RESOURCE ACCESS AND CREATION IN NETWORKS FOR SERVICE INNOVATION

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ABSTRACT

Resource access and creation in networks for service innovation

Current research highlights the role of resources in service innovation success and the role of networks in providing resources for innovation. However, research on resources in service innovation is very limited and a clear deficit also exists in research applying a network perspective for service innovation. This study is the first one to focus on resource access and creation in networks for service innovation.

The objective of this study is to explore interaction for resources in networks over the service innovation process. This is accomplished by analyzing resource access and creation in business-to-business service innovation. The research aims to shed light on resources provided by networks for service innovation, and on relationships and activities to access those resources and to create new resources. The Interaction and Network Approach provides the theoretical background to the study.

This study focuses on the empirical part on business-to-business service innovations in the technical/engineering field. Qualitative multi-case study research with embedded cases enabled investigation on interaction for resources within a real-life context. The empirical research was conducted in three case companies and five service innovation projects in networks, and the main data consisted of 57 in-depth interviews. Processes of the innovation projects were studied longitudinally both in real time and retrospectively. An abductive approach enabled exploration on a phenomenon that has not previously been studied and the building of theory in forms of theoretical models, frameworks, and typologies.

This study found that a variety of resources are accessed from networks for service innovation. These resources were divided into individual and organizational resources depending whether they are bound to individuals or organizations. Resources that networks provide for service innovation could be further categorized into human, procedural, technological, financial, facility, relational, and informational resources. This study also shows that different resource categories play different roles in service innovation. Different kinds of resource can be accessed through four separate access strategies and types of relationship. This research further found that resource integration is a resource access strategy for human and procedural resources,

which is employed in the creation of new resources in service innovation. Different types of service call for integrating complementary, supplementary or heterogeneous human resources.

The main contribution of this research is in advancing understanding on interaction for resources in service innovation. It provides new understanding on service innovation resources. The study resulted in a theoretical model on resource access in service innovation and a model for resource integration in service innovation.

Keywords: resources; networks; innovation; interaction; relations; service business; business services; qualitative research; case study; longitudinal study

TIIVISTELMÄ

Resurssien hankinta ja luominen palveluinnovaatioita varten verkostoissa

Nykyinen tutkimus korostaa resurssien merkitystä palveluinnovaatioissa ja verkostoja resurssien lähteenä innovoinnissa. Kuitenkin resursseja ja verkostoja on tutkittu hyvin vähän palveluinnovaatioita käsittelevässä kirjallisuudessa. Tämä on ensimmäinen tutkimus, joka keskittyy tutkimaan resurssien hankintaa ja luomista verkostoissa innovoitaessa palveluita.

Tämän väitöskirjan tarkoituksena on tutkia resursseihin liittyvää vuorovaikutusta verkostoissa innovointiprosessin kuluessa. Tähän päästään analysoimalla resurssien hankintaa ja luomista innovoitaessa yrityspalveluita. Tutkimus lisää tietämystä verkostojen tarjoamista resursseista palveluinnovoinnissa sekä suhteista ja toiminnoista, joiden avulla resursseja voidaan hankkia ja luoda. Vuorovaikutus- ja verkostonäkökulma tarjoavat teoreettisen lähtökohdan tutkimukselle.

Tutkimuksen empiirinen osuus keskittyy innovaatioihin teknisissä yrityspalveluissa. Laadullinen monitapaustutkimus upotettuine tapauksineen mahdollisti vuorovaikutuksen tutkimisen resurssinäkökulmasta aidossa ympäristössä. Empiirinen tutkimus tehtiin kolmessa tapausyrityksessä ja viidessä verkostomaisessa palveluinnovointiprojektissa. Pääasiallinen aineisto koostui 57 syvähaastattelusta. Innovointiprojektien prosessia tutkittiin pitkittäisesti sekä oikea-aikaisesti että takautuvasti. Abduktiivinen lähestymistapa mahdollisti aiemmin tutkimattoman ilmiön tarkastelun ja teorian luomisen mallien, viitekehysten ja typologioiden muodossa.

Tutkimuksesta käy ilmi, että verkostot tarjoavat monia erilaisia resursseja palveluinnovoinnille. Nämä resurssit voitiin jakaa henkilökohtaisiin resursseihin ja organisaation resursseihin sen mukaan, olivatko ne kytköksissä yksittäisiin ihmisiin organisaatiossa vai laajempaan organisaatioon. Verkostoista saatavat innovointiresurssit kyettiin lisäksi jaottelemaan inhimillisiin resursseihin, prosessiresursseihin, teknologisiin resursseihin, taloudellisiin resursseihin, tilaresursseihin, suhderesursseihin sekä informaatioresursseihin. Tutkimus osoitti, että eri resursseilla on erilainen tehtävä palveluinnovoinnissa. Resursseja voidaan hankkia neljällä erilaisella strategialla ja neljän erityyppisen suhteen kautta. Tutkimus osoitti myös, että resurssien integrointi on keino hankkia inhimillisiä resursseja ja prosessiresursseja. Integrointia käytetään

luotaessa uusia resursseja palveluinnovaatioihin. Innovoitavan palvelun tyypistä riippuen verkoston jäsenet integroivat inhimillisiä resursseja joko samalta tietämysalueelta, toisiinsa limittyviltä tietämysalueilta tai täysin erillisiltä tietämysalueilta.

Tutkimus auttaa ymmärtämään paremmin resursseihin kytkeytyvää vuorovaikutusta palveluinnovoinnissa. Se tarjoaa uutta tietoa verkostojen innovointiin tarjoamista resursseista. Tutkimus tuotti teoreettiset mallit resurssien hankinnasta ja resurssien integroinnista palveluinnovoinnissa.

Asiasanat: resurssit; verkostot; innovaatiot; innovaatiotoiminta; vuorovaikutus; suhteet; palveluliiketoiminta; yrityspalvelut; kvalitatiivinen tutkimus; tapaustutkimus; pitkittäistutkimus

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We cannot escape our point of departure:
here and now,
and our established mental map,
world view,
concepts,
model of reality
and of ourselves.
But to move ahead
we need to take advantage
of the resources that are available to us.
– Richard Normann –

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Raisio, 1st September 2014

Helena Rusanen

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1 INTRODUCTION

1.1 Background to the research

Today, services amount to over 70 percent of GDP in developed countries (World Resources Institute 2007), and services are also increasingly outsourced to developing countries (Amiti & Wei 2005). Business services act as drivers of the knowledge-based economy in the European Union (Alajääskö 2008). At the same time, the deregulation and globalization of markets and the internationalization of service providers have led to increased competition.

Research has concluded that service innovation is the most important factor affecting service providers' competitiveness (Fitzsimmons & Fitzsimmons 2000; Johnson et al. 2000; Lusch et al. 2007). It is not only academics who highlight innovations as the means to competitiveness, service providers and public institutions also have put effort into raising competitiveness through innovations in recent years (Bougrain & Haudeville 2002; European Commission 2011).

However, innovation research has traditionally focused on manufactured products (Avlonitis et al. 2001; Drejer 2004), and innovations have referred to new goods developed by individual companies. Even today, despite the large amount of service business, service innovation research is limited in comparison to physical product development research (Page 2008; Droege et al. 2009; Perks 2011; Barczak 2012; Carlborg et al. 2014). It has not been uncommon to doubt whether services are innovative at all (Gallouj 2002b; Hipp & Grupp 2005; Tether 2005). However, findings made in goods development research might have been generalized also to services, without questioning whether physical product innovation really corresponds to service innovation (Kline & Rosenberg 1986; Cooper et al. 1994; Avlonitis et al. 2001).

Despite the tendency to undervalue or ignore service innovation, several academics have, at the same time, emphasized the importance of service innovation research, arguing that service innovation differs from mere goods innovation (Drejer 2004; Hipp & Grupp 2005; Stevens & Dimitriadis 2005). Providing a service means providing a solution or experience to the customer instead of only a physical product (den Hertog et al. 2010). Therefore, services are typically combinations of physical products and processes. Hence, far more attributes, and potentially also actors, need to be considered in service

innovation than in mere goods development (Tether & Hipp 2002; Smith & Fischbacher 2005; Eisingerich et al. 2009; Halliday & Trott 2010).

Dependence on people, and particularly their skills and knowledge, is characteristic of many services. Innovation in services thus often means changing what people do. As both firm-internal and external actors are often involved in the service process, a single actor cannot develop the process as autonomously as a manufacturer develops its production process (Tether & Hipp 2002). This also necessitates simultaneous innovation in the product and process (Callon et al. 1997). As the product and process are closely connected in services, it can even be difficult to distinguish between product and process innovation (Tether & Hipp 2002).

The extant research associates service innovation process and intra-firm resources with innovation project and product success (Froehle & Roth 2007). Service innovation research has failed to provide broader knowledge on resources, although studies on product innovation have suggested that innovation process can succeed only if relevant resources – referring in current research typically to knowledge – are shared, combined, and developed (Fischer 2001; Miotti & Sachwald 2003; Pittaway et al. 2004; Cassiman & Veugelers 2006).

Product innovation research further suggests that resources needed for innovation are typically in the possession of various business units (Swan et al. 1999; Tsai 2001; Hansen 2002), and a variety of firms and other organizations (Håkansson & Snehota 1995, 14; Oerlemans et al. 1998; van de Ven 2005). Most importantly, these firms and organizations control heterogeneous resources (Håkansson & Snehota 1995, 136; Hunt & Madhavaram 2006). To be able to access resources for innovations, actors need to establish relationships with those in possession of the resources (Ford & Håkansson 2006; Harrison & Håkansson 2006; Gadde & Håkansson 2008). As the needed resources reside in a number of business units and organizations, actors across industries increasingly lean on networks to access them (Hansen 2002; Pittaway et al. 2004; Gressetvold & Torvatn 2006; Lind et al. 2012). Networks can include, for example, customers, suppliers, consultants, competitors, scientific institutions, and associations (Pittaway et al. 2004).

Lately, academics have suggested that service innovation in networks comprising firms and public organizations should also be a focal research topic (Eisingerich et al. 2009; Ostrom et al. 2010; Barczak 2012; Di Benedetto 2012). These calls are shared by public institutions (Ministry of Employment and the Economy 2012; European Commission 2013; Tekes 2013), and business life (Agarwal & Selen 2009; Ritala et al. 2012). This topic is also highlighted in the research policy of the EU (European Commission 2011).

However, studies focusing on service innovation in networks remain scarce (Barczak 2012) despite the substantial amount of service business today.

Although academic research has proven the advantages of networks for innovation across a broad front (Pittaway et al. 2004), and especially the possibilities to access the needed resources (e.g., Håkansson 1987; Bower 1993; Goes & Park 1997; Christensen et al. 2005; Brown & Hagel 2006), empirical findings have also shown high risks and barriers when innovations occur in networks (Håkansson & Eriksson 1993; Smith & Fischbacher 2002; Dhanaraj & Parkhe 2006; Enkel et al. 2009; Lee et al. 2009; Landsperger & Spieth 2011). Barriers directly connected to resources include, for example, lack of financial and human resources for innovation activities (Smith & Fischbacher 2002; Enkel et al. 2009), lack of absorptive capability (Mothe & Quelin 2001; Tsai 2001; Sammarra & Biggiero 2008; Hung Tai Tsou 2012), missing motivation to provide resources (Perks 2004), excessive resource heterogeneity (Oerlemans et al. 1998), loss of knowledge (Johnsen & Ford 2000; Enkel et al. 2009), challenges in resource sharing activities (Hong 2004; Syson & Perks 2004; Bogers 2011), and difficulties in predicting emergent resource combinations (Cantù et al. 2012).

Empirical research indicates that the risks connected to innovations in networks also actualize in many cases. The findings suggest a failure rate of 14–50 percent in innovation processes conducted in networks (Lhuillery & Pfister 2009). Since current research highlights the role of resources in service innovation success and the role of networks in providing resources for innovation, the high failure rate provides an impetus to explore the service innovation process in networks from the *resource perspective* to gain new insights on the phenomenon. This study focuses on access and creation of innovation resources in interaction with actors who possess the needed resources – the topic that has been scarcely studied in service innovation.

1.2 The research gaps

This study focuses on resource access and creation within networks in which the aim is to innovate business-to-business services. Several research gaps can be identified in connection with this topic. First, research on resources in service innovation is very limited. Instead, studies on innovation resources predominate in high technology industries (Mowery et al. 1996; Powell et al. 1996; Stuart 2000; Mothe & Quelin 2001; Hagedoorn 2002; Baraldi & Strömsten 2009; Perks & Moxey 2011) and in manufacturing (Tsai 2001; Dubois & Araujo 2006; Gressetvold & Torvatn 2006; Sammarra & Biggiero 2008). Further, current service innovation research adopts a limited

perspective on resources. Service research takes a predetermined perspective on knowledge as the resource in innovation (e.g., Gordon et al. 1993; Swan et al. 1999; Kandampully 2002; Leiponen 2006; Blazevic & Lievens 2008; Hu et al. 2009). Thus, there is a need to study resources in service innovation as suggested also by Rubalcaba et al. (2012) in a recent article, and to take a broader perspective on resources in innovation.

Second, a clear deficit exists in research applying a network perspective in the service innovation literature (Eisingerich et al. 2009; Hsueh et al. 2010; Barczak 2012; Carlborg et al. 2014). Research has focused on identifying single actors that, in some way, might influence the innovation inside the firm or in dyadic relationships (Djellal & Gallouj 2001; Tether 2002; Leiponen 2005; Smith & Fischbacher 2005; Tether 2005; Freel 2006; Koch & Strotmann 2008) despite the prevailing view that firms are not "islands" but pursue continuous interaction with several actors in networks (Håkansson & Snehota 2006).

Further, although the extant research emphasizes networks as the means to access and combine resources for innovations (Swan et al. 1999; Tsai 2001; Hansen 2002; Pittaway et al. 2004; Dyer & Hatch 2006; Gressetvold & Torvatn 2006; Perks & Jeffery 2006; Nambisan & Sawhney 2011; Lind et al. 2012), rare exceptions of research addressing service innovation resources in networks are an article by Swan et al. (1999) that discusses knowledge management during e-banking development, and an article by Kandampully (2002) that highlights the role of technology, knowledge, and networks in service innovation. Only by paying attention to networks in service innovation is it possible to learn about the element behind the networks – resources. Thus, research that considers the network in service innovation is needed to extend the perspective on innovation and to get a more accurate perception of resource access and creation. Recently, Barczak (2012) also called for network research on innovation.

Third, the current literature on business-to-business service innovation typically adopts the perspective that innovation occurs in formal partnerships, such as strategic alliances and joint ventures (e.g., Goes & Park 1997; Linnarsson & Werr 2004; Eisingerich et al. 2009; Lee et al. 2009; Schleimer & Shulman 2011). Limiting focus to a specific relationship type leads to a restricted perspective on interaction between actors for resources in innovation. Therefore, it is important to study various kinds of relationships in connection with innovations to broaden understanding on resources in innovation.

Fourth, service research has paid scant attention to innovation process (Gassmann et al. 2010). Leading service scholars call for a process-oriented and dynamic approach to service research in addition to the transactional and static approach (Tronvoll et al. 2011). The focus should be extended from the

outcome of the innovation to the innovation process (Russo-Spena & Mele 2012). To date, research on service development process has focused on providing a structure to the activities and concepts associated with the process (Froehle & Roth 2007). Research has typically been limited to identifying different stages in new service development (e.g., Reidenbach & Moak 1986; Bitran & Pedrosa 1998; Johnson et al. 2000; Menor et al. 2002; Kindström & Kowalkowski 2009; Alam 2011). There is a need for more in-depth descriptions of the processes in which actors are involved, and which examine how the actors interact with each other (Cantù et al. 2012). This also calls for studies with multiple informants instead of only single informants, as has previously often been the case (Biemans 2003).

1.3 The purpose and positioning of the research

This study has been motivated by both theoretical and practical issues. The need to know more concerning the contribution of networks to service innovation was the study's starting point. The basis for this dissertation is the common argument which states that relationships, alliances and networks are developed especially because of the resources they provide. This argument can be equally found in the R&D literature (Miotti & Sachwald 2003; Brown & Hagel 2005; Kang & Kang 2009), the resource literature (Hunt & Morgan 1995; Lavie 2006; Bucic & Ngo 2012), the strategic alliance literature (Eisenhardt & Schoonhoven 1996; Das & Teng 2000; King et al. 2003), the relationship literature (Dyer & Singh 1998; Håkansson & Waluszewski 2007; Gadde & Håkansson 2008), and the network literature (Håkansson & Laage-Hellman 1984; Ahuja 2000; Pittaway et al. 2004). For innovating organizations, this means that the innovation process requires sufficient resources that typically need to be accessed from various actors (Tushman 1977; Fischer 2001; Miotti & Sachwald 2003; Pittaway et al. 2004; Cassiman & Veugelers 2006; Lee et al. 2009; Corsaro et al. 2012).

Although resources play a significant role in innovation, service innovation and development research have seldom taken the resource perspective. Thus, an interest arose to explore the service innovation process through resources in networks. *The Interaction and Network Approach* (Håkansson & Snehota 1995; Håkansson & Ford 2002; Håkansson & Waluszewski 2002; Waluszewski & Håkansson 2007) is applied in this study as it emphasizes the resource dimension in connection with actors and activities. Actors control and use resources and perform activities with them (Baraldi & Strömsten 2009).

The Interaction and Network Approach also takes the process perspective on resources by examining resources from their identification and access to their combining and development. It further applies a network approach to resources instead of studying dyadic relationships in isolation (Baraldi et al. 2012). When applying the Interaction and Network Approach, the researcher adopts the perspective that resource activities are based on interaction between actors within and between firms (Gadde & Håkansson 2008).

The overall objective of this study is to explore interaction for resources in networks over the service innovation process. This is accomplished by analyzing resource access and creation in business-to-business service innovation. This objective is divided into the following three research questions:

- What kinds of resource network provide for service innovation?
- How do actors access innovation resources in networks?
- How do actors integrate resources for service innovation?

Together, these three research questions aim to shed light on resources provided by networks for service innovation, and on relationships and activities to access those resources and to create new resources. This study takes the focal actor perspective. A focal actor is a business area, or business unit, or a firm that is innovating a service. For innovation, the focal actor might approach other business areas or units inside the firm, sister companies inside a group, other firms, and various organizations for resources. To access the needed resources, the focal actor establishes or activates different types of relationship with parties that control the resources. Within the network, the actors also establish relationships for the creation of new resources.

This thesis applies the term "service" when discussing offerings that might only include intangible elements (e.g., knowledge-intensive services or web-based software), or comprise intangible and tangible elements that are provided as a solution to the customer (e.g., construction and maintenance services or technology solutions) (Sheehan 2006). New services in this study are based on advances in technology. The literature typically discusses such services as "innovations", which is a term also employed in this study. The term innovation further refers to the strategic nature of development (Perks 2011).

This study defines "resources" as tangible and intangible elements that enable actors to develop and produce efficiently and effectively a market offering that has value to the customer (cf. Hunt & Morgan 1995). Efficient means here that the actors can develop and produce the market offering in an economic way, and effective refers to achieving the set targets and expectations. In this study, "service innovation process" refers to the system of ongoing practices performed by actors who seek, provide or integrate resources with which to

develop new services that are of value to the customer (cf. Russo-Spena & Mele 2012).

This study explores resource access and creation in networks in service innovation process through the three research questions shown above. The first research question discusses resources that networks provide for service innovation, which is the starting point for purposeful interaction for resources. It provides the preconditions for resource access and creation. As the extant research provides scant knowledge on resources that networks seek and provide for service innovation, identification of these resources provides the necessary basis from which to study interaction for resources. The study similarly identifies different roles that these resources play in service innovation. The results and the extant literature enable a categorization to be drawn for resources in service innovation. Based on the results, this study also provides a categorization of roles that resources play in service innovation. These two categorizations are applied in exploring and explaining resource access and creation for service innovation.

The second research question discusses resource access for service innovation. The extant research suggests that resource access necessitates activating existing or initiating new relationships (Chou & Zolkiewski 2012). Then, the focal actor has to make the actors in control of the resources act in accordance with its plans (Mouzas & Naudé 2007), and to commit them to provide the resources (Lundgren 1992, 160). This study explores various relationships that the focal actors establish and activate for innovation resources. Similarly, the study identifies different means to access the needed resources within the relationships. Although resource access is an essential part of interaction for resources (Chou & Zolkiewski 2012), the extant service innovation research provides limited knowledge on it, and the existing knowledge has remained fragmental and unstructured. This study thus provides the first, more comprehensive account on resource access in service innovation. The results enable continuums on resources, relationships, and access strategies in service innovation to be drawn. Based on the continuums and the extant literature, this study provides a theoretical model for resource access in service innovation. These findings also form the basis for the study on resource creation.

The third research question moves the focus to resource creation in service innovation. As this thesis studies resource creation from the interaction perspective, it refers to integration of existing resources in intense interaction between actors with the aim of creating new resources. The extant literature maintains that resources emerge as the result of systematic combining (Waluszewski & Håkansson 2007, 17–18). However, the extant research on service innovation has paid scant attention to resource creation. At the same time, the concept of resource integration (e.g., Lenney & Easton 2009; Cantù

et al. 2012; Chou & Zolkiewski 2012) and its relation to resource combining is explained vaguely in the current literature.

This study explores resource integration in service innovation where the creation of new resources is important, as access to existing resources does not alone lead to innovations. The study enables the peculiarities of resource integration in service innovation to be described. It provides the means with which to construct theoretical continuums on human resource and interaction within networks in resource integration. Based on the continuums and the extant literature, this study provides a theoretical model for resource integration in service innovation.

This study focuses on the interface between resources, networks, and innovations. Although researchers state that interaction for resources within networks is a relevant subject in the innovation process, it has been neglected in the service innovation literature. Similarly, new product development research lacks studies in resource access and creation in networks that would provide a sufficient theoretical basis for this thesis. Thus, the theoretical approach needs to be selected outside these domains. Different approaches that were considered as the theoretical basis for this thesis have been discussed in chapter 2.1. After careful evaluation of the applicability of these approaches to this thesis, the IMP Group's Interaction and Network Approach was found to provide a new approach to service innovation research by emphasizing resources and resource activities in innovation, and also networks as providers and combiners of resources that, together, have strong influence on the emergence of innovations.

The IMP School traditionally combines networks, interaction, resources, and innovations in its research (Håkansson 1987; Håkansson & Snehota 1995; Håkansson & Waluszewski 2007; Baraldi & Strömsten 2009) and it therefore provides an adequate theoretical basis for studying interaction for resources also in service innovation. The IMP School's Interaction and Network Approach is, however, not without limitations (see chapter 2). Therefore, the resource perspective is complemented by the resource-advantage theory (RA theory) (Hunt & Morgan 1995; Hunt 1997b). The positioning of the thesis is shown in figure 1.

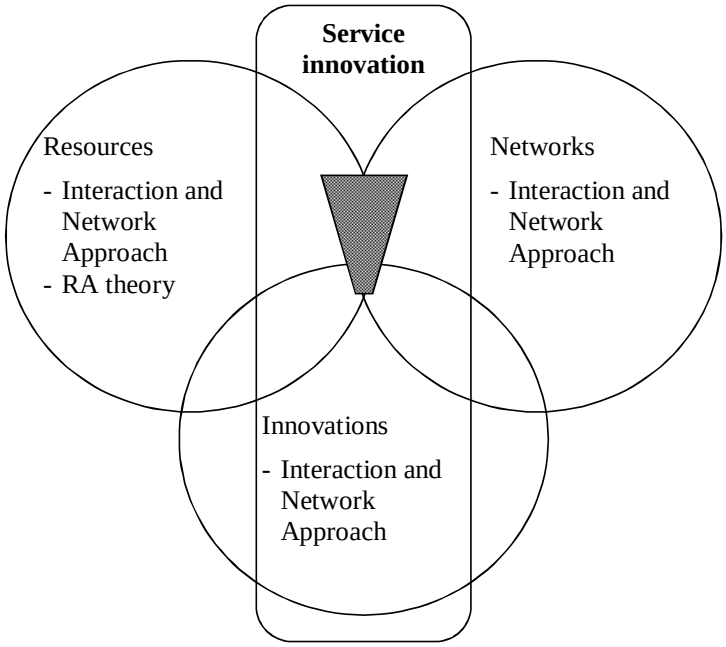

Figure 1 Positioning of the thesis

The IMP Group's Interaction and Network Approach (Håkansson & Snehota 1995; Håkansson & Ford 2002; Waluszewski & Håkansson 2007) is applied in this thesis as it takes a relational perspective on networks and explores reciprocal interaction among the actors and their resource activities. According to the Interaction and Network Approach, a network is a special structure that binds together actors, activities, and resources (Håkansson 1987; Harrison & Håkansson 2006). It also highlights innovating in networks (e.g., Håkansson & Eriksson 1993; Håkansson &Waluszewski 2002; Håkansson & Waluszewski 2007). It has examined resource ties in business-to-business marketing since the 1980s (e.g., Håkansson & Snehota 1989; Håkansson & Johanson 1992; Håkansson & Snehota 1995), which provides a strong theoretical basis for this study that examines service innovation in business-to-business relationships.

The Interaction and Network Approach has developed the actors, resources, and activities (ARA) framework (Håkansson 1982), which was later further developed into the four resource entities (i.e., 4R) model (Håkansson & Waluszewski 2002; Waluszewski & Håkansson 2007). These models provide theoretical background with which to explore various resources in this study. Understanding on resources is complemented through the resource-advantage theory (Hunt & Morgan 1995; Hunt 1997b), which offers a systematic resource categorization that the 4R model lacks.

This study examines real-life phenomena with the aim of building theory. For the creation of theoretical constructs, the empirical part comprises a qualitative multi-case study (Stake 2008, 123) with embedded cases (Eisenhardt 1989) that are studied longitudinally. The extant literature is first reviewed and then applied to the empirical reality. Over the research process, the link between theory, empirical phenomena, and method was formed by applying an abductive approach (Eisenhardt 1989).

This study contributes to service innovation research and, more precisely, to service innovation in networks. In the spirit of current service innovation research with increasing focus on illuminating important issues that have been neglected in innovation research (Droege et al. 2009), this thesis approaches research themes that need attention also more broadly in innovation research. Thus, this study also contributes to innovation research in general.

1.4 Technical services as the empirical context

This study focuses on the empirical part on business-to-business service innovations in the technical/engineering field, which include design and consultancy services, construction and maintenance services, and technology solutions. The extant literature on services states that concentrating on specific types of services provides benefits in research. Services include such a heterogenic field of different business-to-customer and business-to-business services that it is difficult or even impossible to make overall statements concerning them. Studying similar kinds of service thus enables more valid comparison (Hallen & Eisenhardt 2012). The case companies comprise three firms: (1) a construction and maintenance company, (2) an engineering and consultancy company, and (3) a technical trading company.

Several arguments can be expressed in favor of technical/engineering services when studying service innovation in networks. First, technical services play an important role in the economy. They comprise a significant share of business-to-business services (Statistics Finland 2009), and are a notable source of employment.

Second, technical/engineering services represent the peculiarities of services as they typically provide solutions to customers. Information and human knowledge processing play a central role in engineering services (Tether & Hipp 2002). Also, business-to-business engineering services are based on intense interactions between the customer and supplier (Chesbrough & Spohrer 2006). As technical services typically represent customized solutions to business clients' requirements and, therefore, need various and variable resources over the delivery process, service innovation and delivery often

occur in collaboration with other actors (Tether & Hipp 2002). Thus, technical services are likely to be innovated in networks. However, to date, technical services are weakly represented in the academic literature on services (Schilling & Werr 2009).

Innovating in business-to-business markets is characterized by high complexity that requires versatile knowledge resources. Firms need a variety of knowledge to be able to produce services that provide value to their customers. Firms have to know what is going on in customer firms and also with regard to their customer's customers, be they other organizations or consumers. Firms require knowledge on markets and various industries, laws and politics, global trends, and especially on their development. In technical services, expertise in current and future technologies is the base for growth and success. However, as technology is sold as a service, firms also need to understand the peculiarities of service business, which is more or less based on employees' knowhow and skills. Only with all this knowledge are service providers capable of meeting the needs of their existing and potential customers (Gummesson 2003).

Engineering services currently face a need for substantial changes in their business strategy, which necessitates new kinds of business model, service concept, and innovation (Metsä-Tokila 2010). Work for which payment has traditionally been paid based on hourly rates is characteristic of many engineering services such as design, installations, maintenance, and repair. There is, however, a constant need to cut costs because of tight price competition in the field (Toivonen 2001; Metsä-Tokila 2010). Good quality is appreciated by customers, but it should not be reflected in prices. Gross margins have thus reduced (Suomen virallinen tilasto [SVT] 2009).

At the same time, increasing global competition and globalization of services providers calls for attaching more added value to services in the engineering field, and for forming long-term partnerships, which often necessitates innovations. However, this has not been easy to achieve in the engineering field. Competitive bidding remains the prevalent practice in engineering business, and is even a necessity in public procurement. Thus, customers typically do not commit themselves to specific service suppliers for a longer time. This course of action has led to reacting to customers' current expressed needs instead of proactively determining future customer needs and innovating services on that basis. Therefore, service providers may have difficulties in differentiating from competitors in the engineering field.

In recent years, service "development" has typically meant that companies have acquired small firms which are specialized in some engineering field (Toivonen 2001). This has enabled the formation of corporations with a variety of technical and management knowledge, and an extensive assortment

of services. Increasing the scope of services has simultaneously meant concentration in technical services. Competing customer firms might have to rely on the same service providers that can satisfy their vital operations. This has placed engineering firms in a new situation with their customers, which might not only influence everyday business but also innovation; for example, on customer involvement in service innovation.

Innovation is further challenged by the fact that business-to-business service demand very much depends on customers' business success and investments, and also their willingness to outsource operations (Toivonen 2001; Metsä-Tokila 2010). This can lead to considerable fluctuations in the work load of engineering service firms (Suomen virallinen tilasto [SVT] 2009). Similarly, needs and behavior of customers' customers vary at different times, which also has an influence on the service provider.

To improve their profitability and competitiveness, large engineering service companies have started to position themselves as managers or integrators of large service entities (Metsä-Tokila 2010). Development of life-cycle services and innovation of pioneering services are means to this end. As business-to-business service providers, engineering firms also find that improving their customers' businesses is one of their most relevant tasks in safeguarding their own businesses. This has meant developing higher value added management services, and creating service entities with several suppliers and sub-contractors (Toivonen 2001; Metsä-Tokila 2010). Each of these objectives calls for service innovation in networks.

1.5 The research design

The study object, purpose, and expectations set to the research play an important role in the choice of a specific research method (Sayer 1992, 4). This study analyzes interaction for resources in the networked service innovation process with the aim of building theory.

Qualitative multi-case study research (Stake 2008, 123) with embedded cases enables investigation on interaction for resources within a real-life context (Scholz &Tietje 2002, 9; Yin 2009, 2). An embedded design refers to case research that includes multiple levels of analysis in a single study (Eisenhardt 1989; Scholz & Tietje 2002, 9). This method is chosen as the aim is to understand deeply interaction for resources in the service innovation context. The empirical research is first conducted in three case companies, with the focus on their collaborative service innovation. The first firm is a multinational service group delivering construction, maintenance, and professional services within the energy, telecommunications, and industry sectors.

The second firm is a multi-professional engineering, design, and consultancy company that belongs to a multinational group. The third firm is a technical trading and maintenance service company.

At the second study level, embedded cases comprise five service innovation projects in networks within which at least one of the case firms is involved. The first case concerns resource management system development. The second and third cases address wind power service portfolio development. The fourth case describes the development of foundation solutions for wind turbine towers. The fifth case addresses development of new automation solutions for the mechanical engineering industry.

Interaction for resources is studied by exploring (1) innovation resources and (2) their access and (3) creation though resource integration in networks. To gain a more holistic insight on resource access and creation in the service innovation, processes of the innovation projects are studied longitudinally both in real time and retrospectively, applying sequential mapping where data are collected in periods (Halinen et al. 2012). Data were collected mainly through the interview method both at the firm level in the three case firms and at the innovation project level in various firms that are involved in innovation. The Interaction and Network Approach enables various involved parties to be taken into consideration

In this study, the link between theory, empirical phenomena, and method is achieved by applying an abductive approach (Dubois & Gibbert 2010). This study is thus based on matching; that is, iterating between the theoretical framework, data sources, and analysis (Dubois & Gadde 2002). This enables exploration on a phenomenon that has not previously been studied; that is, resource access and integration in service innovation. The abductive approach also enables the building of theory from the empirical data in forms of theoretical models, frameworks, and typologies.

1.6 Structure of the thesis

This thesis comprises seven chapters. After the introduction, chapter 2 provides a theoretical foundation for the study. Chapter 2 follows the order of the research questions; in the first subchapter, the focus is on various resources, their characteristics, and categorizations. Chapter 2 also discusses the alternative theories that were considered for this research and explains the reasons for not applying them. It then introduces the dominant perspective on resources inside the IMP Group, which is supplemented with the resource categorization in the resource-advantage theory. Together, they provide the theoretical basis for identification and categorization of innovation resources

in this thesis. The first subchapter also discusses the IMP Group's ARA (i.e., actors-resources-activities) framework and four resource entities (i.e., 4R) model, which provide the theoretical approach to study resources in dyadic relationships and networks.

Second, the focus is directed to resource access. The second subchapter gives an overview on the extant service innovation literature, which discusses various actors that can provide resources for service innovation. The third subchapter deals with resource access from the interaction and network perspective. On the basis of the literatures, a tentative framework is drawn for resource access.

Next, the focus is directed to interaction in innovation where resources are combined and integrated between the actors. The fourth subchapter discusses the concepts of resource combining and integration in connection with the innovation research. Chapter 2 ends with a summary of the extant literature and a framework that provides a loose basis for the study on resource access and integration.

Chapter 3 provides the methodological framework for the research. In the first subchapter, it describes the basic tenets of constructivism, which is the interpretive paradigm behind this study. In the second subchapter, the qualitative case study research as the applied research method is discussed. The third subchapter describes the case design and case selection. The fourth subchapter discusses process research that is applied in the study of embedded cases. Next, the abductive strategy of this study is discussed. This is followed by descriptions of data collection and data analysis.

Chapter 4 is devoted to the descriptions of the empirical cases. First, the chapter presents the focal companies Alpha, Delta, and Gamma. Next, it provides an introduction to the embedded cases. This is followed by process descriptions of the embedded cases that comprise five service innovation projects.

Chapter 5 focuses on the empirical study. First, it provides the results on resources that networks provide for service innovation. On the basis of the empirical case study evidence, categorizations are provided for the resources and their roles in service innovation. Next, the chapter presents the results on resource access in service innovation. The empirical case study evidence enables drawing theoretical continuums for resource access. This is followed by the results on resource integration between the actors, which is the way to create new resources for service innovation. On the basis of the empirical evidence, theoretical continuums are provided for resource integration. The results are further discussed in light of the literature in the theoretical framework and extant research.

Chapter 6 discusses the main findings of the study in light of the literature in the theoretical framework and extant research. It provides a theoretical model on resource access and resource integration. Finally, chapter 7 summarizes the study; it discusses the theoretical contribution of this dissertation and provides managerial implications. It further discusses the limitations of the research and evaluates the study. The study ends with suggestions for further research.

2 THEORETICAL FRAMEWORK

2.1 Characteristics and categorization of resources

This study applies the *Interaction and Network Approach* to resources (Håkansson 1987; Håkansson & Snehota 1995; Håkansson & Waluszewski 2007), supplemented by the resource categories in the resource-advantage theory (Hunt & Morgan 1995; Hunt 1997b). The Interaction and Network Approach has adopted many of their basic ideas on resources from Edith Penrose's (1959) seminal work "The theory of the growth of the firm" (Håkansson & Snehota 1995), similar to the resource-based view, resource dependence theory and resource-advantage theory. It is noteworthy that, although resources play a significant role in theories that have adopted their resource perspective from Penrose's work, their main focus is on other issues. Also, Penrose's work was constructed for theoretical investigation on prices and allocation of resources, among different uses (Penrose 1995, 11). Before addressing more deeply the chosen literature, the following paragraphs briefly discuss the alternative approaches to resources and their applicability in this study.

The *resource-based* view (RBV) of the firm is founded on Penrose's perception of a firm as a collection of resources (Ali et al. 2011). Since Wernerfelt (1984), the RBV has been a theory on competitive advantage that is based on firm-internal resources. Firm resources comprise physical capital resources, human capital resources, and organizational capital resources that enable the firm to implement strategies that improve its efficiency and effectiveness (Barney 1991). A firm which owns resources that are valuable, rare, imperfectly imitable, and non-substitutable will attain sustained competitive advantage (Barney 1991; Lambe et al. 2002). Value refers to the ability of a resource to take advantage of opportunities and to neutralize threats in the environment. A resource is rare if possessed by few of the firm's current and potential competitors. Imperfectly imitable resources refer to resources that firms cannot easily access and acquire. Non-substitutable resources have no alternatives with which they can be substituted (Barney 1991). Thus, RBV restricts itself to very specific types of resource that predominantly need to exist inside the firm as they cannot easily be obtained from outside the firm. It also lacks empirical evidence (Lavie 2006). Applicability of RBV in this thesis

is scant as this study adopts the network approach and a considerably wider perspective on resources.

Also the *resource dependence theory* (RDT) by Pfeffer and Salancik (1978) has its foundations in Penrose's (1959) thinking. A fundamental assumption of RDT is that organizations are dependent on critical resources, and this influences their actions. Critical resources need to be accessed from the environment (Nienhüser 2008). Therefore, the central proposition of RDT states that firms can survive only if they are able to acquire critical resources from their environment (Casciaro & Piskorski 2005). The focus is on resources without which the firm cannot function (Nienhüser 2008).

The central concept of RDT is power that is manifested in control over resources. Firms attempt to reduce other organizations' power over them, and increase their power over other organizations and their resources (Hillman et al. 2009). This is achieved by making other organizations dependent on the focal firm. The more dependent others become on the focal firm, the more power the focal firm can exert over them, and the better possibilities it has to control their resources (Casciaro & Piskorski 2005). Mergers and acquisitions (M&As) especially are highlighted as they enable direct control of other actors' resources (Casciaro & Piskorski 2005; Hillman et al. 2009).

RDT thus focuses on studying dependency and power relations between the actors, and also mergers and acquisitions. It pays little attention to theorizing on resources; for example, it refrains from discussing the main resource concept – critical resources – more precisely (Nienhüser 2008). As RDT provides little knowledge on resources, and limits itself to resources that are critical for the functioning of a firm, it stands outside the focus of this thesis. Further, RDT is suitable for studying power and asymmetrical dependency in relationships; however, its assumptions do not support the idea of collaboration and mutually profitable relationships.

