organization D’s activities are mainly sales work toward companies to get funding from them as they need to ‘sell’ program’s to other actors. During this sales work it is more important to communicate research problem or challenge to company representatives in a way that they understand it than finding a single person who communicates the problem or challenge internally. (RD-3, 2012).

When value is created within the company relating to deploying new ways of doing things it is possible to go and help people so that they want deploy these new ways. If this new way is right it is possible to make the activities profitable right away. This can be done for example while going to see how people do their daily work and by asking how they do it and if they could do it in this new way. During this kind of close interaction competencies can be transferred. According to CB this is probably the most important thing in this kind of coaching. It requires a lot to find this kind of ways of how to deploy these new ways of doing things so that people would use them in a way that it would bring benefits immediately. By going to see how people do their work and showing how they
benefit from the new ways of doing things are lot more efficient activities than for example questionnaires as questionnaires do not have any effect and people do not answer to them either. (CB, 2012).

From small companies perspective building social relationships makes it possible to probe new business opportunities that can be part of other actors businesses or ecosystems. These business opportunities can be functions that bigger actors do not want to do by themselves. For small companies, bigger ones can offer an environment where they do not need to fight against things like information security just by themselves as they can offer certified environment that is trusted by other companies. In this way small companies can gain more trust while decreasing the need for their own resources. In this setting networking and personal relations are very important for small companies as via them it is possible to gain trust by collaborating with bigger companies. Within this setting also business relationships can be as important as personal relationships although truly working business relationships take time to develop. Especially small companies do not develop several business relationships a year. (CF, 2013).

As company F is an expert organization it is important that the company has good internal atmosphere as it has big influence on the quality of work. From this perspective Facilitator A’s program has had a significant influence on bringing new views and attitude that it is not worth to think that everything is already invented and also new kind of attitude to try new things even if they do not work during the first time as next time they know that some of these new things will carry on and prove to be good. According to CF it is also extremely valuable that via interaction it is possible to find out that they are on the right track. This is because although things are not easy, they are not easy to other actors either. Within this kind of limited communities the idea is to be open and to help others and to realize that things are not always easy. These are the values that Company F also gets from Facilitator A’s program that CF was not able to see beforehand. Further CF notes that for big companies it might be possible that they knew beforehand what kind of things they seek for and what kind of things they would like to research as they might have people that are closer to the research world also within other settings and in this way they could try to find that kind partners and projects that would help them in this. (CF, 2013).

CG notes that as new people are met all the time there is no need to know them beforehand but it is important to deal with them like dealing with all people as everybody market themselves and their company all the time (CG, 2013).
How network’s internal activities and episodes support interaction

As external context have an effect on episodes and the context of this research are innovation networks next the ways how networks internal activities and episodes support interaction will be analyzed. This analysis is limited to activities and episodes where actors are physically presents as the virtual communication will be analysed separately.

FA-1 emphasizes that by far the best activities that support within network interaction in Facilitator A’s programs are sprint meetings. During the first day of these sprints actors tell other actors what they have done so far and during the second day actors freely negotiate about what will be done during the next sprint and who works with whom. Besides sprints also webinars and seminars have been tried but their efficiency is not even near to the efficiency of sprints. Actors know well beforehand when these sprint meetings take place and thus can schedule their activities in a way that they can attend. Depending on the sprint outcomes external people from actors’ collaboration partners can also attend sprint meetings. If external people are invited to speak it is usually arranged during these sprint meetings to avoid unnecessary travelling. (FA-1, 2013).

Programs need to have leaderships in the background so that people understand that even if participating events is not mandatory it is part of the program design. This means that getting funding requires attendance during these events. It is essential to build a framework and motivate people in a way that attending to events is beneficial to them in such a way that later they are willing to attend even if it costs. This is because network as such cannot encourage people to attend events in any other way than contributing that people are motivated and willing to come and participate discussions. While doing so people bring their own contribution by motivating others to come as they know that coming is good and beneficial thing to them for example as they have a chance to tell to others what they have done while others are listening. (RB-1, 2012).

Before this point can be achieved a framework for that needs to be built as no one attend meetings where others do not tell what they have done or which are not beneficial to them. This framework needs to be planned in a way that all the participants find their own interest from there and can find other options if certain things do not interest them. This option can also be a possibility to talk with interesting people. This is possible for example by inviting interesting external experts with certain visions. It is also important to give actors who have made superfine results a chance to present and tell about them. For example within
programs that RB-1 coordinates on behalf of Research organization B there is a
c ompetition about who will have a chance to come, present and tell about their
results. This requires systematic planning and further all the gatherings, meetings
and reviews need to be planned very well beforehand and the boundary conditions
need to be determined so that people know why they need to attend. (RB-1, 2012).

Although people work in full level during workshops they also go out for
dinner every night and to discuss. These evening activities are worth of attending
as they are those places where network is created (RA-3, 2012). Network also
supports interaction by forcing to organize bigger events and bigger meetings.
When networks grow bigger some of its members are followers. When this
happens interaction is more active only with certain actors and with other actors
interaction can mostly be one-directional. (RA-1, 2012).

When individual investors and start-up gurus from abroad are invited to
events Facilitator C’s aim is to maximize the regional effect of these visits by
offering visitors a chance to meet as many regional actors as possible and in this
way to support the creation of new relationships so that Facilitator C would not
 need to foster relationship building forever (FC, 2013).

Some facilitators need to be careful while encouraging other actors. For
example FB from Facilitator B notes that because they are neutral and unbiased
actor with certain transparency and their role is regulated by laws and regulators a
better word would be ‘activating’ although they try to encourage other actors by
bringing up certain topics. Purpose behind this is to activate discussion around
those topics but that encouragement cannot be too strong because otherwise it can
give wrong signal because Facilitator B is a public RDI financier and thus it
cannot be too good friend with the applicant in order to maintain its neutrality as
they deal with the applications from these same actors. This means that actors that
apply funding from Facilitator B always decide by themselves which topics they
continue with, with whom and what their goal is. FB emphasizes this by noting
that although they activate and discuss actively they never go into the content of
applicant’s acts. For example by telling what they should do because it easily
creates situations where applicants come back to ask why they did not get funding
although Facilitator F said that their thing is good. (FB, 2013).

Because of previous Facilitator B’s interaction and social relationships cannot
have any effect on funding decisions as funding decisions are sensitive and
Facilitator B or its employees cannot influence on applications content although
because of the analyses work they do and because of the funding decisions they
make they need to discuss about applications widely and to ask questions. They
can only ask that kind of questions which do not give answers at the same time. In order to make this discussion understandable sometimes Facilitator B needs to give examples to applicants. Questions that Facilitator B asks in relation to applicants’ funding application are focused questions which do not take any stance. By only asking questions it is possible to avoid influencing applications content. If funding application includes that kind of things that cannot be fixed in order to get positive funding decisions, Facilitator B do not engage into this kind of dialogue. Similarly if funding application is good, Facilitator B might engage into deeper questions if they see that it is questionable if everything has been thought. (FB, 2013).

From Research organization A’s point of view consortium levels sprints that are organized four times a year for two days are important as well as bi-weekly meetings around one of their research themes. Within these meetings people are physically present in two places which are connected via remote access. Besides the sprints and bi-weekly meetings, the third important thing that supports communication is research workshops which are held in some outlier place for a couple of days. Having these research workshops in the outlier places makes it possible that people cannot leave from there so easily and thus they need to interact with others. These events are different in a way that there is a lot of communication as people stay there over a night and go sauna together. This interaction is informal and different in a way that people do not just sit somewhere and go home at four o’clock. (RA-2, 2012).

In the regional level there is a lot of active people that are networks nodal centres and in a way connections are made via them as they can see that certain actors could benefit from joint activities. These nodal centres have their own interests and they can be for example business angels. This kind of key actors are important in a region where Research organization D comes from and the strength of the region is that the network is tight. (RD-2, 2012).

As Research organization D is a project organization they need to create ideas for the network constantly. This means testing ideas with other actors and testing ideas of other actors. This is a constant cycle whose purpose is to find things that can be used as a basis for new projects. If these new ideas are not processed constantly when projects are running but only after projects are ending it would mean at least one year gap in collaboration because of the funding mechanism that cuts projects into periods. This means that for example in a two year program the latest the after first year it must be known very clearly what will happen after the first year and what actors want to achieve. This divides interaction into long-
term network activities and overlapping project activities. From this point of view funding mechanism encourages interaction of which focus is to create new project ideas. When Research organization D has ideas or program they try to find suitable funding channel for it. There are different time spans that relate to applying funding. In short time span it means that if Tekes or Academy of Finland has open calls, Research organization D needs to make program that suits into that call. In longer time span it means that for example with EU’s Structural Funds, Research organization D tries to discuss about what the next Structural Fund will look like so that they would notice what Research organization D does and that their programs would be suitable for them. According to RD-1 they have tried to seek if there would be suitable themes and subject areas for them within EU’s Structural Funds Research during 2014-2020 funding period. RD-1 further emphasizes that it is possible to influence funding bodies and what they want to fund (RD-1, 2012). Because of the funding mechanism projects only support activities that are compatible with the project plan. For example if additional webinars about certain themes are not included in the project plans they are not organized within the network around that project. This means that as most of the funding that Research organization D gets is projects based funding, activities that are not project related are quite rare. (RD-3, 2012).

According to CF network encourages interaction via suitable rhythm which is why the program that they attend works, as the focus is not just on presenting large end-results in a one-directional way. From CF’s experience this kind of presentations might be interesting but far away from their own situation and thus linking those results into their world is not too easy. If presentations relate to ongoing activities it is easier to figure out this link and start collaborating around it. If activities are done by a research group that conducts research within a certain field it is easier to ask about them and tell about actors’ own similar activities around it and compare which can be interesting. In this way it is easier to jump into the moving train before the program ends as if the results are presented in a final gathering and the program ends after that gathering that framework cannot be utilized to carry it on as both funding and collaboration end. If actors can find out something interesting for example after two years in a four year research program they have further two years to think, probe and find collaboration possibilities. In this way it is possible to regularly meet new people and hear what they have done as applying end-results can be difficult even if the problem is the same. In this setting the problem is also that people do not tend to read about the end-results and after a year those results can already be old. But if people see and
hear about something interesting and can send someone into the next event about that it can bring up something, especially if that person is new and can identify and throw new ideas. According to CF the cost of this kind of activity is almost zero and even if they do not bring anything they many times bring something beneficial later. (CF, 2013).

Similarly CA notes that network supports interaction via regular but informal collaboration that strengthens the interaction (CA, 2012). Further CD also notes that network supports interaction via regular events where certain people can meet each other and where potential partners can also be met. This is part of the normal activities but if the aim is to get refined result, there must be a common goal that actors jointly work on. (CD, 2012).

For CB the role of network as an activator of interaction is not as important as they have their own agendas to work and these agendas always start from them. For example CB knows so many partners that he knows what kind of cooperation is possible to do with certain partners. According to CB networking is perhaps most visible in this kind of things. (CB, 2012).

As some people never attend non-mandatory events the role of program coordination increases. RB-1 emphasizes this by noting that program coordination and management have the biggest responsibility and effect on the atmosphere they are able to create into the program including joint doing and we spirit. This atmosphere is not created via program that got funding as according to RB-1 there are good and bad examples that people just do not come to the meetings. Further RB-1 noted that it is good to think about why it is like this and what are those factors that lead to this as the same people who also work in other projects do not attend those events organized by other projects. So it is not about the people but those other factors that motive them to attend those events (RB-1, 2012). When project starts it is nice to familiarize with new people outside the work packages but mostly people do not have time for this kind of activities anymore. Also the amount of this kind of events has decreased as besides work people do not have time to attend nonspecific events, although the aim is to always organize those events (RA-1, 2012). The traditional way how network supports interaction is via events where people can meet people. According to RC people make their own decisions based on their basic attitude as the purpose of gatherings can be for example to grow the network, maintain existing network or just to enjoy refreshments. By contrast, network supports interaction between individuals by encouraging creation of new contacts for example via two day seminars where it is possible to build networks for example while going to eat together. For example
the basic idea behind one of Research organization C’s projects is to systematically create new networks via activities that are planned in a way that they support networking. For example during seminars there is time for networking during long lunches and breaks. (RC, 2012).

**Collaboration tools that support interaction**

As external context has an effect on episodes also the interaction that occurs via virtual collaboration tools will be analyzed. These analyses cover interaction tools that support interaction and knowledge sharing and storing within the network, within a single actor and between certain actors.

Facilitator A has offered a specific collaboration tool to be used within their programs but according to FA-2 it has worked quite badly as basically no one uses it and it seems that it is not very good. Programs have their own tools and ways to handle document sharing (FA-2, 2013) and participating actors can choose what tools they use within their work packages and smaller entities (FA-1, 2013). Only one program uses the tool offered by Facilitator A. A couple of programs use some kind of wiki-based tool and one program uses some kind of tool set from Nokia. FA-2 emphasizes that this has puzzled him very much. According to FA-2 probably improvement will be made to get an environment that would be common to all actors and which all actors would really use although they have not achieved this yet. (FA-2, 2013).

Within Facilitator A’s research programs there is no common knowledge base in a network level where all the results from all the programs would be collected, as the place where the end results will be stored is program specific. FA-2 was not sure if there is or would be a common network level knowledge base where all the end results from all programs would be stored, as results are program specific and in FA-2’s understanding Facilitator A do not have a centralized knowledge base where all the results from all the programs would be collected. FA-2 noted that when the program ends probably some kind of package will be created but FA-2 was not sure how it works in that situation as when the program is still running it is the concern of the program to collect the result material. Also consortium contracts limit the common view into all the results from all research programs as based on consortium contracts results are always consortiums internal matters and thus there is no information sharing between consortiums besides things that consortiums make public. (FA-2, 2013)
CA who participates research programs facilitated by Facilitator A shared similar view with FA-1 in that collaboration tools are not used efficiently. According to CA they have not been able to collect the entire program around certain channels and tools that they can say that they have some kind of wiki which represents their results or collaboration. Use of collaboration tools has been fragmented and the program have not find clear and common picture about what tools to use and how. These are partly budget issues but also because people have been adjusted into so many systems and ways, it is a big step if program brings new tools as then people do not familiarize with the new tools and how to use them in a way that it would serve all as peoples’ main focus is in a different environment set (CA, 2012). CD also emphasized people’s unwillingness to use new collaboration environments if they are forced to do so by noting that it is the nature of human beings that they cannot be forced to use certain environments in a managed way. (CD, 2012).

When Company D collaborates with external actors’, interaction systematics are created by common collaboration space that includes common ways how information is shared. Also their internal communication takes place via these common collaboration spaces. Some of those spaces are visible to all employees via user rights. Via these spaces it is possible to see online all the time what is happening within specific things via dashboards. These dashboards are based on information from projects or certain things. All the on-going things are visible via these collaboration spaces including what is done, achieved and closed and which individuals have contributed to which things. Within Company D work is constantly done via these collaboration environments in a two week rhythm. (CD, 2012).

When Company D collaborates with its network partners it uses these same collaboration tools which means that the collaboration environment is partly opened to those collaboration partners in a limited way as these collaboration spaces also include confidential information. People can only access certain collaboration environments which are built around certain things. Work with several companies can be organized for example as work packages within these environments. These collaboration environments are part of one information system not separate ones although in some cases they are used in a limited way. Collaboration tool that Company D uses is very multifaceted in this. Company D’s idea is that they carry out activities with their customers and partners via these collaboration environments so that the interaction or research with external actors do not differ from their internal way of working. Besides these
collaboration environments Company D also uses collaboration wiki’s for information sharing and while working with things. (CD, 2012).

There are different contexts and situations when using collaboration tools to support interaction creation. According to CC new tools that enable this kind of collaborative working should be utilized. Especially the inter-organizational collaboration should be even daily. Most fruitful in this are collaboration environments that are derived from social media in a way that it would naturally tie people together although they do not have daily face to face contact and context. Virtual environments should be a natural way to be in contact often (CC, 2012) as without interaction, virtual work does not exist (CB, 2012). Further CC notes that from their experience traditional stiff intranets are just material repositories and that this is a difficult problem to solve. Although CC emphasizes that collaboration tools should be utilized, in his opinion the biggest additional value is created in face to face situations as he has rarely seen that via collaboration tools significant dialog has been created. (CC, 2012).

One problem that relates to use of collaboration tools when sharing end-results and documents is that those results are often too academic. This means that when Company B arranges interviews for about ten people. Transcribing the interviews would make a 200-page report. According to CB when people see that 200 they do not touch it and thus Company B has to clean those reports and summarise them into two slides. In production related work the channel of influencing is so complicated that for example wiki is not sufficient in any way no matter how refined the content is as people do not read them and they do not have time to read them. Information needs to be targeted in a managed way (CB, 2012) as for example Company D’s internal wiki includes around 11,300 articles (CD, 2012).

Research organization A has used ConnectPro for video communications and tools like wiki’s for communication in general. According to RA-2 (2012) these tools are commonly used and there are specific persons that are responsible for certain tools that they use. They have also their own research group level wiki environment which has been good as companies cannot let other companies or researchers into their own information networks so Research organization A’s so called neutral wiki environment is something that companies can use. This wiki environment is maintained and updated by Research organization A as its licence is not university’s but research groups own licence so university’s people do not have access to it as it contains very confidential information. Because of this it is not possible to keep it open as possible information leaks need to be prevented.
This wiki environment is a big competitive advantage for Research organization A. (RA-3, 2012).

From venture capital point of view Facilitator C does not utilize collaboration tools as such although they have a website where companies from the region are listed based on their industrial domain. Facilitator C’s purpose is to offer this information to actors who come from outside of the local region. They also have long lists of companies from where they can select companies to entrepreneur-investor gatherings and meetings. They also send one page summaries of new companies to regional business angels when they get those summaries from companies. So Facilitator C has different ways to communicate but according to FC they are not as efficient as they could be but at least helpful. (FC, 2013).

Also RC noted that these ‘public points’ that include information about programs make the building of basic trust easier as they can be used as references and communicating from inside to outside is easier if actor can cite to those points as sources of further information about the program. These public points make it possible and easier for people from outside to contact the programs. (RC, 2012).

Utilization of collaboration tools is something that Research organization D needs to improve but according to RD-2 it is quite difficult to figure out which is the right way. They have their own websites, Facebook and LinkedIn profiles and they use emails as communication channel but they lack communication strategy as a whole although this is partly budget issue for them. (RD-2, 2012). Similarly RD-1 notes that Research organization D needs to improve the utilization of collaboration tools as they are not even near the ideal situation and there is lot to do with this. This problem partly arises because they are a project organization where people change when project changes. Change of people creates further problems as very often only a fraction of things that people know can be found from the project reports and when people leave information leaves with them. (RD-1, 2012). Also RD-3 notes that Research organization D does not have official mechanism about how to share results with collaboration partners. Tools that they use for information and knowledge sharing vary from situation to situation. Information they share are mostly beforehand agreed end-results, certain parts of the results and reports. For example they do not have any collaboration tools derived from social media where people can discuss and where discussions would be stored although RD-3 notes that this kind of tools could be good. (RD-3, 2012).

From company perspective also CF notes that utilization of collaboration tools could be improved when they collaborate with external partners. They have
tried and tested different collaboration things but they have not been as beneficial as they had initially imagined. This is partly because of people's skills and capabilities to use such tools in information sharing but they do have a place for information sharing. (CF, 2013).

When research program that Company F currently participates started the idea was that collaboration tools could be used as discussion channels and while working but this has not been realized within this research program. CF is not sure if this has been disturbing as work packages within the research program are very different and within their work package themes are much clearer and limited although they can be quite big. Within these work packages certain actors contribute to them and there is necessarily no need to jointly check them often. Packages do not proceed quickly so it is enough that some actors check jointly what has been done four times a year. This means that research organizations investigate things and tell about those investigations and companies tell about their experiences regularly in a short way. If companies have concluded bigger step then they tell about it in a more prepared way. According to CF this has worked quite well as activities that companies do are not as clearly joint working as he initially thought. Within these work packages regular meetings are also organized via videoconferencing to decrease the amount of travelling. This means that people can attend at nearest place where videoconferencing is organized. Typically in Helsinki or Espoo and Oulu and possibly in Jyväskylä. (CF, 2013).

According to CG supporting interaction within a network occurs via on-going interaction. This can happen by discussing with people they know while seeing them or via social media. CG emphasizes that within all networks personal relationships are important while doing business. This requires being open and determined about actors’ own goals. (CG, 2013).

8.1.2 Relationships

The second element of interaction process besides episodes is relationships. Relationships are characterized by actor’s dependence on activities of other actors, specialization within those activities, interdependences between activities and common and conflicting interests between and within actors. Next the dependences and interdependences of actors’ activities as well as actors specialization within those activities will be analyzed together. After that, common and potentially conflicting interests between actors will be analyzed.
Activity dependencies and interdependencies

As Facilitator A’s research programs exploit sprint method it means that the interaction intensity does not divide smoothly as activities of some actors are emphasized during program’s early phases. For example when something new is created it might be that first three months are used to investigate the global state of the art which is typically done by universities. After university actors have gone through and examined all the scientific materials, it is jointly thought about what technological choice will be made as that choice forms a base for further activities. After this, companies can truly start their activities. This means that when implementing starts and after it is possible to divide the work, it is possible that certain actor might complete its piece of work within a week as the size of work pieces vary a lot. There are a lot of dependences between work entities, which means that some actors cannot start their parts before other actors have finished theirs. This means that actors cannot decide when they start their work as they need to wait for others to finish certain parts of the work first. Those actors also need to tell what they have completed as other actors want to know about that all the time as they want to know when things proceed and what choices will be made after that. (FA-1, 2013).

The most important actors with whom FC has interactions are Tekes and ELY Centre as they give loans, R&D funding and start-up funding to same actors that also venture capitalists invest in. Other interactions occur with companies that seek funding. In this setting Facilitator C’s role is to identify companies business cases and if those cases will interest venture capitalist or not and after that link those companies with venture capitalists. To decrease this kind of individual guidance Facilitator C organizes different kind of events as often as possible, if for example pitching and sparring events. During these sparring events Facilitator C helps companies to develop that kind of presentation which interests venture capitalists as according to FC it is a different to sell technology than to sell a company. Facilitator C also tries to persuade different kinds of funding bodies, like business angels to their events, and also directly send information about new cases to them. Basically all different kind of funding bodies in Finland that Facilitator C knows about are their collaboration partners including public actors like Tekes, ELY Centre and Finnvera. Further Facilitator C counts business accelerators as investors. (FC, 2013).

Facilitator D is involved with supplementary funding related interaction. This means that a couple of months before they give their proposals to Tekes they have
a preparation phase where they internally iterate and spar research groups about their research proposals with external evaluation or sparring group. The research group presents its idea to them and receives sparring about it. At the same time it is a learning episode where other researchers can also attend to see and follow presentations from other groups and to hear feedback about them. Via these iteration and sparring episodes the application is refined into that kind of form which may be justified to send to Tekes. (FD, 2013).

For Facilitator B neutrality about funding related discussions and decisions is the factor that divides interaction firstly into general discussions and guidance in a network level and secondly to mutual funding related interaction and funding decisions. In latter interaction Facilitator B needs to be strict that they are neutral to all actors and thus ensuring their neutral position has a direct effect on the discussions they have with actors that are applying funding from them. This means that for example start-up companies whose personnel do not have experience about funding mechanisms are in a certain way in a worse situation. It is very common that start-up that applies funding sends that kind of application that it does not tell those which should be told to Facilitator B. For this reason Facilitator B has prepared themselves so that companies can come to probe with every funding application and present their case before they send their proper funding application. In this way companies can get the idea what they need to present in their application so that it would be as good as possible and include all the mandatory criteria for funding application. It is not a critical mistake to give an imperfect funding application as Facilitator B’s customers have the right and opportunity to complement their application all the time and further Facilitator B will tell about possible shortages and deadlines for them. There are also consulting companies who help other companies to apply funding although from Facilitator B’s perspective applying funding should not be that difficult and complicated that it would require consultant to help a customer to write the application. (FB, 2013).

Common and conflicting interest

As Facilitator A’s research programs are industry driven they are not beneficial to all academic actors in the short-term as for example Facilitator A’s biggest program is not beneficial to Aalto University’s professors because scientific papers that Aalto University’s strategy rewards are not created from this program. Instead this particular program is beneficial because then the professors would
know that their research has industrial relevance. In this setting FA-1 emphasizes that it is about university’s own strategy and professors own thinking if it is beneficial to attend as it is not shown in personal bonuses as rigid journal are not created. (FA-1, 2013).

Role and motives of smaller companies within Facilitator A’s research programs vary. One clear group of small companies are those that seek for partnership with big companies. From them research programs offer a way to show that they indeed know something and lobby themselves to get for example subcontracting. Similarly some small companies seek for sales channels as for small companies it is hard to sell outside of Finland and thus they see that they can sell their know-how as part of bigger actors’ offering or that they need to be a part of a bigger thing like a certain ecosystem where they do a small piece. According to FA-1 some of the small actors have found this kind of clear role within certain ecosystems and one of Facilitator A’s missions and aims is to create new business ecosystems and some completely new ecosystems have already created. The one driving company behind the creation of one of those completely new ecosystems was a SME. This ecosystem also includes big actors. (FA-1, 2013).

Although in a way all actors have same preconditions to participate Facilitator A’s programs, some actors are more active than others and see network benefits stronger than others. For example although actors would feel that attending network meetings would be beneficial to them people do not come if they have other things to think about, like employee co-operation negotiations. Second thing how organizations differ is the organizational culture as traditionally there have been more organizations which think that if something is not made internally it does not have any meaning for them although this has been changing after the mentality has been changed toward open innovation thinking. (RB-1 2013).

From Research organization D’s perspective problem with collaborating with big organizations is that their organizational change cycles can be quite rapid. This causes challenges for Research organization D if those rapid changes happen in a big organization with whom they want to do collaboration within a certain strategic focus area. Smaller companies typically must engage with their strategic choices as they have limited resources. Bigger companies by contrast are able to make bigger moves with their strategies. Although small companies are more agile than big companies in general they are more stable when doing strategic collaboration within a certain focus area as big companies might react to changing
market or business situation by rapidly changing direction or stopping certain activities completely. (RD-2, 2012).

Themes and focus areas that have been pondered jointly during mutual meetings have interested actors in a different way during programs that CA participates. For some actors certain theme and its content have been very current and fitted well in their current situation and for some actors they have not. Within this kind of interaction actors ponder around common things that relate to program’s needs as a whole within program’s current schedule and focus. Although actors can participate and put effort into this, if there is no link between actor’s daily activities it is not as current as it is to other actors. This means that if themes and focus areas are not current, actor’s possibilities to give and to receive things to and from them differs from those actors to whom they are current and interesting. For example when CA is doing certain specific things and discusses about them with certain partners where the link to their daily activities is direct and immediate and thus relevant to them. This also means that the interaction of certain actors is highest when people have direct interest about specific things and when those things are gone through in the work package level by concrete activities. (CA, 2012).

Within the research consortium there might be either common research problem or set of separate problems. For example Company B was once seeking for a project and funding and asked from EU if ITEA would have open projects that have got approval but do not get consortium up. In this particular project collaboration was not possible and interest toward it disappeared as other actors worked on totally different domain with different tool environment. Sometimes projects are organized in a way that they stay separated. CB (2012) emphasized the importance of actors heterogeneous in asset creation by noting that:

“(…) if we put. Give a problem to a group where all are engineers. Then the answer that comes from there is quite easily blue-eyed. When we put humanists, economists, greens and engineers there all mixed up then the answer from there is not usually very strong. But if that comes it is very high quality. Then here is a bit same. Same situation. So that by organizing that project in some way we get a certain kind of result. And by organizing differently we get a different result. And now do those project leaders know these things then it is a question per se.”

So the way that project is organized and what kinds of people are selected there have a direct effect on asset creation. In a smaller group there will be more
interaction and that interaction is valuable but that interaction is also targeted. (CB, 2012).

If intellectual assets are processes, CB is not willing to take external people to work with things that relate to changing internal things within Company B. Currently they have big internal changes that relate to internal processes that are under internal non-disclosure agreement (NDA). As external people are not used while making internal processes better, interaction is fostered via pilots and development studies to get instant feedback about things that work. In this way Company B creates internal demand for those changes so that people want those improvements. If value in this context is considered as processes that have been put in to use efficiently, interaction is guided via Company B’s internal organization that takes care of these processes for example via forums and persons in charge. Problem here is that people in production are not interested in these processes as product lines are independent and with different variations and deployment times of these processes. To prevent this, processes are tried to make quite generic which is hard. (CB, 2013).

Within the research program that Company C participates there is also sub working groups that are called communities of practice where people from same domain interact. Collaboration and outcomes in these communities differ a lot based on people’s different backgrounds and their organizational goals. At best cases they include people with similar mind-sets with common goals which means that things can proceed rapidly but if views and goals are different it might be that the collaboration does not work at all. Extreme examples of this are international standardization programs where even one actor can effectively hold things on purpose. In general CC’s opinion is that it is worth to advance all kind of openness and seek the limits of that openness as somewhere there is a limit. Further CC emphasizes that the interpretation is too often that the limit is too near as in CC’s opinion it should be always thought how far those limits can be put without risking existing things. (CC, 2012).

When intellectual property rights (IPR) or patents exist within university’s patent portfolio and those rights have been transferred to the company then the role of the university gets very small as then business development activities are done by the team of entrepreneurs and possible by business developers. Facilitator D has aligned their role in a way that they are not involved with activities of these companies in any way. Even if a university gets IPR, the university is not the active owner as university’s role is research and entrepreneurs do business. If research group wants to patent their research results or get other IPR’s they need
to do invention disclosure to the university so that the university can decide if they want to forward it or if they have some commitments to it. These commitments most commonly relate to collaboration with companies as companies might have rights to those inventions and thus researchers cannot forward things independently. If university wants to forward things via patenting university pays patenting costs. If university decides not to forward things then researcher group or researchers have to cover patenting cost by themselves as they cannot use research funds for that either. (FD, 2013).

According to CA last year of Facilitator A’s program they participate is very dissemination focused for academic actors as they need to get something on paper. This means that the focus of academic people shifts toward documenting things that were experienced. Documenting these things is not necessarily as relevant for Company A, as according to CA, although documenting things might include a lot of valuable things, it differs from what is valuable for them. For Company A the biggest value comes from that they have started to critically monitor their ways of working and to seek for views and experiences about how to develop them. For them, putting these experiences on paper is not necessarily the most interesting thing. Company A has not limited academic actor’s publications about their research results in any way as academic world is very careful about what they publish and get approval for all their publications. So Company A does not have any needs to delay any publications and change something in them, although academic researchers ask them if their papers are fine and Company A will give comments if needed. (CA, 2012).

CB also notes that he has been in some projects where the research problem was initiated by university actors which needed field data from companies to solve them. Although these university initiated projects have many times proved to be quite reasonable acquisition from them has generally been quite small. This is because if CB does not have deployment interest it remains only as a potential case for Company B. He further emphasizes that although universities like that kind of projects redundant academic is a bit red cape in Company B and that it is better to be careful with a basic research as it can get so academic that it is not understood in Company B. (CB, 2012).

8.1.3 Differences within interaction

Within Facilitator A’s research programs, interaction differs between network level and work package and sprint levels. The spectrum of interaction is very
twisting. For example relating to the purpose of interaction and speed of doing things and delivering results in industry when comparing to universities (FA-1, 2013) as working stroke in industry is about ten times faster than at the universities (CB, 2012). When Facilitator A started to exploit sprint method within their research programs, many universities said that research, not even industry based research, cannot be done while using sprints but according to FA-1 it has been possible. For example speed can be accelerated and research tasks can be divided into pieces in a suitable way. Within universities this has been a learning process of its own to prove that research can be done in this way, although it messed up the academic freedom and campaigns against it very strongly. Further FA-1 notes that probably basic research related programs could not be done in this way but their programs are applied industry driven research programs. (FA-1, 2013).

Facilitator A’s role is focused on program preparations and contract specific things and thus in work package and theme levels companies act based on the framework that Facilitator A provides. Facilitator A does not have time or resources to follow what happens or does not happen within these levels and thus activities that relate to work packages and sprints stay as program internal matters are organized in the way that programs want. Program activities are guided by a milestone system which guides goals to be met. This means that programs have certain timeframes to do and to deliver certain predefined things. (FA-2, 2013).

Although methods and ways of interaction change and are different, FD is not sure if interactions content differs or not. Interacting with management and ministry is in a more general level than the interaction with researchers as then the communication is in a very detailed level (FD, 2013). Similarly RA-1 notes that interaction in a network level is usually more formal and the interaction between single actors is more informal interaction. Usually there is a defined contact person that handles actor’s internal communication and the communication between these people keeps things up and running. (RA-1, 2012).

This indirect route of communication might have some effect on the intellectual assets that are created but according to RA-1 this is usually taken into account during planning phase as all actors have their own activity packages from where the end-results will appear. Further RA-1 emphasizes that if results are planned well usually it is a sufficient level of communication. But these end-result packages are exactly the same as the planned ones. This means that if the interaction that occurs between planning and end-results is taken away, the value of the end package is smaller than it could be but many times companies do not
want to reveal the whole process and thus many times part of the created knowledge will stay within the company on purpose. Companies will reveal part of those results but results that they reveal are not as rich as the results that were created inside the company but for companies this is a selected way to keep up in the competition. However, usually Research organization A sees the entire output and more than companies publicly release. RA-1 emphasizes that companies always have core businesses that they do not want to tell and as a secondary product of research publications in fact a lot of things about companies activities and their future directions can be derived if companies and research organizations tell all the things that they have seen. Further Ra-1 emphasizes that research organizations need to be very careful so that they remain their confidentiality and neutral position. (RA-1, 2012).

When new individuals come to a community that is not familiar to them they need to consider what kind of knowledge, including business secrets, they can share. Companies in some consortiums have deployed that kind of way of doing that they cannot tell what is interesting to them but if some other actor propose something they can express if they are interested or not. RC emphasized that this kind of actors are very difficult to do research collaboration with. In these cases trust is created while sharing suitable amount of knowledge. First smaller amounts and when actors see that knowledge sharing does not bring harmful effects the amount of shared knowledge increases over time. (RC, 2013).

Generally within collaborative research programs researchers needs to be involved in preparation phase as every participating individual need to have their own research interest that needs to be booked in the projects plans. It does not work in that way that some people agree what to do and some people do research based on those agreements. New actors always need time to learn how to do collaboration with others and vise versa other actors learn to collaborate with new actors as it takes time to find the common tone with new actors but collaboration cannot proceed without it. With old actors, collaboration is easier as then people know each other and ways of working and thus for example starting new projects can be agreed via telephone. Longer time periods without collaboration with old actors is not a problem if both actors have done their job well in previous collaboration. This means that trust between actors is important. When actors from new countries have started Information Technology for European Advancement (ITEA) programs their first projects have been kind of learning projects and according to RA-3 their contribution has generally been quite small during their first project. As cultures and funding mechanisms differ between
countries the focus has been more on the characteristics of an organization rather than its contribution to its first ITEA program as according to RA-3 in the next project they do their job well. (RA-3, 2012).

During the early phases of research programs that are organized as consortiums, all actors do not know all other actors. In this phase actors learn to know each other and trust is created. Typically Research organization A's situation as a research organization is that if they do research in their field they know people but those people do not necessarily know each other. As Research organization A is not usually directly working with products they can participate research programs where competing companies can share their experiences, like best practices, quite freely. According to RA-2 when competitors are sharing information within same programs it has a positive effect on creation of new knowledge. RA-2 has not seen problems with this but notes that information sharing is more sensitive when dealing with products. In this kind of research programs all the actors naturally try to utilize research results and create value based on those results and for example Research organization A takes part of applying research results as it is one of their research focus. (RA-2, 2012).

According to RC within the research programs interaction takes place in two levels: in program level where the focus is on program administration and funding including what funding body want and need, in content level discussions relate to research themes and concrete research interests. In content level actors form shared view about valid research problems that are worth of researching in relation to programs’ research themes. This means that intellectual assets are created within specific focus areas that are decided in the program level. Program level also considers in which direction focus areas should be targeted and decides if new focus areas will be established. If research program includes several focus areas individual actors divide themselves into smaller units like research groups or business units that participate research within specific focus areas. In these cases there is an individual in the program level from these actors that sees over all their units and can spot interesting outcomes that can generate new business to them and thus allocate more resources to those focus areas. (RC, 2012) As Research organization D’s resources are limited, occasionally the focus of how to invest them need to be positioned again. This positioning is partly done in the collaboration with other actors, although the focus is based on actor’s own vision about the direction Facilitator D wants to go. (RD-2, 2012).

Collaboration networks that are purely research based networks are best for program activities as if new program is started with an actor that is already known
it is possible to know that things will work with this actor. On the other hand there are actors that Research organization D has discussions from innovation perspective about what they have done and what could be done that new businesses would be created based on their research related activities. These are the permanent types of actors that often take part in Research organization D’s collaboration projects. Further RD-1 notes that for example during different conferences and similar events antennas are all the time upright to find if there is any new and interesting actors that might be interested to do collaboration with Research organization D. RD-1 further emphasizes that after initial contact its after-care is essential as there it is possible to see if it will create something reasonable or not although it is always possible to try and if it starts to feel good then it is possible to go deeper in that collaboration. As Research organization D does not have any competitors, just cooperation partners, the connections with their ex-employees have stayed quite well, which means that they can still link those persons with external actors if those actors need knowledge that Research organization D’s ex-employees have. (RD-1, 2012)

Actors to Research organization D’s programs are selected based on core know-how and its profile. Their network is like a living organism where actors do not need to participate in all activities. For them network is essential as they do not assume that they would know and understand everything. Other actors’ contribution within their programs can include specific core know-how and coordination know-how. Within Research organization D’s programs it is possible to acquire certain things via sub-contracting from smaller companies if program has resources for that as it is an agile way to do so. If certain companies participate longer programs it can mean that it is not possible to use external actors although these programs could have more resources as in these cases program needs to follow the predefined plans, including funding framework. (RD-1, 2012).

From Research organization D’s perspective also interaction between national and international levels differ in a way that interaction in the national level is more visible also with companies. This means that Research organization D knows more about companies’ current activities. Also discussions in different forms are possible between work packages. Interaction in the network level is more opportunistic while in the program level interaction is more regular and planned. In the network level actors seek opportunities. This opportunity seeking is guided by different funding mechanisms like open calls that relate to certain topics within certain time spans. These open calls are elements that activate the
interaction as for example big calls by EU include a lot of activities like discussions, meetings and seminars. According to RD-3 Research organization D has tried to lobby EU, national and regional level funding bodies so that their calls would relate to Research organization D’s research and research area, although it is hard to say if lobbying has brought any advantage or not. Secondly, lobbying is also beneficial as knowing people behind certain funding mechanisms might turn out to be beneficial. (RD-3, 2012).

The good thing about the programs that Facilitator A coordinates is that they lower the step and expenses while checking new things as otherwise that could be too expensive and time consuming and thus it could be bypassed. Within these programs natural place is created to check this kind of new things with a reasonable cost. This means that actors have the opportunity to check more things. Finding this kind of partnerships and communities is not necessarily purposeful and guided by a plan. CF emphasizes that from the company owner’s point of view participating this kind of programs is absolutely worthwhile as costs are quite reasonable and it is possible to adjust actors own activities along the way. Although it is a research work some of the things from these programs are directly applicable in developing their ways of working that quite fast bring benefits and effectiveness. The set of values within these programs is so big that according to CF it is strange if benefits are not bigger than the investment. For example for employees it might be more interesting to work in that kind of environment where new things are dared to be tried as for example younger people might put more value on things that could be interesting in the future and things that forward their careers. (CF, 2013).

### 8.1.4 Interaction intensity

As Facilitator A’s research programs exploit sprint method interaction intensity within sprints is not divided smoothly as certain activities and contribution of certain actors is emphasized during the programs early phases. According to FA-2 Facilitator A’s representative is FA-1 who is a chairperson of management groups of every single research program they have and thus FA-1 sees and hears what happens but FA-1 or any other person from Facilitator A does not follow research programs within their daily activities as programs are responsible of their own work by themselves. When program starts, a four year plan will be made and also annual plans to apply funding. Within a year there are sprints so that within
programs there are certain dynamics. This means that although there are yearly aims, some within a year adjustments can be made. (FA-2, 2013).