The *resource-advantage theory* (RA theory) is a general theory of competition that aims to describe the competition process. It combines marketing's heterogeneous demand theory with RBV (Hunt & Morgan 1995; Hunt 1997b). RA theory emphasizes market segments and resources. According to RA theory, firms are combiners of heterogeneous, imperfectly mobile resources (Hunt 1997b; Hunt 2012), and they constantly struggle with each other for comparative advantages concerning resources (Hunt & Madhavaram 2006). Each firm has at least some unique resources that might provide it with comparative advantage. Comparative advantage in resources can further lead to competitive advantage (Hunt 1997b).

When one firm achieves superior performance through the position of competitive advantage in some market segment, competitors try to neutralize this advantage through resources. This is because the primary objective of a

firm is superior financial performance. Competitors can try to manage better their existing resources, or acquire or imitate the advantage-producing resource, or find a substitute. However, they can also find a superior resource through major innovation. To reach superior financial performance, firms can exploit their relationships with customers, suppliers, and other actors (Hunt 1997b).

Some of the perspectives in RA theory provide a good fit with this study. First, it contributes to the domain of marketing and defines valuable resources as "tangible and intangible entities available to the firm that enable it to produce efficiently and effectively a market offering that has value for some market segment" (Hunt & Morgan 1995, 6). RA theory is the only one of the resource perspectives presented here that provides a systematic categorization of resources (Hunt & Morgan 1995; Hunt 1997b). Second, it emphasizes proactive and reactive innovation through a combination of resources (Hunt & Madhavaram 2006; Hunt 2012), and maintains that a firm can also obtain resources from other actors without change of ownership (Hunt 1997b).

However, although RA theory perceives relationships with other actors as one type of resource, it predominantly takes the firm-internal perspective on resource integration and innovation (Hunt 2001). Although this is the prevailing perspective of RA theory, it has more recently recognized that product development might also occur in strategic alliances. However, alliances have a specific purpose of creating inter-firm, relation-specific tangible or intangible resources, such as a joint production plant, which might – although with reservation – increase their competitiveness (Bicen & Hunt 2012). These limitations of RA theory restrict its applicability in this thesis.

A more recent perspective in the marketing and service marketing domain is the *service-dominant logic* (S-D logic) which connects the concept of resources closely with value creation and exchange (Lusch & Vargo 2006). According to Vargo and Lusch (2004), the understanding of S-D logic is based on changing the perspective on resources from tangible goods toward intangibles, specialized skills, knowledge, and processes. Also, the fundamental concept of service is defined through resources as "the application of competences for the benefit of another party" (Vargo & Lusch 2008, 4).

S-D logic divides resources into operand and operant resources. Operand resources include tangible resources on which an operation or act is performed with the aim of producing an effect, while operant resources produce effects by themselves. Operant resources are often invisible and intangible, such as core competences, organizational processes, or technology (Vargo & Lusch 2004). Also, customers, employees, and organizations are operant resources as they are both value creators and value beneficiaries (Lusch 2006). Operant resources have the ability to multiply the value of natural resources, and they

can also create new operant resources. Therefore S-D logic regards operant resources as primary resources. Resources are thus not static and fixed but they emerge (Vargo & Lusch 2004). According to S-D logic, operant resources are the foundation of competitive advantage and economic growth (Vargo & Lusch 2008).

S-D logic also defines marketing through resources as "a continuous series of social and economic processes that is largely focused on operant resources" (Vargo & Lusch 2004, 5). It moves the focus of markets and marketing from the output to the process (Vargo & Lusch 2009, 221). With operant resources the firm strives to make such value propositions to customers that exceed the value propositions of competitors (Vargo & Lusch 2004). Value creation occurs in the process of resource integration and transformation that is based on interaction in networks (Lusch 2006), and on resources that the networks provide (Vargo & Lusch 2011). Resource integration can result in the creation of new resources (Vargo & Lusch 2011). Networks comprise mutual service-provision relationships (Vargo 2009). Customers are operant resources when they actively participate in relational exchanges and co-production (Vargo & Lusch 2004).

When considering the applicability of S-D logic in this thesis, it is a relevant fact that S-D logic is not a theory (Vargo & Lusch 2008), and it is not based on empirical evidence (Ford 2011). Instead, Vargo and Lusch (2008) characterize it as a mindset. To date, the main message of S-D logic has included ten foundational premises that are meant to establish a framework for a service-centered mindset in market research (e.g., Vargo & Lusch 2008). Many of the concepts and ideas in the foundational premises can be found in the extant literature; however, S-D logic has collected them under one title.

Although the first premise of S-D logic states that service is the fundamental basis of exchange, service does not refer in S-D logic to an offering, but to the process over which an actor employs its competences for the benefit of another actor (Vargo 2009). Service as perceived by S-D logic thus suits the idea of innovation collaboration and interaction in this thesis. Innovation is defined in S-D logic as a better way of serving (Vargo & Lusch 2008), while this thesis takes a broader perspective on innovation as a new offering that comprises the process (i.e., way of serving in S-D logic) and output. In any event, the emphasis of S-D logic on resources, and lately to networks, and also the idea of value co-creation and service exchange in the process of resource integration, fit well the purposes of this thesis. Focusing on the process, instead of only output, also corresponds to the purpose of this study. S-D logic thus provides an interesting approach to this thesis, although it cannot be applied as a theoretical frame due to its nature as a mere mindset, and because

it is currently undeveloped for the purposes of this study. Unlike this study, S-D logic further focuses on value creation.

The *Interaction and Network Approach* is the paradigm developed inside the Industrial Marketing and Purchasing (IMP) Group since the 1970s (Möller & Wilson 1995) because traditional marketing concepts were found inadequate for explaining phenomena in business-to-business markets (Leek, Turnbull & Naudé 2001; Waluszewski & Håkansson 2007, 15). It takes a holistic perspective on business-to-business exchanges (Henneberg et al. 2006).

The Interaction and Network Approach combines the concepts of relationships, networks, interaction, and resources in research. It defines a network as a structure that is formed by three basic elements – actors, activities and resources – and connections between them; that is, actor bonds, activity links, and resource ties (Halinen et al. 1999).

The Interaction and Network Approach emphasizes research on resource access through interaction (Gummesson & Mele 2010). According to the Interaction and Network Approach, an entity is a resource if producers and users can find a current or potential use for it (Baraldi et al. 2012). Resources are physical and human assets that are adapted to each other during their usage (Lind & Dubois 2008). The importance of resources is especially illustrated in the resource interaction model termed the 4R model (Waluszewski & Håkansson 2007, 17). This model was developed for exploration on resource interaction processes in networks (Harrison & Håkansson 2006; Baraldi et al. 2012).

According to the Interaction and Network Approach, business enterprises typically lack direct control over some resources necessary for their activities. To access the needed resources, firms establish relationships with other actors that control those resources (Håkansson & Snehota 1995, 135, 143, 146). When the relationships develop, the companies direct and orient some of their resources towards each other. Thus a relationship between two parties naturally connects their resources (Håkansson & Snehota 1995, 136, 147).

Table 1 compares the resource perspectives described above. It shows whether their focus is on intra-firm or external resources; what kinds of resource are of interest to each perspective; the role of resources according to the perspective; and what research subjects the perspective typically studies.

Table 1 Comparison of alternative resource perspectives

	Focus on firm-internal / external resources	**Nature of studied resources**	**Role of resources**	**Studied subjects**
RBV	Internal	Resources that are valuable, rare, imperfectly imitable, and non-substitutable	Enable a firm to implement its strategies efficiently and effectively	(sustained) Competitive advantage
RDT	External	Resources that are critical to the firm and that the firm can control	Enable the firm to function	Power relations, asymmetrical dependency, M&As
RA theory	Internal and external	Heterogeneous, imperfectly mobile resources	Provide comparative advantage	Competition, comparative advantage, strategic alliances
S-D logic	Internal and external	Intangibles, specialized skills, knowledge, and processes that produce effects	Create value	Value creation
Interaction/ Network Approach	Internal and external	Entities that have current or potential use for producers and customers	Enable firms to perform their activities	B-to-B relationships, interaction, and networks

Table 1 shows that RA theory, S-D logic, and Interaction and Network Approach consider both internal and external resources in research, while RBV is only interested in firm-internal resources and RDT in external resources. The Interaction and Network Approach takes a broad perspective on resources by considering all entities that have current or potential use for producers and customers. Other resource perspectives focus on specific types of resource. The role of resources is also perceived from a broad perspective in the Interaction and Network Approach, which suggests that resources enable firms to perform their activities. Other resource perspectives, instead, perceive the role of resources from a specific strategic perspective or value creation perspective. The studied subjects vary considerably between the perspectives. The Interaction and Network perspective is the only one that focuses on B-to-B relationships, interaction, and networks.

This study aims at taking a broader perspective on resources than innovation research in general, and studies resource access and creation in networks for innovation of new offerings. For this purpose, the Interaction and Network perspective provides a sufficient theoretical approach. Next, the resource interaction model under the Interaction and Network Approach is discussed in more depth.

The 4R model (Håkansson & Waluszewski 2002; Waluszewski & Håkansson 2007) bases its ideas on Penrose (1995, 25), who suggests that the same resource provides different services when combined with different resources. Similarly, the 4R model proposes that resources gain their value in combinations with other resources within organizations, between organizations, or as a result of indirect interaction (Waluszewski & Håkansson 2007, 17). The 4R model classifies resource entities into four interacting groups: products, facilities, organizational units, and inter-organizational relationships (Baraldi et al. 2012). Each of the four resource entities gets combined within an interaction process (Baraldi & Strömsten 2009).

Two of the resource entities are technological: products and facilities (Waluszewski & Håkansson 2007, 17). Products comprise combinations of goods and services that organizational units exchange with each other. Facilities comprise premises and equipment for development, manufacturing, and transport of products (Baraldi et al. 2012). They include tangible resources; for example, plant, production machinery, vehicles, and various equipment (Gadde & Håkansson 2008).

The other two resource entities, organizational units and inter-organizational relationships, comprise organizational resources. Together, they organize, develop, manage, and control products and facilities (Baraldi et al. 2012). Organizational units include individual organizations or parts of them (Waluszewski & Håkansson 2007, 17), such as divisions, sections, departments, informal groups, or individuals (Baraldi et al. 2012). Organizational units bring together technological and human resources (Waluszewski & Håkansson 2007, 17). They incorporate knowledge, including routines, and the identity and reputation of an organization (Baraldi et al. 2012), and also knowledge and experience of individuals and groups (Håkansson et al. 2009, 67). Organizational units mobilize inter-organizational relationships while inter-organizational relationships connect organizational units (Baraldi et al. 2012). Organizational units exercise their capabilities through inter-organizational relationships (Gadde & Håkansson 2008). The Interaction and Network Approach perceives that relationships are the most significant resources as they make a company capable of unique performance (Håkansson & Snehota 1995, 137). Figure 2 illustrates the categorization of resources in the 4R model.

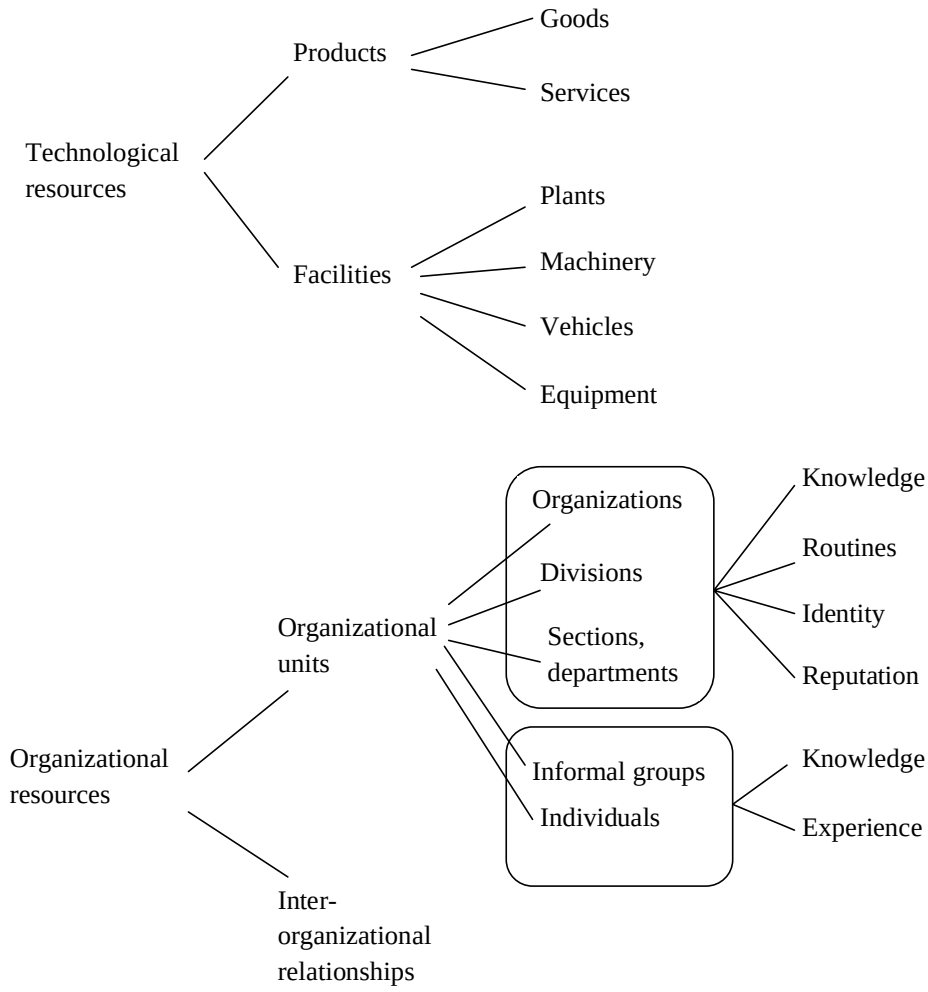

Figure 2 Categorization of resources in the 4R model

Figure 2 reveals some of the problems with the resource interaction model. It divides organizational units and facilities into detailed subclasses of resources while products and inter-organizational relationships lack such division. It is also unclear which resources belong to the same layer. The 4R model further makes study on solutions innovation challenging as it divides products only into goods and services, but not to underlying resources. All services are further placed under technological resources. One reason might be that the 4R model focuses on exploring the process of interaction between larger resource entities and not between single resources (Baraldi et al. 2012). This thesis, instead, focuses on single resources and, thus, applies the systematic resource classification of RA theory when analyzing resources in service innovation.

According to RA theory, resources are classified into financial, physical, legal, human, organizational, informational, and relational resources. Financial resources refer to cash reserves and access to financial markets (Hunt & Morgan 1995). Physical resources comprise raw materials (Hunt et al. 2002), plant, facilities, hardware, software, and other equipment (Madhavaram & Hunt 2008). Legal resources include, for example, trademarks and licenses. Human resources comprise skills, knowledge (Hunt 1997b), and experience (Madhavaram & Hunt 2008) of individual employees. Organizational resources refer to a company's competences[1], controls, policies, culture (Hunt 1997b), procedures, and routines (Madhavaram & Hunt 2008). Informational resources include knowledge on consumers and competitors (Hunt & Morgan 1995), and technology knowledge (Hunt 1997a). RA theory also follows the concepts of relationship marketing by considering relationships, for example, with employees (Hunt 1997b), competitors (Hunt et al. 2002), suppliers, and customers as resources (Hunt & Morgan 1995). The resource categories of RA theory are shown in table 2.

Table 2 Resource categories according to the resource-advantage theory (Hunt & Morgan 1995; Hunt 1997b)

Resource type	Examples of resources
Financial resources	Cash reserves, external financing
Physical resources	Raw materials, plant, facilities, hardware, software, and other equipment
Legal resources	Trade-marks, licenses
Human resources	Knowledge, skills, and experience of employees
Organizational resources	Competences, controls, policies, culture, procedures, and routines
Informational resources	Customer knowledge, competitor knowledge, and technology knowledge
Relational resources	Relationships with employees, competitors, suppliers, customers, etc.

As this study explores resources in networks for innovation and interaction between network actors, a distinction needs to be made between resources and actors that perform various activities with resources. This follows the idea

[1] The current literature takes divergent standpoints to the origins of competences/capabilities. Following Hunt's perspective, in this thesis, competences are perceived to emerge from combinations of resources (see Madhavaram & Hunt 2008). The same perspective can be found also in the service innovation literature (e.g., Agarwal & Selen 2009).

whereby resource combining occurs in interaction among the actors (Cantù et al. 2012). The 4R model, however, focuses on resource structures and omits the actor dimension (Baraldi et al. 2012), which further limits its applicability in this thesis.

Instead, the actors, resources, and activities (ARA) framework (Håkansson 1982), which later led to the 4R model (Harrison & Håkansson 2006), makes distinction between actors and resources clear. The ARA model was developed by Håkansson and Johanson (Håkansson 1987, 14) for research on the three related key components (i.e., actors, resources, and activities) in networks. It provides possibilities for conceptualizing B-to-B relationships and networks (Lenney & Easton 2009). Relationships are conceptualized as bonds between actors, links between activities, and ties between resources (Kalsaas 2011). Actors can be individuals, or groups, departments, organizations, and nets of organizations (Lenney & Easton 2009). Actor bonds exist when actors are related to each other (Lind & Dubois 2008). Bonds are mainly social in nature (Lenney & Easton 2009).

According to the ARA model, actors are defined by the activities they perform, and the resources they control and employ (Baraldi & Strömsten 2009). They perform activities together with other actors (Lenney & Easton 2009), and base their activities on control over resources (Håkansson & Johanson 1992, 29). A relationship with the actor directly controlling the resource enables other actors to control indirectly the same resource (Håkansson & Johanson 1992, 30–34).

Actors employ resources when performing activities (Lundgren, 1992, 162). Activities occur when combining, developing, exchanging, creating (Håkansson 1987, 15), or integrating (Gummesson & Mele 2010; Cantù et al. 2012) resources. When resources are combined, they are connected to other resources (Gadde & Håkansson 2008) through resource ties (Lenney & Easton 2009). Resource development refers to changing the features of a specific resource (Gadde et al. 2012). Exchanges include the “day-to-day exchanges of a business, social or informational nature that occur between the firms” (Easton 1992, 8). New resources are created by confronting various resources (Håkansson & Snehota 1995, 14). Resource integration refers to incorporating an actor’s resources into the processes of other actors in intense and extensive interaction (Gummesson & Mele 2010; Cantù et al. 2012). These different activities can be linked in multiple different ways (Lenney & Easton 2009).

Interaction is a substantial feature of the ARA model, and a multidimensional process (Kalsaas 2011). Interactions constitute the dynamic aspects of relationships (Easton 1992, 8). In networks, interaction comprises three layers: the web of actors, the particular pattern of activities, and the constellation of

resources. In addition to being part of the interaction process, each of these layers is modified and shaped in the interaction (Kalsaas 2011).

The Interaction and Network Approach maintains that resources have no given features; rather, their features emerge in interaction with other resources in relationships (Harrison & Håkansson 2006; Baraldi et al. 2012). Resources are inherently dynamic and can always be employed in new combinations within one relationship or several relationships (Baraldi et al. 2012). Håkansson and Snehota (1995, 132) note: "No element without known use is a resource and the value of resources lies … in their use potential." This necessitates that producers and users interact and develop usages for resources through resource combinations (Håkansson & Snehota 1995, 132; Baraldi et al. 2012).

Resources are more difficult to substitute when they have several strong resource ties (Håkansson & Snehota 1995, 139). The existing resources are themselves a result of systematic combining. Replacement of one resource for another can, therefore, create reactions at several related resource interfaces (Waluszewski & Håkansson 2007, 17–18).

Complementary resources have been widely discussed in connection with strategic partnerships, such as innovation partnerships (e.g., Dyer & Singh 1998; King et al. 2003; Miotti & Sachwald 2003). Current research suggests that firms form relationships to gain access to complementary resources (Harrison et al. 2001), and that complementary resources are the key advantage gained from partners (Dyer & Singh 1998). Also, the Interaction and Network Approach states that resource complementarities can be the reason for relationship formation (Easton 1992, 9). However, it also suggests that value can be obtained from resource combinations only over time. Resource ties take time to develop as they need experimentation and learning. Therefore, a radical short-term change in resource collection is difficult to achieve. Furthermore, the value obtained from resource combinations depends on their use, which evolves over time (Håkansson & Snehota 1995, 134–138, 144–146).

Figure 3 summarizes the relation between actors, resources, and activities in networks based on the Interaction and Network Approach and resource-advantage theory.

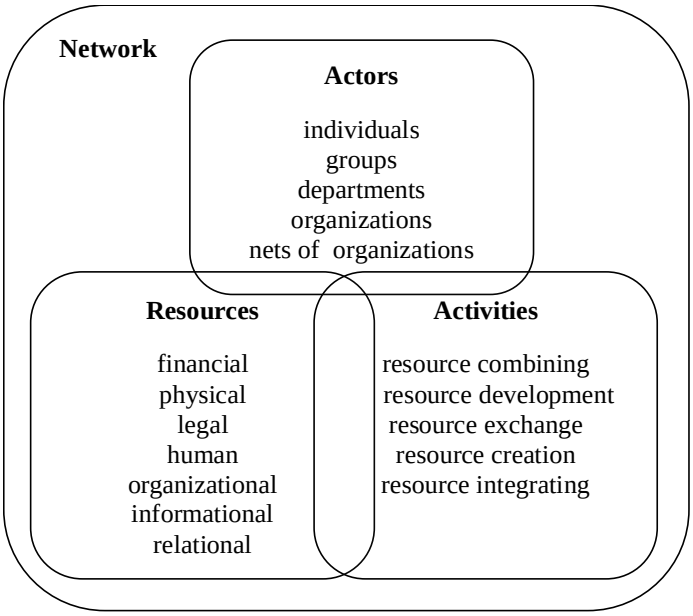

Figure 3 Relation between actors, resources, and activities in networks

In figure 3, the key components of the networks, that is, actors, resources, and activities, have been taken from the Interaction and Network Approach. Actors can be individuals, groups, departments, organizations, or nets of organizations. Resource categories have been adopted from RA theory. They can include financial, physical, legal, human, organizational, informational, and relational resources. Actors control resources and perform activities by combining, developing, exchanging, creating, and integrating resources in interaction. Resources gain their value only when they are combined in interaction between network actors.

2.2 Resources and resource providers in networks for service innovation

The extant research suggests that the lack of necessary resources is the key driver for firms to establish relationships for service innovation (Goes & Park 1997; Tether 2002). However, the service innovation and development literature has focused to date on studying the role of different actor types in innovation (e.g., Lievens & Moenaert 2000; Smith & Fischbacher 2000; Alam 2002; Love & Mansury 2007; Tether & Tajar 2008), instead of taking a resource perspective. Research on service innovation, however, provides some indication of resources that the actors share and integrate.

Knowledge that customers provide for service innovation has gained some attention in research. Gordon et al. (1993) suggest that multiple ways of gathering customer knowledge positively influence the service innovation process. Blazevic and Lievens (2008) found that knowledge co-produced with customers can contribute to all stages over the innovation process. Customers can be active informers, and provide information and feedback on problems they have encountered with services. Customers can also suggest and provide solutions to problems; for example, in virtual communities and online groups. According to He and Wong (2009), knowledge-intensive service firms which participate in their business clients' innovation processes also employ that knowledge in their own service innovation.

Knowledge resources are discussed also in connection with other network actors in service innovation. According to Leiponen (2005), firms that source knowledge from competitors introduce completely new services more often than others. Goes and Park (1997) come to the same conclusion in their study on hospital cooperation. Koch and Strotmann (2008) found that innovation of radical knowledge-intensive services necessitates knowledge from universities and research centers. They further suggest that knowledge provided by suppliers significantly enhances innovation if the cooperation is based on formal commitments. Contradictory findings, however, also exist regarding the role of external knowledge in service innovation. Elche-Hetelano (2011) found that knowledge coming from customers and suppliers can even decrease service firms' innovation intensity.

The extant research has explored knowledge also in connection with cross-functional teams. Hu et al. (2009) suggest that active knowledge sharing inside an innovation team clearly increases service innovation performance. Leiponen (2006) found that tacit, collectively held knowledge leads more probably to completely new services, while explicit collective knowledge mostly leads to service improvements. Relying only on individual tacit knowledge can, however, prevent innovation.

In addition to knowledge, the extant research also discusses ideas as a resource that can be shared between actors. Customers especially provide new ideas for service innovations. Magnusson (2009) explored how technology-based services might involve ordinary users in idea generation. Users were found to provide creative ideas, although they could not judge whether they were technically realizable. Involving users in the innovation process can, however, increase innovations' user-value (Magnusson 2003; Magnusson et al. 2003).

The extant research on service innovation hence indicates that firms exploit both internal and external relationships to access resources for service innovation. Research, however, predominantly refers to knowledge when discussing

resources that are shared and integrated in innovation. Furthermore, knowledge is typically described at a very general level that discloses little concerning the resource. The extant research has further paid some attention to sharing ideas in service innovation. Potential sharing and integration of other resources has not been the focus of the service innovation literature.

2.3 Resource access in networks

Networks have been emphasized as the means to access resources (Johanson & Mattsson 1987; Jarillo 1989; Håkansson & Johanson 1992, 29; Chetty & Wilson 2003). Håkansson and Johanson (1992, 375) define a network as "a specific structure which binds together actors, activities and resources in a certain pattern". A network comprises the relationships of a firm; for example, with customers, suppliers, competitors, and public actors (Chetty & Wilson 2003). As innovating requires the input of substantial heterogeneous resources (Greene & Brown 1997) that are controlled by a number of actors (Håkansson & Snehota 1995, 14; Oerlemans et al. 1998), networks that include a variety of actors are argued to be important for innovation.

The term "networking" refers to the ability to employ external resources systematically (Jarillo 1989). Networks act as sources of resources that an actor can acquire or mobilize. If the actor acquires resources, it internalizes them and takes over their control and risk (Coviello & Cox 2006). Networking provides the possibility also to access resources that the actors do not directly control (Jarillo 1989; Håkansson & Johanson 1992, 29) but which they might still employ under particular conditions. This is termed mobilization of resources (Lundgren 1992, 159).

The extant literature indicates that resource access strategy can depend on the nature of resources. Clearly specified and transferable resources can simply be acquired in arm's-length relationships that require only limited interaction (Lefaix-Durand & Kozak 2009). Some resources cannot, however, be transferred between organizations and individuals, but can be accessed and utilized only through mobilization. These resources include, for example, knowhow, market intelligence, and technology knowledge (Håkansson & Snehota 1995, 143).

Network relationships play a significant role in mobilizing resources. Håkansson and Snehota (1995, 136) note: "It is through relationships that different resources can be mobilized". Relationships enable access to both internal and external resources (Harrison & Håkansson 2006) that are otherwise not available to innovating firms (Powell et al. 1996). In service innovation, access to intangible resources that are embedded in organizational

structures and routines is particularly challenging (Håkansson & Snehota 1995, 143; Syson & Perks 2004).

As resources are relationship specific, mobilization of resources necessitates active relationships with actors who control them (Lundgren 1992, 160). Mobilization is thus defined as "the outcome of utilizing a company's relationships to move other actors … to work within the plans of the mobilizing company" (Mouzas & Naudé 2007, 62). Therefore, the focal firms have to first mobilize other actors and commit them to resource mobilization (Lundgren 1992, 160). Only then can the actual resource mobilization occur (Finch et al. 2012).

Actors can be mobilized by activating existing ongoing or dormant relationships, or initiating new relationships (Chou & Zolkiewski 2012). However, forming new relationships entails changes in a network. Therefore, seeking resources from new counterparts is considered more difficult than mobilizing resources within existing relationships into which some investments have already been made, and where the costs and benefits of collaboration are more apparent (Håkansson & Ford 2002). Established relationships that are characterized by trust and commitment between the actors facilitate resource mobilization (Eisingerich et al. 2009; Håkansson et al. 2009, 18).

Mobilization of resources is, in any event, challenging in a network because mobilization of resources and coordination of activities influence each other. Mobilization disturbs and disrupts coordinated activities. It can further change the existing resource structure in the network. Therefore, the network tends to oppose the mobilization process (Lundgren 1992, 163).

Furthermore, if an actor wishes to mobilize specific resources for a longer time, mobilization requires strong commitment from both parties (Glover & Parry 2005). Basically, mobilization only provides temporary access to resources (Glover & Parry 2005; Finch et al. 2012) as ownership does not transfer. Thus, only a long-term relationship enables continuous access to resources (Glover & Parry 2005).

On the basis of the extant literature, it is possible to draw a tentative framework of resource access through network relationships (see figure 4). The framework indicates that firms seek resources such as knowledge and ideas for service innovation through network relationships. These resources can be accessed through two principal resource strategies: acquisition and mobilization. These strategies call for establishing new or activating existing or dormant relationships in networks.

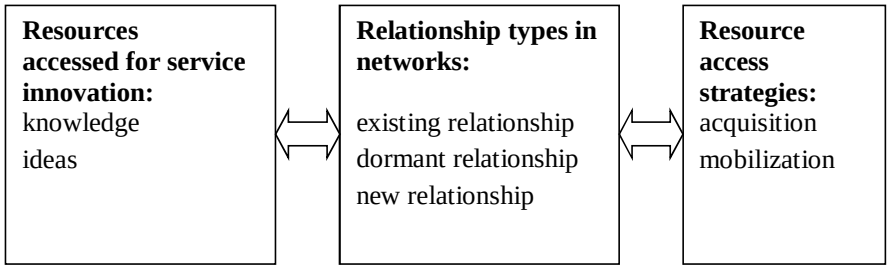

Figure 4 Tentative framework for resource access through network relationships

Empirical evidence on the relationships between resources, relationships, and access strategies is scant. Both the Interaction and Network Approach and the innovation literature discuss resource access through acquisition and mobilizing, although their focus is on actors or relationships. In the framework, the relationship types originate from the Interaction and Network Approach, and the service innovation literature provides some knowledge on resources that are sought from other actors. The role of the loose framework is to gather together the extant knowledge and to outline the key conceptual categories addressed in the empirical study.

2.4 Resource integration in networks

The Interaction and Network Approach connects resources closely to innovations. It traditionally emphasizes resource combining as a way to innovate. When resources are combined they are connected to other resources (Gadde & Håkansson 2008) through resource ties (Lenney & Easton 2009). This occurs when actors connect their resources in business relationships (Gadde & Håkansson 2008).

The combining of resources accumulates knowledge over time, and this can enable finding new, improved resource combinations (Håkansson & Johanson 1992, 33; Lundgren 1992, 158). As an actor's resources can be combined with other actors' resources in various ways, there are always opportunities for innovation (Håkansson & Ford 2002). A prerequisite for this is that the relationship between the actors evolves over a longer time period, and the parties manage to combine and recombine their resources (Gadde & Håkansson 2008). Resource combining that is based on business relationships can thus lead to an innovation. But it requires time, and innovation can be unanticipated and coincidental rather than planned and actively pursued.

The Interaction and Network Approach has also discussed a more target-oriented way of connecting resources. Actors might find new resource combinations when single new resources are systematically confronted with existing resources (Håkansson & Waluszewski 2002, 15; Cantù et al. 2012). In this process, resources gain specific characteristics (Håkansson & Waluszewski 2002, 15) as resource combining influences their features and value (Lind et al. 2012).

According to Håkansson et al. (2009), a coupling and matching process plays an important role in this kind of resource connecting. It is based on fitting a new resource with existing resources so that they are able to function as a resource constellation. Resources can be connected in multiple ways (Håkansson & Johanson 1992, 32–33) and, therefore, actors need to have knowledge on resource combining and usage. This knowledge is only partly explicit; that is, it can be only partly articulated and documented. Mostly, the knowledge on resource combining and usage is tacit, employee specific, and based on past experience (Håkansson & Snehota 1995, 14). Thus, one way of building new offerings is to fit new resources to existing ones until they form a functional constellation.

A more recent perspective on resource activities goes one step further. It applies the concept of resource integration, which refers to incorporating an actor's resources into the process of other actors (Gummesson & Mele 2010; Cantù et al. 2012). Resource integration thus includes more than merely connecting existing resources (Cantù et al. 2012). It is typically a result of intense and extensive interaction between the actors (Snehota 2011; Cantù et al. 2012). The more complex the solution, the more varied the set of actors resource integration requires (Cantù et al. 2012).

In resource integration, actors have a common target to create a solution that solves an actor's problem and achieves the desired goals (Cantù et al. 2012), which makes the actors strive for joint value creation. Resource integration aims to find a better match between resources, activities, and actors' processes. The idea is to find a match both within an actor and the network, or some group within it. In addition to contributing resources, this requires that actors should be able to advance matching between resources, activities, and processes, and contribute to the network's performance and evolvement (Gummesson & Mele 2010).

Figure 5 illustrates the key elements and activities in resource integration.

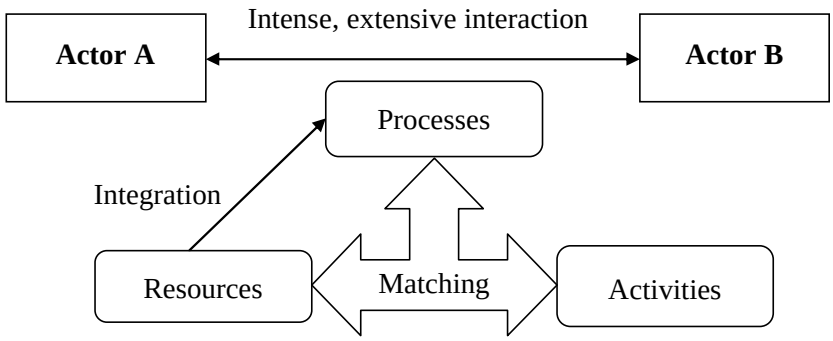

Figure 5 Tentative framework for resource integration

Resource integration follows the ARA model. Actors act in intense and extensive interaction with each other during resource integration. Actors incorporate their resources into the processes of other actors in a network. The number of actors that need to integrate their resources is connected to the complexity of the emerging solution. To increase the value of resource integration, actors are expected also to advance matching between resources, activities, and processes in the network and within each actor.

2.5 Summary of the theoretical framework

The key components of networks comprise actors, resources, and activities. Actors can be individuals, groups, departments, organizations, or nets of organizations. According to the extant service innovation literature, the focal actors especially approach other functions inside the firm, and also customers, suppliers, competitors, universities, and research centers for innovation. However, these studies are limited mainly to firm-internal innovation or strategic partnerships.

If the focal actors wish to access other actors' resources, they can activate existing or dormant relationships with those actors, or establish new relationships with them. They also need to make other actors act in accordance with their plans. This is referred to as the mobilizing of actors. However, according to the extant research, mobilizing existing relationships is less demanding and unpredictable than mobilizing new relationships. The extant literature, however, lacks more detailed knowledge on mobilizing relationships.

According to the extant research, resources can be categorized as being financial, physical, legal, human, organizational, informational, and relational. The service innovation literature, however, refers predominantly to knowledge and ideas as resources that can be accessed from other actors. Needed

resources can be accessed through acquisition or mobilization. Acquisition refers to an actor internalizing resources, and taking over their control and attached risks. Acquisition is possible only if the resource can be transferred from one actor to another. When the resource cannot be acquired, actors need to resort to resource mobilizing. The extant literature does not, however, provide much information on the ways to mobilize various resources, but is confined to noting that resources are mobilized through relationships.

The extant research suggests that innovations emerge through activities in which resources are employed. Resource combining (i.e., connecting resources in different ways in business relationships) can lead to an innovation over time. Such innovations are more likely to be coincidental than planned. However, actors can also systematically endeavor to fit new single resources to existing ones until they form a functional constellation. In this way, actors can develop the features of specific resources and create new resources. In this case, the potential innovation is more planned but seems to be based predominantly on trial and error behavior.

Recently research has, however, applied the concept of resource integration whereby actors have a common target to create a solution that solves an actor's problem and achieves the desired goals. This perspective clearly converges with the definition of resources in this thesis as elements that enable the effective development and production of a market offering, thus providing value to the customer and achieving set targets and expectations. Resource integration refers to incorporating an actor's resources into the process of other actors in intense and extensive interaction. Simultaneously, actors strive for better matching between their resources, activities, and processes. They are also expected to contribute to the network's performance and evolvement to achieve the goals. This idea is close to efficiency (i.e., developing the market offering in an economic way) in this thesis' definition of resources. However, the concept of resource integration lacks further clarification and empirical evidence.

Figure 6 provides a loose framework for interaction between actors for resources; that is, access and integration of resources in networks. It is constructed by combining the extant literature on resources, resource mobilizing, and resource integration. The current literature only provides superficial knowledge on these themes which manifests in various alternatives in the figure. The elements are placed into the ARA framework in the figure. The figure aims to provide a preliminary understanding on resource access and integration by sketching how resource access and integration might take place between actors on the basis of the extant research.

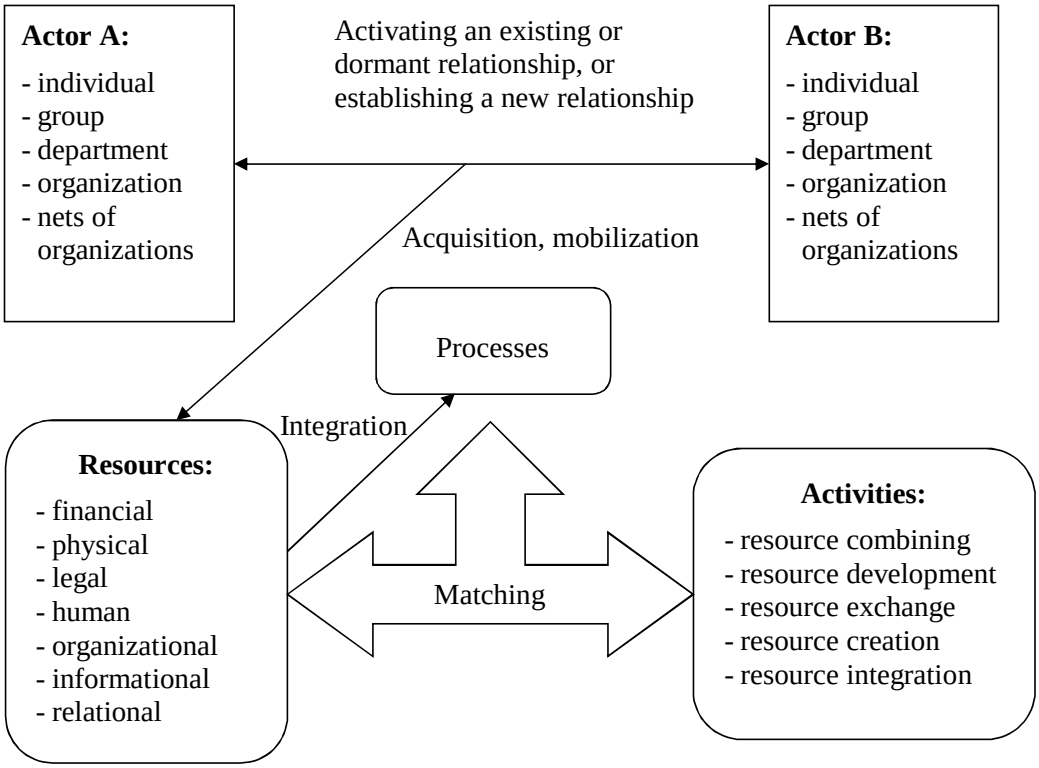

Figure 6 Rough framework for interaction for resources in networks

Figure 6 illustrates how, according to the current literature, interaction for resources first necessitates that the focal actor activates an existing or dormant relationship with another actor or establishes a new relationship with an actor in control of the required resources. Thereafter the focal actor might access the resources of the other actor through acquisition (i.e., by internalizing them and taking over their control and risk), or through mobilization (i.e., by having permission to employ the resources without taking over their control).

Resource integration refers to incorporating an actor's resources into the processes of other actors. Resource integration typically calls for intense and extensive interaction between the actors. In addition to contributing resources, actors aim to advance matching between resources, activities, and processes.

The loose framework suggests that the extant literature provides knowledge on resources, resource access and integration at a very general level. It fails to describe interaction for resources at a more detailed level. The relationship between resource access and resource integration also remains unclear. Furthermore, the extant service innovation literature provides scant knowledge on resources and interaction between the actors for resources.

3 RESEARCH METHODOLOGY

3.1 Philosophical underpinnings of the study

All research is premised upon a variety of assumptions (Mir & Watson 2000). As research is interpretive, it is guided by a researcher's set of beliefs concerning the world (i.e., ontology), the nature of knowledge (i.e., epistemology) and how it should be understood and studied (i.e., methodology), and the kinds of theory we think we can construct on it (Fleetwood 2005; Denzin & Lincoln 2008, 31). The interpretive paradigm defines the researcher's choices (Denzin & Lincoln 2008, 31).

This thesis takes the perspective of *constructivism* and the interpretivist paradigm (Gioia & Pitre 1990). It follows the perspective of relativist ontology, assuming that there are multiple realities (Riege 2003). The human world is different from the natural physical world, and therefore it needs to be studied differently (Patton 2002, 96). The concept of multiple realities can be understood in two ways. First, one universal reality exists behind everything. However, people categorize the raw material in different ways, and create different kinds of interpretation of the world (Lee 2012). Thus, realities are socially- and empirically-based mental constructions of individuals (Guba & Lincoln 1994; Riege 2003). Second, each individual creates a different world from the raw material (Lee 2012). Constructivism examines the multiple realities constructed by people (Patton 2002, 96).

Constructivism adopts subjectivist epistemology, taking the stance whereby actors jointly construct the social world. Therefore, meanings need to be understood within the context of social structures and systems. Meanings are linked to language and social interactions, and also roles, positions, and interactions within a social context (Edvardsson et al. 2011; Peters et al. 2013). Moderate constructivism assumes that community-based reality can be derived from empirical data (Järvensivu & Törnroos 2010).

The researcher and the informant co-create understandings (Lee 2012), and therefore the researcher actively participates in the research process. Reality is a social construction that is articulated as the result of human sense making. Social practices between the researcher and the informant are employed to help facilitate the construction of shared meaning (Peters et al. 2013). As social constructions are variable and personal, created knowledge and

understanding depend on the interaction between the researcher and informants (Guba & Lincoln 1994; Riege 2003).

Research based on moderate constructivist assumptions aims to create new knowledge from the empirical data that involves multiple perspectives. It acknowledges both the rational and social aspects of knowledge. Case studies based on interviews are typical means of conducting research under moderate constructivism (Järvensivu & Törnroos 2010).

Moderate constructivism adopts a research logic based on abduction, thus accepting that existing theory has the potential to improve the theoretical strength of case analysis. However, abduction also enables data-driven theory generation (Järvensivu & Törnroos 2010).

The interpretivist paradigm typically employs coding to discern patterns in the data. The aim is to establish categories and taxonomies, or interpretive schemas that lead to theory generation during further analysis. The theory generation process is typically iterative, cyclical, and nonlinear (Gioia & Pitre 1990). Moderate constructivism perceives that the purpose of case studies is to generate context-specific understanding. However, this does not exclude the possibility of also applying case study-based theories in other contexts (Järvensivu & Törnroos 2010).

3.2 Qualitative case study research

This study examines a real-life phenomenon; that is, interaction for resources in networks for service innovation, with the objective of identifying theoretical implications. This is achieved through qualitative case study research (Scholz & Tietje 2002, 9; Yin 2009, 2). Case studies are typically conducted when exploring networks and relationships as they provide the means with which to develop a multidimensional perspective on the phenomenon in a specific context (Järvensivu & Törnroos 2010).

Qualitative case study research is employed in this thesis as it enables exploration of interaction for resources by building understanding on the innovation processes together with various informants involved in innovation (Silverman 2006, 349; Pratt 2009). Understanding can be considerably deepened by combining the existing understanding with that of each informant. In this thesis, qualitative case study provides understanding on human interactions and processes that constitute real-life settings in collaborative service innovation (Gephart & Rynes 2004).

This research aims to build theory. The studied cases provide empirical evidence that is employed for the creation of theoretical constructs. The theory is emergent, which means that it develops when the researcher recognizes

patterns of relationships among constructs within and across the cases (Eisenhardt & Graebner 2007). This research addresses research problems within the constructivist paradigm, meaning that the research is based on "how" questions (Perry 2001; Yin 2009, 2).

Case study findings can be generalized when systematic data collection and analysis procedures are applied. Unlike quantitative studies that generalize to populations, case studies usually generalize to other situations (Yin 2012, 3, 6, 19). The goal is to extend theories by drawing an analytical generalization (Yin 2009, 15) whereby theorizing from one context-specific case study can be employed in analyzing other related contexts. Analytical generalization is thus applicable to a specific area, whereas formal theory is inherently more generic (Järvensivu & Törnroos 2010). The data collection and analysis procedure of this thesis is described in the following chapters.

3.3 Case design and selection

Case selection is the most important methodological decision during a case study (Dubois & Araujo 2007). When choosing the cases for this thesis, it was important that the phenomenon of interest (i.e., service innovation in networks) clearly existed in them (Stake 1995, 56; Dubois & Araujo 2007). Therefore, cases were chosen by employing purposive selection. The aim was to find rich cases that would have the potential to help fulfill the research objectives (Silverman 2006, 306; Dubois & Araujo 2007).

When the purpose of the research is to develop theory, cases are selected so that they enable theory building (Eisenhardt & Graebner 2007). They need to have spatial, temporal, and other concrete boundaries (Dubois & Araujo 2007; Yin 2009, 32). In this study, the empirical cases address the development of innovative technical services in inter-organizational and also intra-organizational collaboration. Employing the same type of informants across cases is grounded on the perspective that they more probably help to find comparable data concerning interaction for resources in networks for service innovation (Halinen & Törnroos 2005), and thus provide applicable data for theory building.

The service was to be designed in a network comprising at least three organizational actors (see Möller et al. 2005). The cases needed to be such that a pilot version of the service was available to enable a study on actual resource access and integration. It was necessary for the innovation process to still be under way in the chosen cases so that the informants could better remember the innovation process, and the cases could also be followed in real time.

In the context of network research, the case strategy refers to intensive study on one or a small number of networks in which multiple sources of evidence are employed to develop a holistic description of the networks (Halinen & Törnroos 2005). The empirical study of this thesis is based on multiple cases. According to Borghini et al. (2010), employing multiple cases is becoming increasingly common in case research. However, multiple cases are not chosen to increase the sample size in a conventional sense (Easton 2010). As case study research does not apply sampling logic, the typical criteria regarding sample size are irrelevant (Yin 2009, 58). Instead, multiple-case study creates more robust theory as it is more deeply grounded in varied empirical evidence. Multiple cases enable broader exploration of research questions and theoretical elaboration. In multiple-case studies, the choice of cases is based more on the contribution to theory development than on the uniqueness of a case (Eisenhardt & Graebner 2007).

This study applies the instrumental case study approach whereby the multiple cases provide an insight on the research question with the aim of reaching a broad understanding and a general conclusion on interaction for resources in service innovation (Stake 1995, 3; Gummesson 2003; Stake 2008, 123). This study includes two empirical levels; first, innovation is studied at the company level in three case companies. The second empirical level comprises a specific innovation project level where innovations occur in networks. This case study applies an embedded design as it has two levels of analysis (Eisenhardt 1989; Scholz & Tietje 2002, 9). The specific innovation projects in networks are part of the company-level cases (Perry 2001) – cases within cases (Stake 2008, 130). The innovation project cases are included in the empirical study as they add significant opportunities for extensive analysis, enhancing insights on the company-level case (Yin 2009, 52). In this thesis, they enable study on the process of the given innovation projects from the perspective of multiple informants in the networks. Remaining only at the company level would have prevented going deeply into the innovation process and interaction for resources in the network.

The three case companies Alpha, Delta, and Gamma had established new business strategies because of increasing competition and changes in customer behavior. The implementation of these strategies called for collaborative service innovation. One or two of the case firms were involved in the five innovation projects in networks. Table 3 provides information on the case companies and studied innovation projects in which they participated.

Table 3 Overview of the case companies and service innovation projects

Firm	Alpha	Delta	Gamma
Industry	Construction, maintenance, and professional services within the energy, telecoms, and manufacturing sectors.	Engineering, design and consultancy services within the energy industry, traffic infrastructure, manufacturing industry, civil engineering, and the environment.	Technical trading and life-cycle services for equipment and machinery.
Number of employees in 2011	3,300	1,400 (subsidiary)	165
Turnover in 2011	€405 M	€103 M (subsidiary)	€96 M
Operating range	North Europe	Finland	Finland
New service development strategy	Alpha's target was to become a service integrator and take increasing responsibility for their customers' businesses. This called for service innovation in both intra-firm and inter-firm networks.	Delta's target was to provide and manage large service entities. This required development collaboration, primarily between various internal units but also with external partners.	Gamma's target was a change from a mere machine supplier to a provider of life-cycle services. For this purpose, Gamma sought service development partners.
Service innovation projects addressed in this study	Resource management system (IT). Service portfolio for wind power construction and production.	Service portfolio for wind power industry. Foundation solutions for wind turbine towers.*	Automation solutions for the mechanical engineering industry.

*Both Alpha and Delta participated in the same innovation project.

Alpha, Delta, and Gamma were chosen as the case companies because they had some experience of finalized collaborative service innovation projects, and all had ongoing innovation projects in networks. The companies were thus chosen for this study as they were considered suitable for the research purposes. The author of this thesis had no prior relationship to any of the firms

in the empirical study. All three firms emphasized the culture of collaborative innovation. Altogether, 16 service innovation networks could be identified in the studied companies. Alpha participated in ten networks, and Delta and Gamma each in three.

From those development projects, five were chosen for further investigation as they fulfilled the criteria set for the empirical cases. They were selected to provide rich and versatile data on interaction for resources in service innovation. Figure 7 shows the position of the innovation projects in a line illustrating the newness of the innovations. As various types of innovation could occur within the projects that aimed to find new extensive solutions, the position of each project in the figure shows the average type of innovation rather than the absolute location of the project.

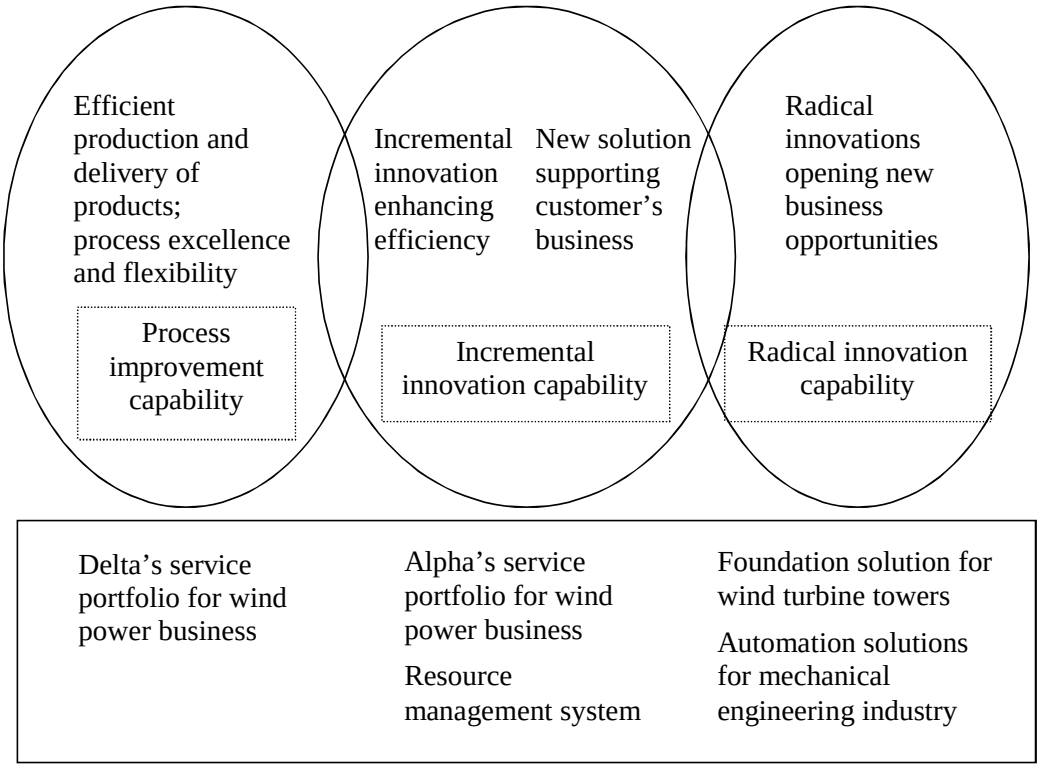

Figure 7 Innovation projects according to newness of innovation (modified from Möller et al. 2005)

The two wind power service cases and the solution for wind turbine foundations represent service innovation in an emergent business field. Delta's

service portfolio for the wind power industry is predominantly developed in various business units within the company, but also with foreign sister companies and knowledge-intensive service firms. The aim is to build a total package comprising a variety of existing engineering and design services for the wind power industry. Delta's service portfolio development represents process excellence and flexibility that calls for a process improvement capability. However, it simultaneously provides a new solution that supports customers' businesses and also necessitates capabilities for incremental innovation (Möller et al. 2005). The service portfolio can be characterized as an architectural innovation that bundles existing services, and also an innovation in processes and organization of existing services (Gadrey et al. 1995).

Alpha's service portfolio for wind power construction and production is developed both inside the firm in various business units, and with suppliers, consultants, and university students. The project includes existing suppliers to Alpha and a new consultant. Alpha listens carefully to potential customers during service development; however, customers play a minor role in the actual development. Alpha innovates new services for the wind power field and modulates them in various service modules. The aim is to build further a coherent process within and between the modules.

Alpha's wind power service portfolio provides a new solution that supports customers' businesses. This demands incremental innovation capability (Möller et al. 2005). Development of the service modules is not directly connected to existing customer projects but, rather, occurs proactively before any wind power projects commence in Finland. The service portfolio can be further characterized as an architectural innovation that bundles existing services, and also an innovation in processes and organization of existing services (Gadrey et al. 1995). Inside the portfolio, a radical innovation (de Brentani 2001; Gallouj 2002a, 72) also occurs (i.e., the wind power portal).

The resource management system case represents a tailored, large software solution in which the customer, Alpha, plays an active role both in development of the solution and management of the project. The resource management system is initiated by Alpha, and comprises several sub-systems. The project includes a number of software and IT solution suppliers that are, to some extent, also competitors. They are new suppliers to Alpha. This resource management system case deviates from typical IT system projects as, in the project, one of the software firms is innovating a new web-based software product for markets.

The resource management system represents a new solution that supports the customer's business and enhances its efficiency, and mainly demands capabilities in incremental innovation (Möller et al. 2005). It can be characterized as an ad hoc innovation (Gallouj 2002a, 20) because it is based on the

problem expressed by the customer, and is produced at the client-provider interface during the service delivery process. It includes a radical innovation (de Brentani 2001; Gallouj 2002a, 72), that is, the asset management system, and incremental innovations (Gallouj 2002a, 74-75); for example, the enterprise resource system (ERP).

Foundation solutions for wind turbine towers formed a new field of business for the fastening technology firm. The firm innovated a new kind of onshore foundation together with two consultants, of which Delta is the main consultant with a new relationship to the fastening technology firm. The first foundation prototype was tested and further developed together with the new customer, Alpha. At the same time, services concerning the foundation were developed so that the foundation could be provided as a total solution. The foundation solution represents a radical innovation that opens new business opportunities (de Brentani 2001; Gallouj 2002a, 72; Möller et al. 2005), and calls for capabilities in radical innovation (Möller et al. 2005).

The automation solutions project was initiated when Gamma and a robot systems supplier concluded a partnership without a previous relationship. Their aim was to innovate a standard robotics solution for SMEs that cannot afford typical customized robotics solutions. Soon afterwards, a public research center joined the project and, later, together with Gamma and the robot systems firm, a business consultant developed an extensive service concept around the machine. Potential customers did not participate in the development of the solution.

During the robotics solution development, an invitation to tender by a foreign large customer made the partners join forces with a laser technology firm that they previously knew; together, they were chosen to develop a new-to-the-world automation solution. The automation solutions represent radical innovations that provide new business opportunities (de Brentani 2001; Gallouj 2002a, 72; Möller et al. 2005), and call for capabilities in radical innovation (Möller et al. 2005).

3.4 Process research

This study applies process research when studying the five innovation projects in networks. Process research studies how events emerge and evolve over time in a context (Halinen et al. 2012). Process research enables exploration on the innovation process in networks, and thereby interaction for resources between the actors in networks at various times. Studying the cases longitudinally provided such knowledge on interaction for resources that could not have been acquired if they had been studied only at a particular point in time. The con-

nection between resources, relationships, and activities at various times, and also events that provided understanding on challenges in resource activities, could be revealed only through longitudinal study. All the innovation project cases were studied in parallel as their purpose was to complement the company case data and provide rich data for theory development purposes rather than enable cross-case comparison or to supplement another case.

Time is always part of network research as the networks undergo constant change. Therefore, to increase validity of the case descriptions in this study, the concept of time is considered (Aaboen et al. 2012) when describing the innovation processes in networks. Nevertheless, gaining a deeper understanding on processes can be challenging as the concept of time is multi-faceted in research. The meaning of events is constructed through their human connection to past, present and future events. This calls for human interpretations of events, on which the event–time network is socially constructed (Halinen et al. 2012).

Constructivism follows the perspective that time is understood in multiple human ways, which are bound to the culture, organization, and personal aspects of the entity. Time periods provide important means for humans to address the flow of time (Halinen et al. 2012), and the innovation processes in this study were also constructed in many respects on the basis of different time periods. When the human time perspective is incorporated into network research, networks are perceived "as sites of continuously evolving interactions performed by individuals on behalf of companies" (Halinen et al. 2012, 217). This calls for perceiving human interaction as the primary driver of network processes (Halinen et al. 2012).

Network processes can be divided into weak and strong processes. Studying the weak process of a network refers to exploration on the network as a changing entity over periods of time; various events and contingent forces that influence the process are of interest. When the focus is on the strong process of the network, attention is drawn to emergent processes of networking whereby the web unfolds through the actors' interactions. Here, networks are regarded as constantly forming, and time is considered as a flow towards the future (Halinen et al. 2012).

When human time is combined with the concept of weak and strong process, researching the network process can occur through flow mapping, sequential mapping, or point mapping. These three methodologies differ in their utilization of human time notions. Flow mapping takes the perspective of a strong process, and requires the constant real-time presence of the researcher in the process. Point mapping is based on the idea of the weak process. Here the process is studied from a distance, utilizing informants' accounts of the past or the future (Halinen et al. 2012).

This study applied sequential mapping, which is considered a powerful process method for constructivist network research. Sequential mapping studies events through both periods and flow of time, thus acting between strong and weak processes. The innovation processes were followed both retrospectively and in real time. Data were thus collected by exploring what had happened and what was currently happening in the five innovation projects (Halinen & Törnroos 2005).

Sequential mapping enables the choice of one or several periods for data collection (Halinen et al. 2012). This study collected data at intervals of approximately a year between 2010 and 2012. For a period, the duration of data gathering was approximately one month in each case.

Process research in networks provides challenges for the researcher. Networks comprise individuals, firms, relationships, and nets. The researcher can fully understand the process only by studying interaction at all of these levels (Halinen et al. 2012); this study has endeavored to consider the various levels. Another challenge is that a variety of processes evolve in parallel (Halinen et al. 2012). These challenges became especially visible when constructing the case descriptions. Although the idea was to provide a straightforward chronological description of cases, multiple simultaneous processes impacted this aim.

3.5 Abductive strategy

The link between theory, empirical phenomena, and method is argued to have a special importance in case research as a case study can be conducted in various ways (Dubois & Gibbert 2010). In this study, a close link was formed by applying an *abductive approach* (see figure 8), which is often employed in research that adopts the moderate constructivism paradigm (Järvensivu & Törnroos 2010).

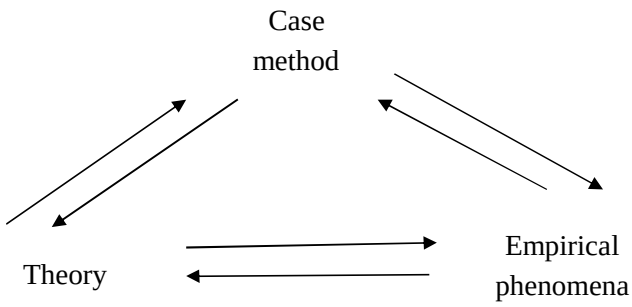

Figure 8 Three dimensions of research (Dubois & Gibbert 2010)

The abductive approach takes advantage of the flexibility provided by the case method (Dubois & Gibbert 2010), and aims to develop understanding on a given phenomenon, and at theory development (Kovacs & Spens 2005). As such, it enables the redirection of theoretical and empirical perspectives over the research process (Dubois & Gibbert 2010). An abductive way of producing knowledge thus lies in the middle ground between induction and deduction. It deviates from induction by accepting existing theory as a way to improve the theoretical strength of case analysis. However, unlike deduction, the abductive approach also enables a less theory-driven research process that focuses on data-driven theory generation (Järvensivu & Törnroos 2010).

The abductive approach fits especially well with qualitative case research, which is inherently an iterative process. The abductive research process comprises constant iteration back and forth between the research steps (Eisenhardt 1989). In abductive reasoning (Kovacs & Spens 2005), abduction is based on matching, which refers to going back and forth between the theoretical framework, data sources, and analysis (Dubois & Gadde 2002). Theory matching calls for seeking suitable theories to empirical observations (Kovacs & Spens 2005). Iterations between and the final matching of the empirical and theoretical domains are characteristic of abduction (Dubois & Gibbert 2010). Four factors affect the abductive research process: what happens in reality, the available theories, a case that gradually evolves, and the analytical framework (Borghini et al. 2010). This constitutes one of the foundations of systematic combining (Dubois & Gadde 2002).

Although, in general, the research process is abductive, the amount of abduction can vary over the process. At some point, the research can be abductive in a pure sense, and in some other phases it might apply more induction or deduction (Järvensivu & Törnroos 2010).

Figure 9 presents a framework for abductive research process.

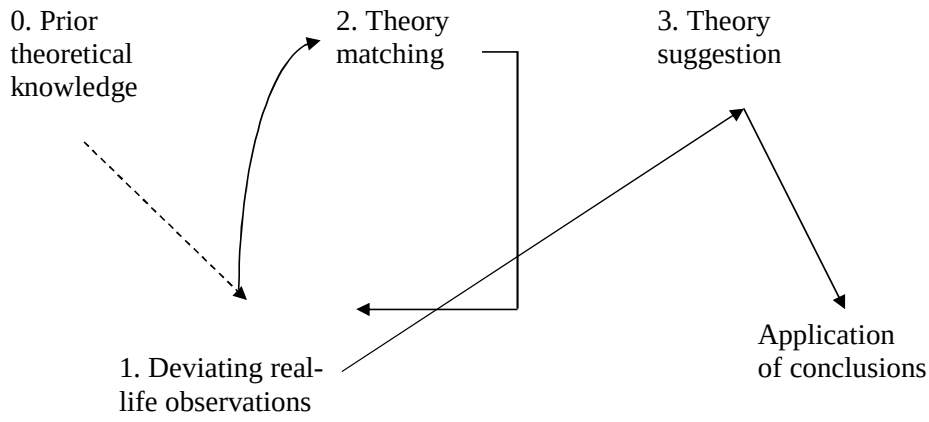

Figure 9 The abductive research process (Kovacs & Spens 2005)

Figure 9 shows how, at the beginning of an abductive research process, the researcher can start with theoretical knowledge or real-life observations (Kovacs & Spens 2005). In this study, the various literature connected to service innovation and development, product innovation, networks, and resources were consulted before starting any empirical research. Familiarization with the various literature thoroughly enabled research gaps to be found and informants to be asked questions that helped to fill the gaps. This phase lasted for approximately two years.

The model suggests that even if the literature is consulted before empirical research, abductive reasoning begins at the time when a real-life observation does not match prior theories (Kovacs & Spens 2005). In this study, this refers especially to lacking theory on interaction for resources in service innovation networks, and to conflicting perspectives in the literature on resources, relationships, and networks.

This observation is followed by a creative iterative process of theory matching and systematic combining. The aim is to find a new matching framework or to extend the theory employed prior to the observation. The researcher can also consciously apply a new theory or framework to an existing phenomenon. This aims at understanding the phenomenon and suggesting new theory (Kovacs & Spens 2005).

In this study, the empirical data collected at the case company level led to the first version of the theoretical framework, which focused on resources, actors, and resource access. This theoretical part was modified when the results of the data became available. The modified theory and the results guided the interviews in the second study phase that occurred at the innovation project level.

When analyzing the results of the second study phase, resource integration played an important role in addition to resource access. At this point, the idea was to build a more comprehensive perspective on interaction for innovation resources through combining the various literatures that partially explained the phenomenon. The analysis of the empirical data was, however, challenged by conflicting theoretical perspectives. This resulted in adopting the IMP Group's Interaction and Network Approach as the main theoretical approach (see chapter 2).

Understanding on the phenomena gradually deepened and new findings were discovered until the research process ended. Similarly, the theoretical background framework was modified until the end of the research process. Creation of a single theoretical framework (figure 6) proved to be challenging when interaction for resources was considered a process in the study. However, it is available in the final version of this thesis, although it only enables a preliminary understanding on resource access and integration to be gained.

3.6 Data collection

This research focuses on socially constructed reality (Gephart & Rynes 2004, 454–455), which means documenting the phenomena from the perspective of the studied people (Silverman 2006, 44, 56, 201). In this study, case study data were collected longitudinally in two phases. In the first phase, the data collection focused on service innovation in the three case companies at a general level. A preliminary understanding on resource access and innovation collaboration emerged during this phase. Also, the innovation projects in the second study phase had already, to some extent, been discussed in the first study phase; however, the selection of the embedded cases occurred only later.

In the second study phase, the study focused on the embedded cases, five specific service innovation projects in networks. Data collection was extended to cover several companies and organizational units that participated in the developmental work. In addition to providing rich data on the innovation process from multiple perspectives, involvement of several network actors helped to increase the validity of the case research (Borghini et al. 2010) by ensuring that various members in the networks had the opportunity to be heard (Järvensivu & Törnroos 2010).

As the research included multiple cases and studied a strategic phenomenon (i.e., innovation), interviews comprised the primary data source (Eisenhardt & Graebner 2007). However, other data sources were also consulted over the research process. In accordance with the constructivist perspective, multiple data sources were, however, not the means to validate knowledge, as valid

knowledge cannot be defined universally (Järvensivu & Törnroos 2010). Each data source helped make the phenomenon visible in a different way, and provided more in-depth understanding on the focal phenomenon (Denzin & Lincoln 2008, 5, 7).

In addition to conducting interviews, the researcher participated in five service business development workshops, in which the three case companies and some other informant firms and organizations were involved. Further, the researcher visited two workshops that were arranged for wind power and vibration metering development at Delta. During the empirical research process, the Internet pages of the case companies and other network firms provided valuable information on the companies and their services, projects, and cooperation. The researcher also studied a large amount of news articles on the case firms and their business field, which provided, for example, a broad picture on the wind power business in Finland. A wind power seminar was also available via the Internet.

This thesis applied qualitative interviewing (Warren 2002, 83). The interviews were conducted in the form of guided conversations (Yin 2009, 106). Similar to a conversation, every interview was newly constructed. Each conversation was unique; the researcher matched the questions to the respondents' experience and expertise (Rubin &Rubin 2005, 4, 12).

Qualitative interviewing is inherently open-ended and exploratory, and aims to elicit details and get deep into experiences (Warren 2002, 86). This enables the capture of different perspectives according to the principles of constructivism (Patton 2002, 97–98). Qualitative interviewing can be employed to describe various events and processes. The interviewer seeks depth, detail, and richness in interviews, which is also termed "thick description" (Rubin &Rubin 2005, 5, 13). Therefore, interviews were based on three kinds of question: main questions that guided the conversation, probes to clarify answers or request further examples, and follow-up questions that pursue the implications of answers to the main questions (Warren 2002, 86-87).

The interviews included questions on the facts of a matter such as network structure, opinions on various events over the innovation process, and insights on particular occurrences (Yin 2009, 107). Thus, interviews were based on obtaining interviewees' interpretations of their experiences along the innovation processes, and their knowledge and understanding on the innovation projects in which they worked (Rubin &Rubin 2005, 36). This enabled the limitation of bias in data collection (Eisenhardt & Graebner 2007).

The interviews in the first study phase were conducted in the three case companies Alpha, Delta, and Gamma by a group of researchers between January and September 2010 (see table 4). The researchers worked in a research program for pioneers in service business that was arranged and financed by

Tekes, the Finnish Funding Agency for Innovation. The three case companies participated in the program. First, CEOs and R&D managers or coordinators were interviewed to gather an overview on the firms' service innovation activities. Second, key actors involved in service innovation were approached. All interviews were conducted in Finnish.

Interviews followed a thematic guide including topics such as the company's service development practices and experiences, cooperation with intra-firm and external actors, and practices and experiences in cooperation for service innovation (see Appendix 1 for the outline of interview questions). Altogether, 32 interviews were conducted. The interview guide was employed very flexibly depending on the informant's position in the company and knowledge on the studied topics. Interviews were complemented with background information on the companies by visiting their Internet pages, and reading articles and press materials.

Table 4 Interviews conducted in the first phase in the three case companies

Company	Interviewees' positions	Date of interviews	Number of interviews	Total n=32
Construction, maintenance and professional services provider (Alpha)	Country manager, account manager 1, supply director, head of supplies	2/9/2010	4	
	Business development director 1, R&D manager, business unit (BU) director	2/15/2010	3	
	Divisional director 1&2, business development director 2, marketing and customer relationship management (CRM) director, account manager 2	2/18/2010	5	
	Account manager 3, business area director, R&D director	2/19/2010	3	15
Engineering firm (Delta)	R&D coordinator 1&2	1/28/2010	2	
	Business area director 1, BU director	2/17/2010	2	
	Business area director 2	2/24/2010	1	
	Business area director 3&4	3/4/2010	2	
	Project manager	9/20/2010	1	8
Technical trading firm (Gamma)	Sales manager 1&2, after sales service manager	2/1/2010	3	
	Service engineer	2/2/2010	1	
	Group president, CEO, marketing specialist	2/11/ 2010	3	
	Divisional director, maintenance specialist	8/20/2010	2	9

Interviews in the second study phase were conducted by the present author between November 2011 and December 2012 (see table 5). Altogether, 25 interviews were conducted in the five innovation projects (see Appendix 2 for the outline of interview topics). Five interviews were conducted in the resource management system case, five interviews in the service portfolio case for the wind power industry at Alpha, four interviews in the foundation solution case, six interviews in the automation solutions case, and five interviews in the service portfolio case for the wind power industry at Delta.

Informants comprised project managers, suppliers' and consultants' representatives, customers' representatives, and innovation partners. The researcher

ensured that specific topics of interest – resources, various network members, and the innovation process from the resource perspective – were discussed during the interviews; however, the informants were allowed to freely describe their insights on those topics.

Table 5 Interviews conducted during the second phase in the companies collaborating on service innovation

Case	Company	Interviewee's position	Date of interview	Number of interviews per case Total n=25
Resource management system	Construction, maintenance, and professional services provider (Alpha)	Business development director/head project manager	12/12/2011	5
	IT business solutions firm A	Business area director	2/28/2012	
	IT business solutions firm B	Project manager	1/25/2012	
	IT business solutions firm C	Project manager	1/13/2012	
	IT business solutions firm D	Project manager	1/16/2012	
Service portfolio for the wind power industry at Alpha	Construction, maintenance, and professional services provider (Alpha)	Business area director, wind power	11/25/2011* 12/11/2012*	5
	Alpha	Sales manager	9/4/2012	
	Engineering firm B	Divisional director	1/24/2012	
	Wind power producer	CEO	1/24/2012*	
Foundation solutions for wind turbine towers	Engineering firm A (Delta)	Project manager	12/12/2011*	4
	Technology firm	Technology director	1/30/2012	
	Construction, maintenance, and professional services provider (Alpha)	Business area director, wind power	11/25/2011* 12/11/2012*	

Automation solutions for the mechanical engineering industry	Technical trading firm (Gamma)	Business area director	12/2/2011	6
	Robotics systems firm	Senior Vice President	12/16/2011	
	Robotics systems firm	Project manager	12/3/2012	
	Laser technology firm (later production systems firm)	Divisional director	2/1/2012 12/13/2012	
	Production systems firm	Project manager	2/1/2012	
Service portfolio for the wind power industry at Delta	Engineering firm (Delta)	Unit director	1/30/2012	5
	Delta	Team coordinator	2/1/2012	
	Delta	Project manager	12/12/2011*	
	Delta	Wind power specialist	9/3/2012	
	Wind power producer	CEO	1/24/2012*	

* Same person interviewed for two projects in a single interview

As the innovation projects had already, to some extent, been discussed in the first study phase, the interviews were based on the data of that study phase. First, the project manager of each innovation project in the three case companies was interviewed. Based on the knowledge obtained, other informants were selected and approached. The subsequent interviews were always built on the earlier interviews in each innovation project. This provided cumulative knowledge and various perspectives on the innovation processes.

Most of the interviews were conducted face-to-face at the respective company's premises, and a couple of interviews were conducted by phone. The interviews lasted between 50 and 150 minutes. Each informant was interviewed once during the first study phase. Managers who were responsible for innovation projects in the case companies were interviewed both in the first and second study phases. In the second phase, some of the project managers were interviewed twice, while other respondents were interviewed only once. Interviews were audio recorded and transcribed verbatim. Informants spoke very openly, and the atmosphere became relaxed after the first few minutes of each interview.

3.7 Data analysis

Qualitative research is characterized by data collection, analysis, and interpretation, in part, occurring simultaneously, and tentative conclusions already being drawn during the interviews (Gummesson 2005). Thus, there was no particular moment when this study's data analysis began. Analysis included the first impressions made in interviews and workshops, and also when writing the final results (Stake 1995, 71). Texts had three main functions in the data analysis of this study. The findings are based on transcribed interview data. Texts are similarly central when presenting and communicating the findings (Flick 2002, 29).

This thesis follows Scholz and Tietje (2002, 30–31) by organizing the case analysis at three levels – Verstehen, Begreifen and Erklären – which are linked to different qualities of knowledge. At the first level, "Verstehen" (i.e., understanding), there is the case as a whole. In this study, this level represents collaborative innovation in the three case companies and the five innovation projects. First, the researcher develops an encompassing and empathic case understanding. At this stage, understanding is mainly based on feelings, pictorial representations, and intuitive comprehension. This enables the discourse to be broken down from general to particular issues.

At the second level, "Begreifen" (i.e., comprehending), there is a conceptual model of the cases. The holistic perspective of the first level is thus changed to one of a system or model. This calls for a more valid case understanding, which is acquired by methods of knowledge integration (Scholz &Tietje 2002, 31). In this study, this phase resulted in the case descriptions provided in chapter 5. A description of each case was necessary to reveal the interaction for resources in the innovation process inside the networks (Halinen & Törnroos 2005).

A large number of retrospective and real-time interviews with managers who were directly involved in the innovation projects of various firms enabled the researcher to construct the innovation process from the beginning to the point when the innovated service was launched (see chapter 5). A thorough description also requires effective means of presenting and displaying the data in the form of illustrative figures and schemes (Halinen & Törnroos 2005). The evolution of networks is illustrated through figures (see chapter 5) that provide further understanding on the innovation process and the actors involved in the empirical cases.

The third level, "Erklären" (i.e., revealing), includes data employed in analyzing the results. Two types of data are applied: data from the company cases and innovation project cases, and data from existing scientific knowledge (Scholz & Tietje 2002, 31). As this study represents an instrumental case

study, in which the cases serve to help understand the phenomena or relationships within them, data were next categorized (Stake 1995, 77). Research questions and the related literature provided the guidelines for data analysis (Marshall & Rossman 2006, 153, 156).

As this study was conducted at two levels, first, the case company level that studied collaborative innovation in the companies in general and, second, the innovation project level that studied interaction for resources in the networks, data were organized in two ways. This also served the analysis of the data as the research questions called for two kinds of data organization. The data of the first and second study phases were coded employing NVivo10 qualitative data analysis software.

Data analysis began with an initial coding and categorization procedure. The research questions guided coding and creation of categories from the beginning. They led to start the coding and categorization from various resources that networks provided for innovation, and actors who provided them. In the initial coding, resource-advantage theory (Hunt 1997b) provided the general framework for categorization of resources, and actor categories were adopted mainly from the new service development literature. Hunt and Morgan's (1995) resource categories provided a good basis from which to analyze various resources in service innovation.

Next, relationships between the two categories, actors and resources, were sought. The literature on resource acquisition and mobilizing provided the theoretical understanding for this phase. The results garnered from the embedded service innovation cases confirmed and also enriched the findings from the single company interviews in the first study phase. Adding the perspectives of other network actors significantly strengthened the empirical evidence. The five innovation project cases considerably increased empirical evidence for data analysis, especially for the study on research questions two (i.e., how do actors access innovation resources in networks?) and three (i.e., how do actors integrate resources for service innovation?).

After the second study phase, case descriptions were written on the basis of interviews that were conducted longitudinally in the five innovation projects. Case descriptions enabled organizing the large data into coherent accounts on the course of the innovation processes. This enabled analysis on how actors access and integrate resources over the innovation process. It further showed which actors are involved in resource activities, and how they interact with other actors along the process. Case descriptions also provided knowledge on challenges and critical incidents in resource creation, and how they emerged.

According to the principles of qualitative research analysis, data were compared with data, with existing theory, and with results from previous research (Marshall & Rossman 2006, 156). The empirical results led to

modifying the theoretical part, and these modifications further led to scrutinizing the data with improved lenses. The theory-building process occurred via recursive cycling among the case data, emerging theory, and the extant literature (Eisenhardt & Graebner 2007).