Within much smaller and more focused ecosystem programs the activities are more experiment related and thus outcomes are not known beforehand. Within ecosystem programs the aim is to get a feeling of certain businesses and their future directions. The fundamental starting point is that in principle Facilitator A does not administrate end-materials as these materials are not theirs and activities that relate to their development are not theirs. Facilitator A just offers the framework where activities occur. In this setting it is essential that companies act and new know-how and results are made for them and that companies utilize them. Facilitator A is just helping companies with this. (FA-2, 2013).

Although research programs include systematics that every three months people gather together to present their results it takes time before everybody notices that this is a good practice and going to these presentations is useful for them. Letting people to know each other takes time. In this way the interaction increases after systematics are learned and it will probably last till the end of the program if network brings benefits to them. If people work together without benefits from networking, the interaction intensity will decrease. But if the network can keep up those benefits via interaction and intellectual assets interaction intensity will stay and it can last in other forms after the program has ended via new projects, programs and interaction between individuals. Interaction increases after ways of work have been learned as well as where assets are stored and who benefit from them have been identified. Within research programs assets are created even weekly although all of them are not assets that are beneficial and can be deployed also by other actors. This means that it takes time before the amount of beneficial and deployable assets starts to increase. The amount of this kind of assets increases dramatically at the end of the research project’s when those assets start to be concretely ready. (RB-1, 2012).

Within Research organization B’s research programs assets are created into a formal form. One example of this formal form is leaflets that are made every three months which include links to those formal assets including information about actors who created those assets, what was the result and where the asset is located or who knows where it locates. This three month cycle is also a deadline when assets have to be delivered into a formal form. As it is planned beforehand what kind of assets will be created they are not just in the minds of people but planned systematically beforehand as well as other results. In this way partial results are created within a certain cycle. (RB-1, 2012).
From FC’s perspective interaction is most intensive while Facilitator C is organizing events and during funding calls. On the international level, interaction intensity is higher while creating relationships (FC, 2013). From FB’s perspective most intensive interaction occurs when Facilitator B receives very promising funding application that instantly raise the feeling that it could be a big thing if it succeeds. This kind of applications will naturally get more effort from Facilitator B although the interaction takes place in a discussion level or within certain theme. As Facilitator B needs to be neutral for all applicants, informal meetings are much easier for them as those meetings do not directly relate to funding but rather Facilitator B’s certain expertise or new theme areas. In these cases Facilitator B does not need to think about their neutrality and thus they can involve themselves into deep and tight discussions and give their personal opinions based on their own expertise. (FB, 2013).

According to FD while following what is currently going on in research the interaction is not as hectic. During this type of interaction and activity it is enough that Facilitator D follows what is happening within certain research groups and visits them once or twice a year. When the bell rings that something is actually happening, then it might be that there is a need to meet researchers if not daily at least weekly to foster things and develop them further. Interaction intensity and how much effort is being used to it varies based on the situation. When Facilitator D has identified certain things with research groups that they want to forward the role of Facilitator D decreases and the role of external experts increase. This is because then Facilitator D’s role switches to coordination as they do not have resources to involve with that kind interaction deeper. (FD, 2013).

According to RA-1 activities of universities and research organizations within research programs are usually quite stable. For example during four-year projects companies might change, new ones established and old ones go to bankruptcy so universities and VTT are stabilizing factors as companies live in a quarter economy when results need to come fast and something happens fast. Within long projects universities’ role might be to look things from longer perspective and thus their role stays similar all the time with similar activities as companies’ activities and focus areas might change very fast (RA-1, 2012). As Research organization A is a moderately big research group their focus is on taking care of their research program portfolio and thus the focus is not on single programs and their continuum, as according to RA-2 many times it is difficult to get direct follow-up program for research. Especially actors like Tekes are in this sense
difficult funding bodies as Tekes is not willing to give a follow-up program if there has been a program. (RA-2, 2012).

While trust in research consortium is established interaction intensity increases. Interaction intensity starts to increase when concrete work is started and after there is clearer understanding about participating actors and what valuable they have brought to that interaction. According to RC intensity usually increases after goals have been achieved and after that network goes into a maintenance mode as there are no active activities going on. In contrast research groups’ own gatherings are those events where interaction occurs. Every time that interaction occurs it strengthens the network. (RC, 2012).

For Research organization D program preparation phase is where additional value is searched for all the participating actors and additional value is unfortunately formed in that phase as implementation proceeds within the plans that were made in the preparation phase. From RD-2’s experience preparation phase is central for identifying factors of additional value. After that phase program proceeds with predefined tracks and implementation phase is less dynamic than the preparation phase as in that phase the assets that will be created are defined as in that phase ideas about things that could relate and support programs activities are created. (RD-2, 2012).

Within Research organization D agile process model has become common although it is not applied through all the research projects and areas within their organization. Further Research organization D exploits sprint method which means that their research proceeds one sprint period at a time and after each sprint goals are evaluated again. Exploitation of sprints has generally shortened research cycles and although sprint meetings are short they are information rich events (RD-2, 2012). Similar short intensive interactions in the informal level occur in the coffee room while morning coffee when it is possible to shortly discuss about what was done and what will be done and while meeting potential collaboration partners or existing collaboration partners to briefly update current situation. This kind of coffee moments are surprisingly important as well as discussions around coffee table as there people often learn new things. (RD-3, 2012).

According to RD-3 although sprint method is exploited within some of the Research organization D’s programs, Research organization D does not use sprint method internally. If a sprint within a research program relates to research question its length is one to two months. If sprint relates to certain software task its length is usually couple of weeks although the length can also be couple of days. Typically these sprints relate to research problems. Research organization D
has weekly meetings with some of its collaboration partners that have agreed about weekly meetings. Purpose of these meetings is information sharing. (RD-3, 2012).

Within some programs that Research organization D participates, interaction occurs if not daily at least several times a week for example via meetings. In some programs, for example in some EU-programs, joint meetings happen more rarely. When project has already started, interface to funding bodies occurs via steering group which is the only interface to them. There project’s current situation and guidelines are discussed and commented with funding body’s representatives. (RD-3, 2012).

RD-1 has a different opinion about the most intensive phase of the interaction. According to RD-1 during the dissemination phase there is a need to be sensitive about what is created as Research organization D wants to actively bring up opportunities about things that have been created as they want that those results would be utilized. If Research organization D sees that certain things are good they actively try to convince other actors to see that they are good things. (RD-1, 2012).

Recently Research organization D has started discussions about how business models could be developed within their research context. Earlier this was not possible as first there needs to be intellectual assets to consider who would be ready to pay for them. According to RD-1 now Research organization D starts to be in a situation where those business models should be actively found so that they could evaluate the potential of intellectual assets and how to seize them. (RD-1, 2012).

CA (2012) has not noticed that certain phases of the program Company A participates would include more intensive interaction than others although interaction of certain actors is in its highest level when people have direct interest about specific things and when those things have gone through on the work package level by concrete activities. For academic actors last year of that program is very dissemination focused as they need to get something on paper. This means that the focus of academic people shifts toward documenting things that were experienced. (CA, 2012).

In CB’s opinion there are not phases that include more intensive interaction than other phases. Instead CB notes that if companies do not start collaboration with each other’s then the collaboration with universities and research organizations increases. According to CB this is a clear phenomenon. Further if there is a lot of collaboration between two companies then there is usually a
researcher or research organization as a third party. Regarding funding related intensity CB notes that if they decide to start to prepare a three-year EU program today it might be that the program ends in five year from now. This is because for example there are certain dates when actors can put applications in and for example Tekes has lined Company B up with their application nine months at most. Further this means that if projects length is three years it might take five years from first project idea to project’s closing meeting. During this time company changes a lot and thus within publicly funded programs it is wise to document aims and operational models loosely so that it possible to react to them. CB notes that he once documented aims and operational models strictly and he was in very big troubles with them as that program related partly to hardware and the hardware generation was changed. (CB, 2012).

According to CC interaction intensity within research program that Company C participates is highest when things are done face to face and via virtual environments while additional work as during that phase all actors cannot be physically present all the time. Deadlines within the program also encourage interaction and virtual collaboration for example via common targets that have to be met before certain days. For example within their research program materials from all actors were required for external evaluation. This material was handled virtually without any face to face interactions. This kind of virtual work is successful if actors have interest, drive and common goals. (CC, 2012).

For Company F there are no phases that include more intensive interaction than other phases within Facilitator A’s program they participate. This is because Company F’s investment into this program is not big and from intellectual asset and value creation point of view they benefit from this program via more efficient networking and opportunity seeking (CF, 2013). Also from Company D’s perspective there are no phases within their research programs lifecycle that would be more intensive than other phases. This is because Company D’s interaction is intensive all the time, just the form of that intensive interaction changes. (CD, 2012).

From Company E’s perspective interaction intensity is highest during certain meetings and events like tradeshows as for example during trade shows it is possible to check out beforehand what companies will participate and do some mapping beforehand. In this way it is possible to utilize those tradeshows more efficiently. (CE, 2013).
8.2 Analysis of valuable assets

In this research interaction is characterized by joint problem solving, it combines activities and resources of actors, increases the value of actors' resources and fosters value creation. As the resources part of the a priori analysis framework includes resources, knowledge and capabilities and as knowledge is a primary source of value also recourse, knowledge and capabilities are considered when assets are combined from several actors. As different actors may have different views about what is valuable and what is the source of value in this research the assets part of the a priori analysis framework consists of potentially valuable assets. For this reason valuable assets part starts by analyzing the nature and importance of interaction in intellectual asset and value creation within the network. Secondly, the focus is on interaction that relates to combining assets from different actors. As interaction increases the value of actor’s resources thirdly the focus is on analyzing how interaction increases the value of single assets. Finally, as actors have differing opinions what is valuable and what is the source of value fourthly the analysis will focus on value potential of intellectual assets.

8.2.1 Interaction in asset and value creation

Facilitator A does not have any role in intellectual asset creation as that takes place outside of them. Hard work that creates these assets takes place within sprints and the interaction within these sprints creates these assets. During these sprints, predefined assets are created, assets that are documented in the sprint backlog. Within sprints interaction that creates intellectual assets takes place within a smaller group of people. FA-1 does not know what actors work within these sprints and what they do there as he is not interested in that. Conflicts that arise are solved but no role besides that is taken as FA-1 is not interested in sprint specific things and which actors contribute to them and what they do. (FA-1, 2013).

Facilitator A does not have role in commercialization or value creation either as they are neutral networker and trusted non-profit organization whose role is to support companies without their own business and development activities. Their role is indirect as they hope that their programs include also business model related R&D and that their programs would create entire ecosystems but as an organization they do not take part in commercialization or value creation that are
based on the program outcomes. Within their programs, commercialization and value creation are part of companies and research organizations role. If Facilitator A sees that certain thing works they can propose it to other actors so that those actors could see if it works also in other environments. This kind of best practices sharing between programs has been tried. (FA-1, 2013).

Conference papers and degrees from universities and research organizations do not have any value to companies or Facilitator A. Facilitator A does not have targets for that kind of outcomes although FA-1 asks that kind of information from research programs once a year to document them. Recently one university rector asked about their share of the funding that Facilitator A shares and emphasized that funding must be same as their share of master’s degrees in ICT. However Facilitator A does not have any obligation to do so as getting funding is based on activity and know-how of actors in a way that companies see that the know-how is current. This is the only requirement that Facilitator A has from universities and research organizations as FA-1 trusts that when companies select universities and research organizations to programs they check that they do reasonable things as the companies are eager. As funding to these research programs is shared annually it means that when next year’s funding will be shared companies note if reasonable outcomes were not received from certain universities. In this point those universities will meet a wall as companies do not want to continue with them anymore. FA-1 note that in this kind of industry driven research people that truly do the work at the universities are not professors or toughest researchers but junior researchers that do their thesis or are in the latest stages of their studies as they are willing to learn new ways. (FA-1, 2013).

Within some of the programs that Facilitator A has actors agreed that certain things will be published during certain time period. For example in one research program all the end-result materials will become public after certain time period. Facilitator A has also programs without compulsory publishing of outcomes. Within these programs only separately agreed material will become public. Within a consortium all the materials are available to all actors immediate after they are done. Within Facilitator A’s research programs participating actors get rights to all result materials within the program they participate which means they have free, irreversible licence to utilize those results in any way. Results of research programs are either public to all or available to actors within the program so there is no middle level between the programs, like joint repository for intellectual assets as all research programs are single entities and consortium contracts are program specific. (FA-2, 2013).
Within Facilitator A's ecosystem programs publishing of outcomes is more limited as actors can decide by themselves what they are willing to share. This means that even if Facilitator A proposes free licenses during the program, and rather also after the program, companies have the right to choose how outcomes are shared and with what terms. Within ecosystem programs certain outcomes are available to all participating actors based on consortium contracts. (FA-2, 2013).

FA-2 did not know how actors that do not participate research programs could utilize program materials as he did not know if mutual discussions with external actors take place or if it is possible that actors could publish those materials publicly or to certain external actors as Facilitator A does not facilitate or guide this in any way. Research programs are their own entities that administrate their own end-result materials although participating actors can utilize them in their own products and other activities freely. (FA-2, 2013).

Within joint research and research programs creation of intellectual assets is quite a lot based on interaction as within networks, ecosystem programs or projects intellectual assets are not created without interaction. This interaction takes place when individuals tell something to researchers in a role of an expert or researcher is doing something in a company in a concrete way. If intellectual assets could be created without interaction it would mean that people just gather around joint bag of money and do something without real benefits as a whole. According to RB-1 within Facilitator A's programs collaboration is required. This is one of the boundary conditions that make network benefits visible in a way that funding is not given if there is no collaboration. In this way actors by force start to seek for collaboration and while doing so in some point they might find right actors that are truly beneficial. (RB-1, 2012).

After intellectual assets have been created and network utilizes them, communication is in a key role as certain group has created them and know that it is good and they benefit from it but the network as a whole does not know about it if those people do not tell about it. According to RB-1 systematics play a key role in this as within Facilitator A's programs actors need to tell about all their results. This can happen for example via demos and poster. In this way when people tell about things others notice that those things can be utilized. Further others can notice that it is good that those people participate and they can do collaboration also with them. In this way people motive themselves to do and share things. This needs systematic mechanisms that push the network forward as things cannot be created just by putting people together. There needs to be a framework that justifies network’s existence. Further RB-1 emphasizes that as
Research organization B’s research is technical and scientific real world research, it is always in an interaction with the real world and thus in many cases research results are based on cases within industry driven programs.

Systematics are also needed while linking technical research and business know-how and bringing them together. According to RB-1 there are people that have researched certain thing all their career and are very good at it. Many times it is helpful for researchers to get perspective about to which real word challenge their research relates if companies tell about their own business, products and services. In this way researchers can find their own contribution when they understand where their research relates to but while doing so the mind-set of researchers and companies needs to be collided. This colliding occurs via interaction when things are explained to someone else. According to RB-1 they have done a lot of this for example via workshops where researchers and companies from certain domain have been forced to discuss about them. As people do not necessarily discuss at coffee or dinner table, systematics are needed to give them themes, introductions, challenges and problems to discuss about. This kind of systematics and leaderships has brought things up as it does not happen spontaneously. (RB-1, 2012).

Actors that have closer collaboration are more active and want to participate and increase pool of intellectual assets more. Actors that think that after they get funding they need to tell others what they have done just to ensure that they will get funding in the future are not necessarily so active to bring those intellectual assets they have generated to others. Interaction relationships and mini ecosystems are created around programs where more benefits are created. There might be actors that do not benefit these ecosystems but if they do not bring benefits or additional value they are not forced to stay although in this kind of research networks all actors are required to bring their own contribution. This means that there need to be systematics to expect, require and monitor to get intellectual assets to increase the knowledge pool. (RB-1, 2012).

Without interaction it is possible that the value of certain intellectual assets decreases as they are not communicated properly and thus other actors do not know what they are and for what purpose. This also means that assets can be more and less valuable and the value of certain asserts could be bigger if they would have been communicated better to other actors within the network via interaction. If actor is active and generates assets within collaboration with other actors those actors by force gain more benefits from that collaboration. Theoretically is possible that actor could take over assets without being involved
in their creation or interaction that relates to their creation but in practice intellectual assets cannot be utilized without understanding where they relate to and how to utilize them. (RB-1, 2013).

According to FC innovation activities in Oulu region are strong, especially technical intellectual assets. Feeding this knowledge pool all the time is very important. Innovations that local innovation mill, including universities and other actors, work on do not create business based on those innovations as the region lacks business related intellectual assets and business model know-how as that kind of knowledge pool does not exist. Because of this Facilitator C focuses on bringing people from out of the region to tell people in the region that this is where the focus should be as if the local people do so things just do not proceed. In FC’s (2013) opinion even the finest technical solution does not do anything if actor cannot build business model for it and bring it to the market and emphasizes this by noting that:

“Some of these older Nokia backed people has that hallucination that when they do amazing product it will be taking away from their hands. They created that illusion probably because of they had those 130.000 colleagues around them where that capability to bring that product to market was. So that they only focused on making the product. It could even look like it was taking away from their hands when there was others who knew how to build it to business. (…) So that we would have already created some kind of pool. Pool like business know-how then. So well. I haven’t found it. But well, that issue develops all the time.”

Facilitator C has organized trainings to utilize assets from these knowledge pools in value creation. These four to five trainings have related to venture capital and life cycle of companies including sales and marketing trainings that last from a couple of hours to a couple of days. As the business model and business know-how are not very strong in the region trainers need to be invited from farther away as even in the national level there is not that much know-how in this. (FC, 2013)

Facilitator B is a public RDI funding body with a neutral role so their interaction that relates to creation of intellectual assets and value is to tell applicants if their application lacks information that has to be in the application based on the funding criteria. They can also ask more details about specific things that already exist in the application but they cannot ask more details about things that do not exist in the application already or are not mandatory parts of the
funding criteria even if those details would have positive effect on intellectual assets and value creation. (FB, 2013).

Facilitator D’s role in interaction that relates to intellectual asset creation is to prepare and hold sparring sessions to help research groups to get research funding for example from Tekes. During these sessions research groups get constantly new information about how they can ‘sell’ their research to funding bodies, how they can present their research idea and which things should be emphasized including business view and application that can be built based on that research. This knowledge is accumulated to them during these sparring sessions and while they prepare their funding application’s. FD emphasizes that it is nice to see that this occurs. Facilitator D brings new elements into this interaction as researchers view their research from technical point of view and Facilitator D aims to narrow that view into certain solutions or segment so that commercial application could be made based on it. FD notes that this is a new thing to researchers and understandable this is a difficult thing to them as they need to think out of the box. This requires several iteration and learning rounds. According to FC they probably bring know-how to those actors in this way including know-how that Facilitator D is not aware of. (FD, 2013).

Within Research organization A’s projects communication methods that relate to creation of intellectual assets are defined quite precisely when projects start. These communication methods include emails, weekly and monthly meetings, activities and different kind of reports. These strictly defined communication methods are fulfilled and besides them also additional communication methods are used. Project related communication methods differ between within research group communication and communication with companies that are project partners. Value creation related interaction from Research organization A’s point of view relates to normal project preparations when people from Research organization A visit companies to discuss about their interests and where they need help. Although these projects are company driven according to RA-1 during the preparation phase research organizations are very actively involved in preparations. Research organization A’s role in these projects is to generate new research information with partner companies and commercialization of these research results remains as companies’ role. According to RA-1 Research organization D’s job is to help companies and companies make business. If Research organization A would intervene into business making then everything would go off. (RA-1, 2012).
Joint working with research organizations and companies is very important within Research organization A’s programs. For example within one of the projects that they lead this interaction occurs via different forums. They have meeting twice a week where people can attend by videoconferencing although it is possible to meet some of these people physically at Aalto University or in Oulu. People have participated these meetings actively. Further they have research workshops twice a year. Besides these there is also interaction between two to four partners around smaller things within their research theme. In the program level whole consortium meets four times a year. In this setting there is a lot of collaboration and that collaboration has been exceptionally good and companies have eagerly participated in it. According to RA-2 within these projects business value is created for companies. For research organization A it is more like mental value although they get financial benefits from their department at the university when they generate research, degrees and thesis and possess quality levels. (RA-2 2012).

RC notes that as there is so many knowledge pool, the problem from Research organization C’s point of view is how to get coverage to those intellectual assets as assets need to be very good so that they can play a role in network creation. To demonstrate this RC (2012) referred to following analogy:

“Here is this kind of academic analogy so if our doctoral student goes to a conference for the first time to present what he has done. Results. He roughly keeps his papers out of the sight so that no one peek his brilliant ideas and accidentally steals his big achievements before he has time to publish them. Well, when he goes there tenth time then after that he is very satisfied about that if someone is interested in what he is researching.”

In RD-2’s opinion it is interesting how information transfers as a lot of it is concealed in a way that there is someone who knows something. As Research organization D operates in quite tight network also this kind of silent information moves quite well. Research organization D has tight connections especially with companies because many of them are recently established companies and some of them have been established by Research organization D’s employees. These connections are especially tight with companies that operate in Research organization D’s focus areas. Some of their employees work part-time in these companies and in that way they make sure that information transfers well. This kind of information transfer has several levels. For example if Research organization D sees that there is an actor that seeks specific know-how or who
could be potential customer they have passed this information to their collaboration partners. If commercial secrets about forthcoming programs or investments allow they also try to help their collaboration partners if they seek for specific competence that Research organization D has already identified within their collaboration network. In these cases information about these opportunities has been passed to actors within Research organization D’s network so that they can offer their own know-how to others. In this way Research organization D also helps other actors within their network to build business opportunities as they do not compete with these companies. (RD-2, 2012).

As a research organization Research organization D shares and communicates its research outward via articles and conference presentations (RD-2, 2012). Research based knowledge that they create is created via public funding and thus it is shared publicly and if someone wants to utilize it, it is possible. However, within some programs, consortium contracts might limit this. For example certain actor or actors might have first refusal right to innovations so they can buy them to themselves in a market price. In some programs actors do not strictly regulate what research outcomes can be communicated publicly. In these cases utilization of those outcomes is open to everyone all the time. In more strictly regulated programs assets and possible their value potential needs first to be communicated within the program. If research outcomes are already shared within the program and companies do not want to utilize them further Research organization D tries actively to ensure that the created assets will be utilized actively. (RD-1, 2012).

Research organization D also actively encourages its researchers to start their own research based spin-offs. This is one of their organizational goals and according to RD-1 it is extremely supported. If needed Research organization D helps to proceed this kind of activity, although in their research field it is challenging to find things that could be patentable. In these cases competitive advantage that spin-offs have is based on researchers own know-how that is not patentable. Further RD-1 emphasizes that in their research field starting a company automatically means that its business is international, growth-oriented and scalable business. (RD-1, 2012).

In the past Research organization D has created competences that relate to specific basic research that needs to be carried out long so that good know-how could be created based on that research. According to RD-2 they have had that kind of case that they have done collaboration with a big company and then the company decided that they had utilized benefits from that area and thus they want to move elsewhere. This meant that in this case collaboration within that specific
focus ended with that company. RD-2 further emphasizes that this is a difficult thing from research perspective as then research organization needs to show that the created competences are that kind of competences that based on them research can be continued with other companies in a different context. This means that even if intellectual assets are created with certain actors’ value or value potential will be created with other companies. In these cases when starting to create additional value to new companies, creating that value requires that it is further refined toward the case which the new company has. From Research organization D’s point of view this means that know-how and intellectual assets they have need to be specialized in a way that they enables many things and thus they would have wide applicability. This is why Research organization D wants to do research within specific focus areas and based on those areas create knowledge that has wide applicability. (RD-2, 2012).

If some companies do not want to utilize further assets they have created but other companies do want, it means that usually these other companies have existing business branch and component that suits with assets that were created by other companies. Consolidating existing components with assets that were created by other actors is a case specific thing and needs coordination and professional development team as well as evaluation if those assets are worth of exploiting or not as knowledge that was created might be bounded into specific development environment or information systems. To be able to utilize solutions that were developed earlier actor might need to develop supporting solutions to that environment. This means that it needs to be pondered if those ideas are worth to be utilized and do the implementation all over again. (RD-2, 2012).

With all the connections where interaction occurs Research organization D’s aim is that results that are created could be utilized so that it would not be just a publication in a library. To do this Research organization D collaborates with companies so that someone could find those things and start to utilize them. These interactions occur mostly within informal activities like collaboration meetings and while having coffee with people. RD-1 note that as Research organization D is a new organization in the beginning they had to be active and bring them out. Now when they have got some visibility other actors have started to be interested about them and had come to ask what Research organization D has done. Only some of these collaboration relationships start to work and if relationship starts to work more intellectual assets are created. For example if collaboration does not work within certain projects with certain actors it is evaluated if they are worth of putting more effort. If projects are not continued knowledge creation will stop and
only one thing is created and there are no active activities with those actors anymore to grow that knowledge pool further. The basic design is that the knowledge pool is a living resource within active collaboration partners. RD-1 emphasizes the importance of interaction with external actors in intellectual assets based value creation by noting that very often the researcher does not even realize there are valuable things in his research information. This means that actors that exploit and apply that information realize that value potential or does the needed additional work from where the product is made. According to RD-1 some spin-offs have started from Research organization D which proves that utilization of research information works like that.

New thing that Research organization D has recently tried are workshops where people from certain technical domain meet business people. Their hope is that this kind of activities would bring new things in the near future (RD-1 2012). According to RD-3 formally this kind of activities does not exist and they relate to program preparations and when Research organization D contacts company partners and company partners contacts them to discuss about new collaboration possibilities and to tell what they have and to map out what others have. This kind of activities and interaction is not planned except that it happens all the time. When new ideas arise potential partners are contacted. These ideas can be research needs, problems or challenges that form ground for discussions about collaboration possibilities. (RD-3, 2012).

In some cases formal meetings are the only channel for intellectual asset creation if other interaction does not exist. In some EU-programs the case might be that during the couple of month’s period only a couple of emails have been exchanged. Within these programs program preparations are made in a way that project milestones and work packages are defined precisely and as actors work on them by themselves there is no need for interaction before these are combined together in the later stages. This kind of programs with low interaction has been withdrawing as the desire is that collaboration would be tight. So far work related to EU projects has been working alone. Research organization D participates only in a couple of EU programs. If the collaboration is tight then the daily work creates interaction as researchers work hard on the same thing. As deliverables and schedules are precisely defined intellectual assets and knowledge pool are created while project results are created. Informal interaction relating to intellectual asset creation occurs for example while having morning coffee at the coffee room when people shortly tell what they have done and what they will do and while meeting potential or existing collaboration partners and updating their
knowledge and understanding about their competencies, offerings and knowledge pool. (RD-3, 2012).

In EU programs people and actors are from different countries and then the interaction is mainly email exchange and network’s utilization depends quite much on people’s own activity. Within these programs there is a lot of information and knowledge if people are willing to follow and build it. When company and university partners within EU projects are compared, RD-3 emphasizes that it is very clear that companies have their own agenda about what they want to do and how. Further RD-3 notes that he has a feeling that companies like to delay telling about things as they want to see what they are willing to tell. It seems that true collaboration with companies and other universities within EU programs is quite minor. Even if there would be more interaction with other actors within EU programs, the pool of intellectual assets would not get any better as by far companies do their part partly outside of those programs with partners that either other actors within those programs or Research organization D does not know about. (RD-3, 2012).

Although programs have their funding frameworks it is possible to make even radical changes to a certain point although this kind changes are difficult because then it is necessary to go through with the funding body about what needs to be changed and why. RD-1 emphasizes that it is good to keep program level things as sub-entities and network tools to ensure that programs form or details do not restrict utilization of program results elsewhere within the network via different tools. This means that even if assets are made in the program level, network level could bring value or value potential on top of that. (RD-1, 2012).

Even if all the research that is conducted has a certain value, goal and purpose in some cases in basic research researchers do not need to think about them if nature of the research project and funding does not require thinking about research goals further. In other projects companies tell about what kind of problem researcher is solving. This means that although all actors contribute to same specific intellectual assets all of them will seek value from their own perspective. For example for a researcher this value can be publications. (RD-3, 2012).

Within the research program that CA’s organization participates the initial interaction in the beginning created openness and trust between people as the interaction started well and formed the ground for good collaboration. After this initial interaction two days workshops have been very good for tying people together as according to CA it is very important to know each other and to know
how different companies act and think to find similarities as it takes time to form that view. Quite many people from Company A have participated this particular research program via discussions, events and workshops to share experiences and views in order to bring them to their daily development activities within Company A. Further quite many people were building the bridge between things that were experienced, seen and learned within this particular program in order to bring them back to daily activities within Company A to develop company’s ways of working in product development. As several people from Company A participated program’s activities the link between certain activities, people and value is not easy to identify as according to CA it is difficult to say what leads to real incremental value. Because of this it is not easy to identify why Company A did certain change at a specific point within their way of doing things as it is hopeless to make the connection if the reason behind the change was that CA went to a workshop that was organized within Facilitator A’s biggest program or if the reason was that someone noticed something. (CA 2012).

Thing that affects value creation is that actors need to know each other and they need to trust joint working and value creation. According to CC added value that network bring to value creation is mainly within joint events. They have used very efficient models of joint working when creating additional value. For example while writing documents or plans during certain events in an iterative and multipolar way so that all actors work on the same document during one day. Certain person might have made template from where the work is started but after that the document is compiled during one day with other actors. Normally it could take a month to do the same. These kind of collaborative collaboration sessions can faster the value creation. Practically in these sessions interaction is face to face interaction. After actors know each other and working methods exist it is possible to start using technical tools like videoconferencing to forward things further. (CC, 2012).

CD notes that in general know-how is developed from areas where the need has been identified. Development of intellectual assets is driven by business needs and business identifies needs for creating new intellectual assets and value based on them. This need has different levels of intensities. Internally Company D tracks its employee’s know-how via tools that list their employee’s know-how and skills in 488 skill areas. These are collected systematically and used in reporting as it is possible to collect historical data and information about areas that interest certain people although their current skill level may not be high. Previously Company D has used different kinds of tools that relate to blue ocean strategy in
value quantification. Most of the tools they currently use in value quantification relate to lean start up approach where value is viewed holistically over the entire network. In this sense Company D also encourages internal innovation and entrepreneurship. This requires management so that Company D could understand, test and seek for new things. After this it is validated what was learned and what the innovation is. Different kind of ideas that Company D does are also tested with its customers and after that developed further. All these are on-going and systematic activities, including collecting ideas systematically internally and externally and validating and refining them further. Some of these ideas are further compiled into activities that they are currently doing and in this way those ideas are further shared and concretised in hand-on activities. These activities are visible via their collaboration environment to their employees. In this way Company D creates visibility into what they are doing. This means that within a program’s lifecycle there are no phases where interaction is more intensive as interaction is intensive all the time. Just its form changes. For example as things can be shared effectively via collaboration tools, necessarily information sharing does not require as much traditional discussions than without these tools. (CD, 2012).

Company E is a small company with an existing product thus their interaction that relates to intellectual asset creation occurs in a local level and interaction that relates to value creation in a global level. This global interaction in value creation takes place for example during trade show where their product is demonstrated to trade show organizations as it is a visual 3D system and the solution is easier to show than to tell about. Interaction that relates to the creation of intellectual assets is more technology oriented and focused on product development. Their product is quite stable so the interaction in value creation is related to sales and business model development. From sales perspective professional trade shows are the most efficient way for Company E as during those trade shows it is possible to reach a lot of people including decision-makers. During these trade shows Company E’s target is on other exhibitors. As Company E is a technology company they have had difficulties with some trade show organizers as their target industrial domain is traditional although for example in US there is own department for technology providers in their industrial domain. During these tradeshows company E tries to find decision-makers to demonstrate their solution via iPad or to agree about meeting after the trade show. Company E has also tried technology oriented trade shows but they were not suitable place for sales oriented networking. (CE, 2012).
Processes that relate to technology that RB-2 is commercializing are not patented as Research organization B has made guidelines that the technology is more know-how based although rights to background information always remain with them. This means that when other actors further develop their technology they have the right to their foreground information if they have funded that development and they can also try to patent things that relate to applications which they have developed. If cooperative programs are funded by companies, rights to foreground information remain with those companies and do not transfer anywhere. (RB-2, 2012).

In Tekes’s joint programs utilization of research results are always agreed separately. According to RB-2 the main funding body in their programs is typically either EU or Tekes and that main funding body makes the rules as different funding bodies always have different rulebooks and contracts. The difference between EU and company funded programs for example is that EU programs are more research oriented and in EU programs EU is the main funding body. Also in Tekes programs Tekes is always the main funding body. This means that in EU and Tekes funded programs rules about how research results can be commercialized are made by them. If a company subcontracts something as their own work that part is regulated by that company. (RB-2, 2012).

From commercialization perspective Research organization B’s challenge is to get enough researchers, both internal and academic, to projects where the target is in commercialization. According to RB-2 this is everlasting educational question as researchers want to research their own things in peace especially if they have funding to do so. In these cases there is not necessarily a way get them excited about this kind of short term projects. This problem relates to both commercialization and commercialization related collaboration within Research organization B and also with researchers in general. According to RB-2 they and at the local university there are researchers who will not understand commercialization. Similarly at the local university there are professors and researchers that commercialize very well and understand it very well. Part of the researchers does not understand commercialization because they do not have any experience about it or attachment into it. Further all people are not that all-round that they could be interested in commercialization and move away from their own comfort zone. Because of this only those researchers who want to understand commercialization and want to do it are involved in commercialization related activities. (RB-2, 2012).
To support commercialization Research organization B has started projects with collaboration with the local university to forward specific things toward commercialization. In this kind of commercialization collaboration with university commercialization is also tight to university’s policy about what they want to make public and from what they want IPR’s. Research organization B has also brought together researchers and business professionals during their seminars and design workshops. For example during one workshop they went through five business ideas in a process oriented way within 24 hours with industrial designers and specialists. This kind of interaction is intensive and the aim is to go through business ideas and figure out if they could be developed into actual businesses. Earlier Research organization B organized so called record panels where they gathered more different kind of regional actors together. From these events some things have started to grow but in general it has taken years to get results. (RB-2, 2012).

More recently Research organization B has organized four trainings with one of their regional partners where they have trained around 100 people. Based on these trainings six new companies were established to forward commercialization. These trainings included a five-day introduction to their facilities at Research organization B’s, local university’s and local university of applied sciences premises, theoretical lectures a during couple of days, presenting the past and the current situation of the field and an ideation session. During these events the aim is to constantly collect business ideas that are shared within further four-week session. Quality of these ideas have varied a lot as some of them were shared after the first training day. After this four week process there is not necessarily much left from the original idea as within the business cases that are based on those ideas the aim is to go through the case from the customer’s point of view not from the technological point of view. According to RB-2 roughly around 10-30 ideas are needed to create one start-up company. For example in November 2012 around 80 business ideas were generated from around 25 participants. These ideas were further reduced to around 30 ideas. After that teams were formed to forward those ideas. As all the participants were not interested to forward those ideas five teams were formed from around 15-17 participants. According to RB-2 the current situation was that those teams were building their business cases and that next week they would have their final meetings to see if companies are created based on those ideas. (RB-2, 2012).

Trainers of these trainings have not included any academic people from business schools but industrial business professionals with practical experiences.
This means that if new businesses and start-ups are created they can also act as mentors as they have contacts and experiences about how things proceed and according to RB-2 (2012) they do so all the time. (RB-2, 2012).

When certain application area develops and actor brings certain assets into that application area based on those assets actor needs to create product. In RB-2’s opinion assets are usually technology assets and based on technology assets it is possible to create products or applications. RB-2 further emphasized that for example technology assets that are created at VTT does not necessarily have any value if applications are not created based on those technology assets. Assets that relate to an application can be things that salesman sees when he goes through the application field and sees and learns different kind of things from that application field although that salesman does not know by which technology that application is created. In this way an actor can search for the right technology by which actor develops that product without developing that technology. In RB-2’s opinion actor needs to be able to separate application field based know-how assets and technology assets because they are totally different things. Further this means that the value potential comes from the application side. (RB-2, 2012).

Interaction that relates to creation of intellectual assets and value does not necessarily take place via actors own contacts. For example company G has participated events abroad that were organized by Facilitator C. They currently have an on-going internationalization project with Centre for Economic Development, Transport and the Environment (ELY Centre) and thus can exploit that internationalization support to cover part of their travel costs while attending trade shows abroad. (CG, 2013).

### 8.2.2 Interaction of combining assets from different actors

The operational model of programs that are coordinated by Facilitator A is that kind that it does not encourage for example patenting as IPR’s are shared within the program. Because of this only a small portion of IPR’s have been created although this is not a surprise to FA-1. This also means that they will get blames about this in program evaluation. Within Facilitator A’s programs patenting is very difficult if all the actors are jointly patenting the same thing as it is technically difficult if all actors are patent owners. Patenting with smaller group of actors is not motivating either as all actors within the consortium have a free right to use that patent. Further reason that patents are typically not created is that estimating their value is very difficult and critical and thus they are very difficult
to sell so that consortium actors would still have right to utilize them. (FA-1, 2013).

When possible Facilitator A tries to combine research results as open source things and put that forward in that form. This is a typical way for them. They also want to ensure that all the program results, including scientific documents and pieces of code, would be documented sufficiently enough so that there would be repository from where all the partners within the program could find them. Next phase for them in this is to reasonably combine all the intellectual assets from programs to one place so that they would be available also to actors that are not currently participating these programs. Another aim behind single repository for intellectual assets is to ensure better result utilization between programs. To make this possible mechanism needs to be created to support sharing of several versions of same results and documents and to provide support if actors that are not participating programs are interested in them. (FA-1, 2013).

Within Facilitator A’s research programs all kinds of things have been created that would not have created without research collaboration within these programs. Also the business ecosystem program’s aim is to enable creation of things that would not be create without collaboration within these programs. Although this happens it is not easy to set out what those things were and what the additional value truly was. In this setting aim of Facilitator A’s activities is to encourage companies via stick and carrots to an open and communal development activities in competence and business related development activities. So it is companies’ responsibility to maintain the joint repository and map other companies’ intellectual assets. (FA-2, 2013).

Clearly a new thing that Facilitator A’s research programs have brought is that within these programs companies and universities genuinely work on things in co-operation. According to FA-2 the traditional way was that companies gave money and universities carried on research but in this way new know-how was created to universities and not necessarily to companies. Besides this companies had their own development programs but universities were not taken into those programs. In Facilitator A’s programs Facilitator A forces companies and universities to joint development activities and to determine common goals and develop them together. SHOK’s way of working has created this kind of joint co-operation that can be called as an innovation ecosystem. Within Facilitator A’s ecosystem programs Facilitator A tries to convince companies that besides ground work also business activities related development activities can be done jointly if it is done in a right way. While doing these kind of joint business development
activities also open and communal way of working can be learned. Universities work within ecosystem thinking setting is typically technology work although it is companies’ responsibility to think about the utilization path and what benefits that work brings. According to FA-2 Facilitator A does not know if companies do this and if they do this at all as Facilitator A cannot know how companies utilize them and Facilitator A does not have any control during this phase. By far universities’ role relates to creation of publications and theses. the creation of these assets takes a place within a framework where company guides the framework content as agenda is defined by companies. (FA-2, 2013).

The aim of jointly funded research operations is to combine intellectual assets and activities as otherwise there would not be any point to take part in this kind of networks other than getting funding. According to RB-1 they have a lot of examples, like top results and business impacts, about what have been achieved from the collaboration of research organizations and companies. These jointly achieved things are also the reason to be in this kind of networks. For example business impacts can be seen when methods, technologies or combinations of them that have been researched have been exported into products, as part of product development or into process or business. These kinds of things are the aims of company driven research programs. According to RB-1 they constantly gather this kind of examples. (RB-1, 2012).