4 EMPIRICAL CASES

4.1 Descriptions of the focal companies

4.1.1 Description of case company Alpha

Alpha is a multinational group delivering construction and installations, maintenance, operation, and management services within the energy, telecommunications, and industrial sectors in Finland, Sweden and the Baltic countries. Alpha was founded in 1998, and has since expanded primarily through a number of firm acquisitions. The company's turnover was 405 million Euros in 2011, and the personnel totaled 3,300. Its operations are decentralized to several locations. Its largest customers include telecom operators, energy production companies, grid companies, and paper mills.

Previously, Alpha had mainly acted as a service contractor to its customers. Lately, as it acted in a challenging business environment, Alpha decided on a new strategy. Alpha's business was very labor-intensive, and there was a constant need to cut costs and, due to strong competition, also to provide more added value to customers. Alpha's new strategy was to become a service integrator and, as their strategic partner, increasingly to take more responsibility for the businesses of their large customers. Alpha's service promise was to assist customers to develop their competitiveness in a sustainable and innovative way. Until this point, Alpha had not been highly rated by its customers for innovativeness.

The new strategy meant that the customer would hand over a significant part of its functions to Alpha, which in turn would take full responsibility for the management of the defined entity. Most of the practical work would be contracted to suppliers and subcontractors. To become a service integrator, Alpha had decided to establish strategic partnerships both with some of the key customers and with strategically important suppliers and subcontractors. As the company already had a large business network comprising equipment and software suppliers, and subcontractors that performed the work, the idea was to conclude strategic partnerships primarily inside its existing business network. Realization of this plan was, however, postponed until a new resource management system was introduced within the firm. The new system would provide the tools to divide the suppliers and subcontractors into different categories in accordance with their importance to Alpha.

Alpha's new strategy emphasized innovation in business networks to find new kinds of solution to changing situations, and to increase innovativeness. Service development with customers, suppliers, subcontractors, and public research institutes was integral to this aim. Also, for the first time, intra-organizational teams were formed for service innovation as new services required various knowhow inside the firm. These teams comprised members of various company divisions and functions. An R&D management organization was established in 2010 to enable the coordination of service innovation within the company.

4.1.2 Description of case company Delta

Delta is a Finnish subsidiary of a multinational engineering, design, and consultancy company employing almost 9,000 experts in Northern Europe, Russia, India, and the Middle East. The subsidiary's turnover was 103 million Euros in 2011, and it had approximately 1,400 employees. The parent company entered Finland in 2003 through a merger. The subsidiary has expanded mainly through acquisitions of several engineering companies in recent years.

Currently, Delta provides consulting services within the fields of energy, traffic infrastructure, industry, civil engineering, the environment, and management. Their customers primarily comprise public sector organizations and industrial companies. Delta's six business areas are located in 26 different towns in Finland.

In recent years, the company has introduced a service innovation strategy that highlights novel ideas and their project-based development into new service products. Earlier service development had meant acquiring firms from various technical fields and, in this way, increasing technical knowledge and service scope.

The motivation to start innovating services in networks arose from the situation in which engineering companies were mostly paid hourly rates for their planning. As much of such work can nowadays be transferred to countries where work expenses are fundamentally cheaper, and as companies have difficulties in differentiating themselves through basic engineering services, Delta found it necessary to include more added value in its services. It regarded specializing in specific technical niches, positioning as a manager of larger project entities, and innovating pioneering services as important means to this end.

In addition, planning in the construction field was increasingly conducted at the same time as the concrete construction work. This meant that more effective and faster processes were regarded as a competitive advantage in the

market. Signs of a new trend, whereby customers increasingly demanded larger entities, were also apparent. Delta's management found this a good opportunity to begin intra-organizational development collaboration, and also to form partnerships with other firms to develop new comprehensive offerings in collaboration.

Delta had lately nominated three persons to manage R&D operations inside the company. The aim was for these persons to support business segments in their service development work. The first task of the R&D coordinators had been to add understanding on the importance of service development in the organization. The company had also bought an IT program that could be utilized when evaluating innovation ideas. Service development networks were first built up of intra-firm teams and public research institutes, although the aim was also increasingly to commit external actors to service development.

At the end of the 2000s, Delta designated projects that combined different technical fields inside the firm as significant strategic projects. The R&D coordinator described the new situation: "The most significant change in our services has been the increasing need for cooperation between different business units and technical fields." These projects comprised services delivered to the customer by three to five business units.

The idea was that service development would also occur in cooperation with various technical fields. The R&D director explained the challenge that cooperation in service development faced: "The business unit is the only level that has got money. The business unit director has to balance when deciding whether to invest some money for development. And, at the technical field level, the needs of several business units will be combined. The challenge is to have parallel needs in various business units so that everybody is willing to invest in joint development."

4.1.3 Description of case company Gamma

Gamma is a 100-year-old family owned technical trading company operating in Finland. Its main product fields comprise machine tools, construction machines, engines, and generators. However, it also offers maintenance services to its machine customers that mainly represent the metal and building industries. Gamma's turnover was 96 million Euros in 2011, and it employed 165 persons. The technical trading firm comprised five business segments: mechanical engineering, construction, engines and generators, spare engines, and aviation and defense.

Gamma has lately expanded its business strategy towards becoming a life-cycle service provider. It entered service business through acquisition of a

maintenance firm in 2006. More recently, it decided to begin systematic new service development, particularly in the field of mechanical engineering. As the future of the mechanical engineering industry seemed uncertain in Finland, the CEO of the company concluded that it is Gamma's role to increase its customers' competitiveness through service innovations.

The group president regarded transition to services as strategically crucial because the technical trade business was no longer growing. Connecting industrial services to technical trade would provide something new to the traditional technical trade business.

Gamma had previously tried to enter the service business; however, the management had then discovered that service business and service innovation require specific knowhow and experience that the company did not possess at that time. In 2009, the company appointed a new CEO who had the required experience.

The service knowhow was regarded as a resource that the company needed to possess. Acquiring service firms or employing people with service knowledge were considered the best means to access such knowhow. Gamma found that this knowledge was necessary if it was to succeed in finding partners for service development, and if it wanted to be a credible service provider to its customers.

To be able to provide service innovations and large entities, Gamma needed new partners. It had lately begun to find potential partners and form relationships for this purpose. The idea was to develop life-cycle services and extensive mass customized services for manufacturing industries in collaboration with other firms.

4.2 Introduction to the embedded cases

The following subchapters describe the five embedded cases that represent service innovation in a network of actors. Alpha participated in three of these innovation networks, Delta in two networks, and Gamma in one network. The cases comprise resource management system development, service portfolio development at Alpha, development of a wind turbine foundation solution, service portfolio development at Delta, and automation systems development. Chronological case descriptions enable the portrayal of the innovation process and the evolvement of interaction for resources in the networks. The case descriptions are based on the interviews conducted among the project management and corporate management in different companies that participated along the innovation process.

In the resource management system case, Alpha was the initiator of the development project and the customer. Alpha's aim was to be a pioneering and agile firm in its field of business. This necessitated a new kind of mindset in managing company resources. For this purpose, Alpha decided to build a resource management system. With the help of the system, Alpha wanted to develop and intensify the traditional way of performing work in the company and rationalize service processes. This was one way of diminishing the cost pressure that was notable in Alpha's business field.

The development work included renewal of the enterprise resource planning (ERP) system and development of a workforce management system. This necessitated the development and acquisition of several sub-systems. This system development project deviated from typical IT projects as one of the software houses was developing a new commercial software product inside the project. Alpha acted as the reference customer and also as an active co-developer and marketer of this web-based software product.

The resource management system would be utilized in practice by everybody working in the company. Employees working on remote sites would access it via mobile phones. It would also be connected to Alpha's customers' systems. Customers delivered hundreds of thousands of orders annually to Alpha through an electronic interface, and the amount was increasing. With the help of the new resource management system, customers would also be able to follow the status of their job orders in real time.

Two cases address wind power service portfolio development, one at Alpha and the other at Delta. Service portfolio refers here to a large service entity that comprises several service modules. The peculiar characteristic of these cases is that they describe an emergent business field in Finland. Only at the end of 2008 did the government of Finland approve the long-term climate and energy strategy, which was based on objectives proposed by the European Commission regarding the reduction of emissions and promoting renewable energy. The directive demanded that Finland had to increase the share of renewable energy to 38 percent of its total energy consumption by 2020 (Tarasti 2012).

The Finnish government set the objective that six terawatt hours (i.e., TWh) of energy would be produced by wind power in 2020. This would mean more than 800 wind power plants with the capacity of 2,500 megawatts (i.e., MW) in total. By the end of 2010, the wind power capacity was a mere 197 MW (i.e., less than 8% of the target value), and the annual production reached approximately 400 gigawatt hours (i.e., GWh), or less than seven percent of the target value (Tarasti 2012). Only 0.5% of the annual electricity consumption was produced by wind power in 2011 (Finnish Wind Power Association 2012).

Operational principles remain unclear and in constant change in the wind power field. Also, public authorities have only very slowly been able to give respective planning permission for wind power sites. Therefore, to date, many actors have been unable to operate. Most of the actors are new in the field, and many have not have previous contact with each other. Several actors have only recently been founded, so they do not belong to any existing business networks. Thus, actors often start searching for potential business or developmental relationships without any prior information. One important source of information has been the Finnish Wind Power Association (FWPA), which was founded in 1988 with the aim of creating conditions for wind energy development in Finland.

The case concerning a foundation solution for wind turbine towers also addresses the wind power business, and brings Alpha and Delta within the same innovation project. In this case, the focal firm is a specialist in concrete connections and composite structures (hereafter referred to as a fastening technology firm) based in Finland, but serving customers around the world. In addition to manufacturing construction products in eight countries, the firm invests heavily in R&D functions.

The fastening technology firm made a strategic decision to commence development work in wind power business in 2009. The company's representatives had noticed that current wind turbine foundations could be substituted by a new foundation innovation, and provided as a total solution to customers in the wind power field. They found Delta, which has expertise in design, engineering, and consulting to innovate with them. Later, Alpha joined the project as a pilot customer. This was the first time that the fastening technology firm also involved the customer so intensively in its innovation process.

The automation systems case represents solution development in the mechanical engineering industry. This development process began as a partnership between Gamma and a robotics solution firm. Gamma wanted to help improve its customers' competitiveness through a new innovation, a robotics service. Gamma had got the idea when in discussions with its customers, and, for that purpose, had tried to form a partnership with a couple of firms. However, cooperation proved to be difficult. In 2009, Gamma heard of a robotics firm that was looking for a partner with connections in the mechanical engineering industry. Together, they finally could innovate the robotics service.

Along the development process, they also received an invitation to tender from a large engineering workshop that needed an automation system. Gamma and the robotics firm first thought of offering their new innovation; however, it soon became evident that the customer required a much larger and more

customized sample production solution. Finally, four companies joined forces to offer the new-to-the-world solution to the customer.

The order of the cases below is arranged so that the three cases in which Alpha was involved are addressed first. Delta was also involved in the third case. Next comes the other case concerning Delta. This is followed by the case in which Gamma was involved. While reading the cases, attention should be paid to the following details: what kinds of resource are sought and provided by the actors for innovation? What kinds of relationship are established or activated to access the resources? In which way do actors access the resources? How do actors integrate resources to create new resources? In which kinds of relationship do they integrate resources? What kinds of challenge are faced by the networks when interacting for resources?

4.3 Resource management system development at Alpha

4.3.1 Accessing resources for system development

The resource management system development project began at Alpha in 2008, and development of the workforce management continued during the interviews in 2012. Alpha's IT department took responsibility for the project inside the firm. A major part of the resource management system was developed by six software service companies that were, to some extent, competitors.

The resource management system comprised the ERP solution and the workforce management solution; the latter being further divided into the asset management, mobile, and small works systems. The small works system only later became part of the project. Also, the mobile system development occurred after the majority of the system was ready.

When Alpha searched for software firms for development, its wide network of suppliers was a good source of information on trusted software suppliers. Alpha's head project manager explained this: "When I ask in our present supplier network, they'll surely recommend firms that can help us." Partner programs of the supplier firms were one way of learning about the prospective partners. Alpha's head project manager noted: "We have so many products by Microsoft that they give us hints concerning suitable partners in their partner network."

When Alpha chose the software service firms, it especially valued deep expertise in specific software products, and experience in Alpha's business field. This can be seen in supplier choices, as Alpha's head project manager described:

> *We could have probably done many things with the basic software system. But then the system would have been, so to say, only tolerably good. It wouldn't have been truly good. So we've tried to find suppliers that are specialized in specific types of software. We have tried to build the entity that way. We have got specialized vertical suppliers.*

Figure 10 illustrates the network for resource management system development in the first year of the project. Arrows show the contracts between the parties and the dashed box signifies passive actors.

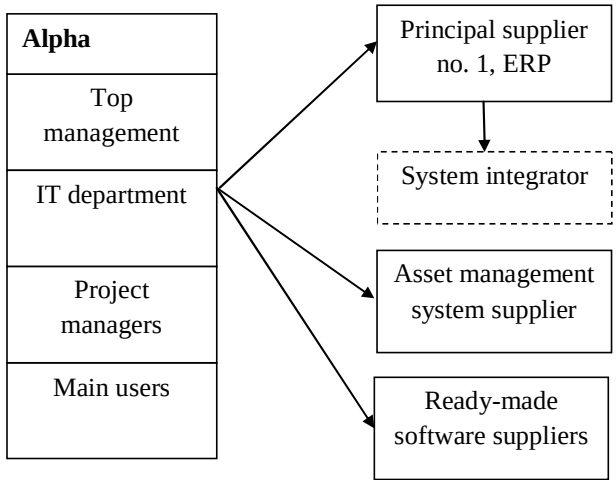

Figure 10 The network for resource management system development in the first year

One software service company was chosen to provide the basic ERP solution (termed principal supplier no.1 in figure 10). It had the position of the principal supplier in the development project. This company had originally not submitted a tender as they found the project plans they had received from Alpha to be at a very early stage. Later, however, Alpha contacted the supplier again as it had decided on the system that this firm provided. The subsequent negotiations resulted in a contract. The principal supplier then concluded a contract with a software firm for system integration inside the project.

At the same time, Alpha negotiated a development contract for the asset management system. The chosen software service firm had 30 years' experience in selling asset management products. It had concluded that it was time to develop a new system for the markets, and was considering having a partner for development that could provide user knowledge and finance, and become a reference customer. Their project manager explained this: "We also sought a

partner … Our main interest was to have a reference customer that provides us with finance for development."

When Alpha then invited this firm to tender, they became interested, as described by their project manager: "We found Alpha very interesting as it was a high-profile and large company. It would make a good reference firm. They were involved in many types of businesses." The project manager noted: "This project deviates from our basic projects because we don't deliver a ready-made product. We don't sell something that we customize only to some extent. Instead, we develop the entire system together with our customer, Alpha."

In addition to the systems developed by the software service firms, Alpha acquired several ready-made software programs for specific operations, such as payroll calculation from firms termed ready-made software suppliers in figure 10. Alpha's head project manager described the acquisition of the payroll calculating software: "It was an easy project. It was their standard product. It didn't require any changes; a ready-made package. It was a specialist application, similar to many others that we acquired." All of the sub-systems were integrated by one of the software service firms (hereafter the system integrator) into an entity.

4.3.2 Challenges in starting resource integration

An important part of a software project is the project method that determines, for example, each party's responsibilities and the way the project will be implemented. The principal supplier previously applied the same project method in all its projects. Alpha's management, however, required that a particular project method was employed. The business area director of the principal supplier remarked: "Alpha demanded that we apply a project method that we didn't know at all. And neither did Alpha … This in a situation where we didn't even know each other. And then we have an unfamiliar method of project management." This led to a situation in which the project members' responsibilities were not clear.

Both Alpha and the principal supplier simultaneously employed several persons in the development project. Alpha's representatives had varying interests in the project. As a result, Alpha's management could not agree on the target and scope of the development project. Nevertheless, the IT specialists wanted to participate intensively in the planning phase of the project. Alpha's head project manager described their way of working at that time: "We specified a lot of things in the new system; although none of us had ever seen it."

The system integrator was originally chosen by the first principal supplier. However, the principal supplier never really included the system integrator in the project; instead, it delivered integrations by itself. The system integrator's project manager explained the effects of the decisions made by the principal supplier in this way: "In retrospect, it was not a wise decision for the principal supplier to perform the integrations by themselves. We have practically made it all over again during the project."

Further, it was not clear which company had the main responsibility for the project. In this fuzzy situation, nobody took the reins. The parties had agreed at the beginning that the principal supplier would take total responsibility for the development project and orchestrate all of the suppliers. However, in practice, Alpha acted directly with some of the suppliers, which caused confusion among the parties. The principal supplier's business area director framed the problem in this way: "The customer acted directly with some of the suppliers, although we had the total responsibility for the project. It became a true hotchpotch."

When the scope of the systems development project remained unclear, Alpha's management decided to determine the needs of the various departments and functions that would utilize the system. Therefore, all of the departments' main users were invited to propose features for the new system. The employees knew that they would constantly utilize the system in everyday work, which resulted in an enormous number of wishes being presented to the development team. The project manager of the asset management system noted: "When we had meetings, a huge number of Alpha's people were present and everybody wanted to express their ideas." The principal supplier's business area director described the situation: "We were doing specifications at that time … The project began with people thinking of all the possible things that an ERP could do for them."

At the same time, Alpha was going through extensive organizational changes, and human resources were also needed for that project. As a result, almost all of Alpha's project personnel changed in the first year of the resource management project. The business area director of the principal supplier explained:

> *When the project had been going on for about a year, almost all of the project people had changed at the customer side. In this situation, both the customer and we should have familiarized the new people with the project. And we should have discussed the goals and responsibilities with them. But, instead of taking that step backwards, the project kept proceeding rapidly.*

Because of the confused situation in the project management, new participants were not properly familiarized with the development project, and the

project's target was not clarified to them. This resulted in a project plan in which the principal supplier had listed a huge amount of development tasks. The principal supplier's business area director stated: "The result was a wishing well that expanded the scope enormously … And when the scope expanded, the budget also increased beyond all reason."

Alpha found that there were no prerequisites to continue the project with the principal supplier, and the contract was terminated at the exit point. Alpha's head project manager perceived the problem in the following way: "The principal supplier couldn't manage the project professionally."

4.3.3 Learning to integrate existing resources

Alpha nominated a new project manager, and started to search for a new principal supplier (termed principal supplier no. 2 in figure 11) for the ERP system. This time, they decided on a large software solution company with experience in conducting challenging development projects. Figure 11 illustrates the network for resource management system development in the second and third year of the project. Arrows show the contracts between the parties.

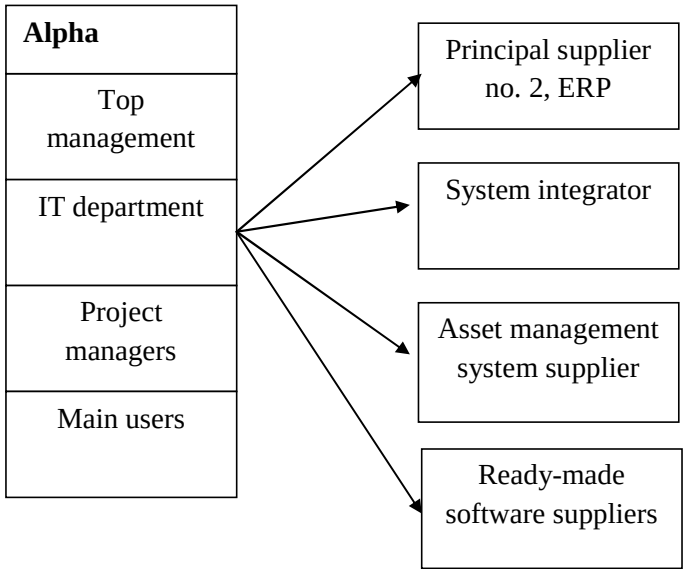

Figure 11 Network for resource management system development in 2009−2010

When the new principal supplier joined the project, Alpha signed a contract directly with the system integrator. Alpha's head project manager explained the reason for starting collaboration with the system integrator firm: "In the customer integration field, they've got our competitor as a customer. They therefore have a lot of experience in those interfaces. They don't need to learn every interface anymore; they've already done that."

The new principal supplier began to coordinate the development project. To speed up the resource planning systems development, the ERP project was divided into two phases. The parties agreed that the project's first phase would be completed in six months.

As the short time allocated did not allow the development of new systems, the first phase of the project consisted mostly of a standard ERP system with some customization. This change to the original project plan was possible because the new principal supplier first showed Alpha's representatives the functions that they could perform with the existing system. It was only then that Alpha realized it did not need to begin everything from scratch. Alpha's head project manager explained this change in their understanding as follows:

> *Maybe the first supplier made the mistake that they didn't show us the standard system. The new supplier, instead, started with teaching us what the standard system is able to do. And only then they asked if we needed something else. They first identified our needs, and then they showed us how the standard system could do those things. We could then tell them if it was sufficient or if we wanted to change something.*

Unfortunately, the old ERP system began to crash only one month later, and the data partly disappeared. Alpha announced that it now needed the new system in three months. This unexpected halving of the project time meant that the principal supplier had to advise Alpha very clearly what it would agree to change in the standard system.

During these three months, Alpha and the principal supplier shared a common project location where the main users and specifiers worked together. The principal partner's project manager explained this:

> *Alpha rented premises for the project, which sped up development in the first three months. We and Alpha's main users worked together there. It was a good place, as we could concentrate on advancing the project. And when we tested the system, we did it together in our premises. We had the premises there for two weeks. Alpha's main users and other necessary people were there, and our technical support and consultants. We could make corrections quickly when needed. It was really efficient, and everybody liked it.*

Then they tested the system together at the principal supplier's premises. Alpha's head project manager described the collaboration in the following way:

> *Our task was to define the requirements for the system; that is, which processes we needed and how we wanted to run them. And our supplier's consultants presented us with alternative solutions from which we then chose. The more we learnt during the process, the more we were able to comment on it. Later, we could even tell them what would not be possible.*

Although collaboration between the principal supplier and Alpha was intensive, the system integrator felt that its voice was not heard. The system integrator's project manager described this as follows:

> *The principal supplier acted pretty much by themselves. They even largely determined how the integrations would function; whereas our view was that we should have done things differently. And before we had the chance to say anything, things were already decided. We had no other option than to work according to those specifications. On a couple of occasions, we had discussions on our role in the project, and how we would like to do things.*

When the role of the system integrator became clearer, the principal supplier increased collaboration with them. The principal supplier's project manager explained: "We took care of the integrations together. We had a hotline open all the time. Our engineer and their personnel had to do that hand-in-hand. When we did something, the integrator supplier had to do something too." The principal supplier's project manager noted that they had learnt a good approach to working from the integrator supplier. The system integrator's project manager found that it was good to consider together with the principal supplier how the system would be constructed.

4.3.4 Challenges in resource integration during ERP development

The project was scheduled so that the ERP system development project would begin immediately after the standard ERP system had been launched. However, at this point, Alpha was not ready to continue with the development project. The principal supplier's project manager stated:

> *We had ended up with a plan to start the second phase of the project immediately after the first phase was ready. But it didn't succeed. Alpha had no resources to get fully involved in the project then. We had to postpone the second phase for a period of three months because of that … But they told us that we*

> *needed to be ready according to the original time schedule. The timetable was halved again.*

Alpha's head project manager found that the biggest challenges were inside the company. Business units found that the resource management system development was a pure IT-project. The IT department had a development team comprising a couple of members. The business units expected that this team would take care of everything in the project. The project manager expressed the high expectations as follows:

> *They think that we do everything from beginning to end. And that we also take care of the change project in the organization. And that we handle the customer integration process too. Our business units don't understand that they must participate in the project. It affects business processes. It's been really difficult to get the necessary resources.*

This again led to a situation in which the development work had to be completed in four months instead of the scheduled six months.

Alpha's IT department and the principal supplier continued to work intensively together; they developed the processes, prepared specifications, and took care of change management. The asset management system supplier and integrator firm were involved through a virtual task manager tool, whereby the principal supplier could send tasks to them, as described by the principal supplier's project manager:

> *We had a virtual task manager tool. We used it actively, and gave the rights to Alpha's main users, the asset management system developers, and the integrator. We documented everything there, and could give a task to anybody in it … All the changes were made in the task manager, where we also tested the changes ourselves. Then the changes were moved to the test environment, where we and Alpha tested them. Only after Alpha had accepted the changes, were they taken into use … It was a good tool for me as a project manager.*

The asset management system supplier mainly worked with Alpha when developing the system. Alpha provided knowledge on everyday life at a maintenance service firm. The asset management system supplier had until that point only specialized in industrial customers. Their project manager explained: "I was listening to and discussing with Alpha's supervisors when they had a staff training day, and our product development manager observed the work of supervisors at two of their offices."

It is notable that the suppliers never agreed on common goals, and seldom discussed potential solutions with each other. The principal supplier's project manager noted:

> *We ought to have discussed things together, such as 'we have considered this kind of a solution. How do you find it? Could this succeed? Would it add something to your solution?' I missed such discussions.*

As the suppliers seldom worked together and, to some extent, were also competitors, it was difficult to make them provide their work to other suppliers. Suppliers held onto their work even it might mean extra costs to the customer, as described by the project manager of the asset management system:

> *A good example was when one partner had made some changes in the program. We then needed a similar price list retrieval system for Alpha that this firm had already made. We wanted to copy it into the system. We told them that Alpha had ordered the retrieval system once, and that they didn't want to pay twice for it … But they answered: 'No, we aren't going to give it to you. We've done this. It's ours.'*

The lack of cooperation clearly led to a situation in which the suppliers did not know what others were doing in the common project. The project manager of the asset management system described the problem in the following way:

> *I do something here, you do it there, and a third party does it somewhere else. Later, we notice that we have either done the same thing or completely different things. However, the idea was to do something in common. We should have sat down together more often.*

Alpha's project management, however, discussed the project separately with each of the partners on the phone almost daily. Alpha's project managers came to know its partners' project managers well during the development project, and therefore communication was easy. Alpha's head project manager put it this way: "One could even say that we can phone each other at any time of the day … Our suppliers ask us and we ask them whenever we face some problems or something needs to be done … We have work pairs who communicate very actively."

Alpha wanted to be involved intensively in the systems development, and to guide their partners. However, having several partners with which to work challenged Alpha, as explained by the head project manager:

> *Of course, the core knowhow on this kind of matter is limited inside our company. It's challenging when we don't have experts to work with every partner. And when our experts have prepared one partner and go to the next, they need to get the things straight first. And this causes trouble for the suppliers; our experts come and tell them not to do things that way.*

Detailed guidance by the customer could, however, make the system development firms provide things that were later found problematic. Especially, the asset management system developer, which developed the software for larger markets, sometimes felt overly led by Alpha. Their project manager commented on the problem and its possible causes:

> *It's good that the customer knows what they want. But it's not good if they know it even at the code level. And then they try to dictate how we do our work … I think one reason was that our first project manager knew nothing about maintenance business. And then he discussed it with the customer that had young and innovative people developing the system with him. And our project manager didn't understand the maintenance business. It wasn't a very good combination.*

Alpha was unable to make all the necessary decisions and tests during the scheduled ERP development period. This meant that only the most urgent things were developed. New decisions then led to a need to make changes in the process, which demanded a considerable amount of work, and when the process was further developed, new development tasks constantly began to appear.

During the ERP development, Alpha once again nominated a new head project manager, who explained the changes in project management: "Of course our business management has high expectations, and this kind of large project in which we change everything is quite a difficult one … And probably different personalities were needed at different times during the project." The principal partner described Alpha's new project manager in the following way:

> *The new project manager has technical knowhow and is very analytical. He can suggest changes that affect different operations: what is worth doing, what isn't worth doing. He knows the system so well. He can use it, test it, and seek knowledge from there.*

The ERP development finally stretched to one year. The time schedule was one of the biggest challenges during the whole project. One partner noted: "The target timetable was rather unrealistic. And, at some point, when the project could not achieve it, the meaning of timetables ceased to exist."

When the ERP project began to be completed, Alpha took over the coordination of all parties from the principal supplier. The head project manager took care of the total architecture. From then on, the principal partner only took care of updating and testing the basic functions when the partners developed their systems. This change in coordination also meant that Alpha was largely responsible for partner communication.

The principal partner's project manager described how it lost contact with others at that time: "It was rather unclear to me what other partners were

doing, although we had the main responsibility for them." Alpha's head project manager noted: "When we're coordinating a project, the idea isn't to tell everything to everybody. In some cases, we just ask for some changes and don't explain their purpose in the entity."

Alpha arranged regular telephone conference calls in which all the project managers participated. Meetings were virtual as partners were located in different towns. The main purpose of the conference calls was for Alpha to check on what each party had accomplished during the week. The problem for the partners' managers was, however, that they did not have much to do with each other at other times; thus, they were not familiar with the others' work. The project manager of the asset management system found conference calls more confusing than clarifying: "We had weekly conference calls with project managers. People listed what they had been doing. I didn't know what they were talking about." The function of the virtual meetings did not correspond to the needs of the partners, as a project manager of the integrator partner put it:

> *Meetings didn't deal with planning. Planning was settled between Alpha and the principal partner. And they decided between themselves things that belonged to our scope. Although we had weekly conference calls, things were discussed elsewhere.*

As the development project lasted for several years, project managers and personnel changed both at the customer side and at the partner companies. This brought its own challenges to the project. The project manager of the asset management system explained: "Our project manager changed and the project owner also changed a year ago. To be honest, nobody knows about the entity anymore."

The change of a project manager sometimes also meant losing specific expertise. When the next manager came from outside the project, the challenge was to familiarize him with the project. The principal partner's project manager noted: "When the project manager changes, a kind of black hole forms."

4.3.5 Resource integration and its challenges during the workforce management system development

Alpha was a notable help in testing the asset management system before it was launched onto the markets, as described by the project manager of the asset management system:

> *One significant thing is that Alpha has tested the system in a very organized way. Of course, they have found many things that*

> *we need to correct under warranty. But we are grateful to them. All the mistakes they find will improve the quality of our product.*

In addition to being a reference customer, Alpha also marketed the new asset management system. The project manager of the asset management system stated:

> *At that time, when there was not much to see, Alpha was already explaining the asset management system to potential customers. Later, they visited potential customers and presented the system to them. Today, some of them are our customers. Of course, Alpha wants there to be other users besides themselves. All users bring something new to the system and everybody benefits from it.*

The biggest challenge was that Alpha wanted to decide the direction that the asset management software development would take. Alpha demanded that the software supported first their wind power business, which was the most important to Alpha. The project manager of the asset management system tried to negotiate with Alpha but they were very strong-minded and would not back down. As a result, the first version of the software did not support the needs of typical customers. The project manager of the asset management system noted: “A customer comes and wonders why we don’t have a ready-made solution for factory maintenance, although we’ve been developing the system for a long time. That’s a quite understandable reaction, but our focus has been elsewhere.”

During the development project, the asset management supplier tried to please its reference customer as far as possible. However, later in the project, the partner understood that addressing all of the customer’s requirements did not lead to the best result. The project manager of the asset management system explained her feelings: “I would have expected more assertiveness from our firm.”

The mobile system supplier and the firm which developed the management system of small works joined the project later, when the other systems were sufficiently advanced (see figure 12). At this time, the principal supplier had already completed the majority of its development work, and it heard about these development projects only in conference calls with project managers. In figure 12, arrows show the contracts between the parties and the dashed box signifies passive actors.

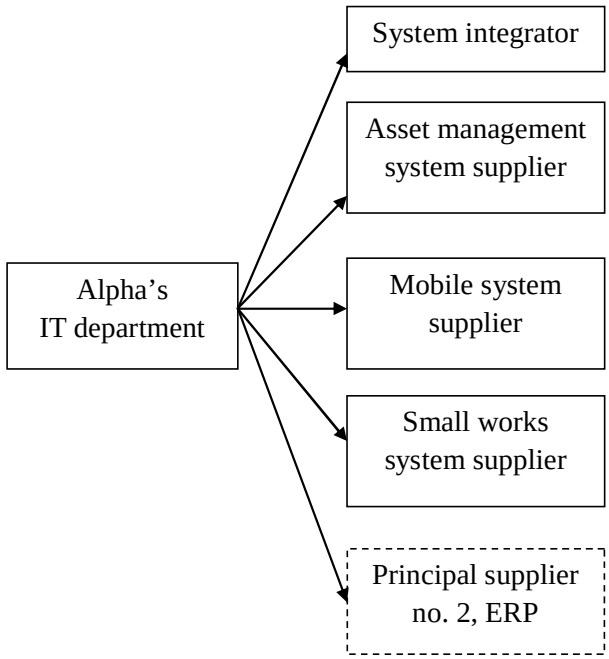

Figure 12 Network for resource management system development during 2011–2012

When the suppliers began to develop the workforce management system, they arranged a couple of workshops, which helped to avoid misunderstandings between suppliers. Workshops also ensured that everyone was going in the same direction. Thereafter, suppliers continued to work mainly with Alpha.

Cooperation between the suppliers mostly remained low during the project. The principal supplier's project manager expressed her feelings:

> *Even though we are competitors, we should be able to consider what's best for the customer, and cross the borders. Our contracts take care of everything else … You need to make your customer happy in every project … So that you can also sell similar solutions to other customers.*

One project manager expressed the end result caused by the lack of cooperation as "[e]verybody fiddled with their own things, even though the idea was to develop one resource management system. Now it comprises separate bricks that are connected by force to each other."

Table 6 gathers together the data concerning interaction for resources in the development of the resource management system and provides empirical evidence for the results chapter. The first column shows the resources that were accessed from other actors for the system development. The second column

shows the resource category, with the given resources being expounded in chapter 5.1. The third column lists the actors that provided the resources. The fourth column provides information on the type of the relationship between the actors. The fifth column lists the means to access the resources. Relationship types and means to access the resources are discussed more closely in chapter 5.3. The table also provides citations from the case text that illustrate access to each resource. Appendix 3 summarizes the empirical evidence from each case.

Table 6 Summary of interaction for resources in the resource management system case

Resource	Resource category	Resource provider	Relationship between the actors	Means to access the resource	Empirical indicators
Ready-made software	Technolog-ical resource	Suppliers	Arm's-length relationship	Acquisition	*It was an easy project. It was their standard product. It didn't require any changes. A ready-made package. It was a specialist application, similar to many others that we acquired. (Head project manager, Alpha)*
Information on trusted relationships	Informational resource: Confidential information	Suppliers	Close exchange relationship	Sharing	*When I ask in our present supplier network, they'll surely recommend firms that can help us.(Head project manager, Alpha) We have so many products by Microsoft that they give us hints concerning suitable partners in their partner network. (Head project manager, Alpha)*
Customer intelligence	Informational resource: Confidential information	Customer	Development relationship	Sharing	*I was listening to and discussing with Alpha's supervisors when they had a staff training day, and our product development manager observed the work of supervisors at two of their offices.(Project manager, asset management system)*
Premises	Facility resource	Customer, supplier	Development relationship	Sharing	*Alpha rented premises for the project, which sped up development in the first three months. We and Alpha's main users worked together there … And when we tested the system, we did it together in our premises. We had the premises there for two weeks. Alpha's main users and other necessary people were there, and our technical support and consultants. (Project manager, principal supplier, ERP)*

Resource	**Resource category**	**Resource provider**	**Relationship between the actors**	**Means to access the resource**	Empirical indicators
Virtual environment	Facility resource	Supplier	Development relationship	Sharing	*We had a virtual task manager tool. We used it actively, and gave the rights to Alpha's main users, the asset management system developers, and the integrator. We documented everything there, and could give a task to anybody in it … All the changes were made in the task manager, where we also tested the changes ourselves. (Project manager, principal supplier, ERP)*
Financing	Financial resource	Customer	Development relationship	Sharing	*Our main interest was to have a reference customer that provides us with finance for development. (Project manager, asset management system)*
Reference customer	Relational resource	Customer	Development relationship	Sharing	*Our main interest was to have a reference customer … We found Alpha very interesting as it was a high-profile and large company. It would make a good reference firm. They were involved in many types of business. (Project manager, asset management system)*
Experience in specific operations, a specific business field, and with specific customers	Human resources	Supplier, customer	Development relationship	Resource integration	*In the customer integration field they've [system integrator] got our competitor as a customer. They therefore have a lot of experience in those interfaces. They don't need to learn every interface any more. They've already done that.(Head project manager, Alpha)*
Professional knowledge and skills, technological knowhow	Human resources	Supplier	Development relationship	Resource integration	*We took care of the integrations together. We had a hotline open all the time. Our engineer and their personnel had to do that hand-in-hand. When we did something, the integrator supplier had to do something too. (Project manager, principal supplier, ERP)*

Resource	Resource category	Resource provider	Relationship between the actors	Means to access the resource	Empirical indicators
Skills and experience in project management	Human resource	Supplier	Development relationship	Resource integration	*We expected professional project management from them; that they could manage the project because of their experience also in difficult situations, and that they would take a strong hold over the project. (Head project manager, Alpha)* *We had a virtual task manager tool. We used it actively, and gave the rights to Alpha's main users, the asset management system developers, and the integrator. We documented everything there, and could give a task to anybody in it … All the changes were made in the task manager, where we also tested the changes ourselves. (Project manager, principal supplier, ERP)*
Technological knowledge, technical knowhow, analytical skills	Human resource	Supplier, customer	Development relationship	Resource integration	*Our task was to define the requirements for the system; that is, which processes we needed and how we wanted to run them. And our supplier's consultants presented us with alternative solutions from which we then chose.(Head project manager, Alpha)*
Technological knowledge, technical knowhow, professional skills, knowhow on projects	Human resource	Supplier, customer	Development relationship	Resource integration	*We and Alpha's main users worked together there. It was a good place, as we could concentrate on advancing the project. And when we tested the system, we did it together in our premises … Alpha's main users and other necessary people were there, and our technical support and consultants. We could make corrections quickly when needed. (Project manager, principal supplier, ERP)*

Resource	Resource category	Resource provider	Relationship between the actors	Means to access the resource	Empirical indicators
Expertise in specific product types	Human resource	Supplier	Development relationship	Resource integration	*So we've tried to find suppliers who are specialized in specific types of software. (Head project manager, Alpha)*
Technical knowhow, professional, analytical, and reflective skills	Human resource	Supplier	Development relationship	Resource integration	*One could even say that we can phone each other at any time of the day … Our suppliers ask us and we ask them whenever we face some problems or something needs to be done … We have work pairs who communicate very actively. (Head project manager, Alpha)*
Technical knowhow, professional knowledge, analytical, and reflective skills	Human resources	Customer	Development relationship	Resource integration	*The new project manager [of Alpha] has technical knowhow and is very analytical. He can suggest changes that affect different operations: what is worth doing, what isn't worth doing. He knows the system so well. He can use it, test it, and seek knowledge from there. (Project manager, principal supplier, ERP)*
Marketing and selling skills, experience with specific types of customer, experience as a user	Human resources	Customer	Development relationship	Resource integration	*At that time, when there was not much to see, Alpha was already explaining the asset management system to potential customers. Later, they visited potential customers and presented the system to them. (Project manager, asset management system)*
Expertise in a specific field and technology, analytical skills, project management skills	Human resources	Customer	Development relationship	Resource integration	*We don't sell something that we customize only to some extent. Instead, we develop the entire system together with our customer, Alpha. (Project manager, asset management system)*

Table 6 suggests that the network provided various resources for development of the resource management system. They included ready-made software that suppliers provided and which became part of the system. Suppliers similarly provided information on trusted actors that could be involved into development. Customers were a source of customer intelligence. Suppliers and customers were allowed to use premises and virtual environment for development. Customer Alpha provided financing and acted as a reference customer to the asset management system developer that innovated and delivered a new system to the markets. Both the IT firms and the customer, Alpha, were important sources of experience in specific operations and in a specific business field, and also acting with specific customers. IT firms and Alpha's IT professionals participated in system development, especially employing their professional knowledge, skills, and technological knowhow. Also, analytical and reflective skills were important in development. The further task of the principal supplier was to manage the entire project through its skills and experience in project management; in later phases of the project Alpha provided these skills. The suppliers and Alpha needed to have knowledge on conducting projects. Alpha also provided its marketing and sales skills to market the new asset management system to other companies.

Resources provided by the network for the resource management system development can be classified under (1) technological resources (i.e., ready-made software), (2) informational resources that include confidential information (i.e., information on trusted relationships and customer intelligence), (3) facility resources (i.e., premises and virtual environment), (4) financial resources (i.e., financing for development), (5) relational resources (i.e., reference customer), and (6) human resources (i.e., experience, knowledge, skills, knowhow, and expertise).

The data suggest that accessing technological resources was possible in arm's-length relationships within the network. Confidential information could be accessed in close exchange relationships and development relationships. Access to all other resources, that is, facility resources, financial resources, relational resources, and human resources took place in development relationships.

When considering how various resources were accessed in the network, the data suggest three different ways to access resources: technological resources are acquired (i.e., purchased), and confidential information, facility resources, financial resources, and relational resources are shared between the actors. Human resource access, however, requires the integration of resources.

4.4 Development of the wind power service portfolio at Alpha

4.4.1 Integrating intra-firm resources for wind power business planning

In 2008, the Finnish government approved a long-term climate and energy strategy. This made Alpha, among others, believe that wind power construction would increase to high quantities in the years to come. Soon after the new energy strategy was announced, Alpha's management agreed on beginning systematic service development for the wind power industry inside the firm. A sales manager explained this decision: "Wind power is one of those businesses where we can make use of our entire knowhow and offering."

Various business units of Alpha had already been involved to some extent in miscellaneous wind power services, such as erection and maintenance of wind turbines. However, they had hardly any contact with each other, as the business area director for wind power described: "Different business units had developed their own wind power services. They didn't even much discuss having consistent processes, or pricing policy, or any service descriptions." Alpha, therefore, employed a business area director to coordinate wind power service and business development within the group.

The business area director – like many others in the emergent wind power field – had no previous knowledge on or experience in wind power, as he noted: "When I started in wind power business in 2008, I actually didn't know anything about wind power or the wind power industry… But I told the management that I'd be interested in the wind power business."

The first task was to make development and business plans for wind power services. For this purpose, the business area director began to form a core team that would comprise representatives of different business fields in the company. He got a list of names of potential team members, and began by finding out more on those persons and phoning them. The business area director described the situation in the beginning as follows:

> *I had to sell the idea of joining the development team to these people. They had all kinds of other things to do. So I had to persuade them. It even required pestering, such as "Couldn't you please help us in this project in some way?"*

Figure 13 illustrates the organization in the wind power service development at the beginning of the project.

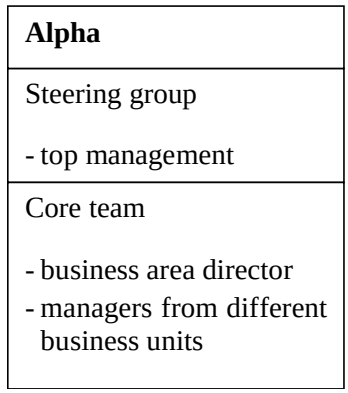

Figure 13 Initial organization of wind power service development

It was not always easy to commit people to the team, as the business area director remarked: “We had agreed with two persons that they would join the team. Well, they popped over but apparently it wasn’t their thing.” The search resulted finally in a core team of five managers from different business fields and service areas. A sales manager who was one of the team members described how he joined the team: “We discussed with my superior what this requires from me, and how much time it’ll take … I saw that wind power is a growing field, and I found it interesting. I readily participated in something like this.”

Top management set the targets for the development project and the core team began to plan the wind power service business. Top management formed a steering group which commented on the team’s proposals. The contents of the business plan developed over an iterative process whereby the team work and steering group’s comments alternated, as explained by a member of the core team:

> *After we met in the project group, the business area director gave a report to the steering group. If the steering group was not satisfied with our work, they gave us feedback. And if it seemed that we were going in the wrong direction, they advised us. The business area director took care of communications with the steering group.*

Alpha’s core team adopted the perspectives of specific target groups in their planning. They expected that their main target group would be investors with no experience in energy production. Instead, they had capital and saw that the wind power business was increasing. As they did not necessarily have any organization or knowhow, they needed a very comprehensive service. The team work resulted in 13 partial programs that needed to be performed to

enable implementation of the business plan, from market and technology studies into service development projects.

4.4.2 Accessing information on external actors

As wind power was an emerging business field in Finland, only a few company names and references appeared on records. The lack of business networks restricted opportunities to find information on other wind power actors, and form a larger picture of the field. The Finnish Wind Power Association was an important source of information for the firms entering the field. Alpha's business area director described how he sought information on actors in the field: "We had some seminars, and we had the Wind Power Association from which you can find the names of their members. And, as we were a member too, I naturally went to some of their meetings to investigate."

Trade fairs and conferences inside the wind power field were other important sources of information on potential partners. As stated by the business area director: "And then I visited some trade fairs … to see which Finnish companies are represented there, and what's taking place. This way, I got an overall picture of the whole business." Figure 14 presents the firms that provided information to Alpha for service portfolio development. Arrows mark interaction between the actors.

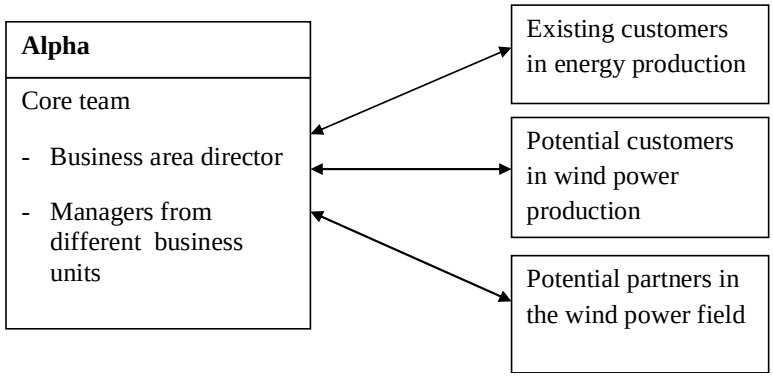

Figure 14 External actors that provided information for service portfolio development

All of the core team members at Alpha took care of stakeholder contacts, while the business area director had the main responsibility for external relationships. Alpha wanted to build relationships both to potential customers

and suppliers or partners who would be willing to provide service entities in collaboration with Alpha. Firms that worked in the wind power field were a source of information for the service portfolio development. They were also potential partners to Alpha. The business area director and the sales manager spoke about contacting these firms:

> *I conducted a market study on firms that are active in the wind power field in Finland, and found out what kinds of service they provide. As a matter of fact, I visited all of these firms. I phoned them, and asked if I could visit and ask some questions. And, at the same time, I tested how they found the idea of a service portfolio. (Business area director, Alpha)*
>
> *We had existing customers and potential customers. We went to meet several of them and tried to find out what's important in wind power, and what things are challenging. This way, we gathered information and knowledge.*
>
> *(Sales manager and member of the core team)*

Alpha had close business relationships with energy production companies that were their customers. They provided information on their future plans in the wind power field. This was described by Alpha's business area director:

> *Similarly, I visited our customers from the energy industry. I asked about their plans to build wind power and about the services they would need. This way, I was able to reflect their thoughts to our ideas on the service portfolio.*

The idea of the service portfolio was tested on customers with which Alpha had long-term and trusted business relationships. The business area director noted: "With them, you can throw in questions such as 'If we could provide this kind of service, how would you like it?' or 'Would you be interested in this kind of service?'."

Alpha's representatives prepared a memorandum of each meeting with their customers, and the ideas were discussed together in the core team. It became evident that energy producers which expand their business into wind power would need modular, although comprehensive, services. These companies partly had their own people doing things, but they did not have the knowhow and resources to do everything by themselves.

4.4.3 Challenges in intra-firm resource integration

The intra-firm collaboration and contacts with stakeholders resulted in ten service modules that Alpha would develop. These service modules formed Alpha's total service offering or service portfolio for the wind power industry.

The modules comprised consulting, design, manufacture of parts and their assembly, building of infrastructure, delivering process, installation and implementation, maintenance and monitoring of condition, supervision and operation, production management and sales, and property management services. A core team member described the emergence of the ten service modules: "We tried to picture the process of a wind power plant. Which kinds of element are included when considering the entire life-cycle of a wind power turbine? And so we found these elements."

Tekes provided funding for the service development for two years in 2009 and 2010, as described by the business area director of Alpha:

> *In the fall of 2008, we made plans to start a development project in wind power business. We also drew a business plan for it. Then we applied for funding from Tekes, and they provided us with funding for two years.*

The idea was to develop an extensive service portfolio for wind power which would encompass the entire life-cycle of the wind power infrastructure. The business area director explained the challenge of committing managers to the development project in the following way:

> *Almost the entire two years passed with nobody building any wind power in Finland. Only some discussions took place at that time. Therefore, most of the managers didn't get interested in the whole thing at our firm. You need to convince people that firms are really going to build something, and that this will be a real business for us.*

Alpha had traditionally based its business on orders from customers. It did not have the culture of developing services proactively, as was the case with the wind power service portfolio. Another challenge was that only a couple of members in the project team could concentrate mainly on wind power service development, whereas most of the team members developed the service alongside their everyday work. The business area director noted: "Typically, employees aren't freed from their actual work even if they participate in a large project. It's a true challenge." A member of the core team noted: "Each team member had some tasks to complete according to a given timetable, but they couldn't necessarily finish them in time. It's normal when you participate in a project in addition to your actual work. Urgent operative tasks are given priority."

Each core team member took responsibility for some entity in the wind power service development, and the business area director supervised the entire development program. The entities were divided according to members' specific expertise or business field. As explained by the business area director:

> *Quite soon, we had planned the service structure. Then we prepared a task list, schedule, and targets. We agreed on regular meetings, and built intranet pages for wind power where everything was documented. Every member took responsibility for some part of the development project, and I supervised the entity. When some part was nearly ready, we tested it.*

The core team members developed their modules together with experts inside the firm. The sales manager explained this: "The responsibilities were shared according to each person's knowhow. Then every core team member worked with various in-house experts. We tried to build the service modules, and then we presented our results at the core team meeting."

At that time, Alpha went through massive organizational changes. This caused problems within the development team, as explained by the business area director: "We had three levels in the wind power service portfolio development: a steering group, a project group, and employees who prepared process specifications. Those who prepared process specifications got new positions in the organization. Thus, they were torn away from this project." As wind power business was very limited at Alpha at that time, the problem was to find new people who knew something concerning wind power.

Only a couple of managers and employees remained longer in the wind power development team. Instead, Alpha got new motivated employees from the university students who had written their theses on wind power during the development project. The business area director explained their motivation in the following way: "They haven't been fixed in any compartment here yet. They are accustomed to participating in projects and changing their tasks. They've got meaningful tasks here, and they've had to challenge their knowledge in them."

4.4.4 Accessing customer and supplier resources for development

The funding granted by Tekes also enabled having external partners for the service development. Alpha had a large number of suppliers, and the steering group members suggested some of them for the development project. The business area director knew from earlier only one of the suppliers as he noted: "I didn't have much information on those firms. I had had some connection only with one of them. I think that firm had another name then. Others were totally unknown to me."

The firms that participated in the wind power service development played the role of suppliers and consultants in the development project. Each firm developed very different services and cooperated with Alpha, but not with each other. Different actors that were involved in the wind power service

portfolio development are shown in figure 15. Arrows mark contracts between the parties. The dashed line refers to an informal relationship in the development project.

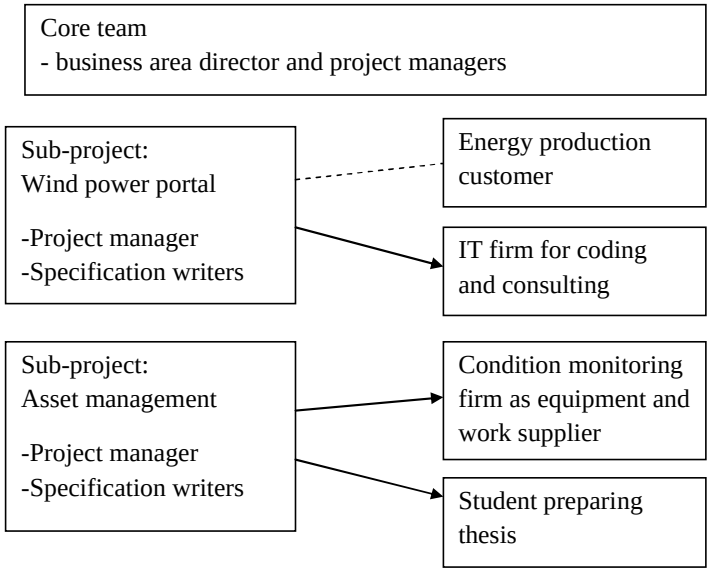

Figure 15 Network in the sub-projects for the wind power service development

A new innovation, an Internet-based wind power portal, came from the customer side. The sales manager with responsibility for the development of the portal described the beginning of the project as follows: “It originated from our discussion with the wind power actors and producers. In many firms, they told us that they didn’t know what actually happens at their wind power plants.” The management team of the information management department planned how the development of the portal would be organized. The sales manager explained this: “We first considered in the management team what we should do about this. Then we organized a project around it. We named a project manager, and formed a project organization that began work on this project.” The sales manager acted between the customers and the project organization. The sales manager said: “We first planned things ourselves, and then we examined them together with the customers.”

A long-term customer, a wind energy production company with experience in wind power turbines, was involved in the development of the wind power portal. Alpha’s business area director explained this:

> *Then we planned on both sides how a suitable solution should look … This was based on our long-term relationships with energy companies. Alpha has historically been closely connected to them. We know those people, and it's not difficult to call or meet them.*

The CEO of the wind energy production company confirmed the importance of dialogue when innovating: "Those persons who are experienced and master communication and relationships play a significant role."

When the project team planned the wind power portal, they came to think of an existing interface that might also be employed in the portal. This was described by the sales manager:

> *We had a user interface for several years that works on the Internet. We then noticed that we could apply this interface to the wind power portal as our customers are accustomed to it. We only needed to receive more information from the power plants and integrate it into our basic system. And, of course, we needed to build new elements into it.*

Alpha needed IT knowhow outside the firm to realize the portal. They had a long-term relationship with a technology firm to which they had outsourced some of their IT specialists several years previously. Alpha's sales manager explained the role of the technology firm in the portal project:

> *We manage the project. We then explain our needs to the technology firm, and why we would like to have things done in a particular way. For example, we tell them how a control screen should look; they then implement it, and also try to improve the result.*

Alpha made a demonstration version of the portal, and tested it in the wind power plant where Alpha worked, as the business area director stated: "We maintain a customer's wind power plant, where we also take care of energy management. So we installed the portal in that power plant and tested it." They similarly placed another energy production customer's wind power park into the portal. The customer then commented on it. Alpha's business area director described this as follows:

> *Of course, we had enquired several times about what they needed, and then we showed them how it would look. We asked for their opinion. This way, they've commented quite a lot on the service.*

In general, the energy producer customer found cooperation in service development with their suppliers challenging. Services that suppliers such as Alpha provided to the energy production firms were invited to tender, and Alpha offered similar services to all of the competing energy productions

companies. The CEO of the energy production firm put it this way: “If we were to participate in their development work, how far could we go before it affected competition. And Alpha, for example, offers similar services to all energy producers. Not everybody necessarily finds it an optimal situation.”

Asset management was one of the ten service entities for wind power plants. The development project began after Alpha’s maintenance technicians had investigated the existing wind power plants, and a university student had suggested in his thesis that attention should be paid to condition monitoring; as described by Alpha’s business area director:

> *In his thesis, the student suggested that there’s a need to develop condition monitoring … I’ve experience in working with these kinds of things, so I could contribute to this thesis. I told the student also to investigate this thing, and this led us, for example, to acquire condition monitoring equipment for one power plant.*

Alpha developed the asset management services mostly internally, but it had a supplier for online condition monitoring, which was a new concept in wind power plants. If Alpha wanted to give guarantees for operational reliability, it needed to have continuous online measurement of vibration. The online systems firm was one of the few firms that supplied online condition monitoring equipment; it also provided condition monitoring services. The firm was a common supplier in the manufacturing industry, and it did regular business with Alpha. Their cooperation in wind power services was taking shape in small steps, as explained by Alpha’s business area director:

> *We acquired, for example, condition monitoring equipment from the online systems firm for our wind power plant project, and we have left the door open to them … They’ve made some plans for us. We’ve read carefully through the technical solutions, and we’ve checked how we would participate in it – if we do. Our company actually decided to conclude a cooperation agreement with them in industrial services, partly because we try to standardize our equipment.*

A year later, the online systems firm’s maintenance personnel worked both at a paper mill and wind power plant near to where their condition monitoring equipment was in use.

4.4.5 Broadening the service scope through a consultant’s resources

In many cases, the constructor of a wind power plant cannot apply for a building permit before an environmental impact assessment (EIA) has been performed by a specialist firm. Alpha had not earlier offered any preliminary planning in the initial stage of the project. Therefore, Alpha had no previous

relationships with consultants. However, extending the service scope meant that Alpha needed an engineering and consultancy partner to perform EIAs. Alpha's business area director sought a partner in an early phase of the wind power service concept development. The idea was that Alpha and the partner would design the service together.

Alpha then found an engineering and consultancy firm that already had some experience in performing EIAs. The idea was that the engineering and consultancy firm would develop their specific knowledge on those operations that Alpha did not itself conduct. In the beginning, Alpha and the consultant considered developing their knowhow together. However, in practice, their cooperation developed so that both parties had their own specific knowhow, and they combined their resources in specific projects. As Alpha's business area director explained:

> *We give total responsibility for the environmental impact assessment to our partner. But some parts we want to do ourselves, such as preliminary planning of the power supply. Or we participate in some layout planning. Some pieces are kind of interlocked.*

As EIA comprised a number of different specialist tasks, several parties were included in the process (figure 16). Arrows in figure 16 show contracts between the parties.

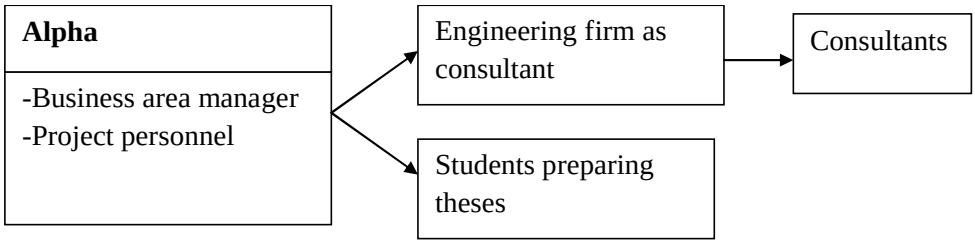

Figure 16 Network for environmental impact assessment development

The development of the EIA services occurred in everyday work. The consultant's divisional director found that the relationship with Alpha had specifically enabled them to reach a high level of learning. The divisional director put it this way: "These two projects that we've undertaken together have been the most challenging ones that can be found in Finland. We've reached a high level of learning because of these projects."

The consultant's divisional director had only entered the firm when the first projects with Alpha were already under way. He did not know exactly on what the firms had originally agreed concerning their relationship or mutual targets.

He noted: “I’ve formed my impression through the projects … Maybe we should sit down together and discuss whether things have changed in our organizations; if we’ve got different resources now, and whether the targets remain the same.” However, he expected to offer extensive services together with Alpha when the construction of the wind power plants had taken place. The consultant’s divisional director noted: “We have a unique cooperation with Alpha.”

A year later, Alpha was again looking for a consultant partner. The business area director described how they were back at the beginning:

> *Their divisional director left the firm … During the time I’ve been in contact with that consultant, people there have already changed four times. We don’t have so much in common any more … First, we see that here we could do something together, and then the people change. If that happens once, that’s still alright, but four times!*

Table 7 gathers together the data concerning interaction for resources in the development of a wind power service portfolio and provides empirical evidence for the results chapter. The first column shows the resources that were accessed from other actors for the portfolio development. The second column shows the resource category, with the given resources being expounded in chapter 5.1. The third column lists the actors that provided the resources. The fourth column provides information on the type of relationship between the actors. The fifth column lists the means to access the resources. Relationship types and means to access the resources are discussed more closely in chapter 5.3. The table also provides citations from the case text that illustrate access to each resource. Appendix 3 summarizes the empirical evidence from each case.

Table 7 Summary of interaction for resources in Alpha's wind power service portfolio

Resource	Resource category	Resource provider	Relationship between the actors	Means to access the resource	Empirical indicators
Information on firms	Informational resource: General information	Associ-ation Exhibitor	Social contact	Absorption	*And we had the Wind Power Association from which you can find the names of their members. And as we were a member too, I naturally went to some of their meetings to investigate.… And then I visited some trade fairs … to see which Finnish companies were represented there, and what's taking place. This way, I got an overall picture of the whole business. (Business area director, Alpha)*
Information on the industry and firms	Informational resource: General information	Firms in a business field	Social contact	Absorption	*I made a market study on the firms that are active in wind power field in Finland, and found out what kinds of service they provide. As a matter of fact, I visited all of these firms. I phoned them, and asked if I could visit and ask some questions.(Business area director, Alpha)*
Information on customer needs and challenges	Informational resource: General information	Firms in a business field	Social contact, or close exchange relationship	Absorption	*We had existing customers and potential customers. We went to meet several of them and tried to find out what's important in wind power, and what things are challenging. This way, we gathered information and knowledge. (Sales manager, member of the core team, Alpha)*
Information on customer needs and challenges	Informational resource: General information	Firms in a business field	Social contact, or close exchange relationship	Absorption	*It [the wind power portal] originated from our discussion with the wind power actors and producers. In many firms, they told us that they didn't know what actually happens at their wind power plants. (Sales manager, member of the core team, Alpha)*

Resource	Resource category	Resource provider	Relationship between the actors	Means to access the resource	Empirical indicators
Ready-made equipment	Technolog-ical resource	Supplier	Arm's-length relationship	Acquisition	*We acquired, for example, condition monitoring equipment from the online systems firm for our wind power plant project. (Business area director, Alpha)*
Financing	Financial resource	Public funding agency	Close exchange relationship	Sharing	*In the fall of 2008 we made plans to start a development project in the wind power business. We also drew a business plan for it. Then we applied for funding from Tekes, and they provided us with funding for two years. (Business area director, Alpha)*
Plant	Facility resource	Customer	Close exchange relationship	Sharing	*We maintain a customer's wind power plant, where we also take care of energy management. So we installed the portal in that power plant and tested it.(Business area director, Alpha)*
Project environ-ment	Facility resource	Customer	Close exchange relationship	Sharing	*These two projects that we've undertaken together have been the most challenging ones that can be found in Finland. We've reached a high level of learning because of these projects. (Divisional director, EIA consultant)*
Information on future plans of an actor Feedback on the service under develop-ment	Informational resource: Confidential information	Customer	Close exchange relationship	Sharing	*Similarly, I visited our customers from the energy industry. I asked about their plans to build wind power and about the services they would need. This way I was able to reflect their thoughts to our ideas on the service portfolio … With them you can throw in questions such as 'If we could provide this kind of service, how would you like it?' or 'Would you be interested in this kind of service?'… Of course, we had enquired several times about what they needed, and then we showed them how it would look. We asked for their opinion. This way, they've commented quite a lot on the service. (Business area director, Alpha)*

Resource	Resource category	Resource provider	Relationship between the actors	Means to access the resource	Empirical indicators
Educational knowledge	Human resource	University students	Development relationship	Resource integration	*We had four theses written on wind power during the development project, and then we've had those people planning the service concept.… In his thesis, the student suggested that there's a need to develop condition monitoring … I've experience in working with these kinds of things, so I could contribute to this thesis. I told the student also to investigate this thing, and this led us, for example, to acquire condition monitoring equipment for one power plant. (Business area director, Alpha)*
Professional knowledge, technical knowhow	Human resource	Managers from different business fields	Development relationship	Resource integration	*The team members especially provided their knowledge and knowhow for the development project. We reflected on various things that have to do with wind power, and it soon became evident that the team comprised the correct people. We indeed needed the knowhow of each member. (Sales manager, member of the core team, Alpha)*
Professional knowledge, expertise in a specific field, project management skills	Human resource	Supplier	Development relationship	Resource integration	*We manage the project. We then explain our needs to the technology firm, and why we would like to have things done in a particular way. For example, we tell them how a control screen should look; they then implement it, and also try to improve the result. (Sales manager, member of the core team, Alpha)*

Table 7 suggests that associations and exhibitors at trade fairs provided general information on firms that were involved in wind power business or were entering the field, and also general information on the wind power industry. Similarly, firms that acted in the wind power business provided general information on their needs and challenges. This adds to the resource management case, as there general information was not sought from the network. As the wind power business was an emerging business field in Finland, actors lacked more general information, which was not easily available, for example, via the Internet.

Ready-made equipment were accessed from supplier firms for power plant construction. In the wind power service development, this equipment comprised physical products, whereas they included ready-made software in resource management system development.

In the wind power service development, the public funding agency (Tekes) granted financing for the project. Alpha's existing energy producer customers provided the means to access wind power plants and project environments, where the services could be tested and where the network actors had the opportunity to learn through experience. Alpha's customers also provided confidential information on their future plans and gave feedback on the services under development.

Also, university students were involved in service portfolio development. They were able to provide the latest educational knowledge when preparing their theses in the project. Managers of different business fields inside Alpha and also Alpha's suppliers provided their professional knowledge and technical knowhow. Suppliers further provided their expertise in specific fields, and project management skills for development.

Resources provided by the network for development of the wind power service portfolio can be classified under (1) technological resources (i.e., ready-made equipment), (2) informational resources that include general information (i.e., information on firms, industry, and customer needs and challenges) and confidential information (i.e., information on customers' future plans and customer feedback on the services under development), (3) facility resources (i.e., wind power plants and project environment), (4) financial resources (i.e., financing for development), and (5) human resources (i.e., educational and professional knowledge, technical knowhow, expertise, and management skills). The service portfolio development case thus suggests that informational resources can be divided into general and confidential information. The service portfolio development case did not reveal any knowledge on relational resources that was found in the resource management system case. Other resource categories are the same as in the resource management system case.

The data suggest that accessing general information took place in social contacts or close exchange relationships between actors. Technological resources were accessed in arm's-length relationships. Financial resources, facility resources, and confidential information could be accessed in close exchange relationships. Development relationships provided access to human resources. When comparing these results with the resource management system development case, they indicate that social contacts can also provide resources for service development. Further, similar resources can be accessed in different types of relationship, at least when the question concerns facility resources and financial resources, which required a development relationship between the actors in the resource management case.

When considering how various resources were accessed in the network, the data suggest four different ways to access resources. General information can be absorbed within the network. Technological resources are acquired (i.e., purchased). Confidential information, facility resources, and financial resources are shared between the actors. Human resource access necessitates resource integration. This adds to the resource management system case by adding absorption as a way to access resources. Other results suggest similar kinds of means to access resources, as in the resource management system case.

4.5 Foundation solution development for wind turbine towers

4.5.1 Integrating resources during the design period

In 2009, the global supplier and manufacturer of fastening technology (hereafter referred to as the fastening technology firm) made a strategic decision to start development work in the wind power business. The technology director spoke about the beginning of its business in the wind power field: "We participated in some wind energy fair. It encouraged us to believe that this could be a real business for us." It had previously supplied bolts for wind turbine towers. Now it decided to develop a new kind of turnkey solution for wind turbine tower foundations. This would include planning work, production of the components, construction of the foundations, and also taking responsibility for the entity.

As wind power was an emergent field in Finland, the fastening technology firm had to give special effort to searching for the information it needed for development. Its technology director explained:

> *We didn't have any existing business with the firms from which we sought information. We just went and talked to them. We told*

> *them that we aimed to develop a business in this market, and then we tried to identify the variables. So we progressed further and further. Each meeting led to a new meeting with another party, and a new bit of information.*

The fastening technology firm knew that it would need an engineering partner for innovating when it implemented its wind power business strategy. It scanned various possibilities, mainly among expert firms in the wind power sector. It first negotiated with a couple of top firms abroad. However, these firms did not perceive that their respective ways of operating would fit with the fastening technology firm's operations.

The technology director explained the next step: "Then we contacted the Finnish sister company of one of those top firms. And we began to work with them. In fact, they didn't have that kind of knowhow in Finland. But we could learn together." This was the beginning of the innovation cooperation with Delta, an engineering and consultancy firm (see company description subchapter 4.1.2). Delta already had some experience in wind turbine tower foundations that helped at the beginning of the development cooperation.

Figure 17 illustrates the network for foundation solution development at the beginning. Arrows mark contracts between the parties.

Figure 17 Network at the beginning of the foundation solution development

Delta's project manager described the development cooperation with the fastening technology firm: "They are our customer and we provide them with our expertise. At the same time, of course, we learn more when we develop new things. We know much more than at the beginning of our cooperation." Delta developed at both the product and entity levels. It conducted spatial measurements, planned, prepared project documents, and sought solutions. The fastening technology firm manufactured the product. Delta's project manager explained:

> *We are the designer. We produce all of the material for them so that they can do things in the best possible way. We design and prepare the project documents. The fastening technology firm brainstorms and produces the solution.*

Most of the ideas came from the fastening technology firm and the ideas were assessed together with Delta. As Delta's project manager noted: "One of their persons is an idea generator. He brainstorms ideas and either I support or disagree with them. And when they've got good ideas, naturally we are able to develop them."

The fastening technology firm prepared a guide that articulated its goals over the next six months. The guide was discussed with Delta, as the technology director of the fastening technology firm explained:

> *We have a guide that tells us how to proceed. What we'll develop in the next six months. And, at the same time, we have projects or potential projects where we produce material. The guide comes from us, but it's based on cooperation. This means that Delta constantly gives us feedback, and together we think about the direction in which we should go next.*

Furthermore, Delta hired two university students to prepare their theses for the development purposes. The technology director of the fastening technology firm explained: "Delta even had two theses written on our case. This project also includes two collaborative theses." Later, a system configurator firm also joined the development project (see Figure 18). It provided expertise at the system level that Delta did not possess. When the system configurator firm developed its system model, Delta introduced its input to the development work, and vice versa. The technology director described cooperation between Delta and the system configurator:

> *Later, also a third firm joined us for development … They are experts in system configurations. With their help we can transform dimensioning decisions into systems. Delta hasn't got the necessary knowledge for that. They work daily in cooperation. When the system configurator develops the system model, Delta continually provides input. And then the system configurator might, in turn, comment that "your thoughts don't match here". Sometimes, they need to change something simple and, another time, some larger entity. It evolves gradually.*

Figure 18 illustrates the network for foundation solution development in 2010–2011. Arrows mark contracts between the parties.

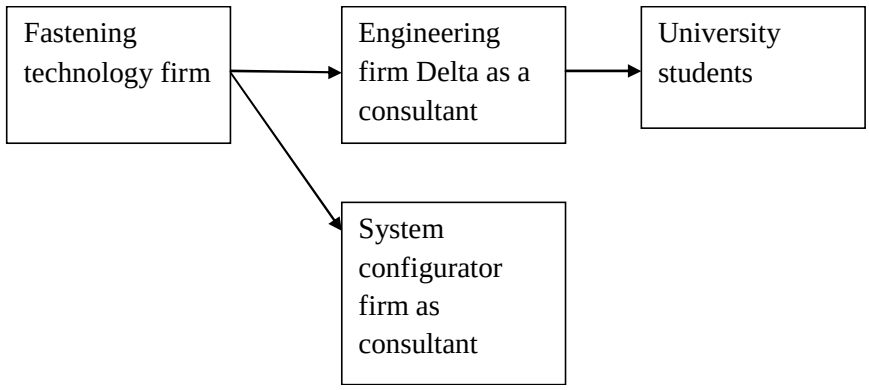

Figure 18 Network for the foundation solution development in 2010–2011

The fastening technology firm managed the entity. Delta and the system configurator firm met separately with the fastening technology firm every third week during the development work. As such, they ensured that things were understood in the same way. This was necessary as nobody had innovated anything like that before.

When the first foundation prototype was ready in 2011, the fastening technology firm began to look for a construction project in which it could be tested and further developed.

4.5.2 Accessing resources during the solution development period

Alpha was the main contractor in a couple of wind turbine projects in 2011. Alpha's business area director had noticed some time earlier that the district where the projects were located had founded a regional development company that tried to entice the wind power industry and turbines to the district. The business area director had some discussions with the company. Then he participated in a field trip to Germany, which was arranged by the development company for Finnish firms interested in wind power business. Alpha's business area director explained: "The regional development company arranged a trip to Germany where we learned about the local wind power business and industry. Various firms participated in that trip from Finland … Everybody introduced themselves and spoke about their company."

One participant was the agent that represented an Asian wind turbine supplier in Finland. Alpha's business area director explained: "The wind turbine supplier knew that they could only have business in Finland if they had connections to a firm with the capability to deliver the total project." After the presentations, the agent invited Alpha's business area director to discuss the

possibility of cooperation. The agent also had contacts with the developer of the wind power park where Alpha was the main contractor, and the developer showed interest in the supplier.

Alpha then led the negotiations with the wind turbine supplier to deliver the turbines for the project. This was the first and, thus, an important deal for the supplier in Finland. The firms agreed that the power plant supplier would deliver the plant to the harbor, and Alpha would take care of everything else.

During the project, Alpha noticed that the foundation solution of the turbine supplier was outdated and complicated. Alpha wanted to find an alternative to the existing foundation. Alpha's business area director said: "I began to find out which firms could provide a more sophisticated foundation concept for the turbines." At the same time the fastening technology firm was looking for a wind turbine construction project in which they could test and further develop their first foundation prototype. The technology director of the fastening technology firm described the beginning of its relationship with Alpha as follows: "It was the result of our active search. We were searching for wind power firms that had been involved in this kind of business. And then we actively approached Alpha."

The discussions between Alpha and the fastening technology firm led to the joint foundation solution development. The technology director of the fastening technology firm explained the motivation for their cooperation as follows: "Alpha had a need for a technology partner because they hadn't got their own resources to develop a solution. And our firm provided the opportunity for that." Also the fastening technology firm found the partnership with Alpha promising. Alpha's business area director described the interest of the fastening technology firm in the following way: "They wanted to proceed with their technology. And they had a need to find a wind turbine supplier with which they could apply their technology. Therefore my suggestion to solve together our foundation problem made them very enthusiastic."

A development network was necessary when the aim was to develop a multidimensional solution, such as the foundation solution. The technology director of the fastening technology firm explained this in the following way:

> *Two things are required. First, a good partner that is also willing to take some risk. Second, we need knowledge from our network partners, such as Delta. And we also have to communicate with other solution providers. And then we combine the knowhow that comes from the customers, from the foundation plans, and our own experience with the components. It requires the entire network to succeed and work.*

4.5.3 Integrating resources for the foundation solution

The fastening technology firm and Alpha began to develop together the solution for Alpha's purposes. They had a number of meetings in which the technology specialists, the fastening technology firm's sales persons, the foundation planners, and Alpha's wind power business management team worked together. Alpha also hired four university students to prepare their theses on wind power. Afterwards, Alpha employed them to work in its wind power projects. Figure 19 shows the network during the foundation solution development. Arrows mark contracts between the parties.

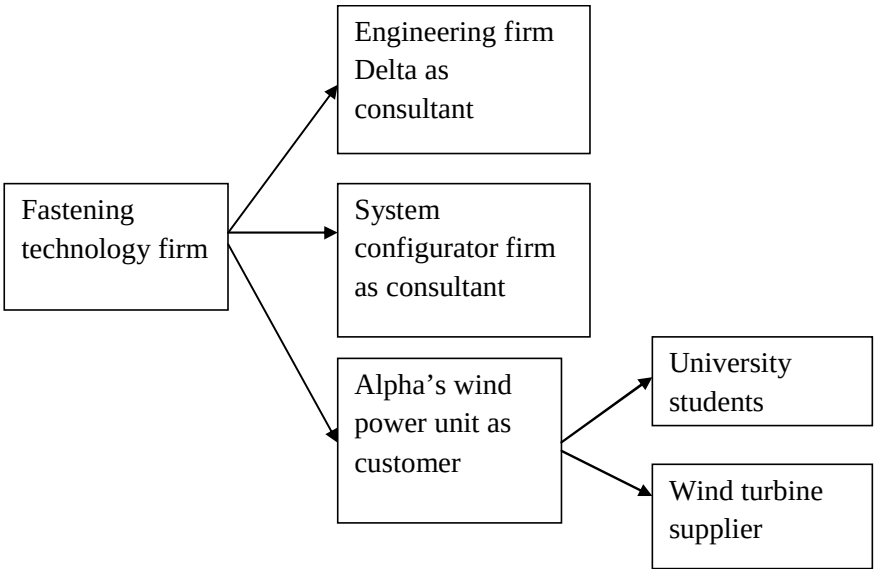

Figure 19 Network for foundation solution development in 2011–2012

When the plans were ready, Alpha contacted the wind turbine supplier and presented the suggestion for the new foundation. The technology director of the fastening technology firm explained the negotiations with the turbine supplier: "Alpha convinced the turbine supplier that our firm's solution was the correct one in this case."

Delta cooperated with Alpha's site personnel during the construction project. Delta's project manager explained their working together for development of the solution:

> *We talked on the phone with the site supervisors and Alpha's project managers every day during the most hectic building phase. And we built four windmill foundations … We also developed things further during that time. We built three foundations*

> *in a similar manner; by the fourth, we had already changed things.*

Every actor in the construction process discussed with Delta whether the solution was reasonable. Then Delta discussed with the fastening technology firm how things should be changed, as their project manager described:

> *We constantly talked with the site personnel … Then we had meetings with the steel fixers. Everyone considered whether something was sensible … And, in between, we talked on the phone with the fastening technology firm, and sent e-mails back and forth.*

Alpha also had the opportunity to learn how other firms had delivered foundations when they worked on wind turbine sites. Alpha's business area director described the advantages of seeing other foundation types:

> *Their foundations have technical differences. We've got the chance to see and learn how their solution differs from ours. And we've noticed that they've incorporated some details in a more clever way than us. We can then introduce this feedback to our solution … And now we are able feed the development phase for our technology partner.*

The fastening technology partner perceived that Alpha's most important role was as a provider of a testing environment and as a channel to the end customer, that is, the turbine supplier. The technology director put this as follows: "They've been willing to act as the platform on which we produce a solution. They needed to find a solution without investing money in its development."