When this kind of company driven research programs has been started research areas within their research agenda are important. For example in one of the Facilitator A’s programs research agenda was built via going through five to seven workshops where 400-500 people from industry and research participated those workshops. In this way input was collected and combined. In a company driven research programs the idea is that they have a business driving company for whom research area is particularly important. The rest of the actors, both companies and research organizations, are built or gathered around this business driving company via certain mechanism and process. Already the SRA will limit access to these programs although these programs are in principle open to all. It is open to all actors that bring their reasonable contribution to that network and thus companies, research organizations and research groups that do not work in that research area are zoned out. For example one program that is coordinated by Facilitator A had an open call for new business cases that would include research challenges within the research area of that program. After this potential business cases were evaluated from the networks point of view to see what business cases would bring higher additional value so in this way organizations are also scanned.
in to the program and out from it. According to RB-1 the idea is that these programs have certain driving company to whom the area is especially important and around that company companies and research organizations gather or are gathered via certain mechanism. Further when network is started to form, the network is probably created more around the driving company and against the research agenda. (RB-1, 2012).

Although Facilitator C is not an operator that organized events and training that would make stat-up companies better and increase their ability to get funding, it funds actors that organize these events on the local level. In this context their strong aim is to support ecosystem thinking in a way that funding would be targeted around certain intellectual assets. According FC they build this kind of infrastructure and enable this kind of things although they have not thought about it from knowledge repository point of view and have not invested in building that kind of repository that would enable knowledge storing or utilization. Actors that Facilitator C funds to organize these events are self-guided in a way that they bring people and intellectual assets together and map them in order to create new business opportunities. As an organization Facilitator C organized around 50 events during both last spring and last fall. Target of these events is to gather together bigger company groups and to bring external experts to talk about specific things. Within these training for example investors and companies that have got funding have shared their experiences to other companies and start-ups. (FC, 2013).

Also Facilitator D does not have many activities that would relate to combining intellectual assets as they do not have many cases where researchers independently started to bring intellectual assets further. When researchers do so Facilitator D collaborates with them for example while applying funding together from Tekes or Foundation for Finnish Inventions to cover patenting or other costs. After researchers have started start-ups they have started their activities within university’s premises and have utilized university’s infrastructure mainly for testing and simulations purposes. When comparing the university which sub-unit Facilitator D is to top universities, Facilitator D does not have enough potentially commercial things or patents or resources to combine intellectual assets. If Facilitator D comes up with ideas or IPR’s experts that Facilitator D collaborates with build the business based on those ideas or IPR. These experts are business-oriented although patent and law offices are also used when contracts are needed. (FD, 2013).
Because of the different time cycles between universities and companies, combining their intellectual assets is not sometimes possible although Research organization A has many times thought that certain things could be suitable for companies. According to RA-1 universities time cycle can be five to six years and companies time cycle five to six months. Research organization A's time cycle in value creation is also longer than companies time cycle as companies need to get financial results right away. Most of the cases where Research organization A has not been able to achieve common results with companies relate to time cycle difference in value creation. Although via better or tighter interaction or interaction between different people could narrow the time cycle difference between Research organization A and companies, just the world situation affects companies so much that although companies knew that development of certain things takes time world situation forces them to change things. (RA-1, 2012).

From knowledge and resource combinations perspective within the Facilitator A's program that Research organization A participates, interaction and joint working have had very big influence. As actors have seen that collaboration within this program has been very beneficial they also want to continue joint working also after that program. Not only while developing things further but also to maintain the network and to gather together regularly. According to RA-2 combining knowledge and resources from several actors also affects value and its adding. This can happen for example via sharing best practices and researched knowledge. It is without a doubt beneficial that within Facilitator A's program that Research organization A participates there are several companies that share and research things as the sum is a lot bigger than the sum of the partial entities and combining knowledge and resources from several actors has large benefits when adding value of intellectual assets. (RA-2, 2012).

In RA-3’s opinion if companies find common interest they will take care of combining assets from the network as Research organization A does not have any business related role within the network. When companies find that collaboration is possible to do they start to negotiate about it directly by themselves. If researchers want to join business related activities it is their personal thing. (RA-3, 2012).

As the spectrum of intellectual assets is wide, mapping possibilities to combine them is situation specific and thus there is no consensus about which intellectual assets are best as intellectual assets can be for example open source libraries. Problem about mapping intellectual assets is that it is difficult to evaluate their quality, utilization and potential, which means that evaluation of
intellectual assets require quite large amount of work. RC gave an example of this by noting that when assessor evaluated Facilitator A’s biggest program they had to be able to perceive if reasonable results were created. According to RC this is difficult as then there is a need to gather together people that evaluate different sectors and outline them. This requires actors that are able to evaluate utilization of intellectual assets within certain purpose. Similarly it is difficult to evaluate if research databases that are collected within universities are applicable within certain use without a person that knows those intellectual assets well. Research organization C has tried this while utilizing the data that was gathered in national Software Industry Survey to make statistical analysis based on historical data about a certain research problem. According to RC the second problem about intellectual assets is that companies that create intellectual assets tend not to share them. All companies do not want to share all intellectual assets they have. One reason for this is that there might be something that violates IPR’s of other companies. A further problem with asset sharing is that assets that actors do not need are badly defined and maintained to have a clear value. If the utilization of assets requires a lot of information about what kind of assets there is and how they were gathered they are not easily shared as it requires that organization that created those assets to be involved. (RC, 2012).

Research organization D’s interaction while combining intellectual assets relates to visits to companies where demands for certain combinations are discussed and Research organization D’s ideas have been presented. Similarly companies have visited Research organization D to discuss about their own ideas and areas where they see meaningful collaboration. These discussions proceed in phases as after initial discussions companies further ponder things internally. After this, things that actors want to proceed further have been identified more concretely. This means that ideas come from both companies and from Research organization D via presenting ideas to others to map potential collaboration methods and theme areas where collaboration is possible. The nature of this kind of interaction depends on what company wants to achieve via that collaboration. For companies this can mean for example very rapid benefits for their own business or long-term development activities. According to RD-2 the further company’s aim extends, more research oriented it is. This choice is based on companies own way of working and its strategy. For Research organization D collaboration with companies is easier if they do not seek for instant win as for Research organization D it is better that companies think from a longer-term perspective. (RD-2, 2012).
According to RD-1 a good example of interaction in combining knowledge and assets from several actors are living lab activities where different intellectual assets have tried to link together. Actors that collaborate within these living lab activities include city, local, university and university of applied sciences and VTT. Within this setting additional value and intellectual assets are created via bringing additional value into that collaboration in a way that from that additional value customer case is created to the entire network which means that there can be several actors and different intellectual assets from those actors that are utilized. Within this kind of collaboration Research organization D’s role is to combine that big picture in a way that all participating actors benefit from it. This big picture can be for example environment where companies can test their new offerings in health care sector. According to RD-1 mapping opportunities within this setting occurs via interaction between these actors while having coffee. RD-1 further notes that this kind of activities can be classified as co-productization of intellectual assets as they have currently on-going program which the only aim is productization of intellectual assets and thus interaction that relates to it is daily as it relates to experiences about actors own intellectual assets, their development and utilization from both value creation and customer perspectives. Customer perspective means that Research organization D sees that companies have demand for this kind of intellectual assets and via living lab activities related interface it is easier for those companies to have access to those intellectual assets. (RD-1, 2012).

CA notes that in a way aims of combining resources and knowledge from several actors are designed via defined business cases that include certain research topics and questions. After this Company A has agreed with the university partners within which plot they work things. According to CA an especially challenging plot for them has been one ecosystem related thing although they did not even imagine that it would be ready during the program. Their aim in these ecosystem things was to initiate it and get help from Facilitator A's program they participate in. CA further notes that probably there is quite little help that it is possible to get from the academic world within this ecosystem thing. (CA, 2012).

Within Facilitator A’s program that Company A participates they map beneficial resource and knowledge from other actors via program and its theme areas as an organization, via individual persons and from potential collaboration partners. According to CA the most beneficial things from the informal ecosystem perspective are personal contacts and discussions that occur outside of the hard
research agenda as they are very valuable and it is possible to obtain a lot from them. Secondly, with respect to the program they participate in, it has been possible to link together different organizations for example via developer’s day when people from different companies have an opportunity to act and ponder things together. These kinds of interactions do not bring any input into the research and it does not lead to dissemination of things but it is an opportunity to change views and experiences and to do things together. (CA, 2012).

CB exploits knowledge and resources from the network in that kind of investigations that Company B does not have resources for. In some cases things are even cheaper to do in this way although CB notes that nowadays direct subcontracting from universities is not cheap as they have similar prices with consulting companies although outcomes of that work are uncertain. Company B is willing to use universities for interview investigations. In this way universities get their own materials from those interviews and Company B is able to guide things which are investigated. As time spans are quite long state of art is also very important focus area for Company B so that they can see to which directions things are developing. This means that Company B maps opportunities internally and with their collaboration partners. When opportunities are identified with partners it is possible that these partners can do part of that opportunity. (CB, 2012).

When Company B applies funding from Tekes the problem is that although they have tried to apply funding with new partners it is difficult as for example Tekes can only cover costs of one research institute per project. According to CB this limits things quite much as they cannot achieve competition between universities at all although in CB’s opinion it is important. This also limits value creation as after one university partner is selected it is not possible to change that partner if it later turns out that things do not work with that partner. As Tekes keeps an eye on how money is used in its projects according to CB it would probably make a noise if an actor tries to do things without universities. Although company partners cannot be changed either CB notes that if certain companies turn out to be not so good collaboration partners it is possible to decrease the amount of collaboration. These mean that partner mapping needs to be done well and according to CB in general actor’s expectations should only be 80%. (CB, 2012).

Most fruitful starting point for combining resources and knowledge from different actors is that all those actors have their own active interests and aims to participate in this kind of collaboration. According to CC win-win situation is
needed as actors that just hang around do not necessarily receive anything. If an actor has a certain concrete need or problem that the actor is trying to solve via this kind of collaboration it is possible to get solution or more information about it. (CC, 2012).

According to CC the starting point of TIVIT’s programs is to create new business and thus companies that participate in these programs has certain interest to create new business. This means that these companies evaluate program results to find if they include something new that they are able to utilize in practice. In this light TIVIT’s company driven programs are good for companies. When comparing to EU level research programs CC has seen that kind of programs where utilization interest is not that high which means that from company perspective those programs are not so interesting. This utilization aspect depends on programs starting point including those whose interests the program primarily wants to serve. According to CC when network and intellectual assets begin to build it is good to make it clear from whose point of view it is primarily done. (CC, 2012).

For example in Facilitator A’s biggest program companies primarily define the program’s direction, not the research organizations. If it is not clear which actors’ conditions are primarily served, disappointments often happen in the asset utilization phase as for example papers that research organization create, may not be usable for companies. Similarly if it is clear from the beginning that networks purpose is to create papers then companies do not come there with so high expectations so that the outcomes would be immediately possible to commercialize. Within this kind of collaboration, expectation management is big part of network collaboration and management of intellectual assets. Within this setting combinations of intellectual assets and value potential are mapped via that program although it is also expected that if there are actors that work on a certain area they could bring up common themes. In this way it is possible to forward goals of all participating actors as then all actors can find their own additional value from that collaboration. If that additional value does not exist then the motivation for collaboration and working is smaller or is missing. (CC, 2012).

For Company F the collaboration environment that Facilitator A’s biggest program offers is that there is quite a big chance to find new things that Company F has not go for and some things can be totally new for them. Funding mechanisms of this program do not force big companies to collaborate with smaller ones. At the same time research organizations are interested to collaborate with big companies as then it is possible to start bigger programs that include
more space for research. According to CF within their research area it is hard to say what benefits they have directly brought to other actors within that focus area. Values and clear benefits that program has brought to them is that Company F accepts that things cannot be easy to them as it would be unrealistic to assume that things would be easy. As Company F is a small company they can try new things more bravely as for them it is easy to come back to the original situation. According to CF in big companies trying new things remain too pilot like as it is difficult to see how they would scale. (CF, 2013).

For Company E the business model is currently an important thing to develop and interaction that combines knowledge from different actors relates to its development. Further Company E needs to be able to tell potential customers about their overall concept before other actors try to come in with a minimal price and offer something that looks similar than part of Company E’s overall solution as then those potential customers might think that it is useless. Because of this it is possible that they do not want to discuss with Company E about their overall solution at all. In this setting the interaction that relates to business model development takes place with the local university to map possible business models as currently it is more important for Company E to get customers than to get cash flow. They have investors in the back so they can acquire new customers in a front-oriented way to get market position as fast as possible. The interaction with the local university relates to ideas and thoughts about Company E’s business model which has been put into practice to get feedback about it from real customers. The discussions about business model and how it should be presented to potential customers helps Company E to explain their business model. (CE, 2012).

Assets that Company G seeks from the network are money and business opportunities and areas. To be able to carry on big projects it needs to be prepared in a way that investors will take part in that project as otherwise those projects do not come true. According to CG it is not possible to sell a project first and after that start discussions with investors about what kind of case they have. (CG, 2013).

### 8.2.3 Interaction of increasing value of single assets

Within single SHOK’s there is no single intellectual assets that would be further developed although from ecosystem thinking perspective there might be actors who see that there is specific intellectual assets that would be profitable to invest
in as there needs to be a business reason to develop intellectual assets further (FA-1, 2013). Also FA-2 notes that Facilitator A does not have that kind of intellectual asset thinking that they would think that certain research program or business ecosystem program would create some intellectual assets that would be further managed to grow. From their point of view the aim is more on competences and new know-how that relate to knowledge and know-how pools or to new kind of business thinking. These are that kind of new know-how that Facilitator A thinks it is creating and if that know-how is relevant from industrial perspective or not. (FA-2, 2013).

In Facilitator A’s programs companies are the critical part that manage their own intellectual assets. New know-how should be created to companies so that they could use that know-how to forward their own intellectual assets. Facilitator A does not want to take any responsibility of those assets and they are not going to do that either. According to FA-2 that is not even practically possible as intellectual assets have only meaning and they are beneficial only if there is an actor that exploit them in something. Actor that exploits those intellectual assets can only be a company that makes business out of them and thus organizations similar to Facilitator A cannot have any role in it as those intellectual assets that are created within Facilitator A’s programs are under the control of some actors and those are the actors that exploit them. (FA-2, 2013).

According to RB the only way to enable combining assets from different actors is to enable interaction around specific themes. This means that if actor has a problem or it lacks something the only way to solve this problem is to start inquiries about it. When actor starts to seek solution for a specific problem within a network the only way to find that solution is to communicate the problem or the need to someone to find out if they would have something that would help them while solving that problem. Although RB emphasizes that network is not that kind of living actor that it would seek answers to actors’ problems, they have had match making activities where people have been invited to network gatherings to discuss about certain challenges. During this kind of workshops researchers and companies ponder around technological problems or challenges. If that problem or challenge is relevant enough, people will attend, if not then they do not come. This kind of problem solving has also been organized in the form of a theme day. (RB-1, 2012).

One of the Facilitator A’s program for example organized this kind of one day theme day to discuss about problematic of a specific research area. To this theme day external experts were invited to talk about it. Also different workshops were
held during that theme day. These kind of bigger events require that there is an actor that organizes and manages them as the problem needs to be identified. Although this kind of discussions around certain problems can take place via single individuals within less systematic interaction in a big scale that interaction requires that there is a bigger problem or challenge that is identified within a network that actors want to know more about. These bigger events can take place for example during meetings and quarter reviews if for example one day is left for discussions around certain predefined things and if certain people have been invited to discuss about them. Via these activities, networks supports the creation of value potential as that potential is created around a specific problem or theme. If several actors have identified a certain problem or challenge and give their own contribution to it, it is likely that the most valuable common intellectual assets are created around that specific problematic. (RB-1, 2012).

From Facilitator C’s point of view it is funding body’s role to find the most valuable single intellectual assets although Facilitator C also spars companies with this. According to FC they sometimes get that kind of comments from the old school that there is no need for any new companies as all we need is a good or better one. According to FC some of the older people have that kind of senseless mind-set that there are people that know and decide beforehand what the forthcoming successful products are and where the effort is only targeted. FC emphasized this by noting that one ex-director said to him recently that:

"This is insane. All crazy. Crazy ideas are financed. So that already children are thought that stupidities will be punished..." (FC, 2013).

Facilitator B is not directly involved to gather several actors around specific intellectual assets or while funding this kind if activities. Indirectly they supported this by bringing actors together via organizing discussion events. During the last couple of years Facilitator B has also organized internal sessions where new global trends have been followed. They also try to create networks by inviting actors together for common discussion. Within this kind of events their aim is to encourage companies to think more about familiarizing themselves with common things and collaboration with other actors. According to FB this collaboration could be joint projects and collaboration. (FB, 2013).

According to RA-1 interaction within the network increases the value of single intellectual assets and every time when intellectual asset is attached to somewhere it grows a lot bigger. At the moment the current situation is that knowledge elements and networks break off very easily as Research organization
A cannot be sure if certain people from companies they collaborate with are working in those companies anymore. Further these people have noted by themselves that at the moment they cannot have discussions as they are not sure if they work in the same company next year or not. This also means that links between single intellectual assets break down if there is not anyone within the company that can combine those intellectual assets and combine them elsewhere. According to RA-1 because of this single intellectual assets will either disappear or they float within the company without finding a partner. Similar thing can happen also within universities although it is rarer as usually intellectual assets that universities create are created into a permanent form like publication, report, dissertation or thesis which means that the intellectual asset that is created will stay as university institution is created for this kind of knowledge transfer and storing. (RA-1, 2012).

Interaction affects on combining intellectual assets when special intellectual asset is needed. This is enabled via mechanisms that are exploited within Facilitator A’s program that Research organization A participates in. These mechanisms include bi-weekly workshops where all the actors in their turn present and share their own results and experiences as well as other common gatherings. These events contribute combining intellectual assets when specific single intellectual asset is needed as then the company representatives can identify those intellectual assets. For Research organization A the intellectual assets that they utilize in publications and dissertations is cumulative researched knowledge about lean software development from all the companies that participate in this program. Based on this cumulate knowledge Research organization A has a better understanding about what lean software development is, how it is modelled and evaluated and how it is developed within companies. (RA-2, 2012).

According to RC the basic idea in Facilitator A’s biggest program is that other actors have the right to utilize materials that are created in the program at finite costs. It is also possible to get rights to those materials that are classified as background material. These background materials are materials that some actors brought into the consortium. Based on consortium contracts other actors have certain legal grounds to start to utilize those materials if these materials are visible to other actors in some way as then actors can perceive quality and potential of those materials via discussions. Basically it is possible to utilize other actors’ background materials either based on consortium contract or based on separately agreed agreement. Because it is required that other actors have possibility to
utilize background materials actors do not necessarily bring critical materials there right away but keep them outside of consortium and consortium contracts. (RC, 2012).

From ecosystem perspective Research organization D makes evaluations about how to grow more value around certain specific intellectual assets. According to RD-2 in this setting is it emphasized that as smaller companies do not have their own resources to further examine all the potential business lines, the aim is to enable research about them and to start programs about them. Interaction that relates to combining intellectual assets usually starts via mutual discussions as they relate to detail level things and might be linked closely to company’s current business. It is also possible that these ideas are that kind of ideas that companies do not necessarily want to tell about to a bigger group of actors. These ideas might be too close to company’s core business, product or new product. Other reasons that companies do not want to share these ideas is that their commercial utilization is in too near future and thus they want to conduct certain background work first. After the status of the new idea is identified in relation to company’s current situation it is possible to bring it as a billet to the common work if actors see that it is beneficial if several actors work on it. These kind of mutual discussions are also part of the network building as in this setting finding partners is very essential. (RD-2, 2012).

According to RD-1 their idealistic aim is that the entity is more than the sum of its parts and thus the aim of packing and collecting more valuable intellectual assets is that they would create additional value from Research organization D’s perspective. Research organization D does not organize interaction that would enable combing external intellectual assets from actors to whom they are not valuable or who cannot utilize them with other actors although this kind of interaction do happen on a personal level. This kind of interaction is based on personal chemistry and is takes place in the practical level of the interaction. (RD-1, 2012).

Research organization D is currently establishing a consortium where intellectual assets from companies and one of the Research organization D’s program would be combined to further offer that combined intellectual asset base to one EU-program. According to RD-3 this is opportunistic situation as there was certain call where their combined core competences and intellectual assets would match although this requires competences and intellectual assets that Research organization D has earlier identified from certain companies. In this case these intellectual assets also include software. Research organization D knows that
certain companies have certain kinds of intellectual assets and competencies that are more valuable than others because they have had joint programs and projects with them. They have obtained this knowledge within those joint programs and projects via experience, trust and communication. Understanding other actors’ core intellectual assets and core competences within a value network requires prior companionship and longer collaboration to truly understand what others have. To develop Research organization D’s own core competences to the direction that they would help to succeed in this kind of calls and to be sure that kind of calls would become also in the future is a difficult question as it would require regular connections to funding bodies. This would also require that research organization D can understand how the funding mechanism affect and what happen within the funding mechanism to direct their competence development according to that. (RD-3, 2013).

Also single personal contacts can be very valuable as for example they might open a channel into other actors’ valuable intellectual assets. These contacts can however break down when a single person leaves its organization for example as a result of co-operation negotiations. When those people leave, the link between those people and valuable intellectual assets their organization possesses disappear. (CA, 2012).

According to CB single intellectual assets that are more valuable than others are similar to core competences and as core competences cannot be subcontracted or sold out it is not possible to combine that kind of assets. This means that Company B is only willing to share intellectual assets and develop them externally if they are not their core competences. Typical characteristic for this kind of assets is that they halve quite fast. For example in relation to methods this means that if processes, organization or products change usability of these assets decreases. According to CB it is probable that also networks halve in the same way and thus it needs to be built all the time to keep it alive as people’s and actors’ interests change and those changes reflect also that network. (CB, 2012).

If actor knows that some other actor has experiences for example about how to utilize certain best practice or method it would mean that other actors have more trust about its benefits also for them. In this setting understanding about context and experiences as well as sharing those experiences and how they could be applied is important while thinking about how those best practices or methods could be applied within actors’ own environment and how they bring additional value. (CC, 2012).
There are a lot of different things that need to be noticed when products and services are created to the market including what is the market, where concrete business value is created and how it could be implemented into company’s products and services. This means that actors need to create different ways to support this kind of decision making including from where the decisions are formed and what things are done and how things are prioritized. According to CD this kind of things that relate to company’s business need to be made by the company and that is also part of the company’s core competence. However, via its customers companies get their needs, areas that those needs consist of and areas where company’s business value is created. In this sense Company D does not have single knowledge assets that ‘sell’ but different combinations of them as according to CD the world is going toward this kind of combination logic and thus it is not possible to succeed with simple things as value formation is not a simple thing anymore. In this setting Company D has certain ecosystem thinking as Company D for example develops platform concept with their partners so that they can develop attractive platform for their customers that would be simple but versatile. (CD, 2012).

Company G has thoughts about several potential patents. They constantly try to gather know-how that relates to their potential patent ideas and their forthcoming products to develop them further. In this setting Company G has also thought about how business will be developed within their focus area in the future with private equity investors. One aspect of this interaction relates to Company G’s potential sources of money in the future. Technology that Company G exploits is mainly open source software and thus they do not need IPR’s from certain companies. For them licensing tested and compatible technology they need from the company that CG previously worked is easier than to start developing that technology by themselves although via CG’s personal networks developing that technology internally would be possible. Internal technology development is not easy or more profitable so for Company G there is no point to do that by themselves. (CG, 2013).

**8.2.4 Value potential of intellectual assets**

When intellectual assets are created jointly with several actors all of them should have clear thought about value proposition of those intellectual assets for them already in their creation phase. These value proposition can relate to actors own business or their research. For example value proposition for research
organization can be that after joint program they can continue that research at the university. Further FA-1 emphasizes that if actor has brought its certain existing assets to this setting and continues with them. A good question is the motivation of other actors toward it as according to FA-1 their only motivation relates to new ecosystems where those assets are important also to other actors. Within Facilitator A’s program this kind of ecosystem thinking is extremely important so that during their programs new innovation ecosystems would be created in a way that all the actors would have their own role in them and would bring their own intellectual assets there to further create common intellectual assets and potential business ecosystems that exploit parts of these innovation ecosystems. (FA-1, 2013).

If these kinds of ecosystems are not created actors, start to seek new ecosystem or business where these intellectual assets could fit. Creation of this kind of ecosystems starts from companies and in some cases from universities via spin offs as the network does not have much role in the ecosystem creation. Networks role is to create know-how and intellectual assets as it is possible that even if the same actors create the ecosystem later it is not created by the same people. It is possible that the ecosystem is created by business people later although it is based on the know-how and intellectual assets that were created earlier within Facilitator A’s program. (FA-1, 2013).

In Facilitator A’s programs they have tried to mix together technical research and business research. When company enters to the program they bring their business case that describes their business case including its technical and business challenges that they try to solve during the program so that they would not be disconnected. Besides technical and business challenges many Facilitator A’s programs also affect companies internal processes which are the third challenge type for them. Facilitator A’s hope is that universities could see that kind of good things that relate to these business cases that other actors could also exploit. For example how certain kind of business models work or best practices that were found from programs business cases and to further communicate that knowledge to other actors. (FA-1, 2013).

In Facilitator A’s ecosystem programs there are companies that work on to proceed their business concept as they have certain business thought that they want to validate to know if it is business or not. During this validation, different kind of assets are created to actors. Some of those assets are that kind of assets that actors can share and based on those shared assets certain kind of common asset base is created although that asset base is common only during the program.
This means that after the program has ended as a result common asset base has not been created but instead all actors have created their own assets that they can forward. During the program actors have been able to increase their assets by the aid of assets that other actors created during the program. Although program has not created any kind of common asset base, it is possible that common business concept have been created or common business idea which can be the base for common business activities. (FA-2, 2013).

In this way Facilitator A’s ecosystem programs differ from their research programs as within research programs all the end result material has to be shared within the consortium and actors can utilize all the work that was carried out during the research program. In ecosystem programs actors can decide by themselves what they are willing to share and thus sharing of program outcomes is more limited within ecosystem programs. Decision making within the research programs starts from that a company decides to do certain things there and understands that it has to share those things. If there are things that company does not want to share, it needs to do them elsewhere. (FA-2, 2013).

Within ecosystem programs single actors have their own assets and can exploit them in the best way although via the whole ecosystem program new views about how to compile different things are created and actors learn to understand better other business opportunities. As Facilitator A does not collect and manage common asset base actors need to gather them by themselves and actors need to be able to utilize them. (FA-2, 2013).

According to RB-1 there are a lot of examples that a certain thing has been pondered within the network but that intellectual asset or result that was created was many times more valuable to a single company than to other network actors. Thus a certain company might make or will make business as for other actors those assets are just nice to know about. Further RB-1 notes that if created intellectual assets are exploitable to all actors within a program, network sees it as a positive thing if one actor creates value and business out of those jointly created intellectual assets. In this kind of setting it is poorness of those other actors if they are not able to utilize those assets and develop them further. (RB-1, 2012).

As based on the consortium contract intellectual assets that were created within the program are available to all actors their utilization cannot disturb them. In quite many Facilitator A’s programs there are competitors and thus the utilization of intellectual assets that were created within the program depends on individual actors point of views and business decisions. If an actor sees that it is about to create something very good and sees huge business potential in it then
the actor does not bring it as an asset to the common asset pool as all actors within the research programs and networks understand that business secrets are zoned out. Although within research programs joint activities might relate deeply to an actor’s products, there is a boundary that especially all the companies understand their business core. (RB-1, 2012).

Similarly within methods research where certain actor’s way of working is developed, companies are quite willing to tell what kind of method they have developed and how many errors corrected but they do not necessarily tell to which product that development was made and what errors they found. This means that in some cases researchers cannot report about these things in their articles either. (RB-1, 2012).

A bigger challenge than recoverability of assets within the joint research programs might be if the central assets will be imported to the common asset base or no. If actor finds out within a publicly funded network that they are developing something very good that is a core thing in their business their motivation to bring that asset to any common asset base is questionable although RB-1 has not noticed this kind of concealing. This is because actors work on that kind of things within the joint research programs that they can share because based on the contracts they have to share them in any case. Because of this actual product development will be made on actors own costs. (RB-1, 2012).

Even if technology related intellectual assets would be very good necessarily business cannot be made out of them. According to FC good examples how business view can be brought are business accelerators which are operated by people that have already shown that they have succeeded and created their own business and brought their business know-how via these business accelerators. For example on a regional level there is a business accelerator that has its first five companies that relate to technology that RB-2 from Research organization B helps to commercialize. FC further emphasizes that traditional venture capital funding bodies guide companies via work of board of directors but are not involved with the operational activities strongly, if at all. New actors do not go to board of directors but stay in the grass roots level and guide via sprints so that they are involved in companies activities and bring their own experiences and views to company’s technical and business teams and spar them. (FC, 2013).

As Facilitator B is a neutral public funding body it cannot guide intellectual assets based value potential strongly, although it can rise up certain themes and organize events and invite people there. In this way Facilitator B can build a framework where positive collisions could happen and create and maintain
discussions. According to FB this is the activity level they can participate in. Typically these kinds of activities are too early activities for private equity investors as they want relatively fast profits for their investments. Also events that are organized by other actors and events where Facilitator B’s representative is invited to speak are events that open up interaction and create relationships so that also small actors know what Facilitator B does and who the right contact persons for them are. In this way those events are also store windows where Facilitator B’s representatives are visible as individual persons. (FB, 2013).

Companies that get funding from Facilitator B do not need to share intellectual assets that they create via that funding and thus intellectual assets they create stay within the company although within Facilitator B’s theme programs there is a requirement that companies need to write short general level description about what they have done during the program. Based on those descriptions public summaries will be made. (FB, 2013).

If Facilitator B has funded certain actor A and is later in interaction with actor B that could fit well with actor A. Facilitator B can even start pairing those two actors if they see that together they would achieve ten or hundred times better outcomes. They can only say that they know companies that actor B should be in contact and ask if it is fine by actor B if they investigate that opportunity. If actor B is willing then Facilitator B can contact actor A to ask if they would be interested to discuss with this other actor. If both actor A and actor B are interested, Facilitator B can deliver needed contact information to them. This means that funding or customerships of other actors are not discussed even in a name level as the relationship with the actors that applied funding is confidential. (FB, 2013).

Because of this Facilitator B is not able to actively combine intellectual assets from several companies and thus there is no point to them to put effort in it as they cannot know if companies are interested or not or if opportunities to combine intellectual assets from several companies will turn out well or not. Thus Facilitator B’s role in combining intellectual assets from several companies relates to different kind of events where they can invite and match people as there people can open up discussions they like. If companies and other actors, like Facilitator B can take part in this kind of discussions in an expert role and speak about technical matters of funding. (FB, 2013).

Facilitator D has built its network to identify the potential things that are justified to proceed further. For them potential means that things are potentially scalable and have clear business potential (FD, 2013). All the commercial
activities need an operator that runs them and according to RA-1 that operator is company or company that is established as without operator there is no activities that directly aim to specific target. In some cases university can run these activities for a while if it has to do so but it is not university’s role. In big companies there might be department or single individuals who are responsible of creating the intellectual asset based value potential. Although patents and research results that are created within university are university’s property individual researchers can utilize those results and their own know-how in many ways for example while writing books. (RA-1, 2012).

Although research results and new knowledge are created within a network in principle the value potential is created within a company or single persons as usually all the knowledge that is created within a research program is available to all partners. Utilization of value potential that is based on intellectual assets and knowledge that are created within the program depends on partners’ and researchers’ personal and commercial interests to utilize them further than other actors. It is usually agreed in the consortium contracts how individual actor can utilize intellectual assets that have been created within the research program. According to RA-1 university is just happy if someone gets business based on those intellectual assets as then university has accomplished its task. Companies know quite clearly within the consortium contract or creation of consortium what their aim is and what will be created including knowledge and intellectual assets. Research organization A has currently on-going projects where competing companies act in the same project on same thing that they use in different ways in their own products or activities. (RA-1, 2012).

Companies that have collaborated a lot with universities know that with university actors they can act quite freely as universities are strict in that they do not intervene or tell about companies affairs. According to RA-1 because of this it is possible that they work with several competing companies at the same time as they ensure that company’s affairs do not get messed. Although Research organization A can discuss with companies about what they should utilize, as they discuss about several things and throw ideas to companies, companies then decide how they want to proceed with them. (RA-1, 2012).

Interaction that supports creation of value potential takes place in many levels. Both individual and organizational relationships support interaction. Common work is also very important part of value potential creation as well as joint publications. Even if value potential is created within single actors, other actors can also utilize it as this utilization is not limited by contracts. According to RA-2.
this is only a positive thing if it creates good examples how the created intellectual assets were utilized somewhere or company has got value and utilizes them. These examples can go to quite a precise and concrete level so that they are not just general level case examples, although the programs’ and actors’ nature has an effect on this. (RA-2, 2012).

Research organization A has more communication and they know more about activities of those actors whom they have more collaboration with. Besides projects networks they also have other networks like global and international research network in software engineering of which founding member RA-2 is. This network gathers together annually and according to RA-2 this annual meeting is extremely important for interaction. This is because via virtual meetings not even near that interaction would occur. This interaction also affects to access to knowledge. It is a valuable network where actors identify, and networks task is to identify, collaboration possibilities and joint programs. Within this network there are actors who Research organization A is in closer collaboration with. With these closer collaboration partners joint programs are easier to create. (RA-2, 2012).

RC emphasizes that network does not create any value potential but single companies or individuals do. When actors collaborate within networks they create things together and combine things from different actors and thus actors need to think what they do internally and what they acquire from elsewhere. As a result within the program there are things that were created jointly and thus companies need to think what things they want to utilize commercially and what things they want to focus on. This means that although intellectual assets would have value potential, it may not exceed their deployment threshold as companies need to see their potential profits. Secondly, companies need to get perception of the quality of intellectual assets and possible problems, risks and costs that relate to their rights. RC emphasizes that the threshold that company deploys certain intellectual assets is quite strict and actors that created those intellectual assets need to use time and energy to market them so that some other actor would deploy them. As the threshold to deploy is strict, actors do not easily deploy those intellectual assets. (RC, 2012).

As companies have many activities they do not take additional things to their agenda easily. This means that company’s goals guide its activities quite much. As company has decided to carry out certain things it carries out activities to seek required intellectual assets. In this way company’s internal guidance defines what
it searches intellectual assets for and those intellectual assets can be located further within the network or outside the network. (RC, 2012).

Besides seeking for intellectual assets that link to company’s goals, companies also have opportunistic behaviour and certain kind of innovation activities. This means that they can exploit ideas that are easily exploitable because their cost benefit ratio is reasonable. According to RC it might be that in these cases, ideas that are nearer within the network will be exploited more easily because companies have faster access to them, they are found more easily, their quality is evaluated in more trustful way and their risks are possible to evaluate. In this setting companies seek needed knowledge further if that knowledge relates to things were company want to differentiate from others. (RC, 2012).

As universities have neutral attitudes and they do not compete with companies, it helps them while creating contacts. This is true at least in Finland where it is easier for universities to get into discussions with companies based on their neutral position. According to RC for example in China universities are not able to discuss with companies that much and further for companies it is easier to start discussions with other companies than with universities. So universities’ access to networks’ intellectual assets is also culture limited. (RC, 2012).

From RD-2’s point of view finding potential partners for value potential creation relates to network building. Within mutual discussions between actors value potential within the network is identified. During those discussions ideas about intellectual assets they could work together with are identified. In this setting value potential is based on know-how that actor possesses and also that demand meets supply. Research organization D’s role in this kind of meetings is a middleman so that demand and supply would meet and via that additional value would be created. (RD-2, 2012).

RD-2 emphasizes that to work efficiently network needs strong hubs that have wide perception about competences and strengths within the network so that it could facilitate parts of that network. In this setting Research organization D’s role is also to forward the value potential that is based on intellectual assets that have been created within the network. From this point of view Research organization D also creates business activities, although they are research organization, as they deliver information about actors offerings to other actors within the network if needed. As knowledge within their network is multipolar Research organization D’s aim is to possess wide perception and knowledge about value potential of that knowledge. Actors within the network know that Research organization D possesses this view so they can ask from them if needed.
Further their operation model is open and they try to work as openly as possible. This means that even though value potential is created within certain part of the network all actors know they can try access actors who possesses that value potential via Research organization D as they are a neutral actor without business activities. In this way actors are able to identify value potential and intellectual assets within the network even though access to them might be limited. (RD-2, 2012). 34.29-37.24

Also RD-1 from Research organization D notes that their activities within value potential creation relate to discussions with companies. Further they have had some discussions with the local university’s business school about tightening their collaboration as it could be a good combination. Even if intellectual assets are created within the network, value potential is created both within the network and within single actor as value is also created as a result of collaboration that requires several actors. If both intellectual assets and value potential are created by several actors within the networks, it still requires an actor to start to exploit them. Within Research organization D’s programs, borders that would potentially limit the utilization of created results are not absolute in a way that only actors that participated in certain programs could utilize its results. (RD-1, 2012).

Research organization D has tried to develop their premises in a way that interaction between individuals would be created. They have user survey team and more technology oriented teams and they have tried to actively increase the interaction so that new kinds of combinations and thoughts would created about what they have accomplished and how they could be utilized. This means that intellectual assets are not necessarily valuable. Instead the value potential needs to be created. (RD-1, 2012).

To foster value potential creation from companies’ existing intellectual assets, Research organization D has an end-user community that includes around 500 real end-users from people in their confirmation age to over 80-year old senior citizens that participate for example in testing. Communication practices within this setting between end-users and companies are operated by Research organization D and include for example surveys, commenting and discussions. Based on that interaction, knowledge about what kind of services those end-users want, what kind of services should be developed and how people would like to utilize them is created. Although currently activities of this end-user community are based on the needs of a certain actor, according to RD-1 when this community is developed further it is possible to utilize ideas that come from end-users that do not relate to a certain actor’s own needs. (RD-1, 2012).
According to RB-2 ideas always require an entrepreneur to refine them as everybody can throw ideas but ideas need someone to forward them. For example within training that Research organization B organized with other local actors they got 80 ideas from participant. Some of them were thrown quite lightly. Within their process, when these 80 ideas were narrowed in to 30, all the participants needed to list three ideas that they could take part in. In this way participants were forced to at least say which ideas they are interested in. Another way to support creation of new star-ups is accelerator experiment that is about to start. This accelerator experiment will last 12 weeks and starts after other trainings. Within this training 12 months of company’s lifecycle is gone through via one week per month rhythm. The main focus within this experiment is to undergo ideas with customers. Other aspects of this experiment include product identification, how business is operated and is required to run a business. As a result of this experiment, a business plan is created as well as some kind of prototype. To access this accelerator experiment, Research organization B has organized review with ELY Centre, Finnvera and Facilitator C where companies’ were required to present based on previous training what they are starting to do. The aim of this experiment is to trim actors so that they would have better readiness to get funding from venture capitalists. Only established companies can attend to this accelerator experiment. (RB-2, 2012).

The aim of this week rhythm is that each week would have its own theme and an expert of that theme tells about it. In addition, each time all actors need to tell about their own thing and what they are doing. Via this kind of collaboration within training’s people are encouraged and inspired as according to RB-2 peer support is very important as there is so many opportunities that it is easy to tangle to your own feet. Via peer support is it possible to get external contacts and views as business is created after the accelerator experiment. During acceleration period team, its product and understanding about customer need refines. Also product demo should be created during that time. RB-2 emphasizes that in a way company’s value should increase or otherwise it should be noted that nothing comes out as there is other companies already in the market. During acceleration experience or mentoring it is possible to see if the company could have potential and what its opportunity to create business is, although peoples personal willingness to take risks also affects. During accelerator experience companies look for potential customers and contact them to seek for possible customer needs. In RB-2’s opinion these customer needs cannot be asked because the customer does not understand it. The only actor who understands it is the entrepreneur. This
customer need relates to sales, marketing and finance trainings and to certain business as a whole as according to RB-2 for example people who come from Nokia generally lack these things. They know many things very well but sales, marketing and finance are not their strong areas. (RB-2, 2012).

For Company A one of the additional values that program, like Facilitator A’s program they participate in, is that it brings together people from different companies who think in different ways and thus can give different kind of feedback and answers to your things which actors could not get internally. CA emphasizes that especially additional value while developing ways of working comes from more different kinds of views, ideas, thoughts, tests and their outcomes actor can see and perceive. As a result of this actor has a better toolbox to ponder things and make their own solutions. According to CA from people who have seen and experienced things within their own company that are relevant to Company A they get more additional value then from people who have worked in a different type of company with a different set-up. (CA, 2012).

As Company A’s capacity to import value that Facilitator A’s program has created is limited there are things that took place that could have been beneficial to them but for one reason or another they cannot access them. Regardless how much value is created within the program at some point, there is a border that limits benefiting from that value. If an actor has not been involved in intellectual assets creation identifying opportunities that relate to them is a resource problem that requires time, interest and understanding that they are worth of examining and where to look for. According to CA within the Facilitator A’s biggest program and also in general there is a lot more knowledge pool that it is possible for an actor to utilize and thus the problem is how to limit needed effort to be able to utilize them. (CA, 2012).

Reports that big EU projects publish are based on published data so that they can be trusted and according to CB those reports possess value potential but as they include so much data that it cannot be forwarded internally as it is so high-flying. CB has been in two projects that wrote a book but no one from Company B has read them as reports and books get old. According to CB one interpretation is that book itself tells that the value potential is old as its trustworthiness has already suffered. Within a company Company B value potential is not created internally based on intellectual assets that were created jointly. Instead Company B has a certain problem that they need to solve. If that problem is close enough to project outcomes then things start to happen, but according to CB usually joint projects do not create solutions that they need as they are very generic. Because
of this there needs to be an individual that modifies the outcomes of joint projects into solutions for certain problems but as there are few people who can do that, the value that comes from joint projects is usually too abstract. Interaction with other actors that relate to sharing best practices about deploying value potential takes place but according to CB they try to do so but as projects are time consuming on a technical level, there is not enough time for that. This relates to the deployment problem around CB’s job, which is work efficiency, so that according to CB projects should aim at smaller steps and more concrete improvement proposals where deployment is taken care of. (CB, 2012).

CC notes that it is possible that external actors find the right angle about how to utilize the intellectual assets that are created within the program. In these cases normal competition laws guides the utilization of those assets as actors need to find their own angle to utilize intellectual assets and the actor that succeeds best in it gets the greatest benefits from them. In CC’s opinion per se it cannot be and should not be defined that the best value belongs to someone as success is based on that actor is able to utilize existing things in best possible way and the actor who does this best should be ‘doff the hat’ not to think that no one else should not benefit from what certain actor does. If truly remarkable intellectual assets will come to prominence from a certain thing or collaboration then there will be bloody competition about who is able to exploit them. But per se it is about actor’s own activity and capability to recognize exploitation potential and about those activities actor exploit that potential. This means that if value potential is near to actor’s core business actor is more careful about it. According to CC within Facilitator A’s biggest program there has been open discussions that if a certain thing is too near with an actor’s core business or research within the program has forwarded further enough so that it could be taken into part of actor’s business then it is honestly take away from that collaboration. As all the actors within Company C’s network are not doing active collaboration all the time there are certain forums where actors can share their experiences and success. CC emphasizes that as success of other actor can create new opportunities to other actors within the network, this kind of sharing of experiences and success should be encouraged so that all actors could succeed. (CC, 2012).

At its best value is created to all collaborating actors but from the different viewpoint. For example CD does not believe in that kind of philosophy where all the value is collected to a single actor as all the collaborating actors need to have certain attraction from where they create something different. In a long run it is not beneficial if all the actors are doing things just for one specific actor. So all
the actors need to find that kind of value of which they can differentiate in the market and create profitable things for themselves. Depending on the target of that value, there can be competitors within the network. This is possible for example within value networks where competitor bring some kind of additional value that other actors do not necessarily have. If collaboration with the competitor takes place within the network, it is limited as according to CD they can compete with the same competitor within different things. CD further emphasize that within programs where competitors collaborate there needs to be certain rules as otherwise it does not work and program does not proceed. (CD, 2012).

In CD’s opinion the hardest thing is not to have deep know-how about something but to form deep know-how about something that can be brought to customer as additional value. Additional value is the way and know-how to create business value to that customer within either the context of products or services. In this setting actor needs to able to see what is the value that customer wants, in what way that value is formed and to forward this image of value to the network as sometimes true additional value is identified within the network, although the customer is not aware of that value. (CD, 2012).

One of Company F’s research billets was created when they had discussions about solutions that relate to other research program where one big company and university had collaboration around specific solutions in content sharing. During this discussion Company F expresses what their interest is and how that interest relates to the problems that their customers have. Via these discussions that kind of thing was created that is currently forwarded to seek possible new kind of tools that could related to Company F’s core business. Company F’s aim is not to solve the big problem in content sharing but to ease their customer working. According to CF this value potential was not created base on some paper but from a couple of sparring rounds to see what the potentially interesting thing could mean. (CF, 2013).

Within this setting network forces that and enable in a fair way that actors that participate a program need to be that active that they tell to other actors what have happened in a tight and open way. This does not mean that actor’s need to present what they have done in every quarterly meeting but regularly enough. CF emphasizes that if all actors do this it enables creation of new things. Telling and communicating what actors have done is not a big effort as actors already have the materials and perspectives about them. Instead CF notes that actors might benefit when they try to classify what they have done and what it means as after
this kind of pondering, understanding about what to do next and if other things
could be created based on these things is created. According to CF within the
program they participated in there were so called ‘demo bazaar’s’ where people
told what they had done without trying to sell anything. Within these demo
bazaars it is easy to get perspective what has been done during one day or a
couple of hours. (CF, 2013).

According to CF it is not necessarily easy for actors that were not selected to
work packages or theme areas to identify intellectual assets and their value but it
might be a low cost to put people there to explore as according to CF in practice
anyone within the program can sign up and come to those events. CF further
emphasized that different people cannot attend every time as then continuity is
not created although for example people who have attended from Company F has
been changed during the program as the theme area has lived and because people
have changed. Only a small portion of Company F’s employees has participated
in these event but they try to communicate and market it internally to seek if they
would have interested people and to tell what they do there. In this setting it is up
to an actor’s own activity how much time the actor is willing to invest in this kind
of networking. According to CF within their program they do not have annual
public events but instead they tell what they have done when they have something
to tell about. Some new tools and methods have been created and the aim is to
openly keep them visible. (CF, 2013).

As Company E already has a product and intellectuals assets that possess
value potential they collaborate with university to get new views and additional
value potential. For them realization of that value potential takes place when they
get feedback from their customers about additional things and views they have
got from the university. Although Company E does not have concrete
 collabroation with their competitors, they have had discussions with some of them
about competitor’s possibilities to use Company E’s platform so that they could
bring their own know-how on top of it to build their own version of it. As it is
possible that competitors could realize Company E’s value potential better these
discussions have been preliminary and rough level discussions. From Company’s
E’s perspective this kind of discussions have kept alive to seek if their competitor
would like to resale their solutions and to keep Company E’s future opportunities
open. As solutions of Company E’s competitors are more traditional than
Company E’s communication between them is toward Company E. As Company
E cannot know if their competitors are developing similar solutions, they need to
be careful when discussing with them so that they would not give too many ideas to them. (CE, 2012).

Company G brings significant amount of value potential that is based on their technical assets internally. According to CG the intellectual assets that their company possesses are that they know how to combine best technologies into best service products and how to seek parts from different technological solutions and how to package them together and how to turn them into sellable entity. Thus their intellectual assets consists of business and business relationships and to technology based intellectual assets as they have very good technology that has been developed by themselves. Their future business will be strongly based on that technology. In this way their business and technology related intellectual assets overlap. (CG, 2013).

8.3 Analysis of asset-based value proposition

Analysis of asset-based value proposition consists of analysis of overlapping value co-creation, value co-capture and value co-opetition. As these activities are overlapping they are not separated in the analysis either. Based on the context of this research these activities can relate to research, development, innovation or two or three of them based on the network activities and the limits from funding bodies.

Within Facilitator A’s research programs all the participating actors can benefit from intellectual assets and value that are created within the program. Participating network has certain head start as typically they publish all the deliverables publicly six months after they have been released within the consortium. A very large portion of the results are public and available via Internet. As FA-1 emphasizes in ICT six months is a lifetime and if actors are not able to utilize certain result within six months it is their own fault. (FA-1, 2013).

If external actors want to utilize results of research programs they usually need actors that created them and typically they try to get into the program when they see or hear about certain deliverables in public seminars. If they are not able to get into the program they can try to partner in some other way. According to FA-1 the most efficient way to benefit from programs results is to be in the programs. If this is not possible, external actors can try to contact companies that participate the program directly. In this case it is about the interest of the company or university that created those results if they want to do collaboration or not as
based on the consortium contract program participant do not need to share results with external actors if they do not want. (FA-1, 2013).

There are two funding models within SHOKS’s. Wide public and narrow public. Within Facilitator A’s research programs they only use the model where practically all the results have to be shared with external actors. However, this occurs only after the program although it can be agreed that certain amount of results will stay within the consortium. Within Facilitator A’s program the amount is 10-20% and companies need to have very strong reasoning if they want to publish something after the program as Facilitator A sees that the speed is the decisive factor. There has been quite a few cases of this kind as companies have learned that results need to be utilized immediately. In ICT when results are two to three years old it does not matter to companies if they are shared or not, but it might create bad blood for companies if they do not share them as it does not have any disadvantage to them. (FA-1, 2013).

Sharing of intellectual assets to other actors is more open within research programs where the focus is on research and technology activities when they relate to competences. Within business ecosystem programs where actors are clearly making business, this openness decreases. FA-2 emphasizes that Facilitator A’s message has been that within the business ecosystem program, openness does not mean that actors share all to everybody but that actors do something with other actors and open some things. This means that actors need to open something so that other actors can start discussions about things that they opened and to make it visible that actor is giving something so that it can also receive something. Things that actors share do not need to exist already as the things that are shared are typically created during the program. In respect to this FA-2 tries to advise companies not to discuss about background at all as if companies have existing assets or IPR’s it makes things immediate lot more difficult. Further FA-2 emphasizes that if existing assets and IPR’s need to hold on to collaboration programs, like Facilitator A’s business ecosystem programs. It would make them immediately a lot more complicated and thus it should be noted that background is not linked to the program at all. Instead the focus is on creating and sharing new things and nothing else. Even if things that are created within the ecosystem programs link for example to certain technology assets and actors those activities can be done outside of the program via dyadic collaboration. In FA-2’s opinion existing assets and dyadic collaboration outside the program are not worth of being involved with the program activities as it is too difficult. Although in the consortium contract there are clauses about background materials
and actors can bring background material to the program. FA-2 thinks that actors do that in a quite small amount. Further FA-2 advises actors not to discuss about background at all and not to touch it at all if it is not a must. According to FA-2 actors have only brought background materials into the program if that has been only way to proceed, for example when a company has had certain things, like components, that are required while utilizing program results. In these cases that material needed to bring to the program as background material, but in FA-2 opinion actors are not willing to do so. (FA-2, 2013).

According to RB-1 within the research program, value creation focuses on innovation research as the core of the network is to innovate together and on joint doing so that one plus one would be more than two. Further RB-1 emphasizes that ideas, research, product development and innovation belong to the same chain where innovation is not in the beginning but at the end as innovation is something that creates benefits and business. In RB-1’s opinion joint pondering about what they have is ideation which is very valuable within the network and because of them many actors involve in these activities so that they would understand it. Thus one thing that relates to networks is the path from ideas that are concretized into assets and further to innovation and business benefits. (RB-1, 2012).

Companies can do ideation together and there are things and entities that require collaboration between competitors for example within certain standards. According to RB-1 they have examples of this kind of collaboration between competitors. In these cases single companies cannot forward things by themselves because it requires certain common frame and thus it is not relevant if collaboration partners are competitors or not. This means that companies need to do ideation or development together to build these frames. Further RB-1 emphasizes that after this it could be supposed that if the competitors operate in the same network they would start their research and development activities separately within this same frame so that they compete against each other or that they would find common things and offer whole solution and in that way be stronger together. These research activities include both innovation and innovation activities. According to RB-1 companies’ collaboration with their competitors depends on how critical area it is to them as development of ways of working or processes are not as critical, although it is important who is more efficient in it and thus things and product development that relate to their core business is done outside the network. (RB-1, 2012).

In FC’s opinion it is difficult to fit into Finnish culture that actor starts to develop business in a way that other actors besides the entrepreneur could benefit
from it. Currently it is not within the infrastructure that actors could benefit jointly but Facilitator C tries to build it within the start-up ecosystem that they will start to build in the next phase. Within Facilitator C’s current activities they had an actor where they originally built this kind of mechanism so that mini ecosystem would be created there, but according to FC because of a couple of individual’s the public actor did not dare to fund it anymore. In this case the point was that via public funding that kind of things would be created that would benefit only some actors. According to FC now time might be mature so that they could build this kind of mechanism that would create mini ecosystem. FC emphasizes that the best business accelerators are businesses to actors that run them because they got a couple of per cent of the stocks of the company or something else of the company that is accelerated. Moreover, via this kind of stock pools and other arrangements it is possible to build these and keep the interests similar. Further FC emphasizes that this is a very important thing that they would like to bring to this business ecosystem and they have tried to copy SHOK models with this. (FC, 2013).

Research organization A tries to be even-handed to their partner companies and give them the information that companies have wanted. According to RA-1 it is companies’ own business how they use that information in their business as they know it better than Research organization A and Research organization A should not stick to it as Research organization A develops services, technology and processes and is not management experts. (RA-1, 2012).

Within Research organization A’s projects actors do not compete against each other about utilizing jointly created value as in RA-2’s opinion in their projects interaction is open and in a key position within value utilization. This is because if within the projects there would be just written documentation that is either stored somewhere or discussed it would be different thing than real interaction. According to RA-2 within their projects utilization of value potential is not limited via contracts. Limitation of utilization of value potential relates to cases when Research organization A researches certain single company that might bring up that kind of confidential things that Research organization A cannot bring outside the company. From Research organization A’s point of view this limits what they can publish, what kind of data they can publish and if they need to hide name of that company or not. This is something that needs to be taken care of every time. There is a clear difference between different actors while publishing research results and data as actors that have experience about research programs are not necessarily as strict as those actors that come to their first research
programs as they are careful about what happens there. This means that there are differences between companies as there is a learning curve that when a company comes to the research program as a new actor they might be a bit careful at the beginning before they notice it is not dangerous to share some information publicly. (RA-2, 2012).

When comparing joint value utilization that is based on jointly created value within networks and ecosystems sharing that value is possible within ecosystems as then that value benefits all actors with the ecosystem. This is because when the ecosystem succeeds it creates value to all participating actors, although the amount of this value for a single actor can vary. Instead network’s benefit can be a problem for a competing network. Within value creation it is more beneficial to research organizations if they have evidence that ideas have been created based on research as it eases the interaction with companies while developing new things in collaboration with them. According to RC within this setting university is a good partner for companies as companies can outsource their tasks to universities as university’s workforce is good and cheap. Further if company needs to decrease its costs it just does not subcontract things to universities anymore. This is an easy model to companies as they do not need to determine negotiations when decreasing subcontracting from their university partners. According to RC this is a model that many companies would like to use while direct subcontracting but the problem is that the company needs to be quite big to do so as for example within software development, subcontracting should be in knowledge-intensive tasks. Further RC notes that many companies work in a traditional way and do not use innovation outsourcing models or crowdsourcing. (RC, 2012).

According to RD-2 research, development and innovation activities have different nature and they are very unique especially within research networks with their own rules. If an actor is able to network in one way for example via research group it opens up a route also to development and innovation activities. RD-2 called this kind of connection as ‘second level connection’ as if Research organization D has a link from development or innovation activities to research activities and that research has a link to research activities for example in California it means that they know the actor who knows the right actor. Further RD-2 notes that this kind of second or third level connections has their own meaning if an actor is able to utilize them. Within Research organization D’s research and innovation activities they have more this kind of second level connections than for example research groups or companies have so that Research
organization D is able to combine those two different levels and according to RD-2 it without doubt increases their network effect. RD-2 notes that in this kind of multi-dimensional network it is hard to say where the value potential is largest. From Research organization D’s point of view target areas where they seek additional value from are based on their strategy and thus strategic demand determines partly where value is focused. (RD-2, 2012).

When programs create things in a business oriented way and compete against each other based on program results outcomes are limited partly as companies have been defining programs’ starting points. In these cases program is planned in a way that it supports activities of those companies that involved program’s starting point determination. This means that companies purposefully limit their activities in a way that parts of them are done within the program and rest are done internally or with other actors outside the program. (RD-2, 2012).

According to RD-1 value resides in research, development and innovation activities and thus value is nearer within the research that is currently utilized and concretized. In this sense time span that relates to value of basic research is longer. Within all the Research organization D’s activities, the aim is to think about their activities via use cases to figure out where those cases relate to so that things that are created would not be just papers that are stored in a library. If companies have created intellectual assets and value potential together and are utilizing them within their own business, according to RD-2 competition is inevitable and even desirable because if there is competition then there is value potential and the created additional value is tested if it is something that companies thought it would be. In this setting RD-2 does not think that competition could be a problem. If this competition relates to concrete product or more specific things that were created within the project then there are contracts at the back and IPR’s have thought about in the consortium contract which means that all the actors get their own share that belongs to them. According to RD-1 one thing that they would like to proceed is formation of researcher commercializer pairs where a researcher is the actor that brings an idea and if the commercializer is interested, the researcher would get fair share of it. In this setting the aim is to be part of that value chain also in the later stages so that researchers would get their share if other actors create significant things based on researchers work. (RD-1, 2012).

According to CB they have been in a same project with their competitor where forwarding organization was a Swedish university. Company B was able to receive many things from that project. Some of those things are still in their ‘potential portfolio’. Some of these things have realized recently and they are
aiming to that direction although their competitor has exploited them already for some time. At the same time CB emphasized that they cannot be dealing with their competitors in any way because of NDA’s. In this setting Company B can create intellectual assets and value potential together with its competitor and compete with them while joining the value within growing business if those assets and value relate to methods. Within products this kind of collaboration with competitors is not possible for Company B. According to CB they need to be careful about their core business areas as they are not too good with core management and how to keep it to themselves. Because of this Company B tries to guide this kind of projects where their competitors also participated in to complementary products and services. (CB, 2012).

In CC’s opinion expectations are wrong if activities within the network are started if it is known that only one actor benefits as it is not fruitful starting point if this has not been clear to all actors from the beginning. CC emphasizes that the best starting points are those when it is beforehand assumed that in the future these activities will bring increasing piece of cake to all. In these situation context is an important factor as actors always need to understand in what kind of environment activities take place no matter if their nature is technical or business. Many times things that relate to ways of doing and processes are less critical than things that are purely technical and near to concrete product or service. (CC, 2012).

According to CD for example VTT takes part in many networks internationally where certain kinds of value are created together. Further VTT has large human capital but to be able to collaborate with companies in Finland SHOK consortiums are required as otherwise VTT’s internal operations create their researchers too big internal revenue expectations. This means that if VTT has certain good researchers who have good know-how and that researcher would come to create value to a company, the price would easily be 100 euros per hour just because of VTT’s internal expectations. According to CD in this setting company’s value is not in know-how but how VTT delivers that know-how and how they can build solutions in a cost-effective and competitive way with their customer. Further CD emphasizes that value formation process is not just about know-how and product but it is also about how that know-how and products are delivered and if they are delivered in time. This means that if things are done together they need to be delivered within the schedule and results need to be ready within a sufficient time window. (CD, 2012).
In CD’s opinion innovation creation requires that customers, business and business value have been understood and that Company D has understood their value internally. This means that an actor needs to understand what valuable things they have and bring them visible so that they can be utilized. Further CD emphasizes that innovations need space and opportunity so that they can be utilized and in this way it is possible to ponder together with the customer to think about how business value and business will be brought. (CD, 2012).

Within Facilitator A’s program Company F does not have competitive position toward any direction as they do not have any direct competitors there. According to CF they could have common areas with big companies but those have a different stance. In CF’s opinion if something is created within the program it creates a win-win situation although CF further notes that perhaps the program is not in that stage yet. In CF’s opinion it seems that within the cases that Company F participates in, revenue logics are visible as they come from participating actor’s current business and what they want or do not want to do within it. (CF, 2013).

Company G collaborates with regional companies that have some overlapping things with them but according to CG this is normal as their aim is to do things better than others. This means that Company G can collaborate with its direct competitors and with competitors that have some overlappings if that collaboration is limited to suitable areas where all participant benefit from that collaboration. Company G has for example fixed its competitor’s platform after their competitor contacted them about this as Company G has the required know-how although that platform was built on competing technology. This was done based on discussions where actors agreed that certain cluster is needed and for them it is better to build that cluster together. As Company G utilizes open source a lot they can also licence their technology and sell their products to their competitors as anyone can utilize and copy open source any way and Company G’s head start can be captured if they do not proceed fast. In this setting CG sees that venture capitalists and companies emphasize patents too much as patents do not matter if actor violates them purposefully and takes over the market. This is because according to CG small companies are not able to sue even if someone violates their patents as when adjudication comes for example from US juridical system violator has made 100 times more revenue then they need to pay. According to CG second reason why patents are not meaningful is that when international or national patent is published in a public database the Chinese
patent it right away in China as it can be copied from the public database and it is public information. (CG, 2013).

8.4 Analysis of business value

In the a priori analysis framework business value was not strictly defined. For this reason analysis about business value starts from analyses about how value potential is realized into business value. Second, the focus of the analysis on how knowledge and value potential can be refined into products or services or other potentially valuable things like capabilities and competences.

8.4.1 Realization of value potential into business value

Facilitator A's hope is that they could give more business support to support business creation. Vicariously actors get this kind of support by getting knowledge about other actors. Facilitator A also hopes that when companies are at that point that they see that support for business creation would be needed they would pick up business professors or other actors that could give this kind of public support. In this setting network supports business creation by networking key actors and other actors so that in collaboration they could give this kind of support. According to FA-1 as the program is four-year long it is understandable that during the first year focus is not on business as during the first years actors learn teamwork and create common intellectual assets. Further FA-1 emphasizes that he requires that during the third and fourth year business thinking gets stronger. Although in some cases companies argue that there is still more to research, FA-1 highlights to all companies that they need to make a choices as the technology they work on might be mature enough to make business out of it. This relates also to the SHOK programs life cycle as they are not yet at that point that there would be business value or businesses. Although business value is possible to make after program has ended, Facilitator A tries to guide actors to increase their business thinking during as early phase as possible. (FA-1, 2013).

It very difficult to identify what actors have gained from the network as some actors might consider contacts to other company and close discussions with them about certain new opportunities as very important outcome of that research program. For other actors important outcomes can be certain concrete elements that they have been able to attach with their own offerings or it has been important that actor has learned to think about certain thing in a new way.
According to FA-2 it is impossible to say what their aim is but this kind of things they try to make possible as all the actors look things from their own perspective and thus the benefits can be very different for different actors especially as within Facilitator A’s programs there is companies from start-ups to large-scale enterprises. Large-scale enterprises by force look program activities from totally different perspective than start-ups their benefits also realize in a different way and those benefits must be a different kind. (FA-2, 2013).

Similarly RB-1 notes that nowadays the aim of quite many programs is to created ecosystems within the program as if certain part of an ecosystem creates business value by force also the ecosystem gains value. This is similar to value that research programs create as if certain company reports that they are participating in Facilitator A’s programs and based on the program results they have gained good results as it creates value to the whole project network. This is because it shows that the program is good and it gets funding and results and similarly participating companies and research organization get appreciation for themselves. Within this kind of networks it is essential that all the companies would get benefits. In RB-1’s opinion it seems that many times small companies have benefited more than big companies as small companies can react easily and they have got new big customerships. Benefits that companies get depend also on their absorption capacity, organizational culture and current business situation as it is very hard to make research collaboration with a company that is not currently receptive. Further RB-1 notes that actor needs its own role, culture and situation to be able to act as part of a network and to be able to benefit from it. (RB-1, 2012).

According to FC new technology that RB-2 helps to commercialize has been developed within Research organization B and otherwise for around 100 million euros. In this setting the second step was business training by one local actor where people gather to seek new opportunities, people that have experience from that technological field which is partially applicable. Based on their training a couple of tens of companies were created and five of those companies are now in an acceleration process within a local business accelerator. According to FC it might be that one or two companies out of those five will get venture capital funding. So the process has started from hard R&D activities and after the new technology was developed it was brought into the environment where people seek new ideas. This is also a way to bring intellectual assets together as within R&D networks it might be that just part of the actors work together and thus other actors within the network do not necessarily know what they are doing. Because
of this intellectual assets remain hidden. Currently Facilitator C is supporting the functional side of the start-up ecosystem of which the main task is to take up the business potentials from R&D based intellectual assets and research. It is important that basic research is carried out although FC emphasized that it does not have any value if business is not made out of it. (FC, 2013).

Facilitator D’s role stops after they have identified thing that they want to proceed further and have contacted and found suitable experts and collaboration partners to continue with it. In these cases Facilitator D also needs to make investigations to make sure that IPR’s are on a solid ground and to make juridical due diligence reports in order to be able to transfer those IPR’s to the actor that exploits them. They also try to make sure that the researcher does not get into conflict situations although Facilitator D does not take much stance about how good the business idea actually is. If someone violates these patents it is not Facilitator D’s role to take any actions but company’s where the IP was transferred to. So it is company’s decision about how their IP’s have been violated, how potential the case is and how they react as Facilitator D does not take that kind of risks as their aim is not to gather any patent portfolios. In certain cases it is beneficial that university’s ownership to certain patents remains for a certain time period because of funding reasons but according to FD ownerships will be transferred forward. Realization of intellectual asset based value potential takes places via identifying that value and Facilitator D does quite a lot of this kind of identifying activities relating to supplementary funding. Identifying this potential starts by identifying customer’s problems and needs. After these have been identified it is possible to think if solution to them can be offered or not. According to FD it is not enough to identify that certain research results can be utilized. Instead that business idea needs to clarify how, where and when it can be utilized. If research groups collaborate with foreign universities and both parties want to patent research outcomes then the typical case is a joint-invention that includes rules about their utilization, although FD notes that it is always easier if only one actor forwards them. (FD, 2013).

According to RA-3 companies do not take part in any research projects if they do not see that it is beneficial to them. This means that when Research organization A has joint research projects with industrial actors both companies and Research organization A see that there is suitable amount of opportunities and benefits for both. During a project companies exploit all the results they can apply and utilize within a company. This is companies’ interest in this kind of research projects. Similarly research organizations exploit project results in their
publishing activities. RA-3 emphasizes that there is a need to be very careful with companies when publications are done if they include data that relates to participating companies. This means that publications need to be checked by companies so that they would not include business related things. According to RA-3 there is no time limits after which they can publish. Instead they cut out things that relate to business from their publications. This requires high ethics from researchers as if Research organization A develops certain method according to RA-3 there is no point to go to the business side as researcher conduct research and science and companies do business. (RA-3, 2012).

So companies’ motive to do research collaboration is that they have a problem and that research helps them to solve it. A researcher’s motive to do research collaboration with companies is that they are able to solve a real problem with scientific methods and based on that research can publish things that forward science. In RA-3’s opinion motives of both companies and researchers are quite clear. (RA-3, 2012).

According to RC from companies’ point of view realization of value potential into business value is based on revenue expectations, cost and risks. All of these are affected by the network in some way and within varying levels as they are all case dependent. This also relates to companies central distinguishing factor versus things that support their operations. Thus companies put more time and effort on things that are competing factors for them to get all the essential knowledge about them. (RC, 2012).

Research organization D’s network supports realization of value potential into business value by extending to as far as possible both nationally and internationally over different business sectors. This makes it possible for Research organization D that they can see quite far and wide. RD-2 emphasizes that this kind of network nodes enable links to totally new networks. In this sense single connections can be very valuable within the network. Within their network there are not actors that coordinate this although network creates connections but after the connections are known actors need utilize them actively by themselves as to create partnerships via those connections, actors need to make them stronger first. (RD-2, 2012).

RD-1 notes that in the end businesses are created by companies and thus companies are central cooperation partners for Research organization D. These businesses are created with actors that support business creation. For example within Research organization D’s network Facilitator C is one of those actors that support business creation and thus Research organization D has tight
collaboration with them to find tools that could advance business creation in the best way to ensure that created companies would get into growth path. (RD-1, 2012).

Within some EU projects companies create intellectual assets with the project but develop business value that is based on those intellectual assets outside the project. Another option is that companies create part of the intellectual assets within the project and partly within the company via its other activities. In these cases it is a conscious decision from those companies that some of the intellectual assets are created outside the project or program and they participate these programs because they seek for certain things from other companies. According to RD-3 there are two reasons behind this when companies collaborate with universities. First, universities, research groups or researchers are not able to communicate to the company that they are able to do more. Second, when companies are first time doing research collaboration with universities their expectations do not match. As companies’ aim about these programs is to create revenue and profits and from companies perspective university actors’ contribution might be lower than they hoped. After companies have done projects with universities they have learned to know what they are getting. (RD-3, 2012).

This problem relates also to program call as according to RD-3 program calls are company driven although common interest is required and to get funding for these programs companies need universities to participate. RD-3 has a feeling that for some companies it is enough that they get into these EU programs within certain theme area and are able to network and bring them out via those programs. In fact the revenue the program generates is enough for them. Thus the aim is not that program results would be a base for certain service or product. Sometimes activities that universities carry on within these EU programs do not link with the companies’ initial visions but sometimes results from universities and companies initial visions match really well so that companies get deliverables that they hoped they will get from the university actor. (RD-3, 2012).

According to RD-3 for example one big company that has done collaboration with universities for a long time knows clearly what they can get from universities and what kind of programs they fund. Because of this in some cases they can give universities quite free hands and in some cases they tell strictly what needs to be done and what they expect. This means that when this actor collaborates with Research organization D it might collaborate with business schools at the same time in business and commercialization related collaboration that Research organization D does not know about. RD-3 noted that this is quite
common practice. Further it means that bigger companies can manage and control their project portfolio in a way that information stays in their hands in a right way and even though actors within the same program tackle same problem or research challenge from a different point of view Research organization D does not know what these other actors are as messages go via certain actors. In this setting bigger companies can have several parallel programs that relate to technology development with different universities and those universities are not in touch with each other. In this setting it is possible that Research organization D’s role is to create technology related intellectual assets and actors that do business research create business potential that is based on those technical intellectual assets and based on these technical assets and business potential company creates market value by selling more products. (RD-3, 2012).

Very often opportunities to turn value potential into business value within Company A are based on personal contacts. As TIVIT’s mission in a way is to support business development they are quite an obvious actor to who an actor can turn to if there is something that the actor wants to develop further and from where the actor can seek for cooperation partner. Programs like Facilitator A’s biggest program creates contacts by bringing together different actors and leaves its mark also in a long run as if thoughts or ideas are created internally those contacts come to mind and in that way it is possible to see and understand what other actors have done and what kind of know-how and opportunities there is. In CA’s opinion all this can well lead to new openings and new ideas. (CA, 2012).

Within the network where CB operates there is very little support from the network to turn value potential into business value and this is the problem of this network. For example when actors start to make EU projects things are quite high-flying as otherwise they do not pass ITEA evaluations. Actors need to promise identified business changes that most properly do not come to true precisely because ITEA does not keep an eye on their deployment in any way and ITEA is not interested in it. According to CB in ITEA projects main focus is not in research but on the innovativeness, business impact and standardization and these three focuses need to be answered. This leads projects away from concrete things and toward hype and actors compete with that hype. Because of this ITEA projects create intellectual assets and value potential but they do not support their deployment. (CB, 2012).

Per se all the organizations utilize value potential further from their own point of view. CC believes that all the organizations hope that the network which have created that value could take part in its utilization and in that way make the value
bigger as a whole rather than that actors forward that value by themselves. Typically network does not have a role in turning value potential into business value as there is no organization that could calculate that other actors would happily contribute to their thing. This means that utilization of value potential has to take place within the terms and conditions that are affordable to all actors and thus the aim is that utilization of intellectual assets could be win-win situations so that actors could find different roles and viewpoints in their utilization so that all actors would benefit. CC believes that all the organizations understand that utilization starts primarily from actor’s own viewpoint in a way that actors’ around are also tried to utilize. (CC, 2012).

CD emphasizes that market value is not something that is created in a minute. Company D has situations that are getting concrete now after they have discussed with their customer for two to three years as those things might be so new to the customers that they do not know how to implement them and have not come around with those things before. Via discussions with their customer’s accumulated perspective why they need those things has formed. In this setting the problem in software business is not software creation but to understand to where that software is developed, why it is needed and from where that need comes from. For example nowadays Company D has a lot of collaboration with start-ups and according to CD start-ups have surprisingly big things from totally new perspective that they deliver to their customers. Further CD emphasizes that value is not something that is just communicated as value is created via discussions with customers while seeking that value as a customer needs to understand why they want that value. Because of this companies that just do subcontracting are not able to see that value or deliver it to customers even if they possess that value as they do not know what the value is because they lack that value which is created via several years of discussions. Even if value is a bigger entity, discussions with customer are required for mapping customer specific value within that entity. (CD, 2012).

Although CF could not evaluate network’s role in turning value potential into business value CF note that some companies have done research that inevitably lead to working things and some research leads to understanding that certain area is not good for business. Latter is also good to know as then activities that relate to it can be stopped and moved elsewhere. CF emphasizes that this kind of elimination of additional programs is also very valuable. This kind of information shows vicariously that company succeeds because it concentrates on other things. Although program that Company F participates in also aims to create new
ecosystems, according to CF it is little bit unrealistic though that ecosystems could be created fast in a way that they would truly create significant cash flows from services that the ecosystem creates. (CF, 2013).

As Company E’s business area is new they do not want to create intellectual assets or value potential together with their competitors. Further they do not want to realize that potential together either as from the ecosystem perspective it is not possible to grow the cake for all actors because Company E does not know what the cake is. This is because the industrial sector they operate is very conservative and Company E has been a global pioneer in it. In this setting network supports value potential realization via development of business models, cloud services and revenue models so that business model would be scalable to several industrial sectors. This means that network collaboration that relates to business models is better to do without competitors. Although Company E does not want to develop its business model with its competitors, it is possible that its competitors use its platform if they do not do it in Company E’s main industrial sector. (CE, 2012).

Company G does sales work also toward public funding bodies as if they need funding for development work they sell that idea to the funding body by presenting good things that it creates. According to CG they are very satisfied about many public actors as they rely on them to a large extend. For Company G being a driving company is an absolute value but they saw that it is important to their business and there were no other actors to take that role so they took it and started to bring up the business. (CG, 2013).

Company G has commercialization and business concept related collaboration and research with universities and Research Organization D. In this collaboration they are the nearest actor who utilizes those research results. Company G also follows carefully what happen in the research. They have one EU project where they develop their own things within EU wide consortium. Although Company G is a small company in practice according to CG they lead this consortium and guide research to the direction they want. Company G’s aim is to be in a leading role in many places as then they can guide tings to the direction that is most suitable and profitable for them. This leading role relates to guiding the research agenda not to management or coordination activities. Within this project there are no university actors at all, although Company G is currently planning a project that includes more university collaboration. To their current project Company G also took Research Organization D so that they can look what both actors are doing and if they have overlapping things. (CG, 2013).
8.4.2 Refining assets and value potential into products and services

Final products and services are not created within Facilitator A’s programs and thus creation of commercial products and services takes places outside of Facilitator A’s programs. According to FA-1 this is not even possible as it does not fill up the research requirement as they have requirements that 80% of the program activities need to be industrial research and thus only tiny portion of activities can be product development. Other reason why final products and services are not created within the program relate to IPR’s. Within Facilitator A’s second program form, which are business concept programs, the creation of final products and services is somewhat possible although according to FA-1 99% of the final products and services as a whole are created within and between companies and Facilitator A does not know what happens there. Further FA-1 notes that there is no monitoring that relates to this as actors do not have any responsibilities to tell Facilitator A about them. Within the SHOK programs focus is on doing and it is expected that companies do not waste their money in programs of which the results they do not want to utilize. This means that it is counted on that if companies put effort and manpower into the program they want to create business based on those programs and has interested to utilize them even though companies get some of their money back from Tekes. (FA-1, 2013).

Similarly FA-2 notes that Facilitator A does not really have a role in turning intellectual assets or value potential into new products or services or to parts of existing once as utilization of intellectual assets and value potential that is created within the programs remains as companies’ own activities. Within the programs that FA-2 runs, companies need to tell them and other actors what kind of business they are chasing but FA-2 does not involve or take a stance into companies within the program activities at all. So FA-2 does not spar or consult them in any way. Facilitator A does not have resources or competencies to turn intellectual assets or value potential into products or services but according to FA-2 they have agreed about collaboration with some of the other actors that they operate with. In this way those actors can help companies that participate Facilitator A’s programs via consultation about their business activities like internationalization of business ideas or turning them to the markets. These other actors include for example Finpro. (FA-2, 2013).

FA-2 notes that from companies point of view programs concretely aim to new offerings so that new business would be created based on the programs. In this setting TIVIT develops the operational environment and according to FA-2
Facilitator A sees that it is communal business development related competence know-how and from Facilitator A’s competence point of view it is about strengthening the business development activities competences that relate to communal and open business development. Although creation of new business’s is company activities Facilitator A’s aim is that new business’s would be created based on their programs. According to FA-2 Facilitator A’s business ecosystem related ecosystem thinking tightens to jointly planned and defined core on top of which actors build their own business although that core can be built jointly with other actors. In this setting actors share something but not all and actors do not even need to tell about all of them. Based on the program activities, joint offering can be created but as well result can be that all actors create business that is independent from other actors. This means that businesses that actors create do not need to link together in any way. According to FA-2 they have had both of these cases. Facilitator A has have these ecosystem programs only a couple of years and they have three currently on-going programs so they are at the beginning of the journey and thus FA-2 emphasizes that they do not know everything but instead they learn new things all the time including what ecosystems are and are not, what is the role of Facilitator A and what it is not and as FA-2 further emphasizes as world changes things that they thought that they knew are not relevant anymore and thus their work in progress will probably not be completed. (FA-2, 2013).

According to RB-1 company’s willingness to interact and amount of that interaction with other actors are affected by their core business and how near asset categories are to their core business as their core business can be method consulting not products or services. Second aspect is the research element. Or in other words when research is changed to product development and how near it is to their core business. Interaction between actors can continue after this but according to RB-1 it continues in more trusted interaction within open network or within trusted, dyadic interaction. RB-1 notes that this kind of interaction is also outcome of the network as such and a good thing as it can create new mini ecosystems as the aim is that companies and research organization would find each other and continue activities between two or more actors. (RB-1, 2012).

Similar to FA-1 and FA-2 also FC note that it is companies’ role to turn intellectual assets and value potential into products or services and Facilitator C’s role in this is to make it possible via their activities and infrastructure that companies would be created as it is good to all parties that single companies that run business make money. In FC’s opinion within this setting it would not be bad
if business accelerators would have certain way of earning for example by owning one per cent of the company that they are accelerating as that profit could be used for example to develop this kind of activities. FC further notes that this is a very difficult thing to get through in Finland. (FC, 2013).

In general Facilitator C does not have any model about how to gather or share intellectual assets although learning happens. According to FC it is visible for example in Yritystakomo that people gather there to seek new ideas and companies in their early stages go there to tell about their experiences. A couple of companies have got into a good growth path from Yritystakomo and according to FC this kind of cycle should be created so that if entrepreneur succeeds he comes and gives something back for example via mentoring. In this way cycle starts from appreciation of entrepreneurship and decision to begin entrepreneurship so that the assets would start to develop themselves. This kind of capability development is a lot easier when they are not directly related to products or services but to certain business or technology areas. Development of capabilities that relate for example to single services takes place within business accelerator or investment company for example via sparring. FC emphasizes that within this setting it is essential from the operational environment perspective where the aim is to create new businesses and start-up ecosystems that information and money circulates. Currently Facilitator C is trying to structure this kind of model and to get compiling actor there. (FC, 2013).

When actors apply funding from Facilitator B actors need to tell in their application what kind of product or service is the outcome and how its commercialization takes place. If actors get funding within certain programs they need to write a short description about what they have done within the program. As this short description is released publicly it opens a possibility to other actors to open up discussions with them because they know what actor have done within the program. If external actors saw value potential in assets that the actors have created within the program they can contact them based on the public information in the short description. In this sense this short description is an advertisement for actors that participated in Facilitator B’s programs although they do not go even near to business secrets as nature of the program activities is to create networks and get networks together. Facilitator B also writes reports and analysis about their funding operations on very minimal level. Besides these companies need to tell them what they have done which should match with what they initially told to Facilitator B in their plan. This means that when actors apply funding Facilitator B can check if they have applied funding before and how the company has
developed. These things affect in funding decisions although their impact varies and the impact is bigger if company has several applications. Facilitator B first checks company’s current situation and how it has developed but previous applications also affect. This means that although failures can happen and Facilitator B does not punish them the evaluation process is tighter if there are several funding decisions that company has failed to evaluate why this is the case. In these cases reasons behind failures have been discussed. (FB, 2013).