When the customer was closely involved in the development process, the commercialization phase was also considered easier to implement. The technology director remarked: "If we only develop internally, we need to trust the markets' power when launching the solution." This was the first time that the fastening technology firm had worked closely with the customer over the development process. The technology director explained how they had previously involved customers: "We have only had weak communication with the customers. Something such as 'Is this good or not?'"

At the end of 2012, the Asian turbine supplier had no more projects in Finland. This meant that the fastening technology firm and Alpha also had no cooperation. The technology director of the fastening technology firm noted: "Our relationship is mainly commercial … Alpha also conducts business with other turbine suppliers. The supplier decides from where the foundation is acquired. Alpha can have any firm produce the foundations." Alpha's business area director found that its relationship with the technology firm had been affected by the exit of the contact person and lack of construction projects:

“The person with whom we cooperated at the technology firm has now left the firm … We thought of continuing the development work when we get new foundation construction projects. Without a concrete project, the development work doesn’t pay.”

Table 8 gathers together the data concerning interaction for resources in the development of the foundation solution for wind turbine towers and provides empirical evidence for the results chapter. The first column shows the resources that were accessed from other actors for the solution development. The second column shows the resource category, with the given resources being expounded in chapter 5.1. The third column lists the actors that provided the resources. The fourth column provides information on the type of the relationship between the actors. The fifth column lists the means to access the resources. Relationship types and means to access the resources are discussed more closely in chapter 5.3. The table also provides citations from the case text that illustrate access to each resource. Appendix 3 summarizes the empirical evidence from each case.

Table 8 Summary of interaction for resources in the foundation solution development

Resource	Resource category	Resource provider	Relationship between the actors	Means to access the resource	Empirical indicators
Industry information	Informational resource: General information	Exhibitors	Social contact	Absorption	*We participated in some wind energy fair. It encouraged us to believe that this could be a real business for us. (Technology director, fastening technology firm)*
Industry information and information on firms	Informational resource: General information	Firms in the wind power field	Social contact	Absorption	*We didn't have any existing business with the firms from which we sought information. We just went and talked to them. We told them that we aimed to develop a business in this market, and then we tried to identify the variables. So we progressed further and further. Each meeting led to a new meeting with another party, and a new bit of information. (Technology director, fastening technology firm)* *The regional development company arranged a trip to Germany where we learned about the local wind power business and industry. Various firms participated to that trip from Finland … Everybody introduced themselves and spoke about their company. (Business area director, Alpha)*
Well-known, esteemed, and trusted actor as a partner	Relational resource	Project management firm	Close exchange relationship	Sharing	*The wind turbine supplier knew that they could only have business in Finland if they have connections to a firm with the capability to deliver the total project. (Business area director, Alpha)*

Resource	Resource category	Resource provider	Relationship between the actors	Means to access the resource	Empirical indicators
Project environment	Facility resource	Customer	Development relationship	Sharing	*Then we contacted the Finnish sister company of one of those top firms. And we began to work with them. In fact, they didn't have that kind of knowhow in Finland. But we could learn together. (Technology director, fastening technology firm)* *They are our customer and we provide them with our expertise. At the same time, of course, we learn more when we develop new things. We know much more than at the beginning of our cooperation. (Project manager, Delta)*
Building site	Facility resource	Customer	Development relationship	Sharing	*They've been willing to act as the platform on which we produce a solution. They needed to find a solution without investing money in its development. (Technology director, fastening technology firm)*
Financing	Financial resource	Supplier	Development relationship	Sharing	*They needed to find a solution without investing money in its development. (Technology director, fastening technology firm)*
Educational knowledge	Human resource	University students	Development relationship	Resource integration	*Delta even had two theses written on our case. This project also includes two collaborative theses. (Technology director, fastening technology firm)*

Resource	Resource category	Resource provider	Relationship between the actors	Means to access the resource	Empirical indicators
Professional and techno-logical knowledge, analytical and reflective skills	Human resource	Supplier, customer	Development relationship	Resource integration	*We need knowledge from our network partners, such as Delta.… We have a guide that tells us [Delta and fastening technology firm] how to proceed. What we'll develop in the next six months. And, at the same time, we have projects or potential projects where we produce material. The guide comes from us, but it's based on cooperation. This means that Delta constantly gives us feedback, and together we think about the direction in which we should go next. (Technology director, fastening technology firm)*
Expertise in specific tasks and in specific field	Human and procedural resource	Supplier, customer	Development relationship	Resource integration	*We sought an engineering partner among the top firms abroad. (Technology director, fastening technology firm)* *They are our customer and we provide them with our expertise. At the same time, of course, we learn more when we develop new things … We design and prepare the project documents. The fastening technology firm brainstorms and produces the solution.(Project manager, Delta)*
Experience in a specific business	Human and procedural resource	Supplier, customer	Development relationship	Resource integration	*We were searching for wind power firms that had been involved in this kind of business. (Technology director, fastening technology firm)*
Experience in a specific business field	Human and procedural resource	Supplier, customer	Development relationship	Resource integration	*And then we combine the knowhow that comes from the customers, from the foundation plans, and our own experience with the components. (Technology director, fastening technology firm)*

Resource	Resource category	Resource provider	Relationship between the actors	Means to access the resource	Empirical indicators
Expertise in specific technology, professional skills	Human and procedural resource	Supplier	Development relationship	Resource integration	*Later, also a third firm joined us for development … They are experts in system configurations. With their help we can transform dimensioning decisions into systems. Delta hasn't got the necessary knowledge for that. They work daily in cooperation. When the system configurator develops the system model, Delta continually provides input. And then the system configurator might, in turn, comment that "your thoughts don't match here". Sometimes they need to change something simple and, another time, some larger entity. It evolves gradually. (Technology director, fastening technology firm)*
Technical knowhow	Human and procedural resource	Customer	Development relationship	Resource integration	*They wanted to proceed with their technology. And they had a need to find a wind turbine supplier with which they could apply their technology. (Business area director, Alpha)*
Technical knowhow, professional, analytical and reflec-tive skills	Human and procedural resource	Customer	Development relationship	Resource integration	*We talked on the phone with the site supervisors and Alpha's project managers every day during the most hectic building phase. And we built four windmill foundations … We also developed things further during that time. We built three foundations in a similar manner; by the fourth, we had already changed things. (Project manager, Delta)*
Marketing and selling skills	Human resource	Customer	Development relationship	Resource integration	*Alpha convinced the turbine supplier that our firm's solution was the correct one in this case. (Technology director, fastening technology firm)*

Table 8 suggests that exhibitors at trade fairs and firms in the wind power sector were the source of industry information and general information on firms in the field when developing the foundation solution for wind turbine towers. This result is consistent with the result in the service portfolio development case at Alpha. The foundation solution case adds a new resource to the two previous cases: a well-known, esteemed, and trusted actor as a partner for development.

Customers provided access to the project environment where suppliers had the opportunity to learn through experience, similar to the wind power service portfolio case. Customer Alpha also provided its building sites as the platform on which the foundation solution could be produced.

Unlike the two previous cases, the fastening technology firm itself manufactured the equipment needed for the foundation solution. It also provided financing to their customer, Alpha, as their cooperation in the solution development meant that Alpha did not need to invest money for development.

Similar to the service portfolio development, the foundation solution development also had university students preparing their theses, thus providing the latest educational knowledge. Development partner Delta hired the students for the foundation solution project and the benefit from their resources accrued to the fastening technology firm.

Corresponding to the two previous cases, professional and technological knowledge were also accessed in the foundation solution development from suppliers. Similar to the resource management system case, customer Alpha also provided these resources. As in the resource management system case, analytical and reflective skills were accessed both from the suppliers and customers. Expertise in specific tasks and in a specific field could be accessed from suppliers and customers. Suppliers provided further expertise in specific technology. Experience in a specific business field and business were accessed both from suppliers and customers. Experience was a resource that was emphasized both in the resource management case and in the foundation solution case for wind turbines. Customer Alpha also provided its marketing and sales skills by convincing the turbine supplier of the new foundation solution.

Resources provided by the network for development of the wind power service portfolio can be classified under (1) informational resources that includes general information (i.e., information on firms and the industry), (2) relational resources (i.e., well-known, esteemed, and trusted actor as a partner), (3) facility resources (i.e., building site and project environment), (4) financial resources (i.e., financing for development), and (5) human resources (i.e., educational, professional, and technological knowledge, technical knowhow, expertise in specific technology and specific tasks, and field, experience in the

specific business and business field, professional, analytical, and reflective skills, and also marketing and sales skills).

The data suggest that accessing general information took place in social contacts between actors. Relational resource access called for a close exchange relationship. Financial resources, facility resources, and human resources were accessed in development relationships. When comparing these results with the resource management system development case, they indicate that, in addition to development relationships, relational resources can also be accessed in a close exchange relationship.

When considering, how various resources were accessed in the network, the data suggest three different ways to access resources. General information can be absorbed within the network. Facility resources, financial resources, and relational resources are shared between the actors. Human resource access necessitates resource integration. These results are in line with the results of the two previous cases.

4.6 Development of a wind power service portfolio at Delta

4.6.1 Accessing resources for wind power business development

Wind power services were an example of a market in which some of Delta's customers had recently begun to demand large entities. One manager at Delta had previously determined what kind of knowhow the firm possessed in the wind power field. He had begun to build a wind power network inside the firm. However, the work ceased because of his other duties.

Delta's R&D management then decided to arrange a wind power workshop in the spring of 2010. Managers who were involved in the wind power business would become acquainted and discuss how they might jointly develop a large service entity for customers. As Delta comprised several acquisitions, cooperation between technical fields was challenged by the fact that they all had their own ways of operating and their own working culture. Technical fields were also located in different towns across Finland.

The R&D coordinator described a collaborative development project with the best potential to commit the participants:

> *We need to know from the very beginning that if the project succeeds, we'll get a real advantage from it. Everyone understands that if we work hard for three months on a development project, our actual work will suffer a bit. This means that we need to work evenings and weekends to get the development project ready. But that's all right if we see that our effort provides us and other people with good things and advantages*

> *… Motivation is, in fact, the most important thing. Therefore we must clearly see the target and advantages.*

The first wind power workshop concluded that an intra-organizational wind power team would be established after a new wind power coordinator had been nominated. In the fall of 2010, the executive group contacted the director of the industry and energy sector and requested that he coordinate the wind power services development. The coordinator began to plan the team composition. He chose persons who had the most to do with wind power inside Delta. Four members and the coordinator then formed the team, the composition of which is shown in figure 20.

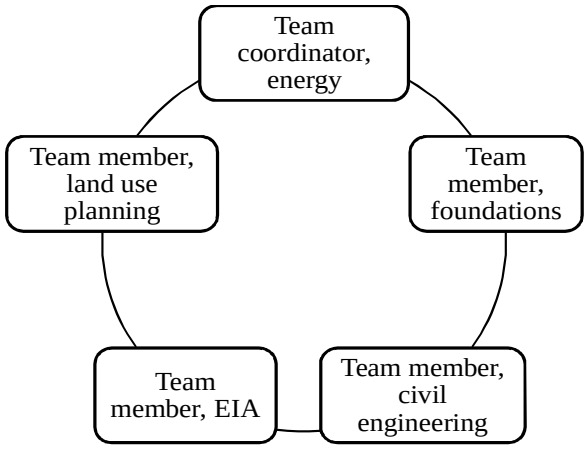

Figure 20 Composition of the wind power team

The wind power team met once in two months. The starting point of their cooperation was that Delta, until that time, had provided separately a number of their existing services in wind turbine projects. Those services would now be organized as a service portfolio. The manager of the environmental impact assessment (EIA) and land use planning unit described Delta's scope of services for wind power projects:

> *We carry out environmental impact assessments. We are now preparing several general plans for which we conduct environmental analyses. We also model the noise and make shadowing studies. We take care of permit applications. We also plan the roads to the wind turbines. We plan the construction area of the wind turbines. Then we plan the foundations. We search for areas that are suitable for wind power plants. We've got due diligence services for investors. We also have project management services. We analyze and model the returns from wind*

> *power with our partners. We have site supervision. We help to choose the suitable turbines after the location has been decided. And we arrange competitive bidding for turbine deliverers.*

The team coordinator noted that their large scope of services was an advantage in the markets: "According to my experience, customers feel that a big firm is a safe partner. They know that we manage everything from beginning to end."

The cooperation was only just beginning when the industrial sector was run down and the coordinator left the company. His successor, the regional unit manager who was a member of the team described their work:

> *Of course we've got an agenda. But actually we have free discussions. We inform others of the projects in which we're involved. We decide who will market to whom, and who's responsible for what. And we inform others of seminars and events, and who will attend them. Afterwards, we explain to the team members what we've learned there.*

Team members had decided to share customer information so that every technical field had a chance to offer its services to the customers at the right moment. The team member responsible for foundations explained the importance of customer information: "Now the environmental impact assessments and land use planning are advancing well. But after they are completed, some other firm might get involved in the rest. At that moment, we should try to keep the customer."

4.6.2 Accessing and integrating resources in service development

The actual service development, however, occurred outside the wind power team. Seminars were regularly arranged at Delta to discuss current topics and to share knowledge with other experts. At the beginning of 2012, a seminar was arranged on noise, which caused a problem in the wind turbine projects. This was described by the manager of the EIA and land use planning unit:

> *I have just returned from a video meeting. Something like 25 employees participated in it from seven locations in Finland. We discussed the latest achievements in noise research on wind turbines, and how we should react to them. A noise expert gave a lecture, and then we discussed the topic.*

Problems that arose during a wind turbine project, such as noise, were solved with the customer. In this way, Delta learnt new ways of working, as the unit manager said: "We've a wide experience in noise issues, and we try to develop solutions together with our customers so that we can avoid the

problems with noise." The network for wind power service development is illustrated in figure 21.

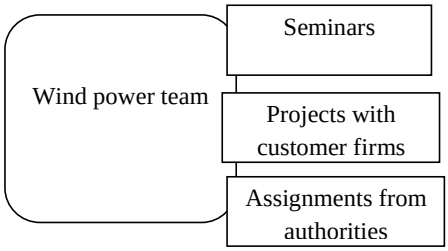

Figure 21 Network for wind power service development

The environmental impact assessment process required, for example, hearing from local residents. Delta had performed a significant number of questionnaire studies among residents across Finland. Thus, when they provided their services to customers, they could simultaneously learn in the projects. The manager of the EIA and land use planning unit explained: "We've collected a large amount of data that show how the Finns react to wind power. We know a lot about these things."

Delta had the advantage of not only having investors and energy production companies as their customers in the wind power field, it also had a significant number of public authorities as customers. Various authorities' decisions directly affected the wind power projects. Acting in the middle of these two parties enabled Delta to develop the entire wind power field. As explained by the regional unit manager:

> *We received a directive from the Transport Agency that the turbines must be placed not less than 500m from the roads. The Transport Agency had made a "just in case" decision. But now they've ordered an international report from us that examines how close to roads other countries have built their windmills, what kinds of risk they might cause, and so on.*

Some months later, after Delta had finished its report, this rule was rescinded.

Traditionally, Delta's R&D projects only lasted for some months. The manager of the EIA and land use planning unit described their development work:

> *We must aim to develop products rapidly. For example, when we decided to begin research on bats, it was only a couple of months before we had projects providing us with money for training and equipment. Our research can't take a long time. We market a new way of doing something quite rapidly.*

4.6.3 Challenges with resource integration in the team

The main function of the team was to develop the process and marketing of the wind power service entity. The biggest problem was that a wind power project could last for several years, from the environmental impact assessment to completion of the construction work. This meant that various technical experts worked at different times, and they did not have any interfaces between their service entities. Furthermore, they had knowhow and expertise in their service entity but not in other services provided by the firm. Thus, sharing professional knowledge and ideas between technical fields for development purposes was uncommon.

The team member and project manager with responsibility for the wind turbine foundations described the situation: “Our business has nothing to do with others’ businesses. And after the land use planning is ready, it can take several years before the construction work begins.” Discussions within the team, however, helped to form a larger picture of the field, which was an advantage when communicating with the customers; as the regional unit manager described: “When discussing a topic from different perspectives, one learns to understand the perspectives of other technical fields. Discussing the topic more broadly with customers can develop skills.”

All team members were involved only periodically in wind power projects, and they felt that they participated in the wind power team in addition to their everyday work. The team noted that their way of operating did not develop as they wished. The team coordinator expressed their challenges as follows: “For nearly two years, I’ve repeatedly said that we should pay attention to construction services, so that we could start marketing them … But it hasn’t progressed at all. The reason is that we all do this alongside our actual work.”

Over time, the team included other functions into their work to speed up their tasks. As described by the team coordinator:

> *To date, we haven’t even been able to design a brochure showing our wind power services. We should have one for our customers; then they would know what we can offer them. So now we try to create a brochure. I gave some materials to our marketing department. I asked them to design any kind of presentation as this won’t proceed if we don’t have something to discuss. We must have some kind of draft, so that we are able to brainstorm.*

4.6.4 Accessing wind power information inside Delta

The team approached the senior management and proposed that the firm employ a wind power specialist and coordinator who would only concentrate on wind power business. In February 2012, Delta found a suitable person from a wind turbine company. The manager of the environmental impact assessment and land use planning unit condensed the expectations of the team: "I wish that our new wind power specialist could better tie all this together. We haven't really had resources to organize our collective work. Key persons are too busy."

The wind power specialist began to coordinate the persons who were located in different towns and departments. He made sure that each task was performed by an employee. He noted: "Invitations to tender are often very extensive. We might need traffic knowhow and also environmental knowhow." As several departments were involved, it was also important to coordinate the flow of information between them. The wind power specialist mentioned: "We noticed that some invitations to tender had been missed because the information didn't reach everybody."

Communication was, in general, an important way to develop the wind power service portfolio inside the firm. The wind power specialist explained:

> *I write a news column, in which I wrote that we've now got an e-mail list of all people who work in the wind power business. Then I'll provide some general information. We should, for example, standardize the terminology we use when talking about wind power.*

Another important way of developing the internal flow of information was to store documents so that everybody could employ them in their work. The wind power specialist remarked:

> *I've collected our references in the server. So, they are always available, and people can attach them to our offers … Often the documents are only in one office. I guess that most of the projects in our firm are performed in one town. But wind power projects are typically performed in several towns … It's an advantage if everybody can use the existing documents. To my mind, that's the reason why it's worth buying the services from a large firm like us. We can say that we've already done similar things before, and therefore we can do things in less time.*

One challenge was to provide an image of one wind power service portfolio to customers. The wind power specialist explained:

> *An important part of coordination is that we've now divided our wind power business into five areas. They are preliminary study, studies and permits, detail planning, construction management*

> *services, and operation services. The managers of these five areas are in our wind power team … It's important to be able to keep the project moving smoothly between the areas so that the customer won't really notice the transition phases.*

The marketed entities could also be further extended through coordination. When employees received more information on the various services that the firm could provide, they were able to sell supplementary services, such as psychologist services or special transport studies, to customers.

4.6.5 Accessing sister companies' resources

The Delta group had multifaceted expertise in the wind power field in Nordic countries. Some years earlier, the group management had launched the idea of "one company". The R&D coordinator described the change in thinking: "At that time, this proposal didn't receive a positive response from the firms. But it's changing now. We're developing our technical opportunities to utilize the knowhow of other countries."

At this point, Delta mainly had contacts in the Norwegian sister company that provided them with wind power turbine knowledge. Furthermore, specific technical fields held international seminars once a year at which experts within the group became acquainted.

The wind power team expected the new coordinator to form relationships in other countries. The former team coordinator explained this idea: "It's no use reinventing everything here, if our sister companies mastered these things 20 years ago. We can get ready-made models from them."

Thus, one of the wind power specialist's first tasks was to widen the contact network to other Nordic countries (see figure 22). He had read that the group had a Wind Power Expertise Network with the chair in a Nordic sister company. The wind power specialist contacted him and heard that the network had not been active lately. However, the chair immediately showed interest in cooperating with the Finnish sister company.

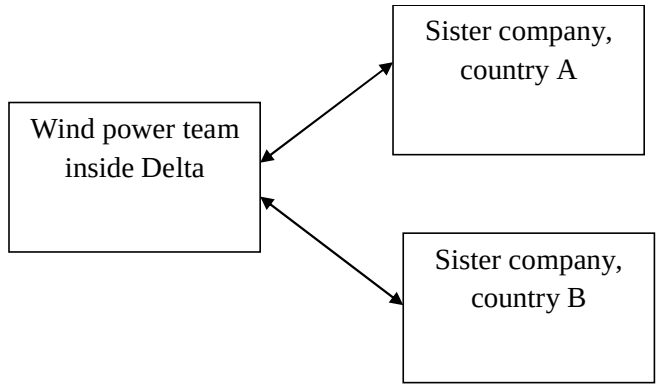

Figure 22 Network for wind power business development in 2012

It soon became clear that the Nordic sister companies needed as much expertise from Finland as the Finnish firm needed from them. As described by the wind power specialist:

> *In one country, they said that they've tried to find a person like me. They don't have turbine production there so it's been difficult to find experts … Then I phoned another country. I heard that they don't coordinate their wind power business like us. They said that we could bring our coordination experience there … But they have long-term experience in environmental impact assessment. They might sometimes come to discuss these things with us, or we could visit them … And one interesting possibility would be to exchange employees. It's a kind of investment in learning.*

The phone calls from Finland seemed also to activate other companies. Together with their new partners in sister companies, the firms aimed to widen the wind power network to new countries, maybe even globally.

Table 9 gathers together the data concerning interaction for resources in the development of a wind power service portfolio at Delta and provides empirical evidence for the results chapter. The first column shows the resources that were accessed from other actors for the portfolio development. The second column shows the resource category, with the given resources being expounded in chapter 5.1. The third column lists the actors that provided the resources. The fourth column provides information on the type of the relationship between the actors. The fifth column lists the means to access the resources. Relationship types and means to access the resources are discussed more closely in chapter 5.3. The table also provides citations from the case text that illustrate access to each resource. Appendix 3 summarizes the empirical evidence from each case.

Table 9 Summary of interaction for resources in the development of Delta's wind power service portfolio

Resource	Resource category	Resource provider	Relationship between the actors	Means to access the resource	Empirical indicators
Information on events and their contents, and information on projects	Informational resources: General information	Team members	Development relationship	Absorp-tion	*We inform others of the projects in which we're involved. We decide who will market to whom, and who's responsible for what. And we inform others of seminars and events, and who will attend them. Afterwards, we explain to the team members what we've learned there. (Regional unit manager, Delta)*
Information on research results in other countries	Informational resources: General information	Sister companies	Social contact	Absorp-tion	*But now they've [The Transport Agency] ordered an international report from us that examines how close to roads other countries have built their windmills, what kinds of risk they might cause, and so on. (Regional unit manager, Delta)*
Project environment	Facility resource	Customer	Close exchange relationship	Sharing	*We've a wide experience in noise issues, and we try to develop solutions together with our customers so that we can avoid the problems with noise. (Regional unit manager, Delta)* *[In our customer projects] we've collected a large amount of data that show how the Finns react to wind power. We know a lot about these things.(Manager, EIA and land use planning, Delta)*

Resource	Resource category	Resource provider	Relationship between the actors	Means to access the resource	Empirical indicators
Professional knowledge and scientific knowledge	Human resource	Experts inside the firm	Development relationship	Resource integration	*I have just returned from a video meeting. Something like 25 employees participated in it from seven locations in Finland. We discussed the latest achievements in noise research on wind turbines, and how we should react to them. A noise expert gave a lecture, and then we discussed the topic.(Manager of the EIA and land use planning, Delta)*
Reflective skills	Human resource	Team members	Development relationship	Resource integration	*When discussing a topic from different perspectives, one learns to understand the perspectives of other technical fields. Discussing the topic more broadly with customers can develop skills. (Regional unit manager, Delta)*
Project management skills	Human resource	Team members	Development relationship	Resource integration	*An important part of coordination is that we've now divided our wind power business into five areas. They are preliminary study, studies and permits, detail planning, construction management services, and operation services. The managers of these five areas are in our wind power team … It's important to be able to keep the project moving smoothly between the areas so that the customer won't really notice the transition phases. (Wind power specialist, Delta)*

Resource	Resource category	Resource provider	Relationship between the actors	Means to access the resource	Empirical indicators
Professional knowhow	Human resource	Sister companies	Development relationship	Resource integration	*We're developing our technical opportunities to utilize the knowhow of other countries. (R&D coordinator, Delta)* *To date, we haven't even been able to design a brochure showing our wind power services. We should have one for our customers; then they would know what we can offer them. So now we try to create a brochure. I gave some materials to our marketing department. I asked them to design any kind of presentation as this won't proceed if we don't have something to discuss. We must have some kind of draft, so that we are able to brainstorm. (Regional unit manager, Delta)*
Experience in specific operations	Human and procedural resource	Sister companies	Development relationship	Resource integration	*Then I phoned another country. I heard that they don't coordinate their wind power business like us. They said that we could bring our coordination experience there … But they have long-term experience in environmental impact assessment. They might sometimes come to discuss these things with us, or we could visit them … And one interesting possibility would be to exchange employees. It's a kind of investment in learning. (Wind power specialist, Delta)*

Table 9 suggests that information was a significant resource in the development of the wind power service portfolio at Delta. After visiting events in the wind power field, members of the wind power team provided information on the events' content. They also provided information on the wind turbine projects. Delta's foreign sister companies were the source of information on research results in the wind power field in other countries.

Delta's customers provided the project environment where solutions to problems could be developed together with customers and which was an important means for experiential learning. Experts within Delta were the source of professional and scientific knowledge. Members of the wind power team provided reflective and project management skills for the wind power portfolio development. Sister companies provided their professional knowhow and experience in specific operations in the wind power field.

Resources provided by the network for development of the wind power service portfolio can be classified under (1) informational resources that includes general information (i.e., information on events and their content, information on projects, and research results), (2) facility resources (i.e., project environment), and (3) human resources (i.e., professional and scientific knowledge, reflective skills, and project management skills).

The data suggest that accessing general information took place in social contacts and development relationships between actors. Facility resources were accessed in close exchange relationships. Human resources could be accessed in development relationships. These results are in line with the results of the previous cases.

When considering how various resources were accessed in the network, the data suggest three different ways to access resources. General information can be absorbed within the network. Facility resources are shared between the actors. Human resource access requires resource integration. These results are in line with the results of the previous cases.

4.7 Automation systems development

4.7.1 Seeking resources for the robotics solution

A robot systems company developed an industrial robot concept for material handling in the metal industry in 1999. The firm employed the robot system for its own production over ten years, and developed it further. The firm had the idea also to start selling the system to metal industry companies. However, it lacked the required contacts in the metal industry.

Around 2005, the robotic systems company contacted Gamma's management and suggested cooperation in the industrial robotics solution for the metal industry. Gamma was a well-known technical trading company from which the robot systems firm had acquired some machines. As Gamma delivered production machines and maintenance services for metal industry firms in Finland, it had close contacts with customers that the robot systems firm wanted to approach. The senior vice president and the developer of the robot system concept explained: "We wanted to have a sales channel to the metal industry, but we're an unknown actor there. Gamma, instead, is one of the best known suppliers there." He described the negotiations: "Both parties took a positive attitude towards the idea of cooperation. But Gamma didn't have any actual need to find new business opportunities. They couldn't allocate any resources for this purpose because their primary business was still booming."

Both Gamma and the robot systems company later had some discussions with other companies to start cooperation in robotics solutions for the metal industry. Gamma even briefly tried cooperating with three companies; however, two were Gamma's competitors, and the customers did not react positively to their cooperation. The third firm was part of a large technology group. Due to its large size, the firm was unable to react sufficiently quickly in comparison to competitors. Furthermore, it could not reach a reasonable price level when offering solutions in conjunction with Gamma.

In 2009, Gamma appointed a new CEO. He had earlier been the CEO of an important customer to the robot systems company. At the same time, the metal industry faced a deep recession in Finland. Gamma's machine deliveries nearly ceased. These events encouraged the robot systems company to re-contact Gamma. Gamma's group president then met the CEO of the robot systems firm. Gamma's group president described the advantages of having the robot systems firm as a partner:

> *Actors with different strengths form a good team. The robot systems firm is a strong technology enterprise. We, instead, have nothing to do with those things. Therefore, we won't face any potential competition. One of the most important issues is that we've got different customers.*

Gamma's divisional director described its motivation to begin cooperation with the robot systems firm in the metal industry: "We haven't conducted any automation business to date. We've only sold single lathes and acquired the robots from some firm. But our idea is to go further, and provide an entity and take full responsibility for it." Gamma had got this idea when it tried to sell machines to small firms in the metal industry. The divisional director described sales discussions with these customers: "Some years ago, customers often told us that they would like to buy a lathe or a machining center if we

could provide a man to use it. Since such employees are not available or they're too expensive, our robot takes the place of the man. We'll sell an entity with a lathe and a robot which will probably wear our cap, too."

The robot systems firm expected that their cooperation with Gamma would provide them a business network in metal industry. Gamma's divisional director noted: "The main reason why the robot systems firm wanted to cooperate with us was to make use of our customer knowledge." The robot systems firm's senior vice president explained why their cooperation with Gamma would provide advantage for both parties: "Automation solutions and projects are not part of Gamma's core capabilities. Thus, we've got knowhow that Gamma lacks. And Gamma has got knowhow and contacts that we don't have."

4.7.2 Integrating partner's resources

As small firms in the metal industry could not invest large sums for a robotics solution, the partners had to develop an offering that would be moderately priced. Gamma and the robot systems firm agreed on developing an automation solution, whereby the robot systems firm would provide a standard product to keep the price moderate. This was the first time that the robot systems firm had developed a standard product for the markets. Gamma would then sell the solution. This was also a new situation for Gamma as it had not previously sold solutions with service; at this point, its sales personnel had only sold machines.

The initial organization for the robotics solution development is illustrated in figure 23.

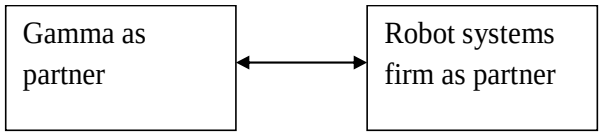

Figure 23 Initial organization for robotics solution development

The solution development began with brainstorming and planning. Gamma's divisional director described how both parties participated in the development process: "The robot systems partner provided the design knowhow and design tools. They also took care of production. We provided

the ideas for the robotics system. We also provided the entity between the machine and the robot."

Gamma's divisional director found that the most important factors in good development cooperation are technical knowhow and the motivation of personnel. He described this as follows:

> *Quite soon, I was convinced of the automation knowhow of our robot systems partner. I didn't see any reason for our cooperation not to work … The most important thing is that the partner firm has one contact person who is also actively involved in this.*

Gamma provided knowledge on customer needs in the metal industry. On the basis of this knowledge, the partners considered what features the system should have and what features could be provided as options. Customers were not directly involved in the early phases of the development process. The robot systems firm's senior vice president explained this choice: "Customers don't necessarily know that they need this kind of a solution because it hasn't existed before in the same form."

4.7.3 Integrating resources into a network

A couple of months after the development project began, Gamma joined a research project that was managed by an appreciated public research center. The researchers also attended meetings for the robotics solution development. Gamma's group president described the advantages of having a development network: "The network creates pressure. And pressure is of utmost importance. It means deadlines. And no single member wants to lose face, especially when authoritative external actors are involved, such as the research center." The network for robotics solution development a couple of months after initiation of the project is presented in figure 24. Arrows mark contracts between the parties.

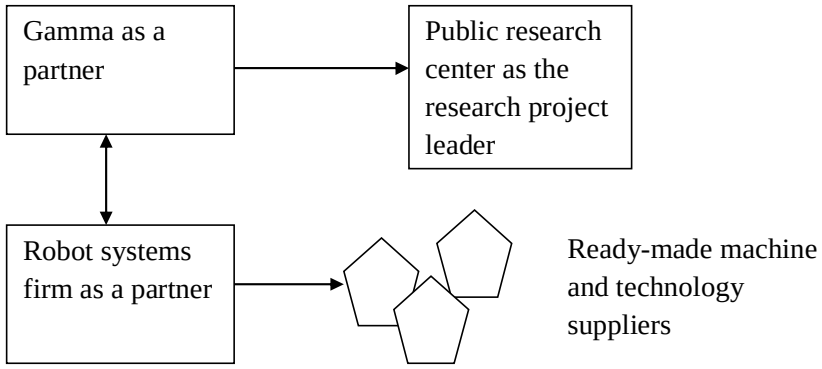

Figure 24 Network for the robotics solution development after a couple of months

The research center guided Gamma in documenting the development project. Gamma's divisional director noted: "The biggest advantage was that we began to record things. Previously, we had started working straight away, only seeing later how it had gone. And we didn't make any notes for future generations."

The senior vice president of the robot systems firm and Gamma's divisional director almost alone took care of the development. However, the research center made Gamma arrange some meetings in which other functions of its firm participated. As described by Gamma's divisional director:

> *We made all those people discuss the topic. We especially planned marketing together. Our marketing people were involved. We discussed how we should approach different customers. This also extended to discussions with the robot systems partner, and supported the initial phase of our cooperation.*

However, when the sales personnel met potential customers, they learned that the solution should also include various services, from potential leasing to life-cycle services. The robot systems firm's senior vice president noted: "When we talked with customers, we noticed the realities in a small workshop or machine tooling shop. Of course, they talked about financial facts, about the size of their facilities, and about the owner being the most important resource." The network for the solution development after discussions with potential customer is illustrated in figure 25. Arrows mark contracts between the actors.

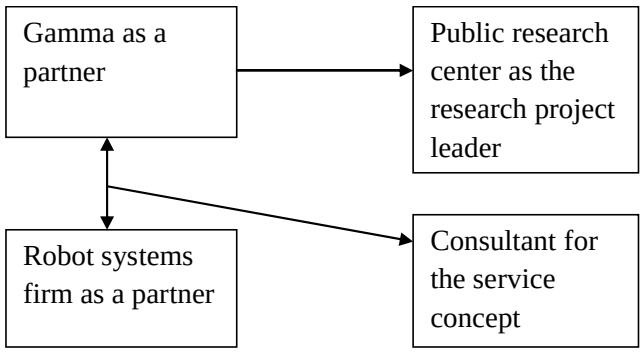

Figure 25 Network for the robotics solution development after discussions with customers

The partners decided to turn to a consultant which would help them in planning the service entity. The senior vice president of the robot systems firm explained this as follows: "The consultant was involved in productizing the service entity … The consultant was a good idea as Gamma has sold machines for 100 years, but hadn't invested much in various services to date."

4.7.4 Challenges when lacking customer and marketing resources

When, in 2010, Gamma launched the new robot solution for SMEs in the metal industry, it noticed that the lack of a reference customer made marketing a completely new solution difficult. Gamma's divisional director remarked:

> *We should have involved a customer in the development process from the beginning. It is important to have customer experience of the developed solution, and a good reference customer to which we can bring potential customers to see [the solution] … As we are a sales company, we thought that we could sell the robot solution with no problem.*

At the same time, investments in the metal industry decreased considerably because of the prolonged recession. A one-man workshop tested the robot solution for some months; however, the owner returned it when his order book was empty. The robot systems firm's senior vice president noted that they, however, had learned something from this case: "We noticed that it's a huge thing to adopt new ways of doing things. And we learnt what our product is suitable for and what it isn't … If the workshop had made some alterations to its products, they would have been better suited to automatic processing."

One clear point that Gamma learned when marketing the solution was that most of the firms needed customization, although the principal idea had been to provide a standard system from stock. Another surprise was that firms wanted a specific robot brand, but the solution was bound to one brand only. Gamma's divisional director explained: "This solution is bound to one robot brand, which the robot systems firm imports into Finland."

The development partnership was established on the expectation that Gamma provided both its good image in the metal industry and its sales capabilities for the project. Gamma managed to sell only one solution, which caused tensions in the partnership. In addition to weak markets, the robot systems firm's senior vice president also perceived other problems in the launch: "Most of the sales people are experienced machine sellers. But they don't know how to sell solutions with services included. If the salesperson doesn't understand what he is selling, the customer won't understand what he could get." Gamma's divisional director described the problems of motivating sales personnel: "We had training for the salespersons, but they won't sell something that somebody else hasn't sold before. And it would be a rare customer that dares to be the first one to buy something."

4.7.5 Accessing resources for a test sample production solution

During the robotics solution project, in 2010, the robot systems firm received an invitation to tender from a large foreign steelworks. At first, they thought they would offer their new robotics solution together with Gamma. But when they talked more with the customer, they discovered that the idea was to build an entire sample production line. The customer, however, wanted to purchase a turnkey that also included laser cutting, which Gamma and the robot systems firm could not provide.

A Finnish laser technology firm had, some years earlier, delivered a modern laser cutting system to their reference customer's plant. The laser technology firm also wanted to offer a laser cutting system to the steelworks, but it needed a partner for machining. Gamma was contacted as it was known to the laser technology firm. Gamma then suggested that all three firms combine their resources and make a turnkey offer to the steelworks as required by the customer.

The initial network for the sample production solution is shown in figure 26. Arrows mark contracts between the actors as initially planned.

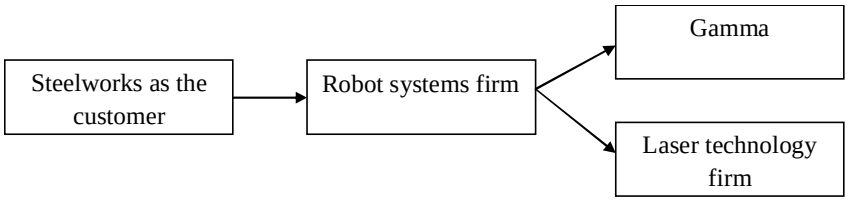

Figure 26 Network for the sample production solution development during the contract negotiations

Globally, the project was unique due to the remarkably high degree of integration and automation. The partners agreed that the robot systems firm would assume the main supplier position, and that Gamma and the laser-technology firm would act as sub-suppliers.

The laser technology firm's divisional director described their cooperation during the tendering phase: "We went through the requirements together. Then, together we made capacity calculations. We tried to avoid a situation in which we duplicated the same work. We had very open cooperation."

The robot systems firm's senior vice president described the next stage of negotiating their offering with the customer: "We were in the last commercial negotiations when I had to say that we would have to withdraw from the project as we couldn't bear the risk." The laser technology firm informed the partners that they had not been able to agree advance payment guarantees with a public financing institution.