From universities point of view interaction about turning intellectual assets or value potential into products and services is very case dependent as according to RA-1 in certain project’s university or research organization can handle end product development quite far, for example to demo level or to workable pilot version that is piloted and what is quite near the commercial version. In RA-1’s opinion it is companies’ role to turn the pilot version into commercial version. In this setting Research organization A’s aim is to be able to pilot things they have developed because if they are not able to go along to pilot phases they are not able to get experiences about how their work has succeeded. In these pilot phases Research organization A’s interaction also relates to development of their own research capabilities. (RA-1, 2012).

Nature of Research organization A’s activities are that kind that there are not many possibilities to establish companies based on their research results even if there would be interest to do so. However one company has been established and one is currently in an establishing process. According to RA-2 Finland is too small country for establishing companies that utilize research results that relate to methods and practices. Further Research organization A does not have much experience about turning certain intellectual assets or value potential into products or services although they currently have one idea that might turn to spin-off program. Further RA-2 emphasizes that when actor starts to build and develop business it is not loud about it and what is going on as when business is being developed it is not shared immediately to the whole world so that all actors can come there. Research organization A also develops services to some extent. According to RA-2 these service are prototype services that are developed especially within RA-1’s research. Services that they develop are typically that kind of services that research consortium can directly utilize so that they are not that kind of service that would instantly create spin-offs although that can also happen. (RA-2, 2012).

Within Research organization A’s internal activities it is specifically important that people learn from each other. PhD students learn from each other and from
the group. Typically during the program preparation Research organization A’s people work together. They also have a book discussion club where they read and go through central books about research methods in a way that people in turns prepare some materials and at least everybody reads them in a way that they can present them. In this way people are not there just for listening but for joint learning and working. This is something where Research organization A tries to put effort. (RA-2, 2012).

From university’s perspective if intellectual assets are used as a basis for development activities it requires people that are able to adopt that information, know that service and are able to bring those intellectual assets to part of some product or service. (RC, 2012).

From Research organization D’s point of view collaboration with companies is in a central position while turning their knowledge and value potential into products and services. According to RD-2 small companies are agile while bringing Research organization D’s knowledge and value potential into their products and thus that interface is important. Further RD-2 emphasizes that it is clearly companies’ responsibility to productize knowledge and value as they cannot do it or know how to do it. In this setting Research organization D’s role is to create additional value into that direction that it supports productization. This means that Research organization D’s network does not support fast scalability of business although experiences how it can be done and how actors have done it can be shared as according to RD-2 it is regulated by competition and companies productize things and handle their business in their own logic. From capability development point of view capabilities that Research organization D develops relate to their networking and business activities that come from their strategy and funding bodies. To be able to build additional value Research organization D needs to have know-how and views to understand business nature so that they can create that kind of know-how that can be transferred to small start-ups. This means that knowhow and understanding need to be on that level that Research organization D is able to offer it. (RD-2, 2012).

According to RD-1 turning intellectual assets or value potential into products or services is not a simple thing as for example certain technical things that relate to 3D Internet are not easy to turn into products. Because of this companies are the actors that present use cases and test things with their customer to find out what customers really want. In this way companies can identify customer needs and get a complete view about what kind of entity they already have and what they need and come to Research organization D with this use case so that they can
do needed amount of basic research so that companies can proceed with their use case. RD-1 notes that within this setting local companies can bring up their needs about why things do not work and in best cases researchers notice that those needs are within their research theme and in this way it is possible to find things that help companies. Other option is that Research organization D for example includes certain company needs within their next research program. Further it is possible that Research organization D’s researches have already an answer to companies’ needs. According to RD-1 their technical focus area is so new that in many cases there have been very good things that lack business as no one knows how to develop income based on them. Because of this Research organization D should increase its activities for example with local business schools research and education institute. (RD-1, 2012).

RD-3 also notes that turning intellectual assets that are created within the project into products and services is companies’ responsibility and universities’ and research organizations’ role within interaction that relates to this is to some extend consultative. This means that for example business experts can consult companies based on their own views and technical experts can do the same based on their views. Further RD-3 notes that this interaction is quite one-directional as in fact company ponders what is really happening. Although researchers are good at certain narrow research focuses companies have mechanisms to combine technical and business views but universities do not have those mechanisms. (RD-3, 2012).

Although Research organization D’s aim is not on productization activities they try to develop their research capabilities and competences within collaborative intellectual asset creation. They aim to that kind of collaboration and contracts with companies that enable them to use their existing assets and competences. This creates a cycle that when Research organization D is able to improve its research capabilities they can create better research assets and better networks that create better research. From research perspective this kind of cycle does not need concrete monetary transfer in any of its stages although when Research organization D conducts better research, better publications and their network is better they get better funding. In this way value is visible to them and this is where Research organization D aims at. Within this setting bringing work that Research organization D does into value is not systematic as according to RD-3 there is probably no systematic methods to know to which areas research funding will be targeted in the future and to which direction to build core competences. Further if companies do not want to share things that are near to
their core business researchers do not want to share their research results either before they have been published. Thus the logic is basically the same with companies and researchers. Companies are quite flexible with publishing if their core benefits will be left out. (RD-3, 2012).

If intellectual assets or value potential are turned into development methods it requires that actor has a good understanding about how it actually currently operates and it needs to have some kind of signal or view that certain things could be done differently. According to CA typically this view or signal comes from discussions and learning what other actors have tried and how they have worked. Things that an actor hears from other actors need to further proportion to actors own operations. CA notes that most probably Facilitator A’s program that Company A participates in do not bring direct help or something that they can directly copy or implement but it can bring ideas that they can proportion to their own operations and make their own application or implementation of it. Within this program Company A has not had cases where they would need help from other actors within the network when turning intellectual assets or value potential into products or services. However CA notes that in general they try to seek partners that have existing know-how in areas that Company A does not have and that this kind of research programs can help to create views about where that know-how is located. In this way trust is created when actors can identify actors that have know-how which they need and that actor feels like a good partner. Within the Facilitator A’s program that Company A participates in there have been less this kind of examples. (CA, 2012).

In a wider context and especially within one regional ecosystem Company A seeks situations where they would come to know more and more new partners from development collaboration that was initiated by them. According to CA in this way it might be possible to create new ideas that start collaboration in a new way around new products or from products that support what Company A develops within that ecosystem. As a whole these new ideas can relate to any development activities that serve the ecosystem as a whole not just Company A’s interests. (CA, 2012).

CB has once been in a project that created promising things but those were forwarded within the next project as in this way the existing know-how, collaboration and people who know those things were possible to hold up as although the project was different, actors were the same. Linking two projects in this way is useful in product development to minimize handover time between them and delays within development activities. (CB, 2012).
When universities conduct interview research for Company B, interview results will be examined internally and the data cannot be delivered further even within the project. Because of this Company B has bilateral NDA’s with researchers to exclude third parties. When reports that are written based on interview data are completed Company B goes through them as they want certain anonymity which means that names of processes and company name cannot be exposed although personal references can. According to CB this gives juridical shelter to them although when CB collaborates with universities he is not interested if they conduct research, publications or degrees as he wants reports from them. When Company B subcontracts from research groups they have personal NDA’s with researchers and multilateral NDA’s which means that information is consortium confidential. Further CB does not usually limit when the results can be published although some actors require that kind of limitations also. In CB’s opinion if the material is free to use, it can be published. (CB, 2012).

In CC’s opinion products and services need to be built from customer’s perspective. Also additional value needs to be created in this way. Intellectual assets help while satisfying customer needs but in the end it is the customer who decides if he gets additional value from the intellectual assets or not as it might be that the customer does not see that additional value. Another way is to make additional value visible to the customer as according to CC it does not help if the actor knows that certain things are really valuable but the customer does not see that value. This means that an actor needs to find the right target group and modify intellectual assets in a way that the customer sees additional value of those assets. In this setting CC notes that before value potential is realized CC does not see how much value intellectual assets have as the value of certain things is based on market economy laws. This means that according to CC Company C is probably more careful about intellectual assets that relate for example to market and customer knowledge as they have direct effect on value potential realization. With this kind of knowledge it might be possible to share information about how to analyze this kind of raw data and with what methods and tools but necessarily outcomes are something that Company C does not want to share. (CC, 2012).

According to CD’s knowledge, idea or value potential cannot be brought into products or service from aside or by doing things internally but it has to be done based on certain needs. This means that if an actor has an idea, the actor needs discussions to identify the actor that needs it as in this way also the value of that idea for that actor can be identified. This is because value needs to be tested and validated all the time. Further within research or product development, results or
partial results are more concrete as some actors turn ideas to products or services quite easily while other actors do not. Even if idea or innovation can be told fast it is longer and not easy way to turn it into products or services. It is possible to develop intellectual assets for example into business capabilities as it is possible to take a look at what to develop and work on it but CD emphasizes that work does not bring any benefits if it is not validated all the time to see if it is reasonable or not. This means that actor needs to think early on what the target of that work is and what the value of that target is. According to CD innovation needs to be validated early on as it is easy to throw innovation although innovation does not have value if it cannot be concretized. (CD, 2012).

Direct benefits that have already been realized with Company F are that their project business has improved. Further CF thinks that they have been successful within competition because they have new models that they can propose to their customers, models that Company F trusts and which are new and interesting to their customers and models that those customers have wanted to try. These things have been direct part of Company F’s project business product or service. Further Company F has got new elements into it, not directly from the program but while pondering, leading and testing them after that. This is because Company F has not done a lot of testing within the program. They have developed their own tools and methods within the research program openly but according to CF this is not necessarily visible, although it could probably be more visible how they have applied them in their project business as although some of those things are small they are crucial and meaningful. Although these things are small they are very beneficial to Company F’s customers and via Company F’s network it is possible to identify what things work and what do not work. These small things can be part of a bigger product and service and very essential for certain kind of actors. Further they can be crucial differences in certain tight competition situations. One thing that slows Company F within this program is that initially they focused on different areas. Current year is their second within their current focus area and according to CF that is too short time to create a research based service that creates direct cash flow as within the program activities cannot be direct product development but valid research results as based on the rules direct product development cannot be done within the program. (CF, 2013).

Besides Facilitator A’s program Company F participates in other programs that relate to research within cloud service and additional value in product development but those are in the piloting stage. According to CF it is possible that they could productize them to service products within next phase if they look
promising. CF notes that if they would be more start-up oriented company that needs to create a new product or service they could be more aggressive to forward it faster but as their business relates to ponderous systems they need to be more humble as their integration and utilization takes more time. As Company F is a small company within a business area where all largest software companies operate it is unrealistic that they would find new methods how these systems could be created in a new way. (CF, 2013).

Company E’s interaction with other actors in turning intellectual assets and value potential into products and services relates to interaction with the local university. They have had this interaction once a month for the last six months where they develop their business model. In this way it is possible to create different scenarios about their pricing model. Because Company E does not sell to single end-customers it cannot test its business model during early stages as they have limited amount of potential customers. This means that they need to develop their business models first in the theoretical level quite far as they cannot afford to lose any customers because they have not thought beforehand how their business model works. Further CE emphasizes that the business model needs to be thought quite far before it is possible to test it as it needs to be tested in a global context. Because of this, pricing models need to be flexible so that it is possible to change it based on discussions with customers and their reactions. Within this interaction it is also important for Company E to identify how much potential customer is willing to pay. When Company E started business model development related collaboration with the local university initially they did not have cases or market data to support this development, but when tested their model with their customers, each customer case was opened and discussed. Further each sale case was put into formal presentation that was gone through with the university actor to develop the business model further based on each sales case. (CE, 2012).

Company G tries to make that kind technological choices and solutions in their product development that they can go to different horizontals and verticals without industrial sector independencies. For example 3D Internet based house automation application could be utilized also for example in ships and factories. As Company G’s industrial sector is in its early stages via its relationships Company G can see further to their industrial sector and as they have limited resources they see further than they can currently be. Because of this they need to make money now so that they would be still alive in that future. (CG, 2013).
8.5 Analysis of network collaboration

Network part of the data analysis includes actors and resources. As the asset-based value proposition of the analysis framework includes overlapping value co-creation, value co-capture and value co-opetition that were already analyzed in Asset-based value proposition sub-chapter, the focus of analysis of network collaboration part does not focus activities separately. This is because resources are created, modified, transformed, transferred and used by actors while performing activities and because main interactivity is to combine resources and activities there is no need to analyze activities separately from actors and resources.

8.5.1 Actors

Analysis of actors within the network starts from analyzing networks and programs they participate from asset and value creation perspective. First, the focus is on how actors networks have been formed and actors activities in network building. Special focus is on mechanisms that potentially support or limit activities within networks or programs and participation of certain actors. Second, the focus is on how actors maintain their networks and relationship with actors whom they do not have current active activities with. Third, the focus is on benefits that actors seek from networks that potentially differ from common network or program goals.

Network formation and building

When Facilitator A got SHOK status they were obligated to build networks and programs. Within the original SHOK specifications framework for that was developed and Tekes created new funding instrument for SHOK’s. One of the main ideas was to create networks because when SHOK’s were created it was noted that Tekes has had networks although different programs did not have anything to do with each other except one annual seminar where presentations were held. After presentation actors went back to do research themselves. At the best companies gave money and universities conducted research and there was a management group that in a small scale guided them although actors were separated. Because of previous the core of the SHOK concept was to get rid of this and get into much closer interaction. (FA-1, 2013).
SHOK’s funding mechanisms limit out public actors as for example taking a city into a program is very difficult as it decreases universities funding share because of the calculation rules. Beside this there are no other rules that limit participation of certain kind of actors in SHOK programs. Companies that work in Finland or abroad as well as universities can participate. Facilitator A has examples of all this kind of actors. However, only companies that have R&D activities in Finland can get Tekes funding. Within Facilitator A’s programs they have had a couple of companies that do not have any presence in Finland and thus they do not get funding from Tekes. Those companies have come to Facilitator A’s network just because of the network and they have been taken in because of their know-how. Similarly also foreign universities and research organizations can participate. TIVIT has not actively searched for actors. For example universities have searched for companies a lot when things that they want to advance have related to Facilitator A’s specific SRA. Universities have searched for companies because they need certain amount of companies to get in. Facilitator A has tried to get actors from abroad by precision strikes and they have managed to do so in some cases. (FA-1, 2013).

According to FA-1 new partners come and go monthly. FA-1 further emphasized that this is a unique feature of SHOK programs when compared to many other programs so that they are not closed in any way. For example if company’s situation changes it can note that it cannot continue certain things and can leave or stop it within the program activities. In these cases company’s funding share is allocated again within the consortium or new partner is taken to the consortium. It is possible that company stays within the consortium with a zero budget. In the cases companies see that they are not able to do things within the consortium but they are seen as a valuable partner who in the next year could possibly continue. According to FA-1 companies leave when their strategy changes in a way that they do not want to continue or when they are expelled. A company can be expelled if it does not do what it promises to do and is not beneficial to other actors. FA-1 notes that for example just two weeks ago they expelled one big listed company from the program. In this case the company did not understood the mechanism and that company was also in turmoil so that the internal turmoil took so much time that they did not have time to focus on the program. Further FA-1 notes that during their first year, which was five years ago, actors come with false pretence but now all the main actors know and understand what the role is. When new SME’s recently come in, all of them did not understand the mechanism as some of them were asking if they really needed to
share all IPR’s and if they really got all IPR’s that were created by a certain large scale enterprise. According to FA-1 even if they organized events and sent consortium contract to be commented months ago, things are still not always understood. (FA, 2013).

Facilitator A’s active work is directed to their research programs which are also innovation ecosystems. There is a large amount of companies that already do collaboration but they do it as technology collaboration or as a R&D collaboration and thus this kind of community already exists. Facilitator A’s strategy is channelled in a way that they select programs and themes and companies come to research programs to do work that fits with those themes. Facilitator A tries to find and make sure that all the things that are mature enough so that they can be forwarded businesswise would be moved out of the research programs. In principle Facilitator A accepts propositions from companies about collaboration they would like to start. Facilitator A does not market themselves actively or seek propositions actively as propositions come accidentally and active work is directed to research programs. From partner selection perspective companies within the programs are Facilitator A’s target group and they can bring other companies to programs if they want. Companies within Facilitator A’s programs range from starts-ups and companies that have been established during the program preparations to large-scale enterprises that have been in the business for decades. For large-scale enterprises Facilitator A’s research programs are just a tiny portion of what they do. This means that facilitator A’s programs are very heterogeneous. (FA-2, 2013).

When new competences and technologies are created within Facilitator A’s research programs, the aim is to pack them to things that create new business. As a program preparer Facilitator A tries to help companies to forward those thoughts together although companies that participate in research programs can and should forward those competencies also by themselves toward business. In principle Facilitator A does not know what those companies do or do not do but via joint-programs they try to make business related development work more visible and to help companies proceed as there might be themes or billets that companies are not able to proceed by themselves or do not want to do it by themselves. If companies are not able or do not have time to build the community that can do this, Facilitator A does that work to help companies that want to do things together. This means that Facilitator A just creates the operational environment and helps to build the program as they start planning what will be done together and what is created as a result. As companies typically want to apply Tekes funding Facilitator
A also helps them in the funding process. When the program starts and funding is granted, Facilitator A starts the implementation phase and runs it. (FA-2, 2013).

Facilitator A’s SRA has been formed via two routes. Within a big picture the starting point is that TIVIT’s aim is not to cover the whole ICT-field. Instead they try to annually select 5-6 themes which they see critical to Finland in the future and that Finland is not quite in the forefront of those themes but is a good challenger. This means that Finland might have single researchers or companies that are in the forefront but in general Finland is not consider to be in the forefront. The SRA is defined in a narrow enough way so that with a sufficient collaboration 10-15 million euros will be invested annually for four years to get to the forefront although that forefront is a moving target as it goes ahead all the time. (FA-2, 2013).

Billets for themes come in two ways. First, the Finnish industry has proposed them and on the other hand TIVIT’s own strategy process has created themes that they have thrown to companies and research world to test them. These themes cannot be too narrow or contribute just for one company as within the programs networking is forced via IPR-contracts as all the actors within the program get free utilization rights to all results and also give rights to all results they have created. This takes place within program consortiums and because of this basic research is not done within Facilitator A’s research programs. Further it is not worthwhile to do product development either, because if actor’s competitor is participating in the same program and an actor does something that relates to their product development their competitor can require that they share it and come out with a similar product. This also guides the activities within the program. According to FA-1 this is often called as a ‘pre-competitive research’ where actors can share things and results even with its main rival.

Further actors do not need to have existing assets but they need to have some evidence that they have know-how from that field because if the IPR rules are abused it is possible that an actor who does not create anything come to the program just to take things from there. Because of this other actors in the consortium need to have a reason why they let companies and universities in. For example small companies bring certain narrow know-how that they have and what consortium can utilize. Companies can have very different annual investments to the program. FA-1 emphasizes that their concept is special because for example an actor that invests 20,000 gets all the results from an actor that invests two million. This means that actors get all the materials that are done during the program without cost although companies can bring background
materials into the programs without losing their IPR’s. If actors want to utilize those background materials in their own business, the actor who bring those background materials is willing to negotiate about them under reasonable cost. This means that it is possible to do some of the activities within the company as some companies bring ‘ready to start’ things to the program while others start from empty table and thus companies have very different strategies. (FA-1, 2013).

In FA-2’s opinion participating in their research programs is quit a good deal for companies from the funding perspective as there is more demand than supply to enter their programs. This means that there are more companies coming in than available funding. As programs apply funding annually companies need to be selected yearly and the amount of them is decided yearly. In researcher programs actors apply funding together. They make a joint research program where all actors have certain specific things that they work on. According to FA-2 this is the only criteria that they have as actors need to do collaboration and companies cannot come to program to work on their own things. This means that to get funding for those activities actors need to do them with a partner which is typically research organization. On the other hand programs have quit strong centralized steering and supportive planning at the back. (FA-2, 2013).

Within the ecosystem programs that FA-1 operates, which are smaller company consortions, program steering is looser and every company makes their own plans from their own starting points. These starting points are combined just in a certain sense. In this setting Facilitator A defines core-thinking of the ecosystem that summarises the thing that is done jointly. This means that a company can have several kinds of things that it wants to conduct to forward its business concept and it is willing to share certain part of it with other actors. When all the actors do this, a common asset pool is built up from the shared parts that are created within the program and which all actors utilize in a way or another. (FA-2, 2013).

Research organization B conducts research with companies and research organizations in Finland, in Europe and outside of Europe. They are one of the central innovation actors in Finland and as they are research organization whose focuses are on applied research, not to basic research, in their research applicability is important. According to RB-1 in practice cooperation of companies and network is a requisition to create this in a network program context. In this setting the aim is to benefit from the collaboration as much as possible. Within this kind of joint-funded programs it is important to think what actors’ motivations to attend these programs are, besides money that is motivation
at the back. In RB-1’s opinion motivation of all actors is probably that they can benefit and bring things to their innovation process elsewhere. Further in RB-1’s opinion there is also another viewpoint in this that in the future single companies cannot do it by themselves. This relates to ecosystem building as being in the network and a part of that network companies can do bigger and more meaningful things from their own business point of view. Further RB-1 notes that these are precisely what is tried to be formed and found within TIVIT programs. (RB-1, 2012).

According to RB-1 all the main actors from Finland participate in SHOK programs and they include big and small companies and research organizations. It is possible that different entities of big companies or universities participate in SHOK programs from their own viewpoints. TIVIT programs differ from EU-programs as they are company driven research programs. In TIVIT-programs companies define research problem and agenda, or they are defined with companies, and researchers conduct research to solve these research problems. Within big SHOK-programs there is a certain group of companies that initially get involved. It is possible to leave and get new companies. Collaboration is done with the actors that are within that entity. From the Research organization B’s point of view they have more or less collaboration with all the significant actors within ICT-field. In a way jointly-funded programs are part of the collaboration portfolio and one way to operate in a network. According to RB-1 drawing the line between research, development and innovation activities is difficult but within the research programs funding rules say that activities need to be research related not product development. This line is also in a certain way flickering so that when to proceed from research to product development and vice versa. The element that the network brings to this setting is that something new is constantly created. The line is clear if an actor has a clearly defined product development program where the actors knows beforehand exactly what to do and what should be the outcome. (RB-1, 2012).

Research programs have a certain research problem. For example within SHOK-programs there is a SRA that defines areas where research is conducted. Within this SRA spectrum to research problems depends on companies’ starting points which can be very different. Within SHOK-programs business case approach is used. This means that from a company’s or group of companies’ perspective solving a certain research challenge helps them to solve their business problem. Research challenge defines what is researched and the focus can be technology research, business research, service or product conceptualising or
something else. Research plans are done against this research challenge so that concrete plans define what each actor will do and what is created. (RB-1, 2012).

The idea is that companies have a business case that describes their business target, which is usually related to money. Towards this business target companies have a certain problem and to solve that problem they need help from researchers or network. In this network companies can jointly plan the steps to achieve that business impact, which can be money but also something else as the target is not always necessarily to launch a new product to market. According to RB-1 within SHOK-programs companies’ business impact is monitored very carefully to know what the impact in the company really is. This impact can be for example savings from process improvement, new products or new customerships. These metrics are case specific as according to RB-1 it is not necessarily possible to define single metrics to a big network program. RB-1 further emphasizes that the motivation for interaction needs to be understood as all the actors need to know about the desired impact. If this is not understood within the network so that all actors know what is expected to be achieved then all actors work on their own things and interaction does not bring any additional value in there. (RB-1, 2012).

Within big programs interaction needs to have certain boundary conditions, contracts and mechanisms within the program so that interaction is truly created as there needs to be a way to bring people together to discuss even though the program has started via certain format. This means that although certain organizations and research organizations work together if the interaction is truly enabled via program coordination, companies and research organization that have not done collaboration have found each others or that results that have been created within another entity have found their exploiter from elsewhere. According to RB-1 this has happened often in their programs. In RB-1’s opinion this is not created by itself but it needs certain mechanisms. Although interaction is discussions between individuals, if that interaction is enabled so that people and organizations trust each other they dare to tell or are able to tell about things. This is not created by itself either so mechanism for that needs to be created also. (RB-1, 2012).

Oulu has quite a long history in venture capital fund investments via early phase funds comparing to other Finnish cities. For the city those investments are not financial investments but strategic investments. Via these investments the city tries to support the renewal of the regional company base so that companies would grow because in that way new jobs are created and tax revenues increased. The city does not make any direct investments by itself but invests via funds that
are managed by private management companies. These funds make investments into both early phase and generic companies. Two out five funds make industry independent investments to early phase companies or companies in their latter stages. Three other funds make investments between these two funds with an industrial sector focus. In FC’s opinion the funding structure is in order although there is not enough money yet. FC’s current focus is to support the functional side of the start-up ecosystem via developing the company development structure. (FC, 2013).

Management companies manage city’s investments based on investments strategy that Facilitator C has defined although that investment strategy gives wide boarders where those investments can be made. FC notes that the role of a public actor in general is to build the playground so that if it notices that something is missing it tries to support and enable it so that as much market-driven activities as possible would be created. As funds are managed by the management company they can include other investments than city’s. In general the amount of a single investments within these funds range from 15,000 euros entrance money to half a million within the fund that invests into early phase companies although it can make additional investments into a single company up to 2.5 million euros. Investments of the other four funds range around 0.5-1 million although they can be bigger or smaller. (FC, 2013).

Facilitator C does also collaboration with Tekes and activities that relate to investments from abroad. These investments from abroad can be divided into two categories. First, to ‘Invest In’ cases that for example brought R&D site of Company A into the region. Second, to foreign investors that invests into regional companies. Facilitator C tries to actively help regional companies to get funding from both Finland and abroad. For example in the beginning on June 2013 Facilitator C and about ten regional start-ups meet investors in Boston and New York. This means that Facilitator C brings start-ups to meet investors abroad and organizes and facilitates those meetings. Also when Facilitator C travels abroad they try to persuade foreign investors to their events. Next this kind of very big event takes place in August 2013. Also single investors visit the region, like one from Silicon Valley in May 2013. (FC, 2013).

Facilitator C has actively created connections with foreign investors as in Finland business angle circles are quite small and Finnish business angels invest in companies in their early phases. After these early phases shift turns to venture capital funds where the investment rounds are bigger. FC notes that roughly speaking business angels operate within 60 kilometres radius from their residence.
Venture capital funds seek for good profits and cases widely. For example one big investment round is currently closing and they try to actively drive couple of investment cases to get the investment from abroad as currently best know-how about these cases is abroad. (FC, 2013).

All the specialists that deal with the funding have quite the same agenda within Facilitator B although there might be minor focus differences if someone is focused on specific funding instruments. For example they have one person that has long been their contact person toward local university and takes care of university related programs and participates in them. All the people from Facilitator B that deal with funding try to ensure that good things would be created based on their funding and that applicants’ goals would be achieved. According to FB during the past couple of years the interest to monitor success of commercialization has been increased a lot within Facilitator B. In general the mission of Facilitator B’s funding is to have innovative and risky programs that would lead to commercial activities and further to export related income to Finland. Facilitator B tries to target its funding to research where commercialization of that research already has some kind of path of thoughts and role. Thus Facilitator B does not fund basic research and they have never funded it. This means that they fund research very directly but always with the focus that it would support business although time spans are longer than in business. When commercialization was sharpened there was a change that especially when universities and research organizations applied funding from Facilitator B they had to tell about the commercialization of research results much clearer than before. (FB, 2013).

All the Facilitator B’s employees that deal with funding also map actors that are worth to fund and act as a contact interface for companies and thus take care of the funding administration. Further all of them do so called ‘activation’ to some extend which means that they contact and meet companies and other actors that can be universities research groups and research organizations to make inquiries about what is coming but in principle the applicant always decides from where the process starts. Facilitator B always tries to tell about their funding to actors and for example when Nokia had to put away big portion of their employees Facilitator B tried to be active and tell in different events what they fund although in general waking up the activity starts from the applicants side as well as responsibility to start to forward their thing. FB notes that perhaps they have more dialogue toward universities as their amount is more limited. When contacts and relationships are created communication is easier. (FB, 2013).
All the Facilitator B’s employees that deal with funding outside of the Helsinki metropolitan area work in the premises of the ELY Centre’s and are also on their payroll. This means that their employer is officially different actor although their operational cost and wages are covered from the same source. According to FB this created small nuance differences as ELY Centre’s are regional actors with slightly different interests although the big picture is the same. This means that the regional situation brings differences all the time as they have officially accepted strategic development plan what they are developing and within that plan there are certain regional focus points that affect. According to FB these focus points do not have big influence on Facilitator B’s funding as the focus points relate to European Regional Development Fund (ERDF) funding and other sources of money that affect decision making in the region and within different actors as those strategies and focuses have more effect on those actors. (FB, 2013).

What Facilitator B’s funding firstly seeks is how innovative and different things applicants have and how big its commercial success potential is. If this thing fits with Facilitator B’s basic criteria so that it includes enough challenges and newness value and Facilitator B sees that it can create big and significant export activities it is interesting for them. According to FB in general these things can come from anywhere although they have certain focus points within research as they follow what is happening in the world and what trends there are although they do not directly guide Facilitator B’s funding. Further FB noted that areas that Facilitator B investigates relate perhaps more to their activation activities as they try to bring up those themes and show actors that these are the new things that are current and there are a lot of new actors within them and that perhaps new business is created there. Facilitator B brings these things up to ask if actors should enter these areas. (FB, 2013).

Facilitator B has companies that have been their customers long and have got funding several times but there is a basic rule that Facilitator B’s aim is that at some point their funding decreases and stops. According to FB there are companies that do that kind of challenging activities with new things within their normal operations that aim to international markets that fit with Facilitator B’s criteria very well. Thus the nature of activities of some companies is that if they apply funding they have typically got it. Facilitator B does not have preferences for company size although they do have certain kind of thought that they hope to get more applications from small companies but according to FB there is that kind of practical problem in this that Facilitator B’s funding instruments, rules and
regulations are not favourable to start-ups that are young and include 1-2 persons. Because of Facilitator B’s rules they are not the optimal funding body for that kind of companies although they also fund them. This means that when they fund small and young start-ups they need to check their situation and that they are in a better condition than most of the start-ups. (FB, 2013).

According to FB the idea of SHOK’s, that started a couple of year ago, was that they relate to Facilitator B’s research and research funding so that the big driver companies would have understanding and knowledge about new things that are worth of researching. These SHOK’s were built in a way that those driver companies have the driving force within those SHOK’s and smaller companies are linked to their activities. Quite significant portion of Facilitator B’s funding for large scale enterprises is channelled to SHOK’s. These SHOK’s operate by themselves by their own processes and Facilitator B does not take a stance about how they are operated. This means that Facilitator B serves companies from start-ups to large scale enterprises. (FB, 2013).

Facilitator B is in contact with for example Yritystakomo and Business Oulu and deals with them a lot. They have joint events and customer events with them and they try to increase their interaction so that they would know what others are doing. For example their collaboration with Yritystakomo has been very tight. Facilitator B tries to be present via actors like Yritystakomo and Business Oulu and to build that network. Although Facilitator B’s funding applicant is always responsible to start the funding process on the general level Facilitator B can activate them and during these events Facilitator B can ask from companies that are in their database and with whom they deal with if they have forthcoming development programs in their mind. According to FB this relates to their more active role and is emphasized with their Growth Track activities that are led by the Ministry of Employment and the Economy. Within Growth Track model Facilitator B goes very near to the company and is involved with the dialogue and discussions about company’s early program ideas. This interaction occurs with a selected group of companies. (FB, 2013).

The role of Facilitator D is to work with the interface of research. According to FD this interface is probably their first network. This means that Facilitator D knows what researchers do and can identify their results and thus is creating that result pool. Further Facilitator D thinks about those results precisely from the commercialization point of view. For example if based on these results, by combining them or by doing more commercial applications can be created that based on that research it would be possible to build activities of which the target
is on commercialization. This commercialization can be transfer of rights to third parties or that business team is created around researchers that start to forward result results via start-up. Form FD’s and Facilitator D’s perspective their network changes according to the phase of this path as the network is slightly different in the programs in early phases and when they identify research results than in the phase when a company is established to forward those results. (FD, 2013).

Facilitator D’s collaboration is not only with the university’s internal actors as especially with commercialization they have tried to bring business perspective and know-how from outside. These actors are private actors with whom Facilitator D has created light relationships that base on confidentiality and NDA contracts. In practice Facilitator D has discussions with these actors from very early on about what they think about certain technologies or applications to find out if they interest them. This means that Facilitator D brings technology know-how from researchers and business development from outside and their own role is to act in between and coordinate. As IPR’s or computer programs often relate to commercialization of research results Facilitator D also makes sure that IPR keeps up. If necessary they protect that IPR and bring it to that point that it can be transferred to an existing or new company. (FD, 2013).

Facilitator D’s partners have come to their network along the way via natural selection. Facilitator D is in contact with this network and when there is an actor who is interested and has certain competences Facilitator D has discussions with them and brings things to them from time to time. From FD’s perspective network and partners need to have substance know-how about how to bring for example certain technology to certain industrial sector so that they have understanding about the field and what kind of business is targeted. Based on these criteria Facilitator D selects its partners. The created discussion connection often has an effect on partner selection as researchers have their own views and interests that Facilitator D tries to fit with the business view. Similarly business people have their own mind set but according to FD fortunately things have been started. (FD, 2013).

Research Organization A has currently around six bigger research programs. According to RA-1 VTT participates in their projects quite rarely as current funding mechanisms make it impossible that there would be several research organizations from the same country when participating European funding channels and international projects. Similar situation is within Tekes programs so that SHOK programs are the only ones where Research organization A has collaboration with several research organizations. Within those programs
Research organization A has closer collaboration with actors within the same work packages. (RA-1,2012).

It is always very research based what kind of contribution and resources Research organization A needs from other actors to create assets and research. When Research organization A’s activities are thought in general according to RA-1 it is not possible that research organization examines and develops software processes just by thinking and reading books as companies are the one that does that. Research organization A helps companies to develop those processes and while doing so they get information about how things are done in real life and what should be done. (RA-1,2012).

The value potential that research organizations seek from the activities that are done within the network is publications that increase research organizations know-how and value. In this way research organizations are able to give companies a possibility to develop product innovations. Usually within the network there is a key actor or actors that Research organization A has more this kind of activities with. For example within big research programs there is several cases that Research organization A deals with so that they can look at same the things within several companies. In this way they get significantly better information than while working with just one key actor. (RA-1,2012).

According to RA-2 Research organization A’s programs are mainly externally funded and their main funding sources come for example via EU’s ITEA program when that funding is channelled to Tekes. ITEA programs are typically international consortiums that include a lot of actors. Within these programs there are many times Finnish sub-consortium and coordinator. In the national level Research organization A has two main program types. First, they have SHOK programs that are big consortiums and new in Finland as they have been in operation only a couple of years. According to RA-2 actors within SHOK consortiums are Finnish research organizations and industrial actors that work within same programs and get funding via that program. Second, Research organization A has programs that are directly funded by Tekes. In these cases Research organization A has its own program proposal and they get funding directly to that. Although these programs also include companies, they do not get funding from Tekes. Instead they give certain funding contribution and often offer test environment where research can be conducted. Initiating these programs usually starts from Research organization A not for example from companies or Tekes although they have consortium programs. Within consortium programs it is possible that Research organization A has involved its idea creation and starting
the consortium with other actors but it is also possible that they jump in after they see that there is an interesting program proposition and consortium and thus involve with its preparation. In all cases programs that they participate in support their own research agenda. Further they have mutual research with companies but that research is quite minor as on average they have one that kind of program. If company pays directly, it is assignment research. (RA-2, 2012).

Funding mechanism limits mainly within ITEA programs as they need to include certain amount of both industrial research and research done by research organizations. The ratio of these two cannot be in that direction that there would be too much research done by universities and VTT. In practice this typically means that as there is only a limited amount of funding available it is difficult to get sufficient amount of funding to both university actor and VTT. These ITEA programs are not funded by EU. They are evaluated on the EU level but they are funded nationally via Tekes. (RA-2, 2012).

As Research organization A does empirical research, things that they mainly seek from the network are companies that are in a way their laboratories where they can work. Thus they typically seek for company partners where they can do empirical research with that company. Because of this it is typically enough that the company does software development. Research organization A does not have single companies they need to work with and single companies do not play a key role in their research. As they do empirical research that cannot be done behind the desk they need to do it with companies and because of this networks are important to them so that they know people and companies. This means that as Research organization A has theory and research know-how and companies have practical know-how and existing systems it is enough that they are able to use companies’ data in their research. As Research organization A's research relates more to methods and practices, although they have small amount of prototype development, they do not have a lot of product innovations. (RA-2, 2012).

In RA-3’s opinion research is done with actors that are reliable and keep what is agreed as research is done between human beings not between organizations. Further this means that every single project needs to be carried out carefully so that actor does what it has promised and rather a bit more. According to RA-3 the secret of their research group is that they carry out all of their projects properly to the end. This means that when an actor gets funding it cannot start to do something else than what has been agreed within the project. (RA-3, 2012).

One motivation to do research with European industry is that real research problems are there. According to RA-3 when new technology is put in use in the
industry new problems arise for example within software development. Like how software development is managed within this new technology and technology environment. When Research organization A collaborates with industry they are able work on true problems that come from the industry. This means that Research organization A needs to collaborate with actors that are in the frontline of their activities within the industry. For example Research organization A currently works with one of the basic supplier within car industry that has all the problems within the current car industry. Further Research organization A has previously worked with suppliers in medical, electronics and industrial automation industries as most of the software is made within those industries. (RA-3, 2012).

Typically Research organization A’s role does not change during the project when comparing to what was initially agreed. As they typically collaborate with companies within the European projects it is possible that certain company might pull out from the project, go bankrupt or some other company buys it so that the projects situation is changed. In these cases there is a change practice within the research programs called change request procedure with which project group presents how project activities should be changed and that request is handled and when it is agreed project group works based on agreed change request. Sometimes new opening for Research organization A are created in this way. This means that research group needs to have wide enough knowledge base, understanding and expertise so that research group is able to evaluate and make new openings. (RA-3, 2012).

Research programs that RC currently participates in are mainly two Facilitator A’s programs including their biggest program which RC’s activities mainly focus on. Second network that RC participates in is a project that he is also responsible of. This project organizes networking events and seminars with international visitors. Besides these two RC participates in some smaller programs. One of their research collaboration is with Aalto University’s Software Business Lab that runs the national Software Industry Survey every one or two years. Data of this survey is utilized in Research organization C’s publications. Second, they have collaboration with companies so that they get research data by interviewing companies and while doing research for them. Third, research knowledge is shared and some publications made via the International Conference on Software Business that relates to academic researchers. (RC, 2012).

According to RC before Facilitator A’s biggest program they had two Tekes funded research programs and after these two it was natural to continue same
research more widely. It was interesting for them to see how SHOK instrument works as according to RC there were quite many bad comments about its weaknesses so that they wanted to see how it works and if it is reasonable or not. Within Facilitator A’s biggest program there is a couple tens of companies and eight research organizations and some of them are new to Research organization C, although they have done collaboration with some of them earlier. This means that by that program their network extended to new companies that they have not had similar collaboration before. According to RC operating in a network is quite much about on-going substance work and about the discussion context it offers and where it is possible to meet and discuss with people about themes in the context. This discussion context can be certain program or network. Within these discussions thoughts arise that relate to companies problems and their possible solutions and secondly to ideas and if there would be a company that is interested in that idea. In RC’s opinion there are two main levels within networks: First, operational level that relates to research within research programs and second, discussion context it offers. In this context it is possible to seek if companies’ problems and interest and universities solutions and ideas would meet. (RC, 2012).

If research has a clear predefined goal it is operational research. When new goals are thought that are shared either between research organizations or companies activities relate more to free ideation which aim is to create new research that would be beneficial later. In RC’s opinion actual research takes place, for example, when researchers do their work or interview companies. Other interactions that relate to corollary activities of research or are done via innovations are quite similar with research related interaction. (RC, 2012).

As Research organization C’s research target is ICT, and especially software intensive companies and software utilization within different companies, if a company has less than ten employees their possibilities to do R&D are quite limited. Because of this if Research organization C wants to do research with them it needs to find funding from elsewhere. This means that if that research is done by paid researchers small companies are not enough as there needs to be bigger companies to get funding or at least company funding to TIVIT or Tekes package. This is because if smaller companies cannot fund Research organization C’s research they need to discuss with medium and big companies if there is no specific reasons to set other goals. (RC, 2012).

Research problems come from companies, research groups and funding bodies. Companies have a lot of problems or aims they want to achieve and they
search for ways to achieve those aims. Research groups have understanding about known problems that have known solutions and open problems where new solutions could be found. Also funding bodies have willingness to fund certain things and they have their internally developed aims that they want to achieve. These different problems and aims need to be combined and checked how they fit as if they are conflicting, programs are not created. According to RC most of the research is done within that kind of area that it fits with funding body’s aims. This means that a funding body defines the research area and tells that if companies have interests relating to this area then they are willing to fund it. Further this means that if a research group has interests that relate to this research area and there are problems that are interesting to them they need to think if those problems interest certain companies as they need to find companies that are interested in it. If these companies can be found then the research organization needs to find funding body that funds research in that area because according to RC there are not many companies that fund directly and widely and thus collaboration with companies, research organizations and funding bodies need to be found. (RC, 2012).

For Research organization C assets that are created are something that they can use while writing articles and conference papers and thus their activities with companies and assets they get from these companies have a direct effect on what kind of publications they can make. RC note that if an actor wants to publish in IS forums the research object can be that kind that it is not directly the primary development target of any company but a phenomenon that exists in any company. If an actor has an access to a group of companies where that phenomenon can be examined it does not depend much what those companies are if there is access to them and it is possible to do research collaboration with them. According to RC for example IT outsourcing can be researched in almost any company that does outsourcing although outsourcing practices might be wiser in companies that have done outsourcing longer and that are typically bigger and perhaps more international and dynamic companies. This means that the actors Research organization C has collaboration with influence to some extend where they can publish their research although they are just one element in it. (RC, 2012).

According to RC network has an indirect effect on publishing as to be able to publish from certain theme, a researcher needs work many years within that theme which means that researcher needs to have funding for several years. If there are enough companies so that it is possible to make several programs one after another it eases making good publications from that theme. This means that
certain critical mass within that network is also quite central so that it is possible to work within same theme longer if that mass relates to certain vertical and target area. Within general IS themes, like outsourcing, it is not that critical if the companies change and are from different industrial sectors. Thus research target affects via its sustainability to quality of publications and publishing forums. (RC, 2012).

Besides research management RD-2’s role is to create innovation collaboration networks. Research organization D’s collaboration interfaces within latter are very wide. This is partly because the centres, like Research organization D, are per se guided by Oulu Innovation Alliance. Besides research activities Research organization D’s goals include effectiveness toward economic life and employment. According to RA-2 their competition point of view is perhaps emphasized toward the role of collaboration building and its enablement. Further their goals include creation of new business areas, forwarding identified growth billets and research and business support. (RD-2, 2012).

Although Research organization D is to some extend in the early phases of its network formation they bring actors to the same table that have their own, strong networks. These networks are quite strong as the industrial sector in Oulu region is strong although the aim is to extend them all the time. As Research organization D’s funding bodies are key actors they already had existing relationships and thus setting that Research organization D offers is one channel to deepen that collaboration and to make new openings. Within this collaboration, additional value is especially searched from big program openings that are difficult to build up by a single actor. Research organization D has done the defining activities that relate to its strategic innovation plan or an agenda with other actors. According to RD-2 they need to build the big picture in a way that research supports innovation activities so that it would be possible to achieve innovations based on research activities. Although Research organization D has both basic and applied research they are in a tight collaboration with companies and they operate more actively in the company interface than traditional research groups. (RD-2, 2012).

One challenge for Research organization D is that the actors they collaborate with are very different kinds. Because of Research organization D’s employment goal the city is an important interface and the city has actors like Business Oulu with whom Research organization D wants to be in active collaboration while developing public sector services and creating conditions for economic life. Second, they collaborate with research organizations like VTT and local
With latter two there is also an education point of view that is partly linked with export view of education know-how as it is one competence with potential for new businesses. Third, they collaborate with company sector which is very heterogeneous so that there are big global actors and SME’s. According to RD-2 in this setting there are needs toward different directions and one of them is creation of new business sector that consists of more small growing companies and companies in their early phases that need to be supported in a different way. (RD-2, 2012).

Research organization D has certain focus areas where they work strongly on program basis. These focus areas are also a way to get companies involved with their activities. As there are a lot of actors within Research organization D’s network they can select most suitable actors to their programs based on companies’ views and knowledge. According to RD-2 opportunities and needs need to be mapped with companies and quite good and dense collaboration has been created with different companies. Research organization D’s main rule is that big companies are in a more leading role and smaller companies are used on subcontracting bases. The operational model is that big guidelines are pondered especially with big companies. (RD-2, 2012).

Similarly RD-1 notes that Research organization D’s aim is that new businesses would be created in the region and they support business that is created based on their research activities. Their focus perspectives relate to, for example innovations and commercialization, and Living Lab activities where special emphasis is on end-users and interaction to different directions so that the environment and user community could be utilized for example in product testing via different test infrastructures. In latter setting RD-1’s role is to identify things that could have commercial potential. RD-1 further notes that his role which relates to combining commercial actors and forthcoming commercial actors and individuals that could have commercial interest toward researchers will increase in the future. This means bringing together these actors and individuals and forward them in a way that based on them business would be created. (RD-1, 2012).

Research organization D has been active so that research would create innovation activities and they have pondered what kind of tools are needed in this. According to RD-1 they have been in a crucial role in the creation of Yritystakomo that has already created 52 companies. Other actor that they have been involved is Oulu Student Entrepreneur Society that started their activities in Research organization D’s premises. The third thing that they were involved was
asymmetric risk venture fund of which preparation was made within Research organization D. RD-1 notes that all these are good examples that they work in the business creation interface as actively as possible so that when they see that something is not working they are involved to find solutions to support those innovation activities. Further these activities relate to situation of one single company and sudden change in economic structure and thus Research organization D has been all the time working on activation of people that lost their jobs. (RD-1, 2012).

Programs and networks that Research organization D participates in are determined by their strategy that has been defined in collaboration with their owners and network. Their main policies come in this way but on situational bases they try to act in a flexible and fast way. Main collaboration actors from company perspective are certain regional key companies and actors that create companies although they also have global large scale enterprises and international networks. For example their flagship program is done with a collaboration of two global large scale enterprises. In this setting Research organization D willingly brings up opportunities to link regional businesses toward collaboration with these big companies. (RD-1, 2012).

Local core actors within Research organization D’s network are quite clear. Besides these there is micro, small and starting companies that are central collaboration partners that Research organization D tries to support so that within the network there are start-ups and Research organization D tries to support their creation. Their aim is that when start-ups are created they are not left alone. Instead Research organization D supports them. For example via linking them into activities of Research organization D’s programs so that within those programs reasonable things would be made that those companies need. In this way companies get additional value from program activities and at the same time research materials are created. Activities with smaller companies are more innovation driven and activities with bigger actors occur with different time spans. For example preparations for EU funded programs can take one year when it is thought over what will be done and how. (RD-1, 2012).

Ecosystem thinking is very central within Oulu Innovation Alliance operations. This alliance is an ecosystem of innovation activities in Oulu. As Research organization D does things within company interface, they try to catch signals within this ecosystem so that it would work better. Further Research organization D brings these signals to actors that can forward them. This means that if Research organization D sees shortages in the infrastructure they try to fix
them, for example via their program activities or trying to forward those shortages in collaboration with other actors. According to RD-1 a good example of this is the risk venture fund that is currently being created. (RD-1, 2012).

According to RD-1 value potential relates to the age of Research organization D as they are currently coming to the phase where they have value assets that from research point of view are research results. This means that now they start to be in a phase where they have something to show. Further this means that they actively tell about research results they have created and what they are about to create and bring them to the company field. Research organization D was involved with the preparations of 3D Internet Alliance that was created in Oulu and is about to extend as national company cluster. They try to bring research result based things to these companies by telling about those results while having coffee. It is companies business to ponder if these results include something that can be utilized or not. (RD-1, 2012).

As there are currently human resources that lost their jobs at the region, actors have actively contacted Research organization D. Vice versa Research organization D has actively presented to their community what research activities they have so that when ideas are created basically anyone can forward them. For example the principle within their collaboration with two global large scale enterprises is that the data that is created within that collaboration can be utilized by anyone so that the data is not utilized only by those two companies. This means that in this collaboration the open innovation view is central. Further the role of Research organization D within their research and economic life interface is to act as a middleman. (RD-1, 2012).

Also RD-3 notes that Research organization D has certain focus areas where to try to go forward. Their activities are mainly funded by project funding as they do not get funding from university or elsewhere so that they aim to get funding via projects. According to RD-3 within research programs main funding bodies in Finland are Tekes, Academy of Finland and TIVIT and then there are EU programs. Their second funding channel is companies on program basis. Recent programs where RD-3 participates in focuses on Living La and Smart City programs where they have a couple of programs running and several applications on application process. One of these programs was funded by ERDF funding and aims at productization of OULLabs's Living Lab and thus the program is not actual research program as it aims at productization of service offerings in a way that it serves the activities of Oulu Innovation Alliance actors by bringing services that fill their needs. Further this program does not have direct research goals but
more common-good relate aims like new business creation to the region. From the other end of the program spectrum Research organization D has a program that is mainly funded by Tekes that includes two global large scale enterprises. Aim and scope of this program come from company partners and the program has been forwarded based on their interests. Via this program Research organization D has built their own competences and research and has networked and linked the actors within the same area. (RD-3, 2012).

In the company world there is very precise evaluation of competences and asset categories when companies start to develop products or service so that the partner network is right. In research side what is important depends on funding source as according to RD-3 for Academy of Finland perhaps curriculum vitae’s are important and for Tekes it is important that there are credible company partners and credible research group and idea. (RD-3, 2012).

Company partners come to Research organization D’s projects for example via program preparations. When they start to build a research program around certain theme in which they have competences and certain thought they start to map and think which companies could possibly utilize those ideas and thoughts businesswise. In this way they map companies that are known and unknown to them and contact and discuss with them to present those ideas and thoughts to find common interests. This means that they start building actors, that either work within that area or are about to come to that area, around their own competences and knowledge. They also seek for actors that they see that they could have something to offer although those actors are not attached to that thing yet or they are not aware of it. In these cases Research organization D sees that they have things that could help those actors. In this way Research organization D tries to be proactive although also companies contact them to ask about their interests and know-how. According to RD-3 they have some concrete examples that this kind of interaction has led to on-going program preparations and billets. (RD-3, 2012).

According to RD-3 commercialization of assets that are jointly developed is per se companies’ responsibility. Although Research organization D can bring ideas, technology and competences into it, company needs to have interest toward business development and commercialization. RD-3 notes that recently for example Tekes shaped its funding patterns from the beginning of 2012 so that it also funds programs where universities and research organizations are clearly pushed to think about and to commercialize their research ideas and from research ideas to business activities. Within Research organization D’s network there are other public funding actors that support business creation more in the
commercialization of research setting. According to RD-3 Academy of Finland funds basic research and does not involve with business or business utilization. Tekes clearly emphasizes that in a certain longer term, like five to ten years or faster, research program should have commercial exploitation. (RD-3, 2012).

As Research organization D is part of the university in a certain way they have a requirement to do high-class research and academic activities and in this relation they have activated much with university’s different research groups and collaborated with them and tried to utilize their own competences and ideated new things. From the industrial focused collaboration perspective funding from Tekes usually requires industrial partners and commercialization. According to RD-3 these are the two clearly visible trends that they have within the interaction development. Besides Tekes also within EU collaboration there is similar emphasizes that although research is done also commercialization aspect has to be thought all the time. This kind of external guidance has changed Research organization D’s role because as they operate with project funding, research sources guide their activities and set certain framework for it. These changes in the interaction have not come suddenly but little by little and thus RD-3 was not able to see that they related to certain essential episodes. (RD-3, 2012).

RB-2 does not do research but focuses on business development. They have a collaboration pattern that relates to commercialization with their founding members. Besides this funding they have got funding from Council of Oulu Region, city of Oulu, Tekes and four companies. These companies were also certain strategic adviser board members within their 2009-2012 program. According to RB-2 the base for building this kind of collaboration pattern is company funding. Besides previous funding sources they have got money from 17 project partners. Further RB-2 estimates that around 15 companies will be established in this area. (RB-2, 2012).

Besides commercialization related funding that they have got, the research that advances separately gets quite much funding for example from EU. According to RB-2 the second important section for them is over one hundred researchers in the region that conduct research that relates to their area and companies that have know-how and understanding what technology that they are commercializing means. Industrial sectors that relate to technology that they commercialize are in the early phase. In this setting EU funds and supports network and partner creation that relate to application field that is based on technology that they commercialize. According to RB-2 the general thought was that they could build superior environment and create new industries where they
would have laboratory infrastructure that they have got quite much, for example at VTT, University of Oulu and University of Applied Sciences, and equipment’s to produce objects. Recently they got hall scale machines that help them to achieve these aims within their next program during 2013-2015. (RB-2, 2012).

Currently they are strongly searching for end-appliers for this technology. They have three programs that relate to production environments, killer applications and know-how transfer from research to industry. Currently they are establishing a cluster where they try to get over 50 companies to work within these three areas. According to RB-2 from these companies at least 10 has to be large scale enterprises that have products and channels to the world markets and other 10 should be SME’s that have products and channels within their own niche in the world markets. This means that part of the companies need to be able to scale the business immediately to big business. According to RB-2 activities that they have with these companies relate to seeing customers where they can ask what kind of applications those customers could start to make and if companies are interested as they have unique network and environment where they are able to be first to test this thing. (RB-2, 2012).

Company A participates in Facilitator A’s biggest program and companies that interest them within this program share similar characteristics with them and are near their work volumes and ways as according to CA necessarily it does not give a lot to them to compare internal operations of small companies with theirs as they are different worlds. Although Company A is globally a big company their operations within Finland are comparable to many smaller Finnish product development companies. Companies that they do nearer collaboration with include for example Company B which is their competitor and in CA’s opinion that collaboration has been good and open. According to CA Company B has luckily understood quite well within Facilitator A’s biggest program that development of ways of working is not really something that actor can copy as it is very context specific. Thus it can be pondered together but that pondering does not create things that can be copied and thus in business secret sense it is quite favourable collaboration. (CA, 2012).

Company A’s reason to participate in certain networks and programs that relate to ways of working is that they started to search for discussion partners from business world and partners with whom they can share experiences and views. Initially they also had a thought to find tug assistance from the university world but CA believes that the cold fact is that university world is too theoretical. Besides some rare exceptions universities have ‘too few kilometres behind’ within
the research areas that Company D was looking for so that it could bring something directly valuable to companies. In CA’s opinion within their university collaboration they offer a playground for university researchers to research different aspects of one of their research theme and its transformation. Their thought and hope behind this are that when they have data and researchers work on it and do research and Company A iterates university’s interpretations something that is beneficial to them is created so that they can make conclusions that gives additional value to them. (CA, 2012).

Company A has tried different collaboration forms. One of the current ones is regular meetings where both company and university representatives share experiences within different themes. Activities within these meetings are very different but typically there is an actor that initializes certain thing that is then discussed. This discussion helps to build consortium’s experiences about things that were tried and done and where those things led. The aim of these discussions and ponderings is to find new ideas and experiences about things that might be worth to test as there is an actor who had tested them or that they are not worth testing based on other actors experiences. In CA’s opinion there is no straightforward model about what leads where and from where value comes from. According to CA a good example of this is that when he goes to a meeting the next day that relates to Facilitator A’s biggest program where he and another person give initializations about how value is perceived within their own product development environment, CA is quite sure that in there value is perceived within very wide scale and that value has many different dimensions and levels. For example value that is formed to Company A via Facilitator A’s biggest program relates to many things. Personally to CA that value is experiences and views that increase his experiences and his abilities to operate in this environment. Value can also relate to process oriented way of working that gives company a new way to operate or it can be different kind of publications or papers that can be utilized wider within the organization. Further when Company A is involved with some activities it gives value to their company’s brand and image and thus value domain is very wide. (CA, 2012).

Facilitator A’s biggest program that Company A participates in have clearly brought together companies with whom Company A did not have previous discussions about ways of working. CA believes that the way how that program was initially defined led to activities where companies that were interested in this theme got together. Initially certain structure within the program was agreed and for example work packages were initially put together in a different way. Further
CB's network formation occurs mainly via EU projects. This interaction is culminated with actors ability and willingness to participate in those EU projects. Company B has also national projects that are funded by Tekes. CB collaborates with external actors on program basis. Development of interaction during the program varies a lot as some SME’s just hang around. CB is currently leading one national program where he brought it out in the steering group that he is worried about the interaction creation as they need to put effort into it and think about tasks that contribute in a way that all actors benefit and participate. According to CB this is also Tekes interests. Further CB emphasizes that it is quite likely that
the collaboration is not continued after the program with actors that just hang around. (CB, 2012).

According to CC when an actor participates in networks it creates value that is not necessarily possible to specify. CC notes that when an actor knows someone who can help in some other issue or knows from whom the actor can ask, it has its own value. From Company C’s perspective CC tries to get additional value from research collaboration programs to their operations that could be realized in their offering to their customers. Actors within their collaboration programs are not mainly their direct competitors although within their network there are actors that are in a direct competition relationship. Company C always tries to find so called safe areas within collaboration. Company C strongly emphasizes collaboration. For example within Facilitator A’s biggest program this means sharing all kinds of information and doings within the consortium as according to CC otherwise there is no point to participate if an actor is not truly willing to share. There are also research organizations within their network. (CC, 2012).

Within these networks Company C’s focus is on R&D collaboration although they also have spectrum to innovations so that they have internal strategic innovation activities. Besides this they have activities that relate to open innovation so that there are external actors’ that are involved in the innovation process. According to CC when compared to their previous way to operate Company C is perhaps opening within different arenas so that they want to open their collaboration networks and ways so that they would not limit to just one certain thing. Instead they try to find within different sub-areas where they could be able to do collaboration. Further Company C tries different kinds of collaboration forms, for example focus groups with their customers, more formal collaboration programs, mutual programs with certain actors so that the spectrum of their collaboration forms is quite wide. In CC’s opinion it should be more like this so that if an actor wants to succeed in the global business only few actors can make it alone. Thus actor needs to think precisely about all the possible ways of networking within different levels. Company C tries to think about different collaboration forms within a large scale as Company C does not necessarily always identify areas where to go. (CC, 2012).

Research programs have their own plans and in CC’s opinion network per se creates assets or additional value as many times within the network that kind of things are created that actors did not necessarily, see in advance. Further CC emphasizes that collaboration is per se valuable and create new assets so that new
possibilities arise from there. These possibilities can relate for example to sales processes that can be discussed and sparred with similar people from different organizations to identify areas that actor was not able to see and where they could network with someone. This kind of possibilities can arise for example from discussions with network partners. CC emphasizes that although asset creation can be planned it is good to keep in mind that all things cannot be planned all the way so that actor needs to have certain mind and by enabling certain things in a way expect that something of that kind will arise. (CC, 2012).

Company C has many kinds of networks. For example customer networks that are based on customership. More informal collaboration networks might mirror through certain community, for example if different organizations have similar interests. Company C participated TIVIT’s creation phases where there were needs to think about how Finnish industry and its competitiveness could be improved. By this discussions and thinking Company C took part in the establishment of for example Facilitator A’s biggest program. According to CC this was a big exercise as there were workshops in four cities and over 200 experts participated in those workshops to ponder competitiveness challenges of Finnish industry in 2015. In this way consortium was created from actors who thought that there is enough common themes to all. According to CC Company C probably did not know all the actors beforehand so that many times networks are created via common interests and goals. (CC, 2012).

According to CD Facilitator A’s biggest program is perhaps one of the most networked of its kind in Finland and external evaluators that evaluated it were very satisfied about its condition. Company D’s focus within this program is mainly about their interface to cloud services. Further they have a couple of research themes that probably other actors within that program do not have. Within this program Company D has different kinds of interaction concepts across the whole program. CD was one of the persons that initially started to create this program and attended its kick-off setup. Within Facilitator A’s biggest program company D has had some collaboration with almost all the companies at some point. In CD’s opinion this is also a kind of networking. Further CD notes that he believes that creation of this kind of value networks is utilization of networking within different contexts as from some things right things are created and from some things they are not created. Company D has had collaboration with different actors in Finland from 2007 within certain activities and part of those actors have participated in the same programs with them last five years although single individuals might have changed. (CD, 2012).
According to CD activities that concretely support asset creation within their programs relate for example to bi-weekly sessions where they go through their research areas with different universities and VTT. They have web-based collaboration form and common tool where they forward research. This two week cycle is on-going and CD has the same concept in all programs so that all actors go through things within this two week cycle to see how program is proceeding and to share experiences. Actors attend these bi-weekly gathering either physically or via web-based collaboration tool and according to CD latter way is almost as good as face to face. Although they do not see people’s faces all of them are in the same space and can hear each other and present and share materials that are visible to all of them all the time. This two week cycle is the systematic whereby things are forwarded and planned. (CD, 2012).

For example within Facilitator A’s biggest program Company D’s value potential is viewed from business concept and business value point of views and thus they do not view things just from the technology perspective. In value setting they collaborate with certain researchers from University of Oulu where they have applied lean start-up thoughts and models and tested them with their customers. Thus they have searched value perspective via this kind of cycle between collaboration with university researchers and testing and seeking value with their customers. (CD, 2012).

Company F comes to Facilitator A’s biggest program in quite a pragmatic way. They had collaboration with Aalto University and when that program ended they noticed that things were not ready and started to seek a follow-up for it. For them SHOK was starting in the right time and Company F decided to see what it is about as CF saw that they should participate in it and network stronger. According to FC it is interesting how companies around their size get involved with SHOK’s as for example Company F often has too few resources to do this kind of probing. It is possible that within a bigger company single individual might just coordinated that program on behalf of his company but in Company F that is not possible. In CF’s opinion SHOK’s starting process was quite interesting, especially when the first SHOK’s were started, as it was quite a confused process. Within this program Company F had a clear focus so that they continued their prior development activities. They defined and saw that it is beneficial for them if also research community is involved with this development and if the theme interests them and they want to research it. Company F is willing to participate as they saw that if they are not able to do it by themselves and it is not reasonable to research everything just for Company F. According to CF researchers just want to
publish and thus they do not necessarily seek for direct business benefits. Instead they support interesting area where it possible to advance academic career. This creates win-win situation to both. (CF, 2013).

Initially Company F’s channel to SHOK and Aalto University’s programs came via personal contacts. This is because when those projects started Company F was much smaller although it is still a small company. Via SHOK’s Company F’s contact network has extended significantly. Further their perspectives about what things they know and do not know and who work around similar things in Finland have increased as according to FC in that kind of big program those who participate in probably know all the individuals that work on similar things in Finland as circles are quite small. (CF, 2012).

Previously Company F participated one Tekes project where the project plan was clearer than in SHOK’s and it was also more limited to certain things. According to CF this was generally fine but it did not support networking that strongly. SHOK that they participate is well organized and works well and that SHOK has organized events firmly. Within their theme there is a certain rhythm so that actors have learned to work within that rhythm. According to FC quarterly reviews that are organized four times per years are an amazing opportunity to network little by little without a clear goal and thus more contact network is made within SHOK’s than within Tekes projects. SHOK also differs from Company F’s prior program with Aalto University in a way that within Aalto University’s program they primarily worked just with Aalto University for the first two years. (CF, 2012).

According to CF SHOK model has value to a company like them and more growth oriented companies should participate in SHOK’s as it is possible to start with quite limited resources. In his opinion very good thing about SHOK’s is that it gathers together know-how and people who are interested in SHOK’s focus areas to truly common place and there is a certain continuity so that things are not created just based on predefined plan. Instead actors in a certain way trust that good things will be created when they gather together. Smaller companies do not have many resources to seek partners by themselves. From universities perspective collaboration with Company F is difficult as then the programs are easily too small so that actors need to use disproportionate amount of time to program preparations and bureaucracy. If that is possible within well working SHOK then the bureaucracy is much smaller. As SHOK’s have certain structure, contacts and actors know the rules within that structure it is possible to work with more companies. Within SHOKS’s it is also possible to seek partners from
research organizations if an actor has certain things it would like to do. Although Company F has not find partner for all its ideas it has found partner to sufficient amount of them and according to FC they would not be able to do more although these ideas do not form big projects but limited entities with a couple of researchers. CF, 2012).

Company E’s network was initially formed as a sales, marketing and resale network. This is because although Company E started in 2007 they got their first customer during the same year from a trade show that was held in Sweden. Their joint program with VTT came via prior relationship with one of the VTT employee. Similarly they heard about the start of Facilitator A’s biggest program from CE’s prior boss that works at VTT. According to CE this kind of programs pretty much come via personal relationships. (CE, 2012).

Initially Company E focused on technology within Facilitator A’s biggest program but later the focus was shifted to cloud business model development. This means that Company E started the program with research focus but then the focus was changed to business side. According to CE good thing about this program is that it combines technology, business model development and business aspects. Besides technology and business aspects Company E was interested in Facilitator A’s biggest program because of its user experience aspect and according to CE all these three aspects were current for them. Further Company E was not seeking for collaboration with certain actors. Instead they just went to the program as a small company as according to CE the message was that the program needs SME’s. Further he notes that during the first seminar he had a feeling about what they actually do there as there were big companies around them but according to CE they have found their own place there although their effort in there is small. There is not many small companies within Facilitator A’s biggest program and as the initial message was that the program wants and needs small companies Company E was encourage to participate. Further reason was that they had contacts to some of the programs’ key individuals. According to CE without this kind of contacts it is not likely that small company would easily participate in completely unknown thing. For Company E after one this kind of program it is much easier to jump in as it is not a big deal anymore once they have learned that although they are small they can operate there and they benefit from that. They tried to get into one other TIVIT program but failed to do so as the program was already operated one year. (CE, 2012).

What Company E gets from Facilitator A’s biggest programs is that they have been able to network there. For example they have monthly meeting with one
business related research team that works at the university. Toward VTT program did not bring new networks as they continue with the same VTT people. Further program brought research program with other university in user experience where Company E also participates with small effort. Most of the collaboration and networks that Facilitator A’s biggest program brought to Company E are with universities and research organizations. (CE, 2012).

Company E has built its sales and marketing network little by little and building that network has happened very much accidentally and because Company E knows some individuals. Even if those individuals change company connection to them remains. Another network they have is more technology oriented and includes especially VTT. According to CE business is about public relations and that an actor knows someone and vice versa. (CE, 2012).

Company G’s products are based on technology platform that is based on open standard that was initiated in Oulu in 2007 by one of their employees who has very wide network around the world. This employee is also the chairperson of an association that was formed around that technology. This association includes companies and actors around the world although most of the companies are from the Oulu region. The aim of this association is to find technology development path to forward this technology. (CG, 2013).

Company G was also establishing 3D Internet Alliance in Oulu and that alliance acts besides previous association with a slightly different scope. This alliance was first established in Oulu. Further aim is to extend it to national level during 2012 and 2013 and after that to the international level. As there are no driving companies in the region Company G decided to take that role and pull things up. Company G has calculated that they can offer big cases because there is a subcontracting network and they can get around 100 persons from there if they want. This network includes companies for example from the association and alliance they were establishing. According to CG for a customer it is not important what the technology is. Instead it is important what applications there is and what they do. Company G and 3D Internet Alliance especially emphasize the interaction with the customer so that reasonable end-solutions would be executed for the customer. (CG, 2013).

During Autumn 2012 Company G participated in the creation of Finland’s 3D Internet strategy that takes a stance about what kind of networks should exist between funding bodies, universities and companies. Within this network Company G saw that biggest opportunity for them to influence was to make as much business as possible and they took the role of a driving company. They
utilize their own know-how within funding side as funding bodies are very familiar to them, both public and private, because CG met a lot of venture capitalists within his last company. Company G has got funding from venture capitalists, Tekes, ELY Centre and EU. CG emphasizes that the amount of funding that they have got from these actors would not have been possible without extremely good networks and extremely good relationships with previous public sector actors that they got funding from. During CG’s prior career he worked at the development company where he got to know all the regional funding bodies and business well. Company G had utilized that knowledge within their own operations. (CG, 2013).

Further Company G has collaboration networks with research organizations. They have very close collaboration for example with Research organization D almost daily. For example some of their employees also work at Research organization D. Currently they are driving up a very big EU project that was accepted recently. This research consortium is Oulu based consortium and includes Company G, three other companies and University of Oulu. This project is part of a bigger EU program that is carried out in parts and their project is next one after core technology project. To get this project they lobbied it heavily and formed international networks. In CG’s opinion they should create and utilize their technology network more for example within standardization. (CG, 2013).

At the same time when Company G builds its network toward customers they give speeches in many places about what 3D Internet is. Via that way they extend their network from people who were listening. These actors include for example funding bodies and public organizations so that when Company G gives these speeches people start to talk about 3D Internet with each other. For example Company G just made a big business deal that was based on one of their employees five years old contact when that employee helped one individual to wrote and to publish an article so that individual later connected them with this new customer as that individual knew that they know that thing. In this way it is possible that networks awake again. Company G has also strong networks within mobile phones domain as CG and many of its employees used to work for Nokia. This means that Company G’s aim is to both create offerings and to create a name for them and their personal networks play a key role in this so that via their personal relationships they have access to beneficial assets. These assets can be for example relationships with funding bodies, actors or business people. CG emphasizes that actor is a lot responsible about what kind of network the actor creates. (CG, 2013).
Maintaining network and relationship

Within TIVIT’s networks there are roughly two kinds of actors, stockowners and the rest. Stockowners are able to influence via board of directors activities. The central task of the board of directors is to decide SRA’s that will be invested in and their investment allocation. However, being a stockowner does not guarantee that actor would be selected to any of the programs. According to FA-1 they still have over 20 stockowners that have not been selected into any of the program and keeping motivation of those actors up is its own challenge. For example some universities have not been selected into any programs yet. Annually around 150-200 companies and 20-30 universities and research organization are involved within Facilitator A’s network and most of them are not stockowners although they have been selected into it. For example one actor sold its share to another actor as TIVIT’s strategy went to totally different direction than the actor’s own strategy. Some actors have stayed and follow activities passively. In this latter case it is possible that those actors still benefit as they have faster access to Facilitator A’s information because Facilitator A discusses about certain things first internally with the stockowners and they can influence via shareholders meetings and to try to get into board of directors that is renewed annually. Further it is possible that those actors wait that their business or TIVIT’s strategy will change. (FA-1, 2013).

Although actors within Facilitator A’s programs change annually when new actors come in and some actors leave, Facilitator A does not really have interaction with actors who have left as their activities are very clearly directed via their programs. This means that they operate with companies that participate in their programs or are interested to come to their programs and thus Facilitator A is not actively dealing with actors who have left although they discuss with the biggest companies. According to FA-2 they only have regular communications via their programs. Further Facilitator A does not operate with single companies at all as there always needs to be a certain consortium or community. This means that single companies do not get any services from them as they do not have any offerings to single companies roughly speaking. According to FA-2 one development environment is coming to them that in principle offers services to single companies and single company can come there to do its own things but also there the aim is to keep the communal component strongly present so that it would be a developer community not just a toolbox. (FA-2, 2013).
According to RB-1 in an ideal situation within the network or program that kind of business connections have been created, of which the interaction continues for example in a form of concrete doing or customerships. Further in an ideal situation it is possible that people would gather together every three months to discuss about what they have done and to share information even if there would not be funding or project. Within Finland’s networks same companies, individuals and research organizations participate in them as there is a limited amount of those actors. Further as there is constantly going on programs and program preparations, RB-1 notes that in a way those networks that have worked found themselves from new programs or things again. In these situations where actors know other actors it is meaningful if an actor has good personal network. (RB-1, 2012).

For example the aim of TIVIT’s programs is to create new ecosystems and according to RB-1 if they succeed with that aim and create new ecosystem that ecosystem will continue its life cycle until better one arrives. This means that within the new ecosystem companies, individuals and research organizations benefit from their interaction so that they continue it. Further RB-1 notes that different kinds of mechanisms have been created within the projects and programs, like different kind of a cooperation networks. This means that there is different kinds of networks like project networks that have been created within the project that can continue their life or disappear. For example networks where specialist gather together and ecosystems that benefit actors within the ecosystem for example when they do business or products together. As networks are inter-personal not inter-organizational every actor is responsible for maintaining its network and bringing its own value to that network as no one is dealing with individuals or communities that do not bring additional value. (RB-1, 2012).

Facilitator C’s aim is to link the foreign contacts they have permanently into their regional operations or at least to two funds they have. According to FC at the moment those two funds are perhaps the most active ones where they have linked the foreign investors permanently. Another way to maintain relationships is via events that they have as the relationships live some time but funding body-funding body link is longer in general. FC emphasizes that Facilitator C needs be able to show that the region creates interesting investments all the time so that it is worth to come to the region. Some of these investors have tight focus, like investors from Israel, but others seek investments within wider spectrum. This depends on the size of the fund as if the size is over one billion euros its spectrum is easily wider. FC notes that recently all investors have been afraid about
hardware as investments have needed to be super-scalable software development. According to FC the region they operate in is a hardware region and Facilitator C strongly believes that hardware know-how that is packed into services in new ways is something that the region will get along with and thus Facilitator C invests into it although all actors do not like that. Further FC notes that it is already possible to see that new service packages will grow from the product interface. (FC, 2013).

When facilitator B does not have active collaboration with actors that it has for example funded, it maintains discussions and relationships with these companies with actors whose aim is also to create new business and companies. These networking actors include for example Yritystakomo and Business Oulu. According to FB Facilitator B has noticed during the last couple of years they need to strengthen this collaboration. Although they have this collaboration quite much already there are many things that they should boost and bring to the field via these other actors. According to FB this happens all the time and has happened but it is not a formal process but highly dependent on personal relationships as some people are more active than others and how well they know people from the field and from which areas and within which things they have events. Further FB emphasises that in principle they could utilize that field a lot more. As Facilitator B is one significant actor within development activities funding they have by force met all the other actors within this setting and also other funding bodies. According to FB this collaboration deepened about four years ago quite much when they got new funding instrument, Funding for young innovate companies, that relates centrally to venture capital activities. Further although Facilitator B had collaboration and they knew other actors before this new funding instrument, this collaboration came ten times tighter and more frequent after that. Via this funding mechanism Facilitator B has started to actively develop collaboration with investor networks. For example they have been one collaboration actor with Teknopolis while seeking foreign investor to different events within the region because it has been essential part of their funding activities that other funding bodies participate in those events. Because of the structure of their funding activities Facilitator B’s direct interest is to get other actors to participate in these events. As the venture capital activities within Finland are not in a very good condition they have got aims and tasks from upper level to seek funding bodies from abroad and they try to attend all the investor related events. If it is possible and needed they organize investor events also by themselves and thus they network with investors all the time. (FB, 2013).
Facilitator D does not have active collaboration with all their partners. According to FD their processes, for example from identifying research results to application that is forwarded with some actor, are easily one or one and half years long before things proceed. At this point Facilitator D has quite a dense phase. From time to time Facilitator D is in contact with their partners and according to FD probably during this time new things that they can offer to their partners are created. Further FD notes that their partners understand that they do not have something to offer all the time. Facilitator D has not tried to seek for consultants but actors that commit themselves and take a deeper role than consulting assignments and reports. FD emphasizes that their partners need to see their university and research interesting and that it is possible that it creates interesting programs to them and are not after quantity. According to FD consultants that want to make market research regardless of what Facilitator D investigates are probably not actors that they consider as a network. For Facilitator D it is important that the network includes specific experts that know certain technology or business area. FD notes that fortunately there is plenty of this kind of actors to work with. (FD, 2013).

For RC keeping the network alive means that an actor needs create results that companies see useful all the time. Secondly, it means that they need to keep the discussion connection so that they understand what things are essential to companies as in this way they are able create supply so that researchers and companies can ponder their needs and what they would like to research to find a new possible gripping surface about what could be researched in the future. For example during programs there are episodes that creates interaction that eases access to coming programs. First, during the program there is a basic trust about who the researchers are and how they use that information. This is formed via experience. For example if research program have been carried on longer and researchers have not misused confidential information it is a factor to advance the research collaboration. This is not created without longer collaboration and in a way the trust creation is part of that collaboration process. Second, the ability to bring information that might be beneficial to actors within the program from other networks and the ability to create additional value for actors within the program from information that is brought from other networks. RC notes that in a way there is information sharing in two directions. First, sharing information about things that were researched with a company to elsewhere, for example via workshop. Second, selected bringing of information that was created elsewhere into the interaction with a company. (RC, 2012).
According to RC traditional programs, like Tekes and EU programs, define beforehand what will be done and those planned things will be executed during two to three years. Besides this other interaction can be created. For example in SHOK’s, activities are not so tightly planned beforehand but what is done lives constantly. This means that activities start by one plan and after certain thing is done based on the ideas that have been developed it is pondered what ideas are worth to advance further. This means that there is an ideation process that is partly loose from the operative research although it utilizes its research. Via ideation process new billets are created for the operative research. According to RC within SHOK’s the whole package proceeds all the time on two levels and there is constant planning and execution, not planning that is followed by execution which is followed by pondering. Within SHOK’s research the cycle is quite long. For half a year onward but the ideation proceeds with faster cycles are at least three months. (RC, 2012).

When Research organization C does not have active activities with actors they maintain their academic network for example by organizing a conference once a year which is one way to maintain that network although it is quite small portion of actors that they have concrete activities in practice. The second way is that for example when results of SHOK programs are presented they can present what they have done with other actors and see what other actors have done as they do not work with all the other actors. In this way Research organization C can seek for interfaces from where common interests could be found although that discussion occurs within that certain program entity. Third, on national level there are all kinds of events where actor can meet people and exchange pleasantries about what actors have on top of their minds and to think if there are things that should be reacted in some way. This interaction is focused on informal interaction between individuals as networks are not usually organizations networks but networks of individuals. (RC, 2012).

As research organization D’s activities are program and project focused it is challenging to maintain relationships with actors that they do not have current collaboration with as their collaboration network is wide. One concrete way to bring actors around the same table in a targeted way is preparations of large program entities. Research organization D has also organized workshops and ideation days. RD-2 notes that for example next week they have a conference in Oulu where their actors from that theme area attend. To some extent actors they collaborate with organize these events also although RD-2 notes that it could be improved. For example some people from the local university of applied science
and city work in their premises and thus from this basis they have joint working model and common events could and probably will be organized more in the future. (RD-2, 2012).

According to RD-3 Research organization D’s on-going discussions with actors it has collaborated with or collaborates relates to new things which they could start to develop together. They for example seek opportunities, think about common project interests, build project billets and try to find partners that they need to those projects. In RD-3’s opinion the network exist all the time and there always comes situations and ideas by which it is possible to figure out partners who might be right for certain things. RD-3 notes that for example their user experience researchers participate actively in seminars in the region and organize seminars and meet their partners and that Research organization D participates in press conferences and meetings of EU’s research programs. According to RD-3 these press conferences and meetings are networking events and also Tekes and TIVIT have similar events that they participate in.

CA did not have experiences about how interaction connection is maintained with actors who Company A does not have on-going programs or collaboration with as he did not have previous experience of research projects. According to CA Company A’s prior interfaces within ways of working were more related to their own activities to find companies and from where help can be found but not to research programs. (CA, 2012).

According to CB collaboration with actors they had collaboration within a project does not usually continue as Company B starts seeking for a new hot spot. One way how collaboration could continue is to continue it in another project as in general project themes do not limit much what is done during the project as it is always possible to view things from different perspectives. (CB, 2012).

CC note that it is possible to have jointly agreed events where actors gather together around a certain theme or group. It is also possible to organize mutual bench marking type of events. Many times it can be that Company C has collaboration relationships that waits for a certain trigger. This means that if there is certain kind of situation or event that connection will be brought up as they do not necessarily have actively kept in touch with all actors. CC note that for example in the near future there is a conference in Tallinn where they can meet collaboration partners from that area and seek where they are currently going. (CC, 2012).