The customer, however, accepted that the project would be split into two entities if the laser technology firm was able to arrange the guarantees within three weeks. Gamma and the robot systems firm would provide one entity, and the laser technology firm another entity. In any event, these entities would comprise the whole. According to the robot systems firm's senior vice president, this arrangement made little difference to the project:

> *Every firm has its own entity in the project, and an interface to another entity. Most of the 2,000 projects that we've undertaken over the past 30 years have been such. Almost all of our entities have been connected to something before and something afterwards. Every firm is responsible for its own entity, and we agree together on the interfaces.*

The laser technology firm, however, could not secure the guarantees. Their divisional director then thought of a production systems company. He knew what kinds of system this firm had made, and that it would be able to produce the laser cutting system if designed by the laser technology firm. The laser technology firm contacted the production systems company, and told them

that they had a ready contract with a customer, and they now needed a partner that could take responsibility for the project towards the customer. The firms then formed a partnership.

4.7.6 From a good start in resource integrating to challenges

Planning for the sample production solution began in the spring 2011. The robot systems firm managed the entity between Gamma and itself. The laser technology firm managed the entity between the production systems firm and itself. The network for the sample production solution is illustrated in figure 27. Arrows mark contracts between the actors.

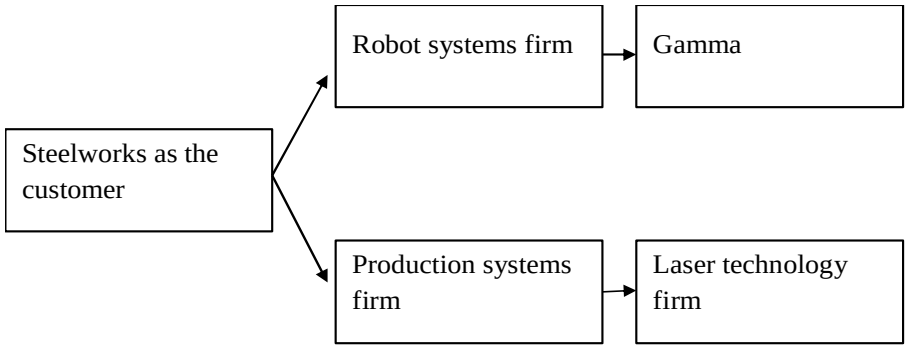

Figure 27 Network for the sample production solution development

Gamma's divisional director described the division of work between the firms:

> *We provided the machine tool, fixing system, and the interface that liaises with the robot. And we also provided training and the machinery technology that picks up the pieces. The robot systems firm implemented the automation part, everything around the system … And the production systems firm, which was also involved in the project, supplied the automation technology. The laser technology firm supplied the laser cutting technology.*

The laser technology firm's divisional director described its cooperation with the robot systems firm during the project: "We worked together during the solution planning because we had common interfaces. We discussed and had meetings several times a month." The divisional director explained the advantages of cooperation during the project: "It resulted in specific technical solutions. It even led us to change the contents of the delivery to some extent.

And the party with the most responsibility for a particular aspect discussed it with the customer."

The development network for the sample production solution between the spring 2011 and fall 2011 is illustrated in figure 28.

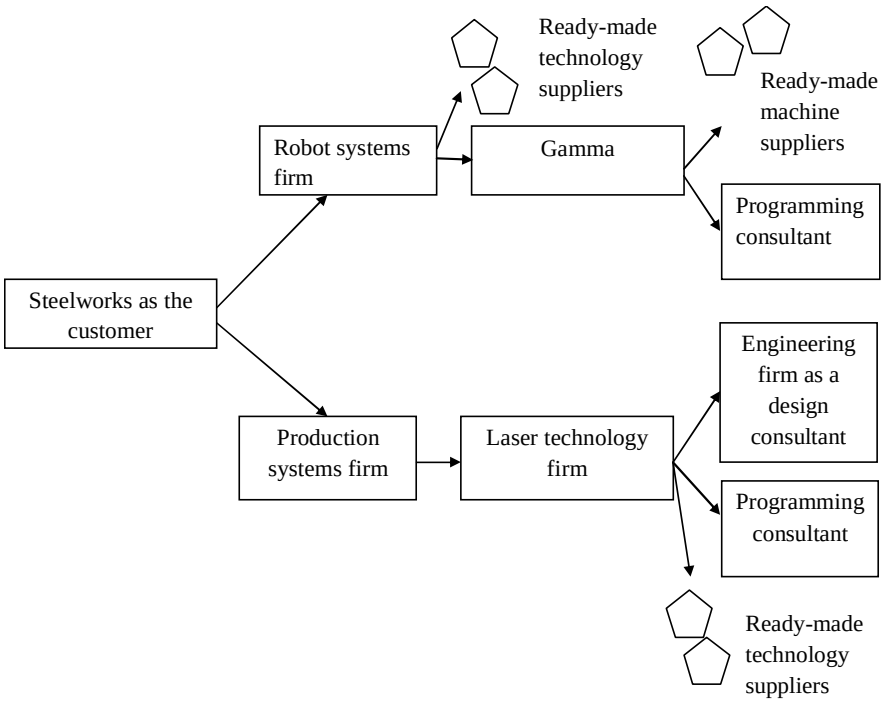

Figure 28 Network for the sample production solution development during the first half year

The laser technology firm provided its customer knowledge to the other project firms. Its divisional director explained:

> *We were actually the only supplier which had a general impression of the production process, thanks to our delivery to the earlier customer. And we had also maintained those machines. I can say that we knew the total customer needs better than the others.*

Project firms exchanged ideas at the beginning of the project, and they openly discussed how each firm should realize their part so that the others could better implement theirs. The laser technology firm's divisional director put the advantage of open discussions this way: "Thanks to information exchange, our understanding on the system's requirements and the best way to

build it has increased … We've been able to simplify, for example, material flow on the way."

The customer provided a virtual project management tool for the project, in which all of the documents and correspondence between the firms were stored. The production systems firm's project manager explained:

> *We partly manage the project through a virtual project management tool. There, we have all of the documents and correspondence, where almost everybody can read them … The customer uses this tool in all of its projects … I even put photos of the machine there every week, so that everybody can see how it is developing … All the relevant data is there.*

In the planning phase, cooperation between the robot systems firm and the customer was intensive. The robot systems firm's project manager explained: "We made the plans together with the customer's contact person." But when the plans were ready, cooperation with the customer did not continue to be that active.

The laser technology firm's project manager changed in the summer of 2011. This delayed the timetables to some extent, which led to delays in payments. The laser technology firm employed an engineering firm for planning and design. When payments did not arrive on time, the planning did not progress any further. The laser technology firm's divisional director spoke about their cooperation with the production systems firm under these circumstances: "We didn't have too many choices. We always arranged meetings and found solutions together."

In August 2011, the production systems firm employed a project attendant (later project manager) from outside the firm. Two weeks later, the laser technology firm's project manager phoned him and said that the project was no longer under control because of delays in the timetables. The project attendant noted: "From that day on, we struggled to manage the state of change."

It soon became clear that the laser technology firm could not finish the design. The production systems firm's project manager described this situation:

> *Only then did our technical department get involved in the project. All the plans were moved into our office … Our electrical planner began to read the project contract line by line. And luckily he did. He told me that the current plans had nothing to do with the contract. And then he designed non-stop for probably two and a half months.*

The contract requirements had clearly never reached the engineering firm. The laser technology firm continued to manage the project and took care of customer contacts. The production systems firm's project attendant only made

some comments. Otherwise, he took care of the project only inside the production systems firm. The project attendant described their cooperation:

> *The laser technology firm supplies us with the design documents, and takes care of some equipment purchasing. We do most of the purchasing on the basis of the design documents. And then we assemble the machine. The laser technology firm has contacts in the firm that supplied the laser equipment. They are standard components.*

However, the production systems firm did not pay for the planning of the laser technology firm anymore as the work was incomplete. Instead, they paid for the laser acquisitions and other equipment so that the project could proceed.

The robot systems firm found communicating with the laser technology firm difficult at that time. The robot systems firm's project manager noted: "Things became more and more difficult … If we asked for something from them, they hardly ever answered us."

4.7.7 Challenges with resources after the bankruptcy of the laser technology firm

In October 2011, the laser technology firm went bankrupt. The production systems firm's project attendant suddenly became the new project manager. He described the difficult situation that he faced:

> *It was extremely hard to acquaint oneself with the project. Everybody else knew much better how to manage the practicalities than the project manager. And I had to learn how such a complex machine works. What's the situation in planning and production? What surprises we might face … They hadn't prepared a proper project plan. There was only a well-prepared time schedule and some descriptions. And a tome full of contractual texts.*

There were three main suppliers remaining in the project (see figure 29). The project had to be budgeted again. But the production systems firm felt that the situation was much clearer now. They employed people from the laser technology firm to continue the project, and acquired a completely new field of knowhow in their firm.

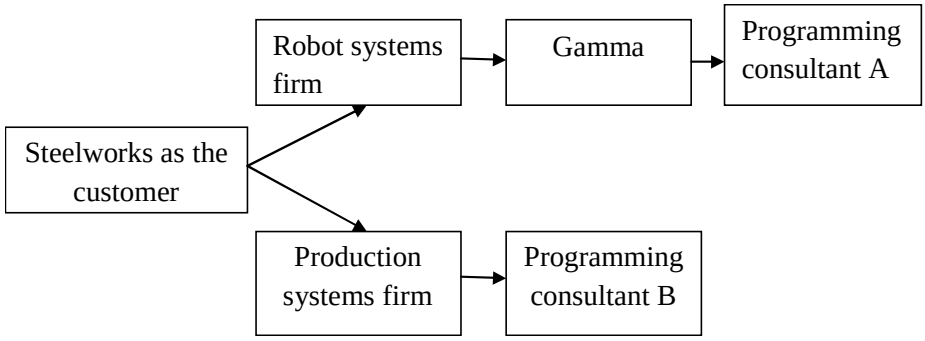

Figure 29 Network for the sample production solution development since October 2011

The production systems firm's new project manager met the robot systems firm's project manager for the first time. He noted: "We agreed on concrete things such as interfaces between our systems. Only then did I begin to piece together the entity in my mind." However, the robot systems firm's project manager found the situation difficult: "The new project manager didn't know the background of the project. And suddenly the things we had agreed on with the laser technology firm weren't clear at all. When the firm changed, the managers changed, and everything changed."

The laser technology firm had facilities in a technology park that was built for the technology cluster. This technology center had received funding from the European Union. Based on this finance, the laser technology firm had entered into a contract with a programming firm for the development of the laser cutting machine's software. Programming was the most critical part of the laser technology supply. The work was only half completed when the laser technology firm went bankrupt. The project manager of the production systems firm explained:

> *Programming of the machine is an extremely critical part of the project … The laser technology firm can't pay their enterprise money. Now they are in a standoff. This is to say, partner networks are extremely good when everything works well. But when something like this happens – the backbone is broken. Then the network is paralyzed … We struggle now with the engineering firm about money that doesn't have anything to do with us.*

4.7.8 Challenges with resource integration during the rest of the project

Although the customer was in constant contact with the project managers and replied to their questions, it did not actively participate in the development of the sample production solution. The knowledge that the customer had was therefore not actively utilized in the development. The laser technology firm's divisional director described how the customer's knowledge, however, accidentally helped them later in the project: "The customer suddenly arrived at our office this morning. They told us the kinds of machining tools that should be used. If particular types of tools are used, it might cause problems."

The traditional way of keeping each project entity separate for as long as possible also caused problems during the project. Gamma's divisional director described these challenges:

> *It's a question of interfaces. When we and the robot systems firm come from different worlds, their perception of the things that belong to us is different to ours. We didn't assume that they wouldn't understand some things. And, similarly, they didn't expect that we wouldn't operate in the same way as them.*

The robot systems firm's project manager expressed the challenge as follows:

> *It was quite clear what Gamma had to do. But only then we really understood that they are a machine seller. And this project would have required machine building, design, and electrification. It seemed to be something new to Gamma.*

Gamma had a programming consultant that designed the machine but it did not solve the problems with the interfaces between Gamma and the robot systems firm. Instead, the robot systems firm finally built hydraulics at the machining center by themselves.

The software played a significant role in the operation of the sample production solution. The software of the laser cutting machine, the software for the robotics solution, and the IT systems of the customer had to function smoothly together. The customer had a major information system development project underway at the same time as the sample production solution development. Also, the engineering firm that designed the software for the laser cutting machine had no experience of these machines. Furthermore, the delays in the project timetables caused a situation whereby the engineering firm had to design the software before it had all the necessary information available. The laser technology firm's divisional director described this situation: "Four firms dealt with the software issues. And we had two separate contracts with the project's customer. It meant that everybody took care of the things up to

their own interface. Maybe we should have had more meetings and collaboration."

One of the biggest problems between the robot systems firm and Gamma was that their ways of organizing the project confused both parties. This was explained by Gamma's divisional director:

> *The robot systems firm has got several project managers. All of them call us and suggest things to do … And nobody coordinates this. For example, we decide to have a particular kind of fixing; then somebody from the partner's side says that it doesn't fit. Well, we change the fixing. Then we notice that our part doesn't work anymore. What should we do then? Okay, we change that too. And things spin out of control.*

The robot systems firm's senior vice president found that the problem was that Gamma did not follow the traditional way of organizing a project:

> *Of course we try to organize so that we've got one project manager as a contact person on both sides. But their task is only to coordinate the project … Then we've got specialists in different technical fields. They're responsible for a distinct entity … And specialists discuss details with each other … Electricians discuss with electricians. And mechanics discuss with mechanics … The problem is that Gamma does not have a clear division of tasks. And they don't have one project manager, but three. And we need to contact all of them because we don't know who is responsible for what. And CEOs also discuss with each other … Too many cooks spoil the broth. Our working cultures are too different.*

Although the test sample production line was one entity, the project was coordinated in two separate entities. It meant that all of the problems between the suppliers were circulated to the customer. This potentially risked the result. The laser systems firm's divisional director noted in February 2012, when its plan was to deliver the sample production system for a test run at the customer's factory: "Now we're in a project phase where we all trust that everything is fine. But when we will integrate our entities it might be possible that the system wouldn't work … Then we'll realize that we've forgotten communication at some point."

The robot systems firm delivered their entity to the customer in February 2012. However, the laser cutting entity was delivered in August 2012, and the pretesting had not been completed. The timetable, however, did not allow for any further delays. The testing of the system was continued at the customer's factory, and it took much longer than normal, partly due to the unfinished laser cutting system and partly because the IT system development was conducted at the customer firm.

A major change at the customer side was that their contact person left the firm. The production systems firm's current project manager (former divisional director of the laser technology firm) described the situation: "For a while it caused confusion in the project. But then the customer hired two persons with automation backgrounds. We have trained them as the main users of the system. And then we've trained the people who will operate the system." For the robot systems firm, the change of contact person meant difficulties in communicating with the customer. As described by the robot systems firm's project manager: "If you send them an e-mail, you may not get an answer. Then you try to phone them, but maybe they only answer the phone after a couple of days."

Testing the sample production system required testing material from the customer. This caused further delays in the testing phase as the recession had reduced orders from the customer's customers. It was thus difficult to find enough material for testing. Also, with two firms being responsible for the tests, sometimes it happened that one or the other was absent at a critical moment. This was described by the production systems firm's project manager: "Splitting the project into two entities has slowed the project. For example, this week two of our people have been testing the system, but the people of the robotics systems firm were not present. We had to ask them for help by phone."

The robot systems firm's project manager noted that the project was not a typical one, which caused specific challenges. He expressed it this way:

> *This was a large export project to all of us. And it involved a great deal of new technology. Nobody has done something like this before … And we had no idea how many sorts of steel the customer actually processes in the factory. Something like 300 different sorts, which make quite a matrix when you look for control parameters.*

If several firms also work together in the future, it would be important to liaise directly with the various involved actors; not everything needs to go through a project manager. Also, the supplier firms' teams should become close to each other at the beginning of the project. As noted by the production systems firm's project manager: "Everybody should consider what is best for the total system."

The robot systems firm's project manager found that the customer played a critical role when the project was divided into separate entities. As he explained: "The customer should have an assertive project manager. They had a named project manager, but it didn't work as it should. The customer's project manager should lead the project, so that the pieces are integrated with each other, and also to the customer's systems."

Table 10 gathers together the data concerning interaction for resources in the development of automation systems and provides empirical evidence for the results chapter. The first column shows the resources that were accessed from other actors for the systems development. The second column shows the resource category, with the given resources being expounded in chapter 5.1. The third column lists the actors that provided the resources. The fourth column provides information on the type of the relationship between the actors. The fifth column lists the means to access the resources. Relationship types and means to access the resources are discussed more closely in chapter 5.3. The table also provides citations from the case text that illustrate access to each resource. Appendix 3 summarizes the empirical evidence from each case.

Table 10 Summary of interaction for resources in the automation solutions development

Resource	Resource category	Resource provider	Relationship between the actors	Means to access the resources	Empirical indicators
Ready-made machine	Technological resource	Supplier, partner	Arm's-length relationship	Acquisition	*This solution is bound to one robot brand, which the robot systems firm imports into Finland. (Divisional director, Gamma)* *We acquired the machine vision from a Dutch firm. It's a ready-made commercial product, similar to the one we used in our original robotics solution. (Senior vice president, robot systems firm)* *The laser technology firm … takes care of some equipment purchasing. We do most of the purchasing on the basis of the design documents…The laser technology firm has contacts in the firm that supplied the laser equipment. They are standard components. (Project manager, production systems firm)*
Virtual environment	Facility resource	Customer	Development relationship	Sharing	*We partly manage the project through a virtual project management tool. There, we have all of the documents and correspondence, where almost everybody can read them … The customer uses this tool in all of its projects … I even put photos of the machine there every week, so that everybody can see how it is developing … All the relevant data is there. (Project manager, production systems firm)*

Resource	Resource category	Resource provider	Relationship between the actors	Means to access the resource	Empirical indicators
Well-known, esteemed, and trusted actor as a partner	Relational resource	Partner	Development relationship	Sharing	*We wanted to have a sales channel to the metal industry, but we're an unknown actor there. Gamma, instead, is one of the best known firms there. (Senior vice president, robot systems firm)*
Customer intelligence	Informational resource: Confidential information	Partner	Development relationship	Sharing	*The main reason why the robot systems firm wanted to cooperate with us was to make use of our customer knowledge. (Divisional director, Gamma)*
Knowhow on marketing	Human resource	Consultant	Development relationship	Resource integration	*The consultant was involved in productizing the service entity … The consultant was a good idea as Gamma had sold machines for 100 years, but hadn't invested much in various services to date. (Senior vice president, robot systems firm)* *We especially planned marketing together. Our marketing people were involved. We discussed how we should approach different customers. (Divisional director, Gamma)*
Technical knowhow and experience	Human and procedural resource	Partner	Development relationship	Resource integration	*Actors with different strengths form a good team. The robot systems firm is a strong technology enterprise. (Group president, Gamma)* *We went through the requirements together. Then, together we made capacity calculations. We tried to avoid a situation in which we duplicated the same work. We had very open cooperation.(Divisional director, laser technology firm)*

Resource	Resource category	Resource provider	Relationship between the actors	Means to access the resource	Empirical indicators
Technical knowhow and professional skills	Human and procedural resource	Partner	Development relationship	Resource integration	*The robot systems partner provided the design knowhow and design tools. They also took care of production. We provided the ideas for the robotics system. We also provided the entity between the machine and robot. (Divisional director, Gamma)* *Programming of the machine is an extremely critical part of the project. (Project manager, production systems firm)*
Knowhow on solutions and projects	Human and procedural resource	Partner	Development relationship	Resource integration	*Automation solutions and projects are not part of Gamma's core capabilities. Thus, we've got knowhow that Gamma lacks. (Senior vice president , robot systems firm)*
Professional knowledge, technical knowhow, knowhow on solutions, analytical skills	Human and procedural resource	Partner	Development relationship	Resource integration	*We worked together during the solution planning because we had common interfaces. We discussed and had meetings several times a month … It resulted in specific technical solutions. It led us even to change the contents of the delivery to some extent. (Divisional director, laser technology firm)*

Table 10 suggests that suppliers and partners provided ready-made machines for the automation solutions development. The customer provided a virtual environment for development. A well-known, esteemed, and trusted actor was chosen as the partner to enable access to new markets. This also enabled access to customer intelligence from the partner. The partner similarly provided technical knowhow and knowhow on solutions and projects. The partner further provided technical experience, professional skills, and analytical skills. Marketing knowhow was accessed from a consultant.

Resources provided by the network for development of the wind power service portfolio can be classified under (1) technological resources (i.e., ready-made machines), (2) facility resources (i.e., virtual environment), (3) relational resources (i.e., a well-known, esteemed, and trusted actor as a partner), (4) informational resources comprising confidential information (i.e., customer intelligence), and (5) human resources (i.e., technical knowledge and experience, knowhow on solutions and projects, professional and analytical skills, and marketing knowhow).

The data suggest that accessing technological resources took place in arm's-length relationships. Other kinds of resource, that is, facility resources, relational resources, confidential information, and human resources were accessed in development relationships.

When considering how various resources were accessed in the network, the data suggest three different ways to access resources. Technological resources are acquired (i.e., purchased). Facility resources, relational resources, and informational resources are shared between the actors. Human resource access requires resource integration. These results are in line with the results of the previous cases.

5 RESOURCE ACCESS AND INTEGRATION IN THE STUDIED CASES

5.1 Resources in networks for service innovation

The results of the empirical study suggest that firms seek a variety of resources from network actors for service innovation. The data on innovation at the company level and at the innovation project level provided evidence for categorization of the innovation resources (see appendix 3). Furthermore, the results showed the importance of understanding which actor is the source of the resource. The following subchapters discuss the resources that networks provided for service innovation. On the basis of the results, a resource categorization is generated for innovation resources in networks.

5.1.1 Human resources and procedural resources

The empirical data show that network actors provided, in particular, knowledge, knowhow, expertise, skills, and experience for the service innovation. They comprise the category of *human resources* when they are bound to individual employees (Hunt 1997b). Similar kinds of resource could also be bound to a larger organization. This necessitated that they were built into the procedures and routines of an organization. As such, Hunt (1997b) refers to competences, and Hunt and Madhavaram (2008) to procedures and routines that they place under organizational resources. The results of the empirical study, however, suggest that resources bound to an organization can be classified into various resource types. Therefore, human resources, which have become an integral part of organizational procedures and routines, comprise here the resource category of *procedural resources*. Table 11 lists the human and procedural resources found in the empirical data (see appendix 3), and provides detailed information on these resources.

Table 11 Human and procedural resources in the empirical data

Resource	Detailed description of the resource
Knowledge	- educational knowledge - professional knowledge - technological knowledge - scientific knowledge
Knowhow	- technical knowhow - knowhow on specific business functions such as marketing - knowhow on solutions - knowhow on projects
Expertise	- expertise in specific tasks, e.g., design - expertise in a specific field, e.g., noise - expertise in specific product types - expertise in specific technology
Skills	- professional skills - analytical skills - reflective skills - marketing and selling skills - project management skills
Experience	- technical experience - experience in specific operations - experience in a specific business field - experience in specific types of customer - experience as a user

Knowledge and knowhow were typically mentioned as resources provided by network actors for service innovation. Knowledge comprised educational, professional, technological, and scientific knowledge. Alpha's head project manager described some of the knowledge that they provided in the resource management project: "Our task was to define the requirements for the system". Knowhow included especially technical knowhow, and also knowhow on specific business functions, solutions, and projects. Gamma's divisional director said: "The robot systems partner provided the design knowhow."

Informants referred also to profound expertise as a resource that was appreciated in the networks. Expertise might refer to in-depth knowledge in some specific tasks or in a specific knowledge field. The technology director of the fastening technology firm explained: "We sought an engineering partner among the top firms abroad." Similarly, professional, analytical, and reflective skills, and also marketing, selling and project management skills were sought for service innovation. The principal supplier's project manager described Alpha's project manager: "He is very analytical. He can suggest changes that affect different operations." Experience in a specific field or operations or with

specific types of customer was also sought for service innovation. Delta's wind power specialist noted with regard to one of its sister companies: "They have long-term experience in environmental impact assessment."

The empirical data suggest that actors often expected the above-mentioned resources to be part of an organization's routines and procedures, especially when an issue concerned resources of another company. Indeed, as table 11 suggests, the same resources can belong to human or procedural resources.

For example, experience might be the main reason to initiate a development relationship with an organization, or if a particular resource could be found in the reference lists of companies, which refers to an organization-level resource. Alpha's head project manager spoke about the reason to choose the specific IT solutions firm as their new principal supplier in the resource management project: "We expected professional project management from them; that they could manage the project because of their experience also in difficult situations." The failure with the first principal supplier, however, was partly due to the lack of management skills of specific project managers. If the persons who had the required resources did not personally participate in the innovation project, their resources might not provide any advantage to the innovation (see also Swan et al. 1999). This finding indicates that management skills and experience in project management were individual-bound human resources in the supplier firm, not organization-bound procedural resources. Thus, for example, skills and experience might refer to a human resource or to a procedural resource that makes the situation challenging from the resource seeker's perspective.

In a similar way, the robotics firm's senior vice president described its interest in a partnership with Gamma in the automation solution development: "We wanted to have a sales channel to the metal industry, but we're an unknown actor there. Gamma, instead, is one of the best known firms there." Although they formed a partnership whereby Gamma agreed to take care of the launch and sales of the developed robotics solution, the launch did not succeed. Only then did it become evident that the marketing of B-to-B solutions mainly required human skills that are bound to individuals working for the organization. The robotics firm's senior vice president concluded: "Most of the sales people are experienced machine sellers. But they don't know how to sell solutions with services included."

The results thus suggest that knowledge, knowhow, expertise, various skills, and experience are primarily human resources, and bound to individuals in an organization. If a person leaves an organization, the resources are also lost to the organization. For example, when a project manager changed in an innovation project, the loss of human resources became evident. The principal

supplier's project manager spoke about the resource management project: "When the project manager changes, a kind of black hole forms."

One therefore needs to distinguish between individuals and organizations as actors, and between human and procedural resources when the question concerns innovation resources provided by networks. Knowledge, knowhow, expertise, skills, and experience can become part of organizational resources only if they are collectively constructed in interaction (Swan et al. 1999) or collectively learned, and if they can be built into an organization's procedures and routines (cf. Dibella et al. 1996; Galbreath 2005; Teece 2012). The reason for this is that, to a large extent, these resources are implicit, tacit resources which require a long learning process, and typically also call for practice (Ambrosini & Bowman 2001).

5.1.2 Technological, facility and financial resources

In addition to human resources, also *technological resources* and *facility resources* were important to service innovation in the studied cases; they were regularly mentioned by informants as resources that networks provided for innovation. As the empirical cases comprised engineering services, this is an understandable result. Hunt and Morgan (1995) refer to physical resources. However, the present study's empirical results indicate that this resource category needs to be divided into two categories for service innovation as different resources under the physical resource category are employed in different ways and for different purposes in service innovation (see chapter 5.2). Furthermore, not all technological and facility resources, such as web-based software or virtual environments, were physical in service innovation.

In the empirical data, technological resources comprised ready-made machines, equipment, and ready-made software that were needed for the solution. They always became part of the service. They vary from technological knowledge, which is a human or procedural resource (see subchapter 5.1.1) as they could be readily applied in innovation. Table 12 lists technological resources that can be found in the empirical data (see appendix 3), and provides detailed information on these resources.

Table 12 Technological resources in the empirical data

Resource	Detailed description of the resource
Ready-made machine	A standard product. The solution can be built around it or it becomes part of the solution.
Ready-made equipment	A standard product that does not require any changes. It enables performance of the service or it becomes part of the solution.
Ready-made software	A standard product that does not require any changes. It becomes part of the solution or the service is built on it.

Gamma's divisional director explained the technological resources that each party provided to the sample production solution:

> *We provided the machine tool, fixing system, and the interface that liaises with the robot. And we also provided training and the machinery technology that picks up the pieces. The robot systems firm implemented the automation part, everything around the system … And the production systems firm, which was also involved in the project, supplied the automation technology. The laser technology firm supplied the laser cutting technology.*

The rest of the resources that Hunt and Morgan (1995) put under physical resources can be categorized under *facility resources*, the term employed in the IMP Group's 4R model (Baraldi et al. 2012). The results revealed that facility resources comprise premises, plant, building sites and project environments, and virtual environments that a customer or a supplier provided for service development, testing, and production (see appendix 3). Table 13 lists the facility resources found in the empirical data, and provides detailed information on these resources.

Table 13 Facility resources in the empirical data

Resource	Detailed description of the resource
Premises	Customer or supplier provides to enhance collaboration in innovation. Potential customers can visit the premises of the reference customer when the solution is launched onto the markets.
Plant	Supplier can utilize the customer's plant for new service testing while working for the customer.
Building site	A concrete project with a building site might be the only way to innovate and further develop a solution.
Project environment	Performing projects in specific environments enables learning by doing, which can lead to innovations.
Virtual environment	Enables working together also when physically remote. Enables storing and sharing documents and data.

The principal supplier's project manager described its virtual development environment in the resource management system project in the following way:

> *We had a virtual task manager tool. We used it actively, and gave the rights to Alpha's main users, the asset management system developers, and the integrator. We documented everything there, and could give a task to anybody in it … All the changes were made in the task manager, where we also tested the changes ourselves. Then the changes were moved to the test environment, where we and Alpha tested them.*

Financial resources also played an important role in service innovation in the studied cases. Informants mentioned that service firms cannot afford to invest much money in innovation. Therefore, development was often progressed with finance provided to the focal firm by customers, suppliers, or a public funding agency without the need to pay it back. When development was part of a customer's project, finance received from customers meant payment for work completed. Table 14 lists the financial resources found in the empirical data (see appendix 3), and provides detailed information on these resources.

Table 14 Financial resources in the empirical data

Resource	Detailed description of the resource
Financing by a customer	Finance provided by a customer when the service is developed for it.
Financing by a supplier	Supplier might pay the development costs when the customer agrees on acting as the development base.
Financing by a public funding agency	Finance provided by a public funding agency for a specific innovation project.

The project manager of the asset management system supplier (resource management system development) described its ways of sourcing finance for software development:

> *Of course, we needed money [for development of the asset management software]. We therefore had a development project funded by Tekes. And we also sought a partner … Our main interest was to have a reference customer that provides us with finance for the development.*

Financial and facility resources are thus often a prerequisite for service innovation to occur. They provide capital and environment for innovation. Technological resources such as machines and software, instead, are an essential part of many services. This result adds to the extant literature on resources that might not separate technological and facility resources from each other (e.g., Hunt & Morgan 1995; Hunt 1997b), or employs the concept of technological resources to refer to a variety of resources, including facility resources and combinations of goods and services (e.g., Waluszewski & Håkansson 2007, 17; Baraldi et al. 2012).

5.1.3 Informational resources

Informational resources were an integral part of service innovation in the studied cases. The empirical results suggest that informational resources comprise a broader scope of resources than suggested by the resource-advantage theory (Hunt & Morgan 1995; Hunt 1997a). According to the results, informational resources comprise general information[2] and confidential information. General information included information that actors openly provided on their industry and business, and also their challenges, needs, and

[2] The term information is employed here to mean explicit knowledge that can be easily communicated (see Ambrosini & Bowman 2001; Day 2005)

thoughts in connection with service innovation. Similarly information on research results and information on various events and projects were sought within networks.

Confidential information included information on trusted relationships, actors' future plans, and customer and market intelligence provided by network actors for service innovation. Further feedback provided by customers on the service under development was appreciated by the focal firms. Confidential information was not openly available but necessitated a close business relationship between the actors. Table 15 lists the informational resources found in the empirical data (see appendix 3), and provides detailed information on these resources.

Table 15 Informational resources in the empirical data

Resource	Detailed description of the resource
General information	- industry information - information on firms - information on customer needs and challenges - information on research results - information on events and their contents - information on projects
Confidential information	- information on an actor's future plans - customer intelligence - information on trusted relationships feedback from customers on the service under development

Existing and potential customers provided valuable information on their needs for and challenges concerning service innovation. Alpha's sales manager explained how it determined what customers find important or challenging in the wind power field when they developed the wind power service portfolio:

> *We had existing customers and potential customers. We went to meet several of them and tried to find out what's important in wind power, and what things are challenging. This way, we gathered information and knowledge.*

Similarly, actors could collect general information on specific industries. Alpha's business area director described how he formed a general picture of the wind power field in Finland at the beginning of their development project:

> *And then I visited some trade fairs … to see which Finnish companies are represented there and what's taking place in there. This way, I got an overall picture of the whole business.*

When a supplier had a close relationship with the innovating organization, they shared information on their trusted relationships that could provide resources for innovation. Alpha's head project manager noted how he learned about some of the suppliers in the resource management system project: "When I ask in our present supplier network, they'll surely recommend firms that can help us."

The focal firms approached their close, long-term customers when they wanted feedback on the services being developed. Confidential discussions enabled them to speak about plans that they did not want to discuss publicly. Alpha's business area director described how they involved customers in the wind power portal development:

> *Of course, we had enquired several times about what they needed, and then we showed them how it would look. We asked for their opinion. This way, they've commented quite a lot on the service.*

Current research on resources (e.g., Hunt & Morgan 1995; Hunt 1997b) and innovation (e.g., Tsai 2001) might not always make explicit the distinction between information and knowledge. However, the results of the empirical cases support the perspective that information and knowledge are different types of resource. Information is explicit and easier to transfer than knowledge that is more implicit, tacit, and difficult to transfer (Håkansson & Ingemansson 2011).

The results of the empirical study revealed that information and knowledge are accessed in different ways. This also applies to general and confidential information (see chapter 5.3). Further, information and knowledge are employed in a different way in service innovation (see chapter 5.2).

5.1.4 Relational resources

The results suggest that in service innovation, *relationships* to other actors mostly acted as a means or intermediary to access the needed resources. In these cases, relationships do not represent resources, which are defined in this thesis as tangible and intangible elements that enable actors to develop and produce efficiently and effectively a market offering that has value to the customer. Alpha's head project manager explained how they found suppliers for the resource management system development through their existing

suppliers: “When I ask in our present supplier network, they’ll surely recommend firms that can help us.”

Relationships, however, can also be resources in themselves, as was the case with reference customers. In those cases, relationships were the means to market a service. A relationship with a customer during the innovation process can promote sales when launching the service. This typically meant providing the solution first to the reference customer. The asset management system supplier’s project manager described their reference customer, Alpha, in the following way:

> *Our main interest was to have a reference customer … We found Alpha very interesting as it was a high-profile and large company. It would make a good reference firm. They were involved in many types of business.*

Similarly, when the focal firm sought new relationships, a relationship with a well-known, esteemed, and trusted actor during development could act as a positive signal to other parties. Gamma’s divisional director described how Gamma benefitted from its relationship with the public research center during the robotics solution development: “When we explained our relationship with the public research center while creating contacts with other parties, they understood that we had really invested in the development project.” Table 16 lists the relational resources found in the empirical data (see appendix 3), and provides detailed information on these resources.

Table 16 Relational resources in the empirical data

Resource	**Detailed description of the resource**
Reference customer	Relationship can be employed to: - increase interest in the solution - increase trust in the solution - bring potential customers to see the solution - promote sales of the service
Well-known, esteemed, and trusted actor as a partner	Relationship can be employed to: - increase interest in the focal actor - increase interest in the innovation project - establish relationships with other actors - promote sales of the new service

The results thus provide evidence that relationships are resources only when they can be directly applied in a service’s innovation and production. Most of the relationships do not fulfill this condition. This result varies from the extant literature, which tends to adopt the perspective that relationships are generally

considered resources (e.g., Hunt & Morgan 1995; Håkansson & Snehota 1995, 137; Hunt 1997b).

5.1.5 Categorization of resources

The empirical results in subchapters 5.1.1 to 5.1.4 suggest that the resources provided by networks for service innovation can be categorized into seven categories, which are shown in figure 30. Resource categories are placed under individual or organizational resources depending on whether an individual or an organization is the source of the resource.

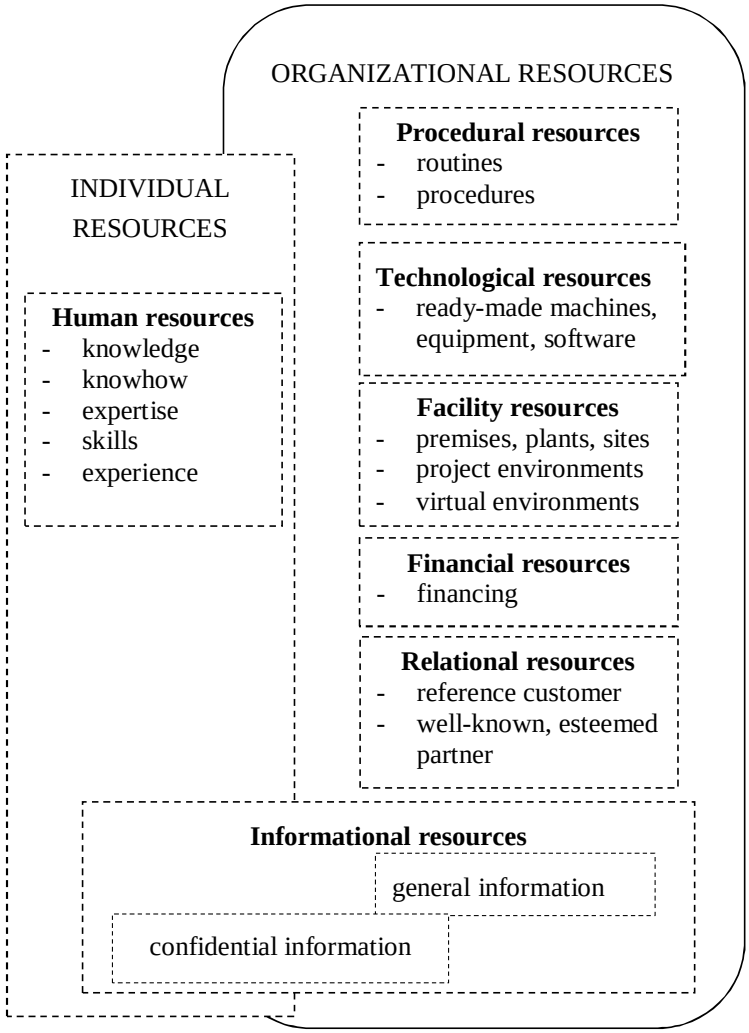

Figure 30 Categorization of resources in collaborative service innovation

In figure 30, resources are divided into individual resources and organizational resources. In this categorization, individual resources comprise resources that an individual possesses or controls, and organizational resources comprise resources that an organization possesses and controls. Human resources are typically implicit, tacit resources that depend on participation of a given employee in innovation. However, if human resources are collectively constructed in interaction between individuals or collectively learned in the organization, they become organizational resources. In the latter case, they manifest in procedures and routines that occur in the realm of an organization, and form the category of procedural resources. This result adds to the resource-advantage theory (Hunt 1997b) and the IMP Group's four resource entities (i.e., 4R) model (Håkansson et al. 2009, 67), which do not make a clear distinction between individual- and organization-bound resources.