Also CD note that there is different kinds of events and ways where certain things can be discussed and based on those discussions sometimes things are
created. Besides this Company D forms assets from their internal activities and learning that can be used again. This means that Company D’s know-how that they have been able to form is slowly created into reusable form. (CD, 2012).

According to FC it is not yet known if maintaining the network and relationships after SHOK collaboration is easier than after traditionally funded programs. Within research community people do not change their big research area all the time. As Company F has already had collaboration with universities and is currently doing so within one SHOK program, universities have also identified that they could be potential partner as Company F is known and they are easy to approach. This is also because funding mechanism in Finland is such that it encourages universities in a way that applications are accepted more easily if they include certain amount of SME’s. According to CF it seems that their collaboration with research organizations will create continuity which is valuable to them. This continuity is based on communication. Further CF emphasizes that they had their own ideas why to participate in these programs and if they would lack those ideas necessarily they would not catch other actors interests. (CF, 2013).

Company E maintains its network for example via a couple of day long partner days where its resellers attend either physically or via virtual connection. They organize partner days a couple of times per year to keep their partner network up to date and to get feedback from them. During the year they have a responsible person per partner who communicates with them. (CE, 2012).

**Other benefits and aims that actor seeks for**

According to FA-1 no one has positioned any goals for them which is quite crazy situation and thus they do not have any key performance indicator metrics or targets from Tekes or any other actor. Only goals they have are positioned by Facilitator A’s board of directors and Facilitator A reports them to the ministry once a year and tell what results were achieved although there is no result requirements that have been set for SHOK’s. Further FA-1 note that they have been evaluated internationally and that evaluation will come in the near future. In FA-1’s opinion evaluation of basic research is easy and also product development in a certain way, because in first case it is easy to calculate the amount of doctors and publications and so on and in the latter case it can be calculated how much an actor invested and how much cash flow that investment generated. As Facilitator A is in the middle of these two cases they have not been able to find ways to do
Companies only work on their products up to a certain point but they do not tell Facilitator A when the product is finished and what things from Facilitator A’s programs were utilized. According to FA-1 it is extremely rare that a product consists of things from just one program as part of them are done within SHOK program, part via direct Tekes funding, part by companies own funding and partly from elsewhere. (FA-1, 2013).

In this setting it does not have any effect on Facilitator A’s activities or focus that companies conduct things within SHOK’s and then bring them out when they want to do so as according FA-1 they are just happy as FA-1 wants that business is created in Finland. Further TIVIT’s success is a meaningless thing for FA-1 and he is not interested if certain wonderful results are created inside of them or not as the main thing is that result is created. Thus if companies feel that making money is near they should take it of TIVIT fast and complete it by themselves. As there is no monitoring about what is the share of TIVIT’s or SHOKS’s, FA-1 emphasizes that the problem is that they cannot say how much new business they have created as they do not see that business although FA-1’s note that he can live with this as it is enough that he sees companies work seriously, get results, want to invest again and again and collaboration is created. This means that when things and business potential are created it does not mean that they should be documented somewhere and thus in FA-1’s opinion it is good to try to decrease the time that is used for administrative tasks and documenting. Further FA-1 emphasizes that so far for each program there has been a lot more interest and willingness from companies than Facilitator A can fund and that is the only metric that FA-1 is truly interested in, although he would like to see numbers about euros but he knows that this is not possible. (FA-1, 2013).

FA-2 has all the time worked with the thought that within SHOK operations the question is to help companies to renew their business and that takes place via competences. In a way within the research programs technology competences are created and within the business ecosystem programs business competences are created. In the end activities are about know-how building so that there the aim is to create concrete outcomes. From Facilitator A’s perspective those are the outcomes by which companies increase their own competences to operate in a new business environment. At the moment Facilitator A does not monitor what those outcomes are or how they have worked. According to FA-2 this is a big question that is discussed all the time so that how the effectiveness could be measured. If the outcome is new know-how it is difficult to measure that.
Although it is possible to measure jobs, revenue or similar entities FA-2 notes that companies do not necessarily come to tell them what new revenue they have created. One reason for this is that if actor unpacks new business that company has created to find out from where it consists of the single factor behind it could not be found. This is because there are a lot of different things that were packed in a right way so it is very difficult to show the effectiveness of operations. Further Facilitator A does not have any systematic way to do it although their business ecosystem programs are one way to make it visible so that new business is created from here or it is at least possible to create it so that it would not remain as technology and competences. (FA-2, 2013).

In RB-1’s opinion if an actor has a research problem that it starts to solve via certain research methods and ends up that the actor cannot solve the research problem with those methods it is a research result as such because it builds a ground for next research. Further RB-1 does not believe that Research organization B would get into any projects just because of the contacts the project includes. Research that Research organization B or universities conduct bring certain result or additional value to someone, for example to a company that makes business out of it. It is possible that Research organization B sees that there are new companies coming and they want to collaborate within a certain theme area because they want to create the network and to understand the operational models of those new actors. In this setting Research organization B’s research question or goal can be for example what new things game-oriented organization can bring to ICT service research or what new elements can be found from there that other actors could utilize. Thus the aim is not to discuss with certain people or to create certain kind of project. (RB-1, 2012).

Other aims that Facilitator C has relate to international relationships in a specific context. This context is a dramatic market change that has changed the region from Nokia driven ecosystem into start-up ecosystem in a couple of years. This ecosystem change into growth company driven related defines all their activities. In a long run Facilitator C wants to look after that their ecosystem does well as currently they have extremely strong know-how within certain ICT-areas. They have for example laboratories that are worth of tens of millions euros at the region and production and R&D know-how that they want to support. According to FC many times the most interesting companies are created from the areas that they boost. As a result of this investors are interested about the region. Thus Facilitator C’s aim is to support the regional ecosystem. (FC, 2013).
Within this ecosystem but outside of the investor networks Facilitator C has tight collaboration for example with Yritystakomo and Business Kitchen as the city is their biggest funding body. FC’s current job description is to develop the company development structure that relates to start-ups. In this setting there is actors like Yritystakomo which is a platform for experienced professionals into new entrepreneurship. Further there is Business Kitchen that brings resources of universities and universities of applied sciences to be used within companies and activates students with it. Facilitator C also has a new accelerator where first five companies are currently in an accelerating process. Besides these actors Facilitator C has a lot of events and trainings and they are building a product development environment where user communities can test actors’ ideas. In addition to this kind of actors and activities there is technology transfer activities at the university and at VTT and Innovation Mill. According to FC these technology transfer activities are very important. Further FC notes that early phase companies and their funding have two sides. From the funding perspective there is a demand side which means if company is good enough to get funding. Previously mentioned actors look after that the company is good enough to get funding. Other side is the supply side which means if there is enough money at the region and venture capital structures for it. Facilitator C has tried to look after that there is enough money at the region. Both of these sides are needed to form working venture capital ecosystem. (FC, 2013).

Commercialization has been one relevant goal from the foundation of Facilitator B. According to FB when that goal is compared to the change that happened a couple of years ago their practical activities, including analyzing work and work that support their activities, did not look commercialization that carefully. Further FB note that roughly speaking during the early phases it was common that if there was a good, interesting and technologically new thing it was thought that it was worth to research and forward it further. Although commercialization has been an interest all the time it was not monitored that carefully. This means that although Facilitator B’s funding has probably have influence for example in Nokia’s creation and creation of Finnish mobile know-how and business, they have had a lot of programs that have not proceeded anywhere. However, as this is normal risk funding some of the programs succeed and some do not. Recently commercialization has become more precise. This means that in a certain way Facilitator B does not want to rely on luck that much so they try to guide, see and evaluate commercialization from early on. This means that even research organizations that present a program need present
already in their application how it will be commercialized including where, by which actors, in what kind of products or services and to which markets. This have created one big challenge to research applicants because previously they have not familiarized themselves with this kind of things as they have not had need to do so as it was enough that it is an interesting and potential area. Currently Facilitator B tries to visualize all the time how the commercialization truly happens. (FB, 2013).

Facilitator B’s interest is to strengthen commercialization of research organizations programs so that bigger portion of research they validate and get their funding would have as good opportunities to proceed to commercialization as possible. According to FB there are a lot of researches that have created dissertations and so on but that dissertation is the finest outcome of that research. Further there are a lot of research data and materials that have not proceeded. Thus Facilitator B’s interest is to create the long tail so that the commercialization would come at some point. (FB, 2013).

One central goal that Facilitator D has relates to supplementary funding as it is the goal that is achieved fastest. This means that when programs have new business opportunities it is possible to apply funding from Tekes. The amount of supplementary funding that university gets from Tekes is also one metric that the Ministry of Education and Culture measures although this is the phase before companies are possibly established. In FD’s opinion one central metric is how they create transfer contracts. These contracts relate to situations where research outcome materials that were created within the university are transferred via licensing or sales ledger. This is a central metric measuring how much new business university is creating. Although patents and the amount of them are monitored in FD’s opinion invention or idea activity is more important as patent is more a tool that supports business creation. According to FD they have annually 60-70 invention disclosures and from those disclosures 10-15 patent applications are created by university, researchers or companies. When researcher has an idea it is evaluated quickly if similar solutions already exist as it removes the need to make an invention disclosure but nonetheless there is still that business opportunity. In business opportunity setting Facilitator D has annually about a hundred patent and idea or invention disclosure and idea level things that are identified by researchers which are further examined (FD, 2013). According to Foundation for Finnish Inventions statistically from the region two-folded number of innovations is created when comparing to the Helsinki metropolitan area (FC, 2013).
Besides research goals for Research organization A it is very important that PhD students who work as researchers qualify and that the know-how increases both internally and within companies. This is important because it is not possible to know what kind of research and company projects will come next year or become current so that it is important to extend and deepen the network. Although spin-offs are created based on passion to do certain things in a certain way Research organization A creates good conditions so that research results are available. This is not actively encouraged as Research organization A does not have immediate hope that their best know-how leaves all the time. This means that although spin-offs are not actively encouraged they are not held back either. According to RA-1 nature of universities is that personnel changes. For example when PhD and master’s degree students graduate it is a natural phase to make choices and start to seek new career and at that point spin-off can be a very good option to continue the dissertation work. (RA-1, 2012).

Similarly RA-2 notes that direct results like publications are important to them as well as thesis but especially dissertations. Further Research organization A tries all the time to increase their competence as a whole. According to RA-2 research group like theirs differs from research groups that operate within industry in a way that PhD students come and leave after graduation so that they are the moving part of the group that does not necessarily stay as a permanent competence. (RA-2, 2012).

The operational model of academic networks is partly from its content but there are also activities that benefit the academic community so that the activities are done to enliven the academic activities within certain area. Via these activities actors’ role within that network is also clearer. This means that actors keep up things so that the network would stay together more easily. Within program setting programs need to be that kind of programs that they create reasonable results so that if they do not support actors’ own activities in a certain way they are not willingly started. Further some things need to be done without programs just because from there reasonable results can be made. These things are not worth to shifting into programs as there is no program funding for them so that they need to be carried on as basic activities to get research results. (RC, 2012).

Research organization D has bidirectional goals. Common to all is the effectiveness which is at the end of the line. This can be measured via different metrics. Research effectiveness is measured via research metrics and effectiveness of innovation activities by metrics of its own. Within innovation activities company interface is important so that it can start from rough metrics...
like the amount of Research organization D’s collaboration companies that they have active collaboration with and how many of them are growth companies. Via this kind of metrics Research organization D’s work is measured within the Oulu Innovation Alliance framework and thus they develop their activities so that via those metrics as good results as possible could be made. From network activities point of view Research organization D has their own competences and they need to identify competences that relate to their strategy within this collaboration network and try to build program entities that in a certain way strengthen them or build on those competences. Further their goal is to achieve results in areas of research and innovation activities effectiveness via these competences within their metrics. From ecosystem point of view Research organization D’s aim is to grow the ecosystems business. Further within their activities research funding and new business creation go hand in hand (RD-2, 2012). Also RD-1 notes that besides RDI activities Research organization D’s aim is to advance innovation activities. This means for example networking so that they try to find collaboration partners that would be beneficial to them so that there would be channels that can be used for example to find supplementary know-how or channels that can be used while bringing their new innovations into market. (RD-1, 2012).

Similarly RD-3’s note that other aims that Research organization D has relate to commercialization. When they get ideas they discuss about them and to some extend even document them about how this thing should be commercialized. These things are told quite openly as it is not in the university’s interest to hide them although it might be that single researcher might want to withhold them. In RD-3 understanding there is no systematic way to do this although Research organization D supports this kind of activities by encouraging to apply funding for example from Tekes or by noting that an actor should talk with a certain company as that actor might be interested. Further RD-3 believes that it is relatively active nowadays that researchers try to think the business aspect and try to use those ideas and start business. Quite many researchers have their own companies although in RD-3’s understanding those companies are currently more passive. (RD-3, 2012).

According to CA one of their regional offices in Finland was started to build very much based on ecosystem thinking. All of the Company A’s partners within that ecosystem do not participate in Facilitator A’s biggest program. One of the Company A’s business cases within Facilitator A’s biggest programs is about building this ecosystem and operations in its geographical region. Time span of this aim is much longer than what Facilitator A’s biggest program covers. Within
ecosystem thinking setting Company A’s aim is to create a way of working that increases the common good and bigger ecosystem. This is because they see that in order to bring as good value as possible to Company A that ecosystem has to give as good and big value as possible also to their partners within that ecosystem and also to that part of the ecosystem that is not necessarily in collaboration with Company A although that part is also involved in growing that ecosystem. This includes regional capabilities to carry on product development programs and to bring actors and expert into those activities. (CA, 2012).

Besides goals that are set by network and funding mechanisms Company F have aims that clearly relate to renewal so that they could create cloud services. They have seen this collaboration as one opportunity to examine cloud service area and to ponder from which direction their service could be found. As that collaboration includes researchers that have thought about how business within cloud differs from traditional business models Company F is able to utilize that know-how and those people. According to CF if those people use small amount of time to examine Company F’s problematics it is possible that something will come up which they could not find or when they find them time has already passed them. (CF, 2012).

### 8.5.2 Resources

Resources part of the data analysis focuses on the networks common asset pool. This part includes discussions about the importance of interaction in asset mapping within the network and what assets actors can and are willing to share and what assets actors are not willing to share within the network. Discussions are limited to factors that potentially support or limit utilization of networks common asset pool. This is important as company’s external network is a vital source for value creation and capture and because interaction has a key role in value creation from both intellectual and physical assets. Further as Valuable assets part of the a priori analysis framework consists of both resources and knowledge also the Resources part of the framework consists of resources and knowledge and further from capabilities.

According to FA-1 in a certain way they are after companies assets. For example via one of their program and TIVIT’s strategy process they identified that Finnish universities have an extreme amount of different kinds of algorithms and algorithm know-how that has created an extreme amount of scientific papers but they have not been turned into business. Instead most of them are spoiling in a
shelf. Because of this they wanted to make a program where the aim is precisely
to transfer this asset pool from universities to companies and thus this program
was clearly after identified assets. Typically when program is started the situation
is not like this. For example Facilitator A is not after a single company’s assets.
Instead if they see bigger things that will change the business and that support
their strategy then they decide if they invest into it or not. After this it is decided
who attends that program and with whom. Example of this kind of bigger things
is for example Internet of things. When program is started certain technologies or
business models are not attached to it as Facilitator A’s hope is that when best
actors come to the program they have sufficient view about winning technologies
and business models. (FA-1, 2013).

From Facilitator A’s perspective there is no certain assets within the network
that could or could not be utilized except the relationships within the network to
different actors. When programs are started companies and universities bring
openly what they have and what they have done and what kind of asset pool and
know-how they have. This is because actors see what kind of asset pool and
know-how could potentially be formed when their own asset pool and know-how
is combined with certain actors’. This takes place mostly when all actors dish out
their assets and know-how. Further TIVIT does not force actors to come and bring
assets and know-how as they are a neutral actor. Instead they define the big
picture and make big choices. As things are not advanced from technology point
of view it eases Facilitator A’s role and functionality of their mechanism as they
do not need to manage the technology deeply as they can not do that. According
to FA-1 if they would need to justify all the technology choices they would not be
able to finish any of their programs. During this time those technologies would
become old. (FA-1, 2013).

Also FA-2 note that asset mapping is done via companies. For example
within Facilitator A’s ecosystem programs Facilitator A does not intervene the
content in almost any way. They evaluate those programs only in a theme level to
see what kind of things those programs aim at. After that Facilitator A’s board of
directors checks if they fit with their strategy’s themes. This means that Facilitator
A does not go deeper to a company to see what they have and what they do not
have and what they do and what they do not do. Facilitator A’s role is that when
certain result material is agreed which is created jointly all actors create
something to that material. Programs management group monitors material that is
created. Further consortium contract is made which lists clearly what results are
created and it is monitored that those results will be created. (FA-2, 2013).
Assets that companies are willing to bring to program vary a lot. Typically companies bring a certain tool, platform or development environment that the company opens to other partners. If asset is a platform on top of that platform new business can be built. Further that platform is offered to partners within that program or it is a combining environment where partners can bring their own elements. In this case the aim is to build a bigger entity around it. If it is a tool certain things can be done by that tool. In these cases companies bring assets that they typically have. Another case is that company brings information about markets, how certain business works or similar information, experiences and knowledge that can be shared. In both cases companies are willing to share assets that grow the ecosystem or best practices that cannot be copied as such. (FA-2, 2013).

According to RB-1 within big programs they have there is a repository where all actors put their results. Without common program or ecosystem which aim is to store knowledge about assets or things that actors have created together to common asset repository those assets would just be in people’s heads. Further RB-1 note that asset and knowledge sharing is challenging within big programs. It is even more challenging with situations like TIVIT where there are six completely separate programs so that the challenge level increases. According to RB-1 TIVIT is currently thinking about testing laboratory which could include programs’ common asset repository. Although RB-1 was not sure if the technical form of that asset repository was already decided that repository could include for example open source components or other components that actors can utilize or for example list or catalogue of central publications. Not all the conferences papers but certain central key things including white papers and descriptions of methods or tools. These are the concrete assets that were defined within the program. According to RB-1 in a certain way they have categorized what they mean by assets. These categorizations include for example IPR’s, patents, method assets, tools and program code, components and –modules. This categorization is utilized when an actor needs those assets. Further RB-1 note that in many bigger programs and networks, asset repository is a complex question how it is handled. It is better than nothing to have an asset list and link to company or person or contact information to know what certain people have done or know about or what a certain company has done. (RB-1, 2012).

At the moment Facilitator B does not have significant asset mapping with their network partners within their direct activities. According to FB this have been talked in many situations so that in a way they have had informal activities
toward common asset mapping as they have certain theme areas and they have been in a certain way in an activator role while inviting companies and research organizations to gather together to discuss. The aim of these discussions is to create better seedbed so that mini ecosystems would be created. However, Facilitator B is not directly nor actively forming those groups via their funding activities by themselves or in collaboration with other funding bodies. According to FB this is the line for them as they are not the guiding actor or actor that starts the actual funding process. Private money could do this but as Facilitator B has strong neutral position they cannot do this. Although Facilitator A has joint- and collateral programs with several actors as well as single funding applicants they never modify their content or guide those actors. (FB, 2013).

According to FB reason and need for Facilitator B’s existence from funding perspective is that their funding is targeted to a point where programs risks are that high and credibility is not that high that private funding would dare invest into it because it seems very uncertain even if there would be available private funding and possibility to get it. In this setting Facilitator B’s central point within their role is to be at the point where actor can show that they have advanced enough and proved themselves and that they get other funding. Further Facilitator B’s role is that they accompany universities strongly and for example a lot of networking occurs via joint programs. In this setting Facilitator B enables that universities activities go deeper and that they can advance things when Facilitator B also funds them. Thus Facilitator B’s funding occurs during earlier phase than private funding so that they are creating billets that can create successful business later. (FB, 2013).

In FD’s opinion assets in their region are not as good as for example in the Helsinki metropolitan area especially when they relate to business development as in the region there are few actors that can truly bring additional value. If assets relate to asset protection in the region there is asset that relate to that. When assets relate to business development Facilitator D works directly with actors from Helsinki metropolitan area or from abroad. When Facilitator D works with business accelerators that develop business before the company is established those accelerators have their own networks and in that way Facilitator D’s network expands at least vicariously also in the global context. Further FD note that they do quite a little collaboration with the local business development actors. (FD, 2013).

In general level richness and broadness of asset pools that companies within their network possess is important to Research organization A as the wider their
research questions are the more important those asset pools are. If the research target or problem is very specific then the diffused know-how is not necessarily always beneficial. Within a bigger projects they are beneficial for Research organization A and nowadays projects are usually bigger. They map these assets for example via workshops and idea creation. According to RA-1 in principle within all bigger projects, also in Facilitator A’s biggest project, there are four times a year workshops for all participants where actors present results of all the project parts. These workshops act as an information sharing places although RA-1 emphasize that personal discussions and workshops within the work packages are the places where new things and results are searched for. There are very often competing companies within Research organization A’s projects although they also develop some things together so that both companies can utilize them. In RA-1 opinion university’s role in a certain way is to act as networking and coordinating actor because it does not have any value reservations to certain directions or barriers to work with certain actors. As university is a neutral actor that does not compete with company actors it is natural that then the university acts as networks hub point. Research organization A gets different kinds of equipments from companies if they need them but according to RA-1 they rarely need those as within their research domain there is quite a few testing equipments that relate to software and service development. (RA-1, 2012).

According to RA-2 their research could be compared to business research in a way that it is enough that there is a certain kind of companies to research how they operate in an economic life. In this setting research is not searching for certain assets or research is not about developing certain assets. Instead there is a company case that is researched. Research organization A’s typical company case is about software service production that they research as a phenomenon. Further they develop methods and practices that relate that phenomenon as well as existing practices. According to RA-2 within this kind of research, assets are not created in the same way as for example within algorithm or machine vision research where concrete things are created that can be commercialized. (RA-2, 2012).

Similarly RA-3 note that Research organization A is not after assets but after research problems and research collaboration. According to RA-3 if Research organization A knows that there is a certain research problem in a certain industrial sector there is also know-how. It is jointly written in the project plan what actors are going to do, what the problem is and how actors aim to solve it. Based on this plan actors try to solve that problem. Further Research organization
A tries to publish as much as possible in collaboration with industrial partners. Besides projects with industrial partners Research organization A has had project for example with 11 research organizations which means that within the project there is also research collaboration network. Further in every project new contacts are created. Projects that Research organization A participates in create empirical data to them so that deliverables they jointly create are reviewed by that project group and thus it can be trusted as the data is reviewed and verified. Based on that data it is easy to write articles although according to RA-3 they have not necessarily been able to utilize all the data because of time limits. (RA-3, 2012).

Research organization A as a research group generates new research topics constantly. This means that when they do research and notice problems that were not solved during that project they can start discussions with their previous partners if they would be interested in them or if they have noticed this kind of problems and if they would be interested to start common projects. According to RA-3 this happens typically in Finland and with Finnish companies as they need to have Finnish consortium. At the same time Research organization A asks companies about other acute problems. On the national level they try to search for research problems that could interest other actors. After this they start to look for European partners. Within industrial setting Research organization A mainly collaborates with European actors. (RA-3, 2012).

According to RC many times the operational model when mapping important assets from the network is that there is collaboration with companies. For example discussions of single individuals or organized meetings to see what ideas actors have and if there are ideas that Research organization C could catch. Based on this it is pondered within the research group if solutions to those ideas exist and if research group has information that could be utilized or if certain network could have assets that could be combined with this idea. The role of the research group arises from its links to different directions so that it is not a network of single individuals but it is active utilization of researcher’s own research group to forward certain things and to locate know-how that could be utilized for certain purposes. Although RC does this kind of mapping he does not have systematic model for it. Further RC note that a big organization can maintain finite product portfolio and they can share accessory knowledge. If smaller organizations have not found their core business they are not probably willing to share all their ideas. (RC, 2013).

RD-2 note that smaller companies have tried to form more visible clusters, like 3D Internet Alliance. Research organization D participates in board of
directors’ activities of that cluster and their aim is to increase the awareness of that cluster. They have for example common marketing activities with companies of that cluster. The aim of this cluster is that actors could combine their own know-how so that bigger value potential and richness of know-how would be achieved. As there is competing companies within this cluster this is challenging as for example recently established companies need to find right collaboration models that support them. There are certain things within this cluster that are commonly beneficial like software platform that is jointly developed and assets that relate to that platform are central. Similarly within this framework there are things that could be developed like documentations about how that open platform could be utilized so that its productization would be easier and more efficient in the future. (RD-2, 2012).

According to RD-1 Research organization A identifies assets from other organizations within the network. One aspect of this is the competition aspect which means that all the actors do not necessarily want to have tight collaboration with all the other actors or they feel that some of these actors are their competitors. In an upper level Research organization D brings these opportunities visible all the time but companies decide with whom they want to start deeper collaboration. In RD-1’s opinion this is not as big problem with research organizations because collaboration can be found when a certain actor has done something that Research organization D can utilize or vice versa. RD-1 note that as one specific feature of 3D Internet and Internet is scalability in both positive and negative sense it means that things are easy to copy from the Internet. Vice versa this also means that the market opportunity is huge if that thing is good so that to a certain extend companies try to protect their core ideas before they start wide collaboration based on them. Collaboration needs to be found from the interfaces of companies’ core operations so that the core business is not done in a better way by some other actors. From Nokia’s Innovation Mill process Research organization D got the idea to develop their own innovation process so that they developed their Turning Ideas into Business that was taken into use in Business Kitchen. (RD-1, 2012).

RD-3 note that with certain actors they know very well what their asset, know-how and competences are. As new actors and development happen all the time they need to update their knowledge about what other actors are doing. This activity is emphasized during project and program preparations. RD-3 was not able to answer what kind of assets that were identified during the program preparations are possible to truly utilize and what assets are not although actors might have certain core things that they are not willing to give up. Further RD-3
note that funding bodies requirements for software is that open source software is made and all actors gain access right to research results. (RD-2, 2012).

According to CA partner and asset mapping comes via meetings and discussions they have along the way. In this way the picture is formed about what is done within which companies and what are the areas where it is reasonable and worthwhile to discuss more and be in contact. For example Facilitator A’s biggest program created one year ago business case concept where it is possible to see very clearly what is the focus of single companies and what they think about things. Along the way companies have presented these cases to each other several times. This is one source for actors to learn to see what certain actors do and with what thought so that if thoughts are the same it is easy to see that it might be worthwhile to discuss more about those thoughts. (CA, 2012).

In CA’s opinion within ways of working setting there is very few limits about things that could not be discussed very openly about what they have done. This is because nowadays tools that are used in software development are quite the same all around and thus in competition sense there is not big differing factors so that it is more about with what thought actors use them and what they do. For example transformation that Company A is focusing in Facilitator A’s biggest program is quite far about way of thinking in their specific environment with people and know-how they can use rather than something concrete that is possible to copy. Further within more technical research there are easily boundaries where open collaboration or information sharing is not possible. (CA, 2012).

Company B has a strict line that if they open their processes NDA’s are instantly used. This means that their competitor gets information for a specific research purpose but it cannot utilize them for other purposes. This is even stricter if shared information relates to products or services. Company B has a principle that they do not show their processes although CB note that it is just a principle and he does not think that it would be a big thing as he believes that open collaboration would be more fruitful although that open collaboration is not always possible. Further CB note that they are not even near the strictest company in this as for example the smaller the company is the more closed it is if it is not a consulting company as their competitiveness can be in a few sentences. (CB, 2012).

Within Company C’s business area there is an interesting feature that actors are very open with each other. This means that if an actor finds security threat it will tell about it to other actors so that the habit is not that the threat or vulnerability is hide from other actors. Instead if for example virus is found it will
be immediately told to other actors so that this kind of active collaboration exists. When actors start mutual collaboration trust needs to be built. For example Company C has joint programs where the starting point is that information is shared. According to CC Company C has taken the view that many times they start to share information and expect that when they share they will also receive so that there would not be situations that nobody shares anything. They try this approach actively especially when they are in the driver’s role so that when they start to share information other actors start to do the same. (CC, 2012).

There is always business critical information that they do not share outside of company. This information is typically business secrets and can relate to almost any business area including technology and sales. Further it needs to be evaluated case by case how critical certain thing is as CC emphasize that many times companies see the value of keeping something secret too high. In CC’s opinion it always needs to be questioned why certain information or thing could not be shared instead that all is per se secret to other actors as it is much better starting point to question why certain information or assets could not be shared (CC, 2012). Similarly also CD emphasize that if an actor has beneficial assets while sharing those assets things are created which can be utilized in the next phase. This means that when an actor shares information in the next phase the actor can receive information. (CD, 2012).

According to CG their activities within Facilitator A’s biggest program relate to that kind of thing, which is the same as Company A’s, that it is easy to share especially in that kind of community where actors do not have direct competitors. Further they are that kind of things that are possible to share even if direct competitors would exist in the same community as it is more about collaboration than direct sharing of actors’ own know-how with some other company. (CF, 2013).

As Company E is a small company their resources within Facilitator A’s biggest program are limited. According to CE within business development their investment is visible via universities in a form of public publications. In this setting some business development foundings are generic and thus can be published as some things need to be internal. Thus it might be that from bigger companies’ perspective Company E’s investment into the program is very small or even negligible but from universities’ perspective Company E might be a good case for an article. Company E’s investment into this program is around one person-year. (CE, 2012).
8.6 Summary

In this chapter the analysis about interaction within the network, valuable assets, asset-based value proposition, business value and network were carried out.

The focus of Chapter 8.1 was on interaction processes including interaction episodes and relationships to identify the bigger framework where interaction occurs, main interaction episodes and actors’ different roles within the network. Also networks’ internal activities and episodes that support interaction were identified as well as collaboration tools that support the interaction. In relationship part dependencies and interdependencies between actors’ activities that potentially have an effect on asset and value creation were identified as well as actors’ potentially common and conflicting interests. Last, differences within interaction and interaction intensity were discussed.

The focus of Chapter 8.2 was on valuable assets. On interaction in asset and value creation and then on interaction that relates to situations where assets were combined from several actors. Also the interaction that related to increasing the value of single intellectual assets as well as value potential of intellectual assets was discussed.

The focus of Chapter 8.3 was on analyzing overlapping value co-creation, value co-capture and value co-opetition activities from single actors, networks and funding requirements perspective.

The focus of Chapter 8.4 was on analysis of how actors turn value potential into business value and how assets and value potential are refined into products and services. This was analyzed from single actors, networks and funding requirements perspectives.

Last, in Chapter 8.5 the focus was on actors and resources including network formation, building and maintenance. Also aims and benefits that actors seek from network were discussed when they potentially conflicted with other actors’ aims or differed from networks of funding bodies aims. Last the recourses that actors seek from the network were discussed.

In the next chapter the revised framework of the interaction in asset-based value creation within innovation networks is presented. After that the key theoretical, managerial and empirical implications will be discussed. Last, the software industry implications will be presented.
9 Discussion

In this chapter the discussion that is based on the empirical data analysis in previous chapter will be presented. First the a posteriori framework of the interaction in asset-based value creation within innovation networks will be presented. This a framework sums the changes that were made to the a priori analysis framework based on the empirical data analysis of this research. The a priori analysis framework was built based on the earlier research and was presented in Chapter 6. Changes to the a priori analysis framework provide basis for the theoretical, managerial and empirical implications of this research. Therefore, after the revised framework of interaction in asset-based value creation within innovation networks is presented the implications of this research will be discussed. Managerial implications are divided into implications for software professionals and into implications for policy makers and facilitators and offer the key practical findings of this research. Finally, the software industry implications will also be presented.

9.1 Changes to the interaction in the asset-based value creation within innovation networks framework

The revised framework is based on the empirical data analysis presented in the previous chapter. This revised framework of the interaction in asset-based value creation within innovation networks is presented in Figure 10. It is structured partly in line with the interaction model by Håkansson (1982). In this research the environment part of the a posteriori analysis framework was identified as funding mechanisms as based on the data analysis actors from outside of the software industry have a direct effect on both asset development and deployment based on their funding requirements and aims. In the a posteriori framework atmosphere is located inside of this wider environment of funding mechanisms. Based on the data analysis important factors of this atmosphere were identified as trust, openness and mutual benefits. Data analysis shows that most of the interaction episodes and relationships occur within the context of this atmosphere. Further, data analysis shows that within this atmosphere the interaction framework is an important motivator and entity that enables direct benefits to participating actors from their interaction and collaboration.

Based on the data analysis it was identified that the wider environment of funding mechanisms has direct effect to all the elements within the network part
of the a priori analysis framework and thus the a posteriori framework is structured in a different way to consist of funding mechanisms as an environment and atmosphere within that environment. This structure is similar to the interaction model by Håkansson (1982). The structure of Håkansson’s model is applied because it is the first model of IMP tradition, one of the two core models of it and because the Model of Business Interaction by Ford et al. (2010) is based on the empirical work within IMP Group. Ford et al.’s (2010) model is important for this research because it emphasizes that the interaction has a key role in the assets based value creation from both intellectual and physical assets. Further, based on the data analysis within this atmosphere there is an interaction framework. Interaction episodes within the environment, atmosphere and interaction framework are partly overlapping although some episodes relate to just environment, atmosphere or interaction framework.

Next, the theoretical implications that relate to interaction environment and atmosphere will be firstly presented. Second, managerial implications to both software professionals and policy makers and facilitators will be presented. Third, empirical implications that relate to interaction including interaction episodes and relationships, assets and actors will be presented. Finally, software industry related implications will be presented.
Fig. 10. Revised framework for interaction in asset-based value creation within innovation networks.
9.2 Theoretical implications

The main purpose of this research was to investigate how interaction affects asset-based value creation within innovation networks and more specifically within the software industry setting. This purpose was presented and clarified in the a priori analysis framework that was built in Chapter 6 based on the earlier literature. As the research data was gathered from actors that operate within the software industry or have clearly identifiable roles and aims in asset-based value creation within software industry, it can be argued that the theoretical findings are software industry specific although it is potentially possible that some of the theoretical implications, like the funding mechanism and opportunities, could be found also from other industrial settings.

The main theoretical implications of this research relate to funding mechanisms as an interaction environment and to factors of the interaction atmosphere. Some of these implications are further discussed in more detail and from different angles as part of the managerial and empirical implications.

9.2.1 Interaction environment

Based on the earlier literature it was identified that interaction cannot be examined without the wider context where the interaction takes place (Håkansson 1982, Axelsson 2010). It has been argued in the earlier literature that this wider context includes aspects of market structure, dynamism, internationalization (Håkansson 1982, Axelsson 2010), position in the manufacturing channel and the social system (Håkansson 1982). However, based on the data analysis of this research it was identified that within the software industry domain and interaction in asset-based value creation in innovation networks setting these aspects were not identified.

Instead, it was identified that there are mechanisms and actors that have a direct effect on interaction in asset-based value creation within innovation networks. These include funding mechanisms that may require that actors do collaboration with certain kind of actors and interact in a certain way and within certain interaction episodes. For example, some facilitators require collaboration and interaction as otherwise funding is not given. Further, it was identified that all the facilitators that give funding, or support while applying funding, for non-basic research require that a certain type of actor presents business case, business
creation path or commercializable applications. Finally, commonly the funding body decides what asset that were created within the program actors need to share, with whom and when and who owns rights to those assets and how they can be utilized by other actors.

Funding requirements and opportunities within the funding mechanisms environment and outside of the atmosphere within it have a direct effect on the interaction episodes within the interaction atmosphere and framework. Further, the funding mechanisms commonly require that assets that were created by public funding need to be shared publicly and set requirements how they need to be shared. Moreover, common to all funding bodies is that funding is expected to lead to business activities. Thus interaction episodes within the funding mechanisms environment and outside of the interaction atmosphere were identified as funding requirements and opportunities, sharing of assets publicly and business creation activities. These episodes will be discussed further as part of the empirical implications.

9.2.2 Interaction atmosphere

In Håkansson’s (1982) interaction model environment includes the overall atmosphere of the relationship that is divided into economic and control dimensions. Based on the earlier literature this overall atmosphere of relationships can be affected by conscious planning (Håkansson 1982). Atmosphere is characterized by power and dependency of actors within relationship, actors’ mutual expectations (Håkansson 1982, Axelsson 2010), conflict or cooperation within it and relationships’ overall closeness or distance.

Trust, openness and mutual benefits were identified as important factors of atmosphere within programs, projects and other entities like communities of practice, when assets and experiences are shared. Further, important interaction episodes within the atmosphere were identified. These episodes will be discussed as part of the empirical implications.

Within the interaction atmosphere interaction framework has an important role as a motivator and as entity that enables direct benefits to the participating actors from their interaction and collaboration. This interaction framework and episodes within it will be presented in connection with the empirical implications.
9.3 Managerial implications

In this section managerial implications of this research are summarized. These are divided into implications to software professionals and implications to policy makers and facilitators.

9.3.1 Implications to software professionals

The results of this research show that getting funding for non-basic research requires a plan about how the results could be commercialized or what kind of commercial applications research results can form a basis for from either a company or a research organization side. This means that the asset-based value proposition needs to be presented either by a company or by a research organization.

A company presents a business case

In some programs companies bring their own business cases into the program. This includes the technical and business challenges of the case that company tries to solve during the program so that these two are not disconnected. In these programs business cases are collected and combined by a smaller steering group that consists of key actors. The case collection is done annually and as a result main tasks and deliverables are created. Although these programs are company-driven and companies bring their business cases, research organizations help them with their business cases.

This is a potential problem as it was noted by the main facilitator that from these programs scientific results that certain universities reward are not created. Within these programs companies need to collaborate with universities to get funding and it was noted by facilitators, research organizations and companies that these programs are good for companies but the intake from universities is considered to be smaller than typically thought and too academic. Further, it was noted by companies and the main facilitators that academic papers do not have value to them. Thus based on the data analysis it remained unclear how universities actually benefit from these programs if rigorous scientific results are not created.

One possible answer to the universities’ role within these programs is that when the research starts, their role is to do the state of the art investigations before
companies start their research activities, as it was noted by the main facilitator that this is typically done by the universities and by some companies that they are willing to use universities to investigate the state of the art and conduct interviews. Previous could be a potential threat in programs, where the research agenda and assets that will be created are defined by companies and the main facilitator. Moreover, this could be a threat in programs, where the main facilitator does not monitor which actors contribute to which results and deliverables and if companies need to collaborate with universities and/or research organizations to get funding. Based on this, actors have clearly different roles within the programs and their contributions are also different.

A research organization presents the commercialization path

It was identified that another option to get funding is that the research organization presents how their results can be commercialized or what kind of commercial applications results could form a basis for. This is a new thing for researchers, as traditionally this has not been required. However, research organizations and researchers as individuals lack business skills, although several facilitators help them to apply funding and some facilitators and even research organizations help research organizations to develop business skills and interest by offering them training and networking possibilities. Collaboration between researchers and/or technical people and business people can also relate to commercialization of research-based assets created by research organizations.

Episodes, where facilitators spar research organizations to get funding are common, as well as episodes where facilitators and research organization help technical people and/or researchers to meet with business people. It is important to companies, facilitators and research organizations to participate program preparations to be able to decide about assets that will be created and to be able to influence which actors contribute to which results and deliverables, so that all participating actors would benefit from the collaboration and that the assets would create new business, companies and/or additional value to either participating or external actors.

University actors have, however differing views about encouraging their employees to start business and/or companies. Some research organizations support this and encourage their employees to this, while some research actors noted that it is not their interest that their best people leave, business creation is not their role, moreover they do not have business skills and/or if they intervene
to business then everything goes off. This was emphasized by research organizations also regarding their neutral role within the network, as they do not want to compete with companies. Although some funding bodies and funding mechanisms force research organizations to think about the business aspect of their research results, not all research organizations are not willing to take any business related role.

As it was identified that getting funding for non-basic research almost invariably requires business thinking either from a company or a research organization, two potential scenarios can be presented. The first is that, research organizations shift to programs and funding sources where companies present the business aspect. The second is that, research organization presents the business aspects but will not take any non-mandatory activities to achieve business related aims because funding mechanisms do not reward research organizations from this.

### 9.3.2 Implications for policy makers and facilitators

Interaction requires a framework that supports actors to interaction and collaboration in a way that all participants can benefit. This framework needs to be formed by a neutral actor that does not compete with companies. The actor can be either a facilitator or a research organization, depending on the purpose of the program or network. In programs interaction and collaboration need to be managed and coordinated, but the actual network activities can be more informal. Company-driven programs commonly form around a driving company and/or agenda, although also networks require a central hub actor that has a wide perception about the network.

Facilitators have an important role while organizing episodes, where technical people and/or researchers work together with business people, as funding mechanisms require that business aspects of non-basic research are presented in the funding application. These activities were identified new to some facilitators. Some research organizations organize similar episodes, although in some cases these episodes are part of program preparations. Other activities that some facilitators identified as important episodes where that they spar and prepare research organizations and/or companies to apply funding.

However, although both of these aim for the creation of research-based businesses, it was commonly identified that facilitators do not monitor how and to which extend businesses are actually created, and facilitators do not either have proper ways to monitor this and/or companies do not need to report about this.
Based on the data analysis it is not clear if research organizations need to report afterwards how businesses were created based a particular research results or what activities they had in business creation that relate to funding application.

Based on these findings, facilitators should take a deeper role in program preparations to monitor which actors contribute to which results to guide research organizations to see how business aspects are taken care of. Further, facilitators should monitor business and company creation by both companies and research organizations by forcing them to report about related activities during and after the program. Finally, facilitators should include reporting and success of research based business and company creation activities into their funding criteria to force companies and research organizations to truly aim to research based business creation activities, even if it turns out that they were not created or that some business opportunity was not as reasonable as it was initially thought. It is also important to know if business is not possible, because then resources can be shifted to other activities.

The current situation in funding is that prior research based business creation is not rewarded, when research organizations and companies apply for funding and it is unclear if universities reward mechanisms support and/or force business creation, as it was identified that for researchers this is much based on their personal willingness and passion. Further, policy makers and/or facilitators should ensure that a proper interaction framework within the program and/or network exists and that interaction and collaboration would be a funding requirement, so that interaction between actors would be regular, on-going, occur within a certain rhythm and be beneficial to all participants including constant experience and result sharing. In this way actors would get regular feedback and could direct their activities better. Special episodes, where technical people and/or researchers meet business people should be supported, encouraged and organized in a way that business creation related activities would be monitored, and first of all rewarded by funding bodies, for both companies and especially for research organizations regardless of their neutral role within the network.

9.4 Empirical implications

In the a priori analysis framework it was identified that interactions are the building blocks of networks and their role cannot be ignored, when their networks are examined. Further, it was identified that networks consist of actors, resources and activities and their interplay. It was also identified that there are elements that
affect and are affected by the interaction. These elements are interaction processes, including episodes and relationships, participants, and the interaction environment and atmosphere.

Based on the data analysis of this research the environment was identified as funding mechanisms that target funding into programs and projects and consisting of requirements for collaboration and actors who get funding. Further factors that relate to the atmosphere within programs and projects were identified.

Discussion about empirical findings are divided into interaction, asset and actor related findings as the environment and the atmosphere guide activities, where the actors create and utilize resources.

9.4.1 Interaction related findings

Interaction related findings deal with the importance of the interaction framework, most common interaction episodes and the prior social relationships. The importance of some of these finding were already discussed above.

Interaction framework

Interaction requires a framework that supports actors to interaction and collaboration, when interaction occurs within programs, and/or a framework that supports network creation and networking. Because of this the framework for interaction is located inside the atmosphere where interaction occurs. The framework is formed by neutral actors that are either facilitators or research organizations that coordinate networks and/or programs or are central hubs in them. In all cases it was identified that these actors do not compete with companies. The framework is important, as it motivates people to attend events by being beneficial to them. During these events it is possible for example to meet other actors, combine and identify external resources, create connections and seek for new openings and opportunities via both formal and informal interaction.

Interaction episodes in asset-based value creation

Several interaction episodes within the interaction framework and the interaction atmosphere were identified, although regularity of these episodes varied significantly. Some of the interaction episodes that mainly relate to the interaction atmosphere overlap with either funding mechanisms as a wider environment or
with both funding mechanisms and the interaction framework. Further, some of these episodes are potentially more important during the interaction in asset-based value creation.

If the created assets were clearly defined and provided by a single actor or certain actors, interaction within the program was less regular before assets were ready. Most of the actors saw regular interaction very important. Especially quarterly reviews, where actors go over what they have done and where they plan what will be done during the next phase were identified very important. They have fostered interaction a lot and when the results are shared continuously, valuable feedback, asset identification, opportunity seeking and networking become possible.

Types of interaction episodes differ between actors, based on their role regarding how they support networking and business creation, although facilitators and research organizations do not compete with companies within these networks and programs and business creation is clearly the responsibility of companies. In most of the cases programs were company-driven and included industrial research and/or aimed for commercial applications and business creation. Six main types of interaction episodes were identified which relate to asset-based value creation. Besides them also the research agenda creation and funding calls were identified important interaction episodes.

Within the interaction framework interaction episodes relate to program preparation, creation of predefined assets within the program and sharing and communication of assets within the program.

**Program preparations** are important, because in most cases assets are defined during the program preparation phase. In some company-driven programs only the main facilitator and companies participate in this.

Second, the *creation of predefined assets within the program*. As the results and deliverables are mostly defined beforehand during the program preparation, interaction episodes and methods vary a lot and both face to face interaction and interaction via collaboration tools were identified useful. On the one hand in some EU programs where actors work on their own things, interaction between the participants can be limited. On the other hand, it was identified that a two week rhythm in asset creation within program, project or work package levels were common. The rhythm of result and/or experience sharing and communication at the program and network levels was, however, from three months to one year.

Third, the *sharing and communication of assets within the program*. Some of these episodes were identified as within the program events, as based on
contracts or consortium contracts, results have to be shared first within the program. There are also sharing of assets publicly episodes that occur outside of the interaction atmosphere and framework, but within the funding mechanism environment. Communicating results and/or experiences in public occurred most commonly via seminars. It was also identified that besides the created results also experiences and best practices were shared, for example via communities of practice or events that were organized by facilitators. It is important that these episodes are regular and mutually beneficial as actors need to learn from each other and trust needs to be created. If prior collaboration has not existed actors need time to learn that sharing of things is not harmful. This was identified important for companies when they start collaboration with other companies or first time with universities.

Interaction episodes that occur within the atmosphere, but outside of the framework for interaction will be presented next. Initially these interaction episodes relate to agenda formation and funding calls that will be discussed shortly during the prior relationships. These episodes are affected by the funding requirements and opportunities that occur within the wider environment of funding mechanisms.

Facilitating funding application episodes are important because during these events it is possible to get sparring and coaching about how to apply funding and prepare funding applications. In some cases it is possible to see and listen when other actors get feedback on their research and/or business proposals. These episodes are also important to research organizations, as there are some facilitators that prepare or spar them to apply funding and it was identified that those actors require that research organizations can present how their research results can be a basis for commercial applications or how businesses could be created based on them.

Business definition episodes are important because getting funding for non-basic research requires a plan about how the research results can be commercialized or what kind of commercial applications the research results can form a basis for from either on a company or a research organization side. This was discussed in more detail during the implications for software professional’s part of the managerial implications.

Business meets technology episodes, where researchers from certain technological domain meet business people. These were organized by both facilitators and research organizations and they were mainly identified as workshops, trainings, part of program preparations or business accelerator
activities. They also relate to episodes, where actors help and/or prepare research organizations to apply funding as it was identified that some funding calls require that business aspect is included. These were identified important for example because technology assets do not necessarily have any value, researchers may not see what is valuable in his research and/or external actors might find the right angle to utilize created assets.

**Identification of the value of assets.** This can occur during interaction with customers, when salesmen go through the application field or living lab activities where resources are combined from several actors to seek for new customer related opportunities. These activities can also be internal, for example when value relates to process deployment. These episodes overlap with interaction environment, atmosphere and framework.

Several companies and research organizations aim to develop their competences within the network. These findings indicate that competence development episodes overlap with the interaction environment, atmosphere and framework parts of the a posteriori framework.

**Prior relationships**

Prior social relationships with other actors were not identified as a requirement for interaction and collaboration but in some cases companies were not willing to have certain collaboration with their competitors or direct competitors, or they wanted to limit the collaboration to safe areas.

Prior relationships ease collaboration for example when there are funding calls, where actors can offer their combined assets that were identified during previous collaboration. From facilitators and research organizations’ point of view these funding calls are interaction intensive and they trigger that interaction as they include a lot of interaction, for example discussions, meetings and seminars. For some research organizations funding calls are also problematic because they are company driven. For example in some programs preparations and agendas are defined by companies. This means that companies that have participated program preparations and agenda formation are in a better position as they can seek for suitable partners and they know what the program is about. This also means that network and programs are in a certain way formed around driving companies and key actors, although it was identified that also a small company can be program’s driving company and that the driving company behind the creation of a completely new ecosystem can be such a company.
Some programs and facilitators require that companies collaborate with universities although it was identified that some facilitators only have enough funding for one university and if they have funded a research project they are not willing to fund its continuum. Facilitators that can only fund one university, but require collaboration between universities and companies, are also difficult funding bodies to companies, because if that university actor turns out to be not so good, it is not possible to change or tender them, although one company actor noted that tendering universities would be important.

Some facilitators do not require to take universities into their programs for example based on universities share of annual ICT degrees in Finland, as funding is based on actor’s activity and know-how in a way that companies see that the know-how is up to date. Within these programs companies select universities and research organizations to programs. It also means that active actors benefit more. It was also identified that for research organizations it is easier to start collaboration with actors that they have had collaboration before, if that collaboration has been good.

### 9.4.2 Asset related findings

Assets related finding deals with valuable assets, limitations in asset sharing and factors of good asset sharing atmosphere. These will be presented next in more detail.

**Valuable assets**

Some research organizations and facilitator found that technical assets do not necessarily have any value, if business is not made out of them. Although some facilitators require that research organizations can identify possible commercial applications or a business development path that their research results can be a basis for it, was identified that it is clearly companies’ responsibility to utilize assets commercially, as only a company or a company that is established for that purpose can do that. Although some facilitators and research organizations support researchers to start companies, some research organizations do not. Reasons for latter included that it is researcher’s personal thing, it is not in the research organization’s interest that their best people leave and researchers and even people that work in companies lack business skills and business related intellectual assets.
Some facilitators and companies noted that scientific results that universities create do not have any value to them. Further, some research organizations and several companies noted that people do not read program deliverables, results and/or reports because they are not considered as assets, they are too academic, they are already old or become old quickly, they are too long and need to be refined, or people do not have time to read them and/or they do not have any value for them, although they might include valuable things. Besides research based assets, for example contacts can be very valuable to both big and small companies. Some bigger companies considered that result from universities tends to be too academic and their contribution is smaller than companies initially thought. For these reasons identification of the value of assets occurs in the interaction environment, atmosphere and framework levels.

**Limitations in asset sharing**

Within programs and projects it was defined by consortium contracts often through the main funding body and/or funding mechanism, how actors have to share the created results within the program and publicly. It was identified that if several actors collaborate via public funding the results are commonly available to external actors although it was also identified that the best way to benefit from program results is to participate in the program. The aim of facilitators and research organizations that coordinate programs or create research results is that the results would be utilized and businesses would be created based on them. It was noted by research organizations and companies that as assets are available to actors it cannot be a problem, if other actors utilize them better. However, this only relates to assets that need to be shared based on contracts and funding requirements, and companies know that business secrets are not made in the programs and if some assets are ready to be exploitable businesswise or they are too near to companies core business, actors will take them out of the program. This was noted by facilitators, research organizations and companies, and means that part of the assets are made within the program and commonly assets are made partly within the company or in other programs or networks. Latter is also an interaction episode in the a posteriori framework that occurs outside of the funding mechanisms environment.

Two reasons for this were identified. First, requirement of some programs is that most of the program activities need to be industrial, and only a smaller portion of activities can be product development. Second, if contracts of joint
research programs force actors to share things, actors will work on such things that they can share. Because of this actual product development will be made on actors’ own costs. Some companies and facilitators thought that the focus should be on things that can be shared, not necessarily on the existing assets and within some programs companies only need to share some of their results. For example, one company identified single assets that are more valuable than other assets similar to core competences and that company was only willing to share assets and develop them externally, if they are not their core competences. Further, several companies and research organizations aimed to develop their competences within the network.

One facilitator noted that as their research programs are industry driven, they are not beneficial to all academic actors in a short-term, as for example their biggest program is not beneficial to professors, because scientific results are not created from this program. Instead this particular program is beneficial because then professors would know that their research has industrial relevance.

Factors of the asset sharing atmosphere

Program results need most often to be shared publicly, although in certain cases contracts might limit this and often results are shared within the program first. In some programs the actors get free, irreversible licence to utilize program results in any way, but in some other programs companies can decide what they are willing to share within the program, although they need to share something. Companies are more willing to share things that do not relate to products or technologies, but to experiences and best practices. Latter was found fruitful and occurred both within the program and within more informal communities of practice. Sharing of experiences and best practices was fruitful, when actors had common interests and similar context where they applied them to.

In asset sharing trust building, openness and mutual benefits were found important. It was commonly noted that programs, projects and networks have to be beneficial to all participating actors. Trust creation takes time and in some cases actors learn to share things incrementally as then they learn and see that it is not harmful for them and that sharing results and experiences is mutually beneficial. Similarly, it takes time for actors to learn to know each other. Thus trust, openness and mutual benefits are important factors of the atmosphere within programs, projects and other entities like communities of practice, where assets and experiences are shared.
9.4.3 Actor-related findings

Actor-related findings focus on their different roles and contributions within collaborative programs. It was identified during the interaction related findings that program preparations are important, because created assets are commonly defined during that phase. Because of this that phase will be discussed in more detail.

The role of facilitators

The role of facilitators was identified somewhat minor. Common to all facilitators was that their role was supportive in business creation. Some research organizations had similar supportive role, but this role was either given to them or based on interests of individuals in business creation. Further, actors that help other actors to get funding are commonly seen as facilitators especially by research organizations.

The role of facilitators in business creation and support was partly minor, as some of them do not have ways to monitor how well their activities have created new business and they do not follow asset creation either. It was also identified that some facilitators and research organizations focus on commercialization of existing assets, mainly technology assets, as it was identified that a lot of technology assets exist but there is not enough skilled people to utilize them in business creation, because business related assets do not exist or people lack those assets and skills in both companies and research organizations.

The role of companies

The role of companies was clearly identified to business creation. It was noted by some research organizations and facilitators that often small companies benefit most from research programs. Two possible reasons for this were identified. First, all actors within research programs regardless of the effort of small companies have access to all research results and commonly they can utilize those results in their business without limitations. Second, via programs’ valuable contacts, networking and even customerships are possible to be initiated.

Things that limit small companies to get into the programs and projects were also identified. First, some facilitators initially wanted small companies into their programs, but without prior experience and direct contacts it is a considerable
step for small companies to enter programs, where big companies participate, as their role and contribution to other companies is not clear. Still small companies are good cases for universities because they offer different kind of research data. Also because small companies are agile, they can test things more easily than big companies. Second, funding mechanism of some facilitators do not favour start-ups and newly established companies, and their personnel may not have experience of the funding mechanism. This was only a partial problem as with some funding bodies it is possible to present a case before putting in any funding application, because the actor can complement it all the time and also the facilitator helps companies to get funding in collaboration with other actors with similar interest during business accelerator related activities.

It was identified common to small companies and their entrepreneurs that they utilized their prior connections and relationships and that this played an important role in their activities. It seems that small companies are more commonly and actively utilizing their prior connections and relationships than bigger companies. This might be because the amount of those contacts and relationships is smaller and small companies are more active in opportunity seeking. Some research organizations identified that companies’ internal and external changes and situation effect their willingness and ability to utilize networks and programs.

The role of research organizations

Although the role of universities was clearly identified as research related, their actual input to programs remained unclear. This is because from the company perspective input from universities was smaller than initially thought and commonly results from universities were not necessarily valuable to companies as such. The aim of all facilitators and programs was that businesses would be created based on research results, although the interest of research organizations in business creation and support was varying. Many facilitators either required that research organizations present how business and commercial applications will be made based on their research results or that companies present their business cases that include research challenges within the program research area. Some facilitators search for business cases that would bring the highest additional value. Some facilitators require that companies collaborate with universities and thus the research organizations’ role in business creation is at least indirect and supportive. These programs were identified good for companies by facilitators,
research organizations and companies as there are more companies willing to come to programs than programs can take and fund. These programs also require universities to find companies with whom they will collaborate, to get in.

**Collaboration and program preparations**

Programs where companies present business cases are company driven and program preparations and agendas are defined by companies and also the intended results are predefined during the program preparation phase by companies. During the data analysis it was identified that program preparations are important for research organizations mainly for two reasons. First, every participating individual needs to have its own research interests to be booked in the project plans as it does not work that some individuals agree what will be done while others conduct research based on those agreements. Second, assets are defined in the preparation phase. Programs commonly require collaboration between companies and universities, although programs were prepared by companies and assets are defined by them, possibly in collaboration with facilitators, and facilitators require that either companies or research organizations present how research results are commercializable.

Companies know that research organizations favour projects where they can define research problems, but from the company perspective the intake from those projects has been quite minor as then the company lacks deployment interest. The best starting point for collaboration is that all participating actors benefit from their own perspective. It cannot be clearly identified how research organizations benefit, if they are not able to participate in program preparations and agenda formation and the created assets are defined by companies, possibly with the facilitator, and if it is claimed by the facilitator that scientific results that some universities reward are not possible to create in programs.

Commonly companies do not limited research organizations when they publish research results, as they know that research organizations are careful about what they publish and leave certain things out of their publications. However, some companies are stricter than others with this.

Project-based research organizations need to constantly create new ideas for the network and test ideas with and of other actors as if this kind of constant cycle in which the purpose is to find new things for new projects does not exist then the funding mechanism would cause at least one year gap between projects. This was also identified as a way how funding mechanism encourages interaction of which
the aim is to create new project ideas, although it was also identified that some facilitators are not keen to give continuum if they have already funded a project which was identified as a problem.

9.5 Software industry implications

Based on the following definition of innovation networks by Möller & Rajala (2007: 904) innovation networks are not primarily business networks but innovation networks are:

"(...) relatively loose science and technology-based research networks involving universities, research institutions, and research organizations of major corporations. These are characterized by professional and social relationships and are not primarily business networks but are guided by the ethos of scientific discovery”.

Innovations have been identified as one of the fields where co-operations enable positive network effect (Lampela 2009) and innovation networks as a natural effect of increasing complexity of innovative products and services (Calia et al. 2007). Companies seek for cooperation that lower the expenses of individual actors and cooperation that has a positive effect on single company's profitability (Hagedoorn & Schakenraad 1994). For example in technology monitoring and development of innovations, complementary resources are needed and important motives behind the formation of strategic alliances (Hagedoorn 1993). Companies’ benefit from R&D activities are done by other companies that operate in close technological proximity (Feldman 1999).

Based on earlier studies academic research does not always result in useful knowledge to all industry sectors. However, some academic departments are expected to be more important to certain industries. Industry R&D, skilled workforce and university research have a positive and statistically significant impact on knowledge generation (Audretsch & Feldman 1996). According to Feldman (1999) activities around innovativeness should cluster into regions where knowledge spillovers are most relevant. Clustering seems to be important especially in industries where industry R&D, university research and skilled workforce are important inputs in innovation creation (Feldman 1999).

Based on this research, in some cases companies are not willing to do certain collaboration with their competitors or direct competitors or they limit the collaboration to safe areas. Data analysis shows that the safe areas may include
asset sharing in best practices and experiences but not in assets that relate to products or technologies. One reason for this is that based on the data analysis funding bodies in publicly funded R&D collaboration within innovation networks, where the aim is to create business, require that all created assets are shared with all the participants regardless of their effort and that commonly created assets need to be shared publicly with some limitations. The data analysis indicates that because of these funding requirements assets are partly created within these innovation networks or programs and partly within the company or in other networks or programs. This also indicates that as companies are not willing to share technology or product related assets with other companies and as within these innovation networks companies are forced to do so to get funding, not many actual software solutions and services are create within these networks.

For example in the biggest program from where the empirical data for this research was gathered, only a small portion of product development can be made because of the requirement to conduct industrial research. Although these research programs are their own entities that administrate their own end-result materials, participating actors can utilize them in their own products and other activities freely. This means that within these programs it is not worthwhile to develop products because if an actor does so, its competitors in the same program can require the assets to be shared, based on the consortium contracts. This means that within these programs that kind of things are done that can be shared even with the fearest competitors. Because of this within these programs companies do not develop their own products.

It was also identified that there are business ecosystem programs where companies develop their business competences instead of the technology competences that are created in research programs. Within these business ecosystem programs openness between actors’ decreases, as actors can decide what they are willing to share, although they need to share something. Within these programs things that actors share do not need to exist already as things that are shared are typically created during the program. This means that even if things that are created within the ecosystem programs, links for example to certain technology assets and actors those activities can be made outside of the program via dyadic collaboration.

Similar to the Audretsch & Feldman (1996) findings about un-usefulness of academic research, this research shows that assets that universities create are not always seen as valuable by companies and facilitators, and actors commonly agree that business is companies’ responsibility.


10 Conclusions

In this chapter research questions that were presented in Chapter 1 will be answered which a respect to theoretical, managerial and empirical findings of this research that were discussed in the previous chapter. To conclude this research, some limitations of the research, methodological thoughts about the research process and methods and finally recommendations for future research will be presented.

10.1 Answers to the research questions

The focus of this sub-section is to answer the research questions that were presented in Chapter 1. These questions are:

1. *How interaction affects the development of intellectual assets in innovation networks?*

2. *How interaction affects the value creation based on intellectual assets in innovation networks?*

10.1.1 How interaction affects the development of the intellectual assets in innovation networks?

Funding mechanisms have direct effects in interaction as they set requirements for collaboration and actors that get funding for non-basic research. This mechanism might require that in order to get funding actors need to collaborate with certain kind of actors, for example that companies need to work together with universities. It can also require actors to interact in a certain way and within certain episodes. The funding mechanism represents a wider environment of interaction than the software industry. Within this environment trust, openness and mutual benefits are important factors of the interaction atmosphere that consists of smaller entities like programs, projects and communities of practice.

In this context interaction in asset-based value creation requires a framework that facilitates interaction and collaboration, while being beneficial to the actors. This framework can be formed by a neutral party that does not compete with companies, like a facilitator or a research organization. If this framework is not formed for a program or a similar smaller entity it can be formed to support network creation and networking. In both cases it is important to motivate people...
to attend episodes by being beneficial to them in several ways. Within programs interaction needs to be managed and coordinated, while in networks activities can be more informal.

Assets that are created in a program are commonly defined during the program preparation phase and thus these episodes are important, although in some company driven programs research organizations do not attend this phase. Because company driven programs form around driver companies and/or agendas, both agenda creation and program preparation phases are important episodes.

Program preparations are important to all actor types as during these episodes assets that will be created are defined and in this phase it is possible to influence which actors contribute to which results and deliverables. Participating program preparation is important because although company driven programs are good for companies, in these programs rigor academic papers that certain universities reward are not created. From companies perspective intake from universities in these programs has been smaller than they initially thought and the created academic papers do not have any value to them or the facilitator. Commonly people do not tend to read created deliverables, results and/or reports for various reasons.

Agenda formation is another important episode because companies that have participated in program preparations and agenda formation are in a better position because they can seek for suitable partners and know the program better.

Funding calls are interaction intensive and trigger that interaction. Prior relationships and collaboration support funding calls because then actors can offer an asset mix that was identified during previous collaboration.

Although assets are commonly defined during the program preparation phase, regular interaction is important. Especially quarterly reviews where actors tell what they have done and where actors plan what is done during the next sprint are important because they foster interaction a lot. When results are shared in this kind of episodes, continuous feedback, asset identification, opportunity seeking and networking become possible.

Contracts and/or consortium agreements limit result and experience sharing as in some programs they need to be shared first internally. The experiences can also relate to business creation. It is important that these episodes are regular and mutually beneficial because actors need to learn each other and trust needs to be created. If actors lack prior collaboration, they need to learn that sharing is not harmful. This learning happens incrementally. If things need to be shared, actors work on something they can share and thus the focus should be on things that can
be shared, and not necessarily for example on existing assets. Sharing of experiences and best practices is fruitful while common interest and similar context exist. Further companies are more willing to share things that do not relate to products or technologies.

In publicly funded research results are commonly available to external actors, although this is partly limited. The best way to benefit from created assets is to be in the program. If assets are too near to core business or ready to be exploited businesswise, they are taken out of the program and thus part of the assets are created within a company or in other networks or programs.

Because assets that were created within joint programs are commonly available to all actors to utilize, it is possible that small companies have benefited more from these programs when comparing to their effort as they can also make valuable contacts, networking and even find customerships. For them and their entrepreneurs utilization of prior connections and relationships play an important role, possibly because they are more active in opportunity seeking. For small companies entering programs without prior experience and direct contacts is a big step if program includes big companies because then their role and contribution are typically not clear.

10.1.2 How interaction affects the value creation based on intellectual assets in innovation networks?

The wider interaction environment has a direct effect on asset-based value creation because commonly the funding body decides what assets that were created within the program need to be shared, with whom, when and who owns rights to those assets and how they can be utilized by other actors. Getting funding for non-basic research always requires a plan about how research results are commercialized or what kind of commercial application research results could form basis for. This is done either by a company or a research organization and is always required by the funding body.

However, within the interaction episodes roles, contributions, aims and motivations of actors are seemingly different. For example actors may have differing views about encouraging their employees to start business and/or companies. Some research organizations support and encourage this but other do not for several reasons. Although some funding bodies and funding mechanisms force research organizations to think about the business aspect of their research, not everyone is willing to take a business related role.
If a company does not present how research results are commercialized or what kind of commercial applications they form, the research actors need to present it to get funding for non-basic research although all actor types think that business is the responsibility of companies. This business aspect was identified new to the researchers and both research organizations and researchers lack needed business skills. Two important episodes related to this can be identified.

First, several facilitators help research organizations to apply funding and some facilitators and research organizations help them to develop business skills and interest by offering training and networking possibilities. Episodes where facilitators spar and/or prepare research organizations to get funding are common. Second, episodes where researchers and/or technical people are collided with business people that can relate to commercialization of existing research based assets created by universities or other research organizations. Facilitators have an important role in organizing these episodes although they are new to some facilitators. These are the episodes that should be supported, encouraged and organized. This is important as technical assets do not necessarily have any value if business is not made out of them.

Although both sparring and colliding events are meant to address research results based business opportunities, facilitators lack episodes to monitor how and to which extend these are actually created because facilitators do not have proper ways to monitor this and/or companies do not need to report about this. Further funding or funding mechanisms do not reward prior research based business creation.

Within episodes that relate to interaction in asset-based value creation between actors interaction needs to be regular, on-going and occur within a certain rhythm to be beneficial to all participants. This should include constant experience and results sharing because in this way actors get regular feedback and can direct their activities better. Episodes where value is identified from the customer perspective are important and can occur with customers, by salesmen or by living lab type of activities where resources are combined from several actors to seek what kind of solutions customers want.

10.2 Limitations of the study

This research followed qualitative, case and interpretive research approach. Most of the research data was gathered via qualitative interviews. Each of these methods poses potential limits for the research but at the same time they gave an
opportunity to look at the phenomenon with a broader scope and the whole interaction process rather than some limited part of it.

This research applied qualitative interviews as data gathering method. One of the most important data gathering methods in qualitative research are qualitative interviews as via qualitative interviews it is possible to see things which are not normally viewable, examine things that are rarely seen (Rubin & Rubin 2005) and it is a powerful data gathering method. However, qualitative interviews also include some problems and pitfalls (Myers & Newman 2007). This research tried to tackle these problems by preparing well to each interview and fitting interview themes and questions to support not only the research but also to interviewees’ work. The aim of the interviewee selection was to select people who ‘speak the same professional language’ with the interviewer to avoid unfamiliar terms. Thus it is possible that during the interviews important interaction episodes and relationships and important factors of interaction environment and atmosphere that influence intellectual asset and value creation were not mentioned.

Interaction episodes, relationships and factors of environment and atmosphere that were identified during this research were relevant in the context of software industry. It is possible that by interviewing more and different kind of actors that give funding and/or make funding rules and requirements, a clearer picture about funding mechanisms and their effect on interaction in asset and value creation could have been formed.

Further this research applied qualitative and single case research approaches. There are authors like Markus (1983) and Lee (1989) that have argued that no generalizations can be made based on single case although some authors like Walsham (2006) have argued that single case can be generalized. To justify research results, the framework for generalization by Lee & Baskerville (2003) was applied and especially its theory to empirical approach.

According to Lee & Baskerville (2003) the common mistake is to expect that generalizations are proven statements rather than well-founded hypothesis that can be untested and that "A typical and legitimate endeavour in interpretive research is the study of a single setting." (Lee and Baskerville, 2003: 231). Lee & Baskerville (2003) have noted that there seems to be no prohibitions that increase in sample size leads to increase in generalizability. Further Lee (1989) have noted that as mathematics is a subset of formal logic, logical deductions can be executed without using mathematics in case studies (Lee 1989). For example Dubé & Paré (2003) have argued that in specific instances single case studies are useful. In this
Lee & Baskerville’s (2003) from theory to empirical approach includes generalizations from theory which is conformed in one setting to descriptions of other settings. This form of generalizability is the most important one in business schools and thus Lee & Baskerville’s (2003) framework seemed to be the most suitable for this research in which research the field was identified as knowledge management.

The only way for a researcher to justify generalizability of a theory into a new setting is to present that theory was already tested and confirmed in a new setting (Lee & Baskerville, 2003). In this research this was done by building the a priori analysis framework based on the earlier literature. As researchers do not usually have time or interest to test theories in scientific way in their own organizations prior to their application Lee & Baskerville (2003) have argued that it might be fair to ease the requirements of strict scientific procedures.

Fieldwork setting is a fundamental base of interpretive research and thus fieldwork is context-based (Walsham 2006). In this research this context was identified as software industry. One advantage of using interpretive approach is the ability to choose or change theory in different stages of the research. In this research the a priori analysis framework was built before interviews although during the interview process it was possible to make additional questions based on previous interviews as during the interviews actor’s relationships to each other become clearer. Thus via interpretative research it is possible to ask additional questions based on the feedback and prior interviews about the context and relationships between actors. In this research funding mechanisms and funding requirements were found important factors that were not possible to identify based on earlier literature.

This research included ethnographical elements but it was not an ethnographical research. Ethnography usually requires long periods of time in the field or research context (Yin 1994). The data of this research was gathered during five and half months period. According to Lee (1991: 350) one way of testing the validity of interpretation in ethnography “is the extent to which the behaviour of the native does not, or no longer, strikes the ethnographer as absurd, peculiar, pointless, irrational, surprising, or confusing”. This criterion was achieved early on during this research and was partly based on the a priori analysis framework that was built before interviews and partly by reading significant amount of public software industry related reports and literature and
by getting familiar with actors and their activities before interviews based on public information about them. After each interview interviewees were asked to propose potentially good interviewees that the interviewer should interview and most of these proposed persons were already interviewed or the plan was to interview them.

10.3 Methodological considerations

During the research process and especially during the data analysis some methodological indications were made. These indications relate to researcher’s thoughts about the used research methods and theory building.

One potential practical danger of looking at the research phenomenon with a broader scope related to the length of software industry part of this dissertation. This is because although some parts were interesting and relevant to this research it was not sure how relevant they actually are and if they are actually needed or not although they provided deeper understanding about the research context and actors in it.

The second potential practical danger was the decision to focus on a single case although it is possible that some other researcher would have found cases within this one case as it was possible to compare actors within the case. In the end applying single case research turned out to be a good choice as by focusing to single case it was possible to get better understanding about the interaction in asset-based value creation within innovation networks and to analyse and compare differences within the case.

The third practical danger was the wide scope of the study and occasionally it was challenging to keep track on the differing views and roles of actors as these were not always the same as the researcher initially thought even if the researcher tried to get familiar with the single actors roles and aims beforehand. For this reason it turned out that the decision to build the a priori analysis framework as simple one including only the main parts and elements and interactions between them was wise.

Moreover, fourth, all the interviews were arranged and held by the researcher and they were also transcribed from tape to text files by the researcher. Arranging and conducting interviews turned out to be easier and less time consuming than the researcher initially thought but transcribing and data analyses took much longer than the researcher could ever imagined. Choice to transcribe all the
interviews by the researcher turned out to be a very good decision as in this way the researcher got much better understanding about the research data.

10.4 Recommendations for future research

Presented research results offer some potential possibilities for future research. Also some of the limitations of this research offer possibilities for future research.

The role of facilitators in interaction framework utilization could offer valuable information about how interaction framework should be built, managed and coordinated and how this framework can be supported for example by research organizations, facilitators that give funding and/or facilitators that support networking, business opportunity identification and/or business creation. It could also be valuable to investigate how this interaction and interaction framework could be utilized after programs and/or funding has ended and what are the reasons that advance this utilization. Further it could be investigated between what actors this interaction will most likely continue and what created that interaction. Finally it could be investigated in more detail what kind of benefits interaction framework should offer to different kinds of actors and how those benefits motivate actors to bring their own contribution to the interaction within the framework.

Investigating more funding sources and/or mechanisms could bring valuable information about how different funding sources and/or mechanism support interaction and via what kind of interaction episodes. Future research could for example include different EU-level funding sources and/or mechanisms and for example the Academy of Finland from the national level.

It was identified during the data analysis that several facilitators and research organizations organize interaction episodes where technical people and/or researchers are collided with business people and several facilitators help and spar companies and/or research organizations to apply funding. It could be valuable to investigate how these episodes actually support interaction, asset, value and business creation from both companies’ and research organizations’ perspective. In this respect two potential research streams could be valuable to investigate further. First, how facilitators could monitor how business value is created based on the assets that were created within the program by both internal and external actors and how asset utilization by external actors could be supported more effectively. Further it could be investigated what assets external actors were able to and willing to utilize, with whom, based on what grounds and if this utilization
was limited to assets that actors needed to share publicly based on the funding requirements and contracts. It could also be investigated in more detail what kind of actors actually benefit most from the created assets and what kind of actors utilize them most and how. Second, role of universities and research organizations in general in business and/or company creation could be investigated in more detail because the data analysis shows that in facilitators’ and research organizations’ opinion business making is companies role. Further data analysis indicates that university actors are perhaps not so willing to take business creation role although facilitators help and sparc them to prepare their research applications to include also the business creation and/or commercialization paths and funding bodies require that either a research organization or a company presents business aspect.

This is important because data analysis indicates that research organizations present business aspect just because it is mandatory part of the funding applications for non-basic research and thus it is possible that research organizations do so just to be more competitive while applying funding and/or during funding calls. Thus it could be valuable to investigate what non-mandatory activities, if any, research organizations actually take toward research result based business creation and/or commercialization, with whom and how these activities could be supported, encouraged and rewarded. This means that it could be valuable to investigate real business and/or company creation effect of these activities and universities role within new funding mechanisms and requirements. For example the role of business accelerators and facilitators that support business and/or company creation could reveal interesting findings as well as how their role could be increased and supported by both public and private sector actors.

The role of small, start-up and newly established companies in asset and value creation could be investigated in more detail including their abilities and decisions about participating in different kind of programs and networks and how facilitators and possible research organizations could support them more. For example when they apply funding, build their networks and/or seek new business opportunities.

As interaction episodes where technical people and/or researchers are collided with business people were found important it could be interesting to investigate how business researchers could support technical researchers within and/or between research organizations. Further it could be valuable to investigate relationships between university actors proven business related outcomes, like
patents, invention disclosures and established companies, in relation to their success in supplementary and/or external funding.

During data analysis it was identified that created assets are commonly defined during program preparations and thus it could be valuable to investigate how this affects the value of these assets and how this value could be greater. Also roles of different actors during the program preparations could be investigated in more detail to identify how the biggest possible value expectations could be created. Finally, it could be valuable to investigate how predefined assets could be redefined during the program within the limits of funding mechanisms and requirements so that for example changing market situations and/or changes in single company’s strategy could be taken into account.

Although these suggestions for future research can be seen more managerial than theoretical, they could potentially increase the understanding of asset-based value creation and increase the utilization of both existing assets and assets that will be created in value creation so that more companies and businesses would be created and that funding mechanisms and requirements would more clearly support and encourage interaction and business and company creation.
References


Appendices
## Appendix 1 Conducted interviews

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Appendix 2 Case organizations

- Facilitator A
  - A non-profit limited company owned jointly by several companies and research organisations. It combines together several research programs and by doing so offers a collaboration framework where actors can work together to jointly develop know-how and innovations. The path from research to business activities is fostered via systematic R&D activities within this framework.

- Facilitator B
  - Is a publicly funded organisation which funds RDI activities in Finland. It collaborates with the most innovate companies and research organisations in around 2000 projects. Its aim is not just on creation of technological breakthroughs but also on their commercialization to benefit the Finnish economy and society as a whole.

- Facilitator C
  - Is a city level public enterprise whose role is to implement city's industrial policies and to support and foster the growth of business and entrepreneurship by developing the local level business environment to enhance employment situation and to allure foreign investments.

- Facilitator D
  - Works closely in the interface of researchers to identify and support the commercialization of research results. It also acts as a mediator between research results with commercial potential and external technology and business experts.

- Company A
  - A large multinational company which focuses on wireless and fixed network services and equipment, multimedia services and telecom services. It is one of the leading actors in its field worldwide and one of the few actors which can offer end to end solutions for all wireless communication standards.

- Company B
  - A large multinational company which focuses on wireless networks, wireless technology and telecom equipment and services. It is one of the leading actors in its field worldwide.

- Company C
– A big company in information security business. It is a global player in security as a service solution business for mobile and fixed devices for both business actors and individuals.

– Company D
– A big company that focuses on demanding embedded hardware and software solutions for specific industries where it owns long-standing relationships with the leading industrial actors.

– Company E
– A small company with around 20 employees. It offers web-based visualization tools to customers in selected industrial sector internationally. It is a relatively young born global company which does technology and business research with public research organizations.

– Company F
– A small growth-oriented company which is owned by its employees. It employs around 60 persons. It offers business intelligence solutions for its customers on project basis.

– Company G
– Is a small born global company that offers 3D virtual world environments.

– Research organization A
– An academic research group in software engineering. It collaborates with industrial partners to conduct empirical research with both academic rigor and practical relevance. It has wide domestic and international networks with industrial partners which builds a solid base for empirical software engineering research.

– Research organization B
– A large multidisciplinary not-for-profit research organization which focuses on applied research. It offers its research and technology services to domestic and international organizations, companies and public sector. It has wide national and international collaboration and networks that enable efficient technology transfer and its utilization.

– Research organization C
– An academic organization which combines information systems and business perspectives in its research and teaching activities. Its research partners include domestic and international business, research and public sector actors.

– Research organization D
Research organization D is a university affiliated research and innovation unit in the field of multi-disciplinary Internet research. It offers a collaborative environment for researchers and network partners in its research field. Its responsibilities include both research and effectiveness toward local business via fostering innovation creation in its research field.
613. Ardanov, Pavlo (2013) Priming capacities of endophytic Methylobacterium sp. on potato (Solanum tuberosum L.)


615. Holm, Jana (2013) Catalytic pretreatment and hydrolysis of fibre sludge into reducing sugars

616. Kemi, Ulla (2013) Adaptation to growing season length in the perennial Arabidopsis lyrata


618. Rodríguez, Pilar (2013) Combining lean thinking and agile software development: how do software-intensive companies use them in practice?

619. Vatka, Emma (2014) Boreal populations facing climatic and habitat changes

620. Isomursu, Marja (2014) Host–parasite interactions of boreal forest grouse and their intestinal helminth parasites


622. Matusek, Florian (2014) Selective privacy protection for video surveillance

623. Virranen, Elina (2014) Effects of haulm killing and gibberellic acid on seed potato (Solanum tuberosum L.) and techniques for micro- and minituber production in northern latitudes

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625. Loukola, Olli (2014) Information networks among species: adaptations and counter-adaptations in acquiring and hiding information

626. Langrial, Sitwat (2014) Exploring the influence of persuasive reminders and virtual rehearsal on the efficacy of health behavior change support system


Timo Koskela

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THE CASE OF SOFTWARE INDUSTRY