Technological, facility, financial, and relational resources are organizational resources. Within informational resources, general information is an organizational resource. Confidential information, instead, can be either an individual resource or an organizational resource. For example, customer contacts can be the responsibility of individuals, and therefore customer intelligence can remain an individual resource if not shared in the organization.

The findings show that firms employ network relationships to gain access to a broad range of versatile innovation resources such as knowhow, equipment, development environments, financing, customer intelligence, reference customers, and industry information. These findings add to the service innovation literature, in which only anecdotal evidence is available regarding resources sought through network relationships (e.g., Syson & Perks 2004). The findings broaden understanding on resources sought for the purpose of service innovation, as the extant literature has primarily discussed only customers' knowledge and ideas (e.g., Goes & Park 1997; Leiponen 2006; Magnusson 2009).

5.2 Roles of resources in service innovation

The results of the empirical data suggest that resources play different roles in service innovation and actors employ them in different ways. Human and procedural resources were employed to create new resources. They thus act as creation resources. When actors want to create new resources for innovation, they transform their human and procedural resources into new resources. Technological resources provided the possibility to apply existing technology in service innovation. They could be connected to new, created resources. Created resources and technological resources together formed a service (i.e.,

solution). Facility resources and financial resources provided the setting for the innovation process. Informational resources and relational resources helped in promoting the innovation process.

In the studied cases, human and procedural resources were transformed into new resources over the innovation process. These resources formed the most critical part of service innovation as they formed the core of new services after transformation. They comprised employees' knowhow, knowledge, expertise, skills, and experience, and also organizational procedures and routines. They all represent knowledge-based resources that are typically tacit, implicit resources.

The technology director of the fastening technology firm described how various resources were transformed in the foundation solution development into new resources:

> *We need knowledge from our network partners, such as Delta. And we also have to communicate with other solution providers. And then we combine the knowhow that comes from the customers, from the foundation plans, and our own experience with the components. It requires the entire network to succeed and work.*

Transformation of knowledge-based resources resulted in plans that described what the actors were going to develop, how development would be performed, and how the service would look. Transformation of knowledge-based resources similarly manifested in features obtained by services and physical products.

Actors connected technological resources to created resources. They included ready-made machines, equipment, and ready-made software. Technological resources can provide the core product or base, around which the service is developed, or they can help in providing or extending the service. Alpha's sales manager described the beginning of the wind power portal development:

> *We had a user interface for several years that works on the Internet. We then noticed that we could apply this interface to the wind power portal as our customers are accustomed to it. We only needed to receive more information from the power plants and integrate it into our basic system. And, of course, we needed to build new elements into it.*

Ready-made resources that were connected with other resources did not transform into something else. As they were commercial products, it was possible to transfer them from one actor to another. However, in many cases, connected resources were a substantial part of the service.

Facility resources and financial resources provided the setting for the innovation process. They enabled the innovation process to take place. Facility

resources included, for example, premises, building sites, and virtual environments where development could take place and where new services were tested. Facility resources might also act as learning environments that enabled discovery of new ideas and best practices.

As the firms could not spend much money on service innovation, external finance was necessary. A company might agree to act as a reference customer and participate in innovation when the supplier financed the development project. This was explained by Gamma's divisional director: "This IT company was willing to develop the software for us as their own development project. It wouldn't have been possible for us to invest several hundreds of thousands of Euros in software development."

Informational and relational resources assisted in promoting the innovation process. Informational resources, such as industry information or customer intelligence, could increase understanding of the actors that developed new services. Similarly, information helped in reducing risks in innovation by supporting decision making.

When the actor that developed a solution for the customer needed to understand better the customer's everyday operations, it could observe how the customer acted. The project manager described how the actor increased its understanding on Alpha when developing the asset management system: "I was listening to and discussing with Alpha's supervisors when they had a staff training day. Also, our product development manager observed the work of the supervisors at two of their offices."

Relationships to actors that acted as reference customers helped to market and sell a new service. Reference customers increased credibility and confidence in the service, and the focal firm could bring potential customers to see the solution at the reference customer's premises. Similarly, a relationship to a well-known, esteemed, and trusted actor increased interest and trust in the focal firm, innovation project, and the new service.

Table 17 summarizes the roles that each resource category plays in service innovation, and describes how the resource is employed in service innovation.

Table 17 Roles and employment of resource in service innovation

Resource category	**Way of employment**	**Role in service innovation**
Human and procedural resources	Transformation	*Creation resources:* Used in creating resources for the new service
Technological resources	Connecting with the new, created resources	*Ready-to-connect resources:* Base of the new service, or part of the service, or extension of the service
Facility resources	Utilized as development and testing environments	*Background resources:* Provide the setting for the innovation process
Financial resources	Utilized to finance service development	
Informational resources	Utilized to increase understanding on and reduce risks in the innovation process	*Promoting resources:* Assist in promoting the innovation process
Relational resources	Utilized to increase interest in and trust on the focal firm or innovation project or developed service	

Table 17 shows how each resource category plays a specific role in service innovation. Human and procedural resources form the core of new services. They are creation resources as they can be transformed to create new resources. Technological resources are built into the service by connecting them to the new, created resources (e.g., programming of a robot).

Characteristics of the service determined whether connectable, technological resources were included in the service. They can be readily acquired and also remain the same after connecting, which facilitates their employment in innovation. They are thus termed ready-to-connect resources. Facility resources are utilized as development and testing environments, and financial resources are utilized to finance service development. They are thus background resources that provide the setting for the innovation process. Informational resources are utilized to increase understanding on the innovation process and to support decision making. Relational resources are utilized to increase interest and trust in the focal firm or the innovation project or the developed service. Informational and relational resources thus promote the innovation process, and are therefore termed promoting resources.

On the basis of the empirical data, resources can thus be categorized into creation resources, ready-to-connect resources, background resources, and promoting resources according to their roles in service innovation. This

categorization clearly adds to the extant innovation literature that has discussed resources without paying much attention to their role in innovation. Figure 31 illustrates the roles of different resources in service innovation.

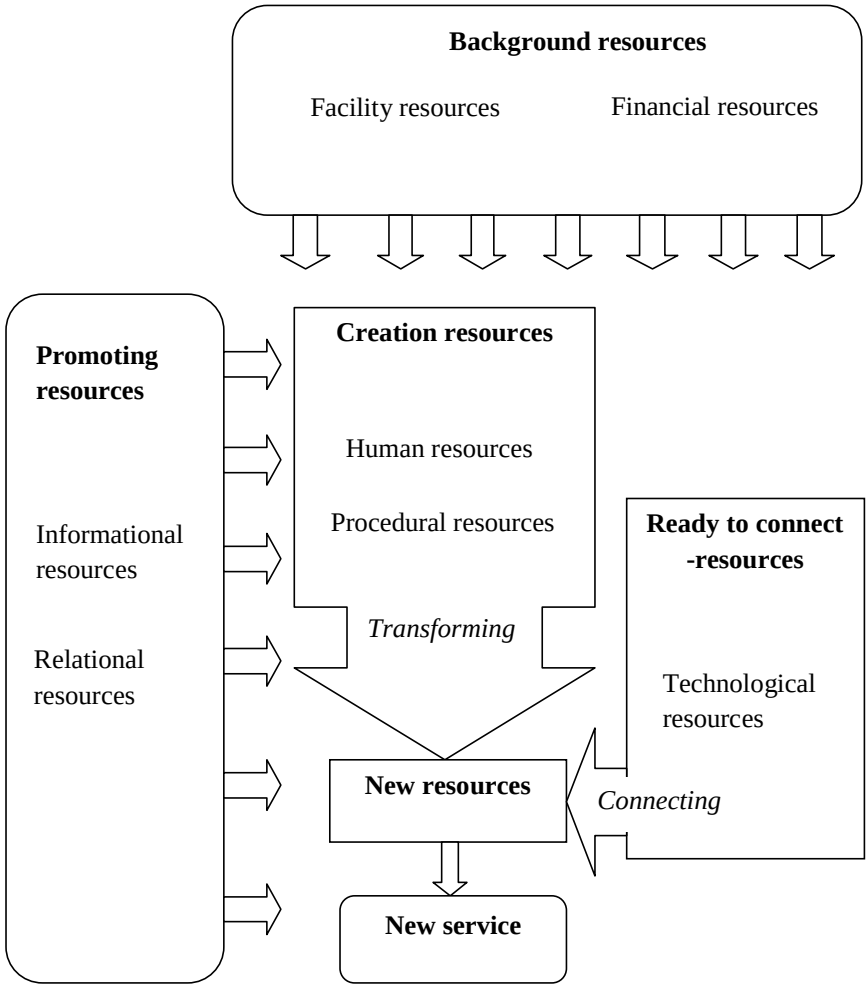

Figure 31 Roles of resources in service innovation

Figure 31 illustrates how different resources influence the service innovation process. Human and procedural resources comprise key resources in innovation, in which they play the role of creation resources. They can be transformed into new resources, thus enabling innovations to take place. New services also take advantage of existing technological resources. Ready-made machines, equipment, and software play a role as ready-to-connect resources

that are connected to new, created resources. New resources and connected resources form the services.

Facility and financial resources play a role as background resources in service innovation. They provide the necessary setting for innovation process to take place. Informational and relational resources act as promoting resources that advance and facilitate the innovation process.

It was possible to access all resources shown in figure 31 through networks for service innovation. The following chapter 5.3 examines more closely resource access for service innovation.

5.3 Resource access in networks for service innovation

The empirical cases showed that focal actors accessed resources in various ways for service innovation. The nature of relationships employed to gain access to the needed resources varied significantly. Organizations collaborated with a range of actors both internally and externally, building different types of relationship that can be categorized into social contacts, arm's-length relationships, close exchange relationships, and development relationships (Rusanen et al. 2014).

Focal actors similarly employed various strategies to access resources for service innovation. They could access resources through absorption, acquisition, sharing, and resource integration, depending on the resources in question.

The following subchapters discuss characteristics of resource access. Types of relationship between the actors, and types of resource access strategy were an essential part of resource access in the empirical cases. On the basis of the results, subchapter 5.3.4 provides theoretical continuums for resource access. The theoretical continuums illustrate transferability of resources between the actors, strength of relationship that is required to access different resources, and intensity of interaction that is needed for each resource access strategy.

5.3.1 Relationship types in resource access

The results of the empirical data suggest that focal actors accessed resources through four types of relationships for service innovation. They comprised social contacts, arm's-length relationships, close exchange relationships, and development relationships (see appendix 3). A social contact, arm's-length relationship, or development relationship can be initiated for the needs of innovation resources, or any existing relationship can be activated to gain access to resources.

Social contacts refer to occasional, informal meetings with other actors. Social contacts took place with association and firm representatives. Social contacts could take place with actors that were unfamiliar to each other or that occasionally met informally. Social contacts provided access to general information that the focal actor sought for service innovation. General information on a specific industry and business, and also information on the challenges, needs, and thoughts of various actors inside an industry or social network can be accessed through social contacts. Such information was provided quite openly, for example, in various social events, and when visiting other actors. General information could be accessed even by listening to others' presentations, when interaction between the parties was low. Firms that were innovating new services often contacted firms with which they had no prior relationship, but which might be able to provide some important information (Rusanen et al. 2014). Alpha's business area director described how he investigated the wind power field when Alpha developed the service portfolio:

> *I conducted a market study on firms that are active in the wind power field in Finland, and found out what kinds of service they provide. As a matter of fact, I visited all of these firms. I phoned them and asked if I could visit and ask some questions.*

Arm's-length relationships refer to exchange relationships that require only limited interaction between the actors. Exchange in arm's-length relationships took place when focal actors acquired readily available products from markets for service innovation. Technological resources that comprised ready-made machines, equipment, and software could be acquired from suppliers as ready-made packages requiring no customization. It was thus possible to access them in arm's-length relationships with suppliers that were new to the focal actor or with which the focal actor had previously performed exchanges. Alpha's divisional director described how they accessed the measuring device for their new service in measuring real-time electricity consumption:

> *We carry out more one-time transactions with the measuring device suppliers [for the real-time electricity consumption measuring project]. We purchase meters from them, and deliver them to our customers over the next four years. Then we will maintain them.*

Close exchange relationships were the source of confidential information, finance, facilities, and relational resources. These kinds of resource are shared between actors that have a close and trusted exchange relationship. In the empirical cases, the focal firms could have such relationships with their customers, suppliers and sister companies. Also, relationships with the public funding agency could be characterized as a close exchange relationship. Typically, close exchange relationships developed over time.

Alpha's business area director had trusted discussions with its long-term customers as he wanted to determine what kinds of service they needed for their wind power businesses. At the same time, he presented the services Alpha had been developing, and asked for the customers' opinions on them. He emphasized that they wanted to discuss their development projects only with trusted parties. The business area director explained this as follows:

> *Similarly, I visited our customers from the energy industry. I asked about their plans to build wind power and about the services they would need. This way, I was able to reflect their thoughts to our ideas on the service portfolio … With them you can throw in questions such as 'If we provided this kind of service, how would you like it?' or 'Would you be interested in this kind of service?'*

Close exchange relationships can also provide funding for service innovation. For example, a customer project that is funded by the customer could also lead to a new innovation in the studied cases. The focal actor could further utilize premises, plants, and sites of their customers for service innovation purposes if the focal actor worked in the customer's facilities. Alpha's business area director explained how they might test their wind power portal: "We maintain a customer's wind power plant, where we also take care of energy management. So we installed the portal in that power plant and tested it."

Similarly, access to relational resources necessitated, as a minimum, a close exchange relationship between the actors. In the case of service innovation, relational resources refer to reference customers and well-known, esteemed, and trusted partners. Alpha's business area director spoke about the beginning of their relationship with the wind turbine supplier in the wind turbine foundation project: "The wind turbine supplier knew that they could only have business in Finland if they have connections to a firm with the capability to deliver the total project."

Development relationships were the most intensive and closest relationships between the actors for service innovation. They were formal relationships based on contracts between the actors inside the innovation projects. Development relationships were established with various business units inside the company, with customers, suppliers, consultants, universities, and public research centers. Development relationships could be established within existing relationships and also with new parties.

For innovation, development relationships were required to access human and procedural resources from other actors. Human resources are individual-bound and procedural resources are organization-bound (see chapter 5.1.5); therefore, these resources can be accessed only when the actor with the resources participates in service innovation. In addition, as knowledge,

knowhow, skills, experience, and expertise, and also organizational procedures and routines are tacit, implicit resources, they can only be accessed when the actor intensively acts in the innovation process, applying the resources to innovation. Access of human and procedural resources necessitated a development relationship between the actors. Gamma's divisional director explained how they developed the robotics solution together with the robot systems firm:

> *The robot systems partner provided the design knowhow and design tools. They also took care of production. We provided the ideas for the robotics system. We also provided the entity between the machine and robot.*

The relationship type necessary to access each resource represents the minimum relationship. This means that, through social contacts, the focal firm can only access general information for service innovation. But an arm's-length relationship may provide access both to general information and technological resources. A close exchange relationship can act as a source of general information and technological resources but also of confidential information, funding, facilities and relationships. A development relationship might possibly provide any of the resources. A development relationship is at the same time the only relationship that can provide human and procedural resources for service innovation (see appendix 3). This also means that if the focal actor lacks, for example, a close exchange relationship to an actor that can provide needed confidential information, it can have this resource only through a development relationship.

5.3.2 Resource access strategies

The results provide a rich picture of the strategies that firms employ to access resources for service innovation. On the basis of the empirical data, it is possible to identify four conceptually distinct access strategies that are termed absorption, acquisition, sharing, and resource integration (see appendix 3).

The empirical results suggest that *absorption* was employed as the resource access strategy in connection with general information. As general information was explicit and easy to explain and document, it could be absorbed by focal actors. Absorption typically took place when listening to other actors at various events or when meeting them. The technology director of the fastening technology firm described how they accessed information for wind turbine foundation development:

> *We didn't have any existing business with the firms from which we sought information. We just went and talked to them. We told*

> *them that we aimed to develop a business in this market, and then we tried to identify the variables. So we progressed further and further. Each meeting led to a new meeting with another party, and a new bit of information.*

Acquisition was employed as the access strategy for technological resources. Acquisition of resources occurs through market transactions in which the ownership and risk attached to the resource are transferred to the purchaser; that is, the innovating actor. This was possible when the resources were transferable and readily available in markets. In service innovation, such resources comprised ready-made machines, equipment, and software. The senior vice president of the robot systems firm explained how they accessed the machine vision for the automation solution project: "We acquired the machine vision from a Dutch firm. It's a ready-made commercial product, similar to the one we used in our original robotics solution."

Sharing was the way to access confidential information, facility resources, financial resources, and relational resources. Confidential information was shared within trusted, close relationships. Customers could talk about their future plans to their long-term service suppliers that regularly conversed with their customers. Similarly, customers and suppliers shared their ideas on services under development, or recommended trusted actors for innovation. Alpha's head project manager explained how they found suppliers for their resource management system development: "When I ask in our present supplier network, they'll surely recommend firms that can help us."

Sharing also enabled access to facility resources, such as premises, building sites, or projects where a new service could be developed and tested. Alpha's business area director expressed the importance of a building site in developing the solution for wind turbine foundations as follows: "We thought of continuing the development work when we've got new foundation construction projects. Without a concrete project the development work doesn't pay." A relationship to a well-known and esteemed partner, or to a customer that agreed to act as a reference customer, provided the possibility of using their name in marketing the innovation project or new service.

Resource integration was the access strategy employed for human and procedural resources. The results of the empirical cases suggest that human and procedural resources, which are implicit and tacit knowledge-based[3] resources, can be accessed only when the actor that possesses them actively participates in service innovation. This result provides a good fit with the concept of resource integration, which the extant research specifies as

[3] Knowledge-based approach has dealt with transfer of individual and organizational knowledge. See, e.g., Kogut & Zander (1992) and Grant (1996).

"actively incorporating an actor's resources into the process of other actors" (Gummesson & Mele 2010; Cantù et al. 2012).

Resource integration thus takes place with human and procedural resources, while other resources can be accessed without their possessor actively participating in the actual innovation process. Delta's project manager described how they incorporated their resources into the wind turbine foundation solution: "They are our customer and we provide them with our expertise … We design and prepare the project documents. The fastening technology firm brainstorms and produces the solution."

5.3.3 Resources, relationships and access strategies combined

The results in chapters 5.1–5.3 are drawn together in this chapter. The table 18 shows first, the resource categories found in service innovation. Second, it presents the actors that can provide the resources in each resource category. Third, the table shows the kind of a relationship required as a minimum between the actors in each resource category. Fourth, it describes the various ways to access resources for service innovation. Fifth, the table shows the role of each resource category in service innovation.

Table 18 Access of resources for service innovation

Resource category	Actors providing resources	Relationship between actors (min.)	Resource access strategy	Role in service innovation
Human resources Procedural resources	Business unit, Customer, Supplier, Consultant, University, Public research center	Development relationship within existing relationships or with new parties	Resource integration	Utilized in creating resources for the new service
Informational resources: Confidential information Relational resources Financial resources Facility resources	Customer, Supplier, Sister company, Public funding agency	Close exchange relationship Typically requires an existing, trusted relationship	Sharing	Assist in promoting the innovation process Provide the setting for the innovation process
Technological resources	Supplier	Arm's-length relationship within existing relationships or with new parties	Acquisition	Base of the new service, or part of the service, or extension of the service
Informational resources: General information	Association, A firm in a specific business field	Social contact within existing contacts or with new parties	Absorption	Assist in promoting the innovation process

Table 18 reveals that accessibility of innovation resources varied considerably. From informational resources, general information was quite openly available, and as it was inherently explicit, focal actors could absorb it in social contacts with associations and other firms, and employ it in service innovation at any time. As described in chapter 5.2, general information was utilized to promote the innovation process.

Technological resources (i.e., ready-made machines, equipment, and software) were easily transferable and readily applicable in service innovation. Focal actors could therefore acquire them in arm's-length relationships with

suppliers. This meant that market transactions of resources transferred attached ownership and risk to the focal actor. Technological resources can provide the base of the new service (e.g., software as a platform for service), or become part of the service (e.g., machine used in service production), or extend it (e.g., machine vision enabling automatic identification).

However, many resources called for sharing them between the actors. Financial and facility resources, and also relational resources and confidential information were accessed in this way. Sharing of resources necessitated a close exchange relationship in the form of a common project or trusted, long-term business relationship. Financial and facility resources provided the setting for the innovation process, which meant that innovation might only be possible if they could be shared with other actors. Confidential information and relational resources were important in promoting the innovation process. The focal actors could have close exchange relationships with other business units or their customers, suppliers, and the public funding agency that provided finance for service innovation.

Human and procedural resources could only be accessed in development relationships that were established for service innovation. Their access required resource integration as implicit, tacit resources are organization- or employee-bound. Development relationships were established with customers, suppliers, universities, and the public research center. These resources thus require the actor possessing the resource to be actively involved in the innovation process by incorporating its resources into the process. Human and procedural resources play a special role in service innovation as they are the only resource types that can be transformed into new resources. They thus have specific potential to lead to innovations.

The extant literature suggests that resource access can depend on the nature of resources (e.g., Håkansson & Snehota 1995, 143; Lefaix-Durand & Kozak 2009), which typically refers to the tangibility and explicitness of resources. Table 18, however, indicates that easily accessible resources can be both tangible and intangible. Instead, explicitness of knowledge-based resources clearly influences accessibility. The table shows that explicit information can be accessed far more easily than implicit knowledge. Furthermore, some resources are more openly (i.e., general information) and readily (i.e., ready-made commercial products) available than others.

This result also emphasizes the need to describe resources more precisely than is apparent in the innovation literature. A distinction needs to be made, for example, between general information, confidential information, and tacit, implicit knowledge, which, as shown in table 18, can be accessed by actors through different types of relationship. Also, the function of these resources is different in innovation; information plays a promoting role in innovation,

whereas tacit knowledge is transformed into new resources through integration.

The result of various relationship types – social contact, arm's-length relationship, close exchange relationship and development relationship – adds to the extant research that mainly discusses the state of the relationship, ranging from a new relationship to dormant and existing relationships (Chou & Zolkiewski 2012). The result similarly adds to the extant service innovation literature that predominantly refers to formalized partnerships, such as alliances, joint ventures, and interlocking ties, as typical relationships in service innovation (Goes & Park 1997; Eisingerich et al. 2009). In contrast, only a fraction of the relationships employed to access innovation resources can be characterized as formal partnerships in the empirical cases (Rusanen et al. 2014). This finding considerably adds to the existing knowledge.

The extant literature mainly refers to acquisition and mobilizing as the means to access resources (e.g., Lundgren 1992, 159; Coviello & Cox 2006). Also, while networks are often cited as important resources for innovating (e.g., Tether 2002; Perks & Moxey 2011), the extant research provides little insight on how resources actually become available to the innovator through relationships (Rusanen et al. 2014). The findings thus extend the perspective on ways to access resources by showing that resources can be accessed through absorption, acquisition, sharing, and resource integration in service innovation.

Earlier research on resource access has failed to pay attention to the role of various resources in innovation. Research has focused on a specific relationship type, mainly formalized partnership, and thus taken a limited perspective on resource access. These limitations have further led to a limited perspective on resources in innovation. The results of the empirical cases show that although new services are based on human and procedural resources and technological resources, other resource types are involved in innovation process, in which they all play specific and important roles.

5.3.4 Theoretical continuums for resource access

The results that are summarized in table 18 made it possible to generate three theoretical continuums for resource access. The results indicate that these continuums play an important role in resource access; they are transferability of resources, strength of the relationship, and intensity of interaction in service innovation. These three continuums are discussed more precisely below.

The first theoretical continuum is termed transferability, which refers to the easiness and possibility of transferring a resource between actors for innova-

tion purposes. Table 19 illustrates the different resource categories and provides a theoretical continuum of transferability across them.

Table 19 Transferability of resources in service innovation

Resource category	Theoretical continuum: transferability
Human resources Procedural resources	Low  High
Informational resources: confidential information Relational resources Financial resources Facility resources	
Technological resources	
Informational resources: general information	

At one end of the continuum, general information comprises a type of resource that is easy to articulate and transfer from one actor to another. At the other end of the continuum, human and procedural resources that are tacit and implicit represent resources which are clearly more difficult to communicate and pass on (Rusanen et al. 2014). Although knowledge resources or skills have been described, for example, in a continuum between explicit and implicit (e.g., Ambrosini & Bowman 2001), these findings add to the extant literature by providing a continuum of various types of resource. In addition to informational and human and procedural resources that are knowledge-based, this continuum also includes technological, facility, financial, and relational resources. Technological resources are not as openly available as general information, but they can still be quite easily acquired in markets. Facility, financial (i.e., funding without an obligation to repay) and relational resources, however, call for close relationships with actors possessing these resources.

The empirical results further enabled a theoretical continuum of relationship strength that is connected to relationship types in service innovation to be drawn. Table 20 illustrates these relationship types, and provides a theoretical continuum ranging from strong to weak relationships. The strength of a relationship refers here to the depth of the relationship between two actors for innovation, depth of involvement in the innovation process, and level of resource commitments for innovation.

Table 20 Strength of relationship in service innovation

Relationship type	Theoretical continuum: strength of relationship
Development relationship	Strong  Weak
Close exchange relationship	
Arm's-length relationship	
Social contact	

Social contacts represent the weakest relationships, and development relationships represent those that are strongest in the continuum (Rusanen et al. 2014). In service innovation, social contacts can be based on occasional meetings with earlier unknown actors, or actors meeting informally every now and then. Thus, they typically lack characteristics of a real relationship. Social contacts are not included in the innovation process and lack any commitment to provide resources for innovation.

Arm's-length relationships refer to exchange relationships in which exchanges typically take place on an irregular basis or are based on single purchases without any need for customization. Arm's-length relationships are typically customer-supplier relationships in service innovation. Suppliers provide ready-made products for innovation but are not themselves involved in the innovation process.

Close exchange relationships refer to considerably stronger ties between the actors. Often, the question concerns long-term, trusted customer-supplier relationships that lead also to the provision of resources for innovation.

Development relationships are established for innovation purposes, and actors are involved through their resources in resource creation for innovation. Development relationships thus form the strongest ties in service innovation. Actors might have previously had a close, long-term exchange relationship, but development relationships can be established equally with new actors.

In addition, the extant network literature provides some indication of weak and strong relationships' importance in innovating. Elfring and Hulsink (2003) apply the perspective whereby weak and strong ties are distinguished on the basis of the frequency of contacts, emotional intensity of the relationship, the degree of intimacy and reciprocal commitments between the actors. According to their findings, start-ups that pursue radical innovations can benefit from having both weak and strong relationships with other actors. Weak relation-

ships can be helpful in discovering opportunities, and strong relationships provide tacit knowledge and feedback when the start-ups evaluate different opportunities.

Table 21 illustrates the identified resource access strategies. They form a theoretical continuum that portrays the intensity of interaction needed between the parties.

Table 21 Intensity of interaction in service innovation

Resource access strategy	**Theoretical continuum:** intensity of interaction
Resource integration	high
Sharing	
Acquisition	
Absorption	low

At the polar ends of the continuum for intensity of interaction are absorption, which requires low interaction, and resource integration, which necessitates intensive joint efforts (Rusanen et al. 2014). Absorption can take place when listening to an actor speaking to the audience of an event or when informally conversing with an actor. Acquisition calls for limited collaboration when negotiating the sales terms. Sharing necessitates regular communication and exchanges between the actors. Resource integration calls for intense interaction in resource creation.

The transferability of a resource, strength of a relationship, and intensity of interaction between actors thus have significant influence on resource access in service innovation. Access to human and procedural resources necessitates a strong relationship and intense interaction between actors. At the other end of the continuum, access to general information only requires a weak relationship and low interaction between actors.

5.4 Resource integration in networks for service innovation

The concept of resource integration has been scarcely elaborated in earlier research. The results of the empirical study show that resource integration is a resource access strategy that enables the creation of new resources for service

innovation. Resource integration occurs in development relationships in which human and procedural resources are actively incorporated into the innovation process of another actor, and transformed into new resources in interaction between the actors. New resources then form the core of a new service.

Resource integration called for diverse human resources from the actors. When the new service was innovated in a specific knowledge field, actors integrated complementary human resources. When the service linked different knowledge fields, supplementary human resources were integrated between the actors. When the aim was to innovate a service package, actors integrated heterogeneous human resources.

In addition, the frequency of intense interaction varied between actors. They had continuous intense interaction when they innovated in a specific knowledge field. When, instead, actors innovated in distinct knowledge fields that were linked to each other for new service, they had intense interaction in particular innovation phases. Actors that innovated a service package in heterogeneous knowledge fields only had intense interaction in service interfaces. Procedural resources, and especially attitudes to innovation in the organization and ways to organize innovation projects, seemed to significantly influence resource integration.

On the basis of the results, subchapter 5.4.5 provides theoretical continuums on resource integration. The continuums present human resource fit in resource integration and frequency of intense interaction in service innovation.

5.4.1 Conceptualizing resource integration

This thesis follows the perspective whereby resource integration concerns actively incorporating one's resources into the process of other actors (Gummesson & Mele 2010; Cantù et al. 2012), typically as a result of intense interaction between the actors (Snehota 2011; Cantù et al. 2012) and, further, when actors have a common target to create a solution that solves the problem of a particular actor and achieves the desired goals (Cantù et al. 2012).

The concept of resource integration was previously discussed to some extent in subchapter 5.3.2. It was suggested that human and procedural resources are the only resource types that need to be actively incorporated by their possessor into the innovation process, whereas actors can access other types of resource without involving their possessor in the innovation process. Subchapter 5.3.2 further showed that resource integration is one of the resource access strategies that is employed to access human and procedural resources for service innovation.

The reason for discussing one of the resource access strategies in this chapter is the special role played by human and procedural resources in service innovation. They are resources that can be utilized in creating new resources for innovation (see chapter 5.2), and resource integration is the way to access other actors' human and procedural resources for the purpose of resource creation (see subchapter 5.3.2).

Resource integration also demands much more from both the focal actor and the resource possessor compared to other resource access strategies. The peculiar thing with human and procedural resources is that they are bound to individuals and organizations (see subchapter 5.1.1). Thus, they cannot be easily exchanged and transferred between the actors, as they are inherently implicit, tacit resources. This means that resource integration calls for actors' active participation in the innovation process. Further, the significance of interaction between the actors that transform their resources into new resources is the fundamental premise in the Interaction and Network Approach (Håkansson & Snehota 1995, 132; Baraldi et al. 2012). Interaction is discussed more closely in subchapter 5.4.3.

Thus, the results of the previous chapter propose that resource integration is the access strategy for human and procedural resources which can only be accessed through development relationships in service innovation. The actor that controls these tacit, implicit resources has to intensively incorporate them into the innovation process; they cannot be accessed in another way.

The above explanation on the concept of resource integration, and the result that resource integration focuses on specific resources and relationships in service innovation, adds to emergent research on resource integration (Gummesson & Mele 2010; Cantù et al. 2012). The extant research has vaguely and fuzzily described the concept of resource integration. Research has further lacked knowledge on how resource integration manifests. The result that resource integration is closely connected to resource creation is in accordance with Gummesson and Mele's (2010) perspective.

The difference between resource integration and resource combining (i.e., connecting resources to each other) has also lacked explanation. Chapter 5.2 suggested that resource connecting takes place with technological resources in service innovation, as they are ready-made resources and therefore connectable. The focal actor connects technological resources to the created resources after their acquisition. This means that resource combining is a way of employing technological resources in service innovation. Similarly, transformation is the way of employing human and procedural resources that leads to new, created resources (see chapter 5.2). The new, created resources form the core of a new service that further shows the importance of resource creation and, thus, resource integration in service innovation. The connected

technological resources can form the base of a service, or become a part of a service, or extend a service (see chapter 5.2). Thus, resource combining or connecting takes place with technological resources in service innovation, and resource integration is utilized with human and procedural resources.

5.4.2 Diversity of integrated human resources

The empirical cases revealed that actors integrated their human resources for three types of service. First, they might innovate a service or part of it in a specific knowledge field, such as environmental impact assessments (see chapter 4.7). Second, they might innovate a service linking different knowledge fields, such as the resource management system (see chapter 4.3), the robotics solution (see chapter 4.6), or the foundation solution for wind turbine towers (see chapter 4.5). Third, they developed a service package including several services and knowledge fields, such as the wind power service portfolio (see chapters 4.4 and 4.7).

Diversity of human resources varied according to the type of service innovated. When the actors innovated in a specific knowledge field, service development called for *complementary human resources* from them. This required somewhat similar knowledge bases between the actors. Thus each actor's knowledge was from a specific knowledge field but was not identical to other actors' knowledge. Knowhow and experience in the given knowledge field enabled the integration of resources in interaction with other actors. As the question concerned innovating in a specialized expertise field, actors needed to have education, knowhow, and skills in the field. Delta's service on noise issues is an example of the integration of overlapping human resources. At the beginning of 2012, noise caused problems in wind power projects, and the noise experts met to find solutions. The manager of the EIA and land use planning unit described this:

> *I have just returned from a video meeting. Something like 25 employees participated in it from seven locations in Finland. We discussed the latest achievements in noise research on wind turbines, and how we should react to them. A noise expert gave a lecture, and then we discussed the topic.*

When service innovation linked different knowledge fields, actors integrated *supplementary human resources*. The idea was to build a coherent service from distinct human resources. This called for resource fit whereby the actors' resources could be effectively integrated to create new resources for service innovation. Knowledge bases thus had to be distinct, while matching each other well. Gamma sought supplementary resources to enable develop-

ment of the robotics solution in the automation systems case. It then found the robot systems firm that had the necessary knowhow to make the system work. The robot systems firm's senior vice president explained: "Automation solutions and projects don't belong to Gamma's core capabilities. Thus, we've got knowhow that Gamma lacks. And Gamma has got knowhow … that we don't have." Gamma's divisional director described the resources provided to the robotics solution by the robot systems firm and Gamma as follows:

> *The robot systems partner provided the design knowhow and design tools. They also took care of production. We provided the ideas for the robotics system. We also provided the entity between the machine and robot.*

In the development of the wind turbine foundation solution, the system configuration firm joined the project to supplement Delta's resources, as explained by the technology director of the fastening technology firm:

> *Later, also a third firm joined us for development … They are experts in system configurations. With their help we can transform dimensioning decisions into systems. Delta hasn't got the necessary knowledge for that. They work daily in cooperation.*

Development of a service package was based on a number of *heterogeneous human resources*, as the service package comprised varying services that called for a variety of knowhow and skills in different knowledge fields. Therefore, different kinds of knowledge, knowhow, and skills were needed from actors. Alpha's sales manager described the development of the wind power service portfolio: "The responsibilities were shared according to each person's knowhow. Then every core team member worked with various in-house experts. We tried to build the service modules, and then we presented our results at the core team meeting." Similarly, Delta developed a service package of various heterogeneous human resources, as the wind power specialist explained:

> *An important part of coordination is that we've now divided our wind power business into five areas. They are preliminary study, studies and permits, detail planning, construction management services, and operation services. The managers of these five areas are in our wind power team … It's important to be able to keep the project moving smoothly between the areas so that the customer won't really notice the transition phases.*

Table 22 shows the types of service that were developed in the empirical cases, and the diversity of human resources integrated in their development.

Table 22 Integrated human resources in various service types

Type of service	Diversity of integrated resources
Service in a specific knowledge field	- Complementary human resources
Service linking different knowledge fields	- Supplementary human resources
Service package comprising various services in different knowledge fields	- Heterogeneous human resources

Current research on innovation has scarcely studied integration of human resources. Instead, the focus has been on knowledge transfer and acquisition that is based on learning the knowledge of another actor in strategic alliances (Grant & Baden-Fuller 2004; Buckley et al. 2009). Similarly, the IMP approach lacks any detailed elaboration of knowledge in resource interaction (Baraldi et al. 2012).

Former research, however, tends to highlight complementary human resources between actors. According to Emden et al. (2006), similar kinds of knowledge base between the actors enable the realization of potential in resource integration, discover complementarities in resources, and to communicate these between the organizations. Similarity in knowledge bases is further needed to facilitate application of the new knowledge. The results of the empirical cases provide new knowledge on integration of human resources, and suggest that complementary human resources are integrated especially when innovating a service or part of it in a specific knowledge field.

Buckley et al. (2009) state that supplementary knowledge enables actors' knowledge bases to be widened. The empirical results of this study are in line with this perspective. The results suggest that supplementary human resources that fit each other are integrated when innovating a service linking different knowledge fields.

Current research, however, proposes that significant differences between actors' knowledge bases call for many learning steps, before the actors' knowledge can be efficiently employed (Cummings & Teng 2003). According to the extant research, resource integration involves coupling and matching resources, and therefore a good resource fit provides more value in integration (Gadde et al. 2012). The results of the empirical study show that heterogeneous human resources were integrated only via service interfaces in service innovation. This result supports the view that integration of heterogeneous

resources is challenging. The next sub chapter 5.4.3 discusses interaction between the actors in integrating human resources.

5.4.3 Interaction in integrating human resources

The results of the empirical cases indicate that the human resources' diversity influenced interaction during service development. When actors integrated complementary human resources, having similar knowledge bases (see subchapter 5.4.2), they continuously worked in intense interaction during the innovation. When Alpha developed its resource management system, its IT department worked in intense interaction with the IT suppliers, which was possible as they had quite similar knowledge bases. Alpha's head project manager said:

> *One could even say that we can phone each other at any time of the day … Our suppliers ask us and we ask them whenever we face some problems or something needs to be done … We have work pairs who communicate very actively.*

When the actors had the aim to integrate supplementary human resources to build a coherent whole (see subchapter 5.4.2), each actor mostly had intense interaction with actors having similar knowledge bases. Thus, they integrated complementary resources until the development was at the stage where supplementary resources needed to be integrated. The resources from different knowledge bases were integrated, for example, when planning, or testing, or launching the service; actors with supplementary human resources had intense interaction with each other only at these times.

In the automation solution development, Gamma, the robotic systems firm, and the laser technology firm joined forces, as together they provided the necessary supplementary resources for the project. The vice president of the robotic systems firm described the typical way of integrating resources in such joint projects:

> *Every firm has its own entity in the project, and an interface to another entity. Most of the 2,000 projects that we've undertaken over the past 30 years have been such. Almost all of our entities have been connected to something before and something afterwards. Every firm is responsible for its own entity, and we agree together on the interfaces.*

The laser technology firm's divisional director described how they and the robotic systems firm had intense interaction in the planning phase when they discussed the interfaces between their entities:

> *We worked together during the solution planning because we had common interfaces. We discussed and had meetings several times a month … It resulted in specific technical solutions.*

During the time when the foundation solution was implemented for wind turbine towers at the building site, engineering firm Delta worked in intense interaction with Alpha, which constructed the foundations. Most of the time they had no active interaction. Delta's project manager explained this as follows:

> *We talked on the phone with the site supervisors and Alpha's project managers every day during the most hectic building phase. And we built four windmill foundations … We also developed things further during that time. We built three foundations in a similar manner; by the fourth, we had already changed things.*

In the resource management project, the system integrator provided supplementary resources to other IT suppliers. They integrated their resources when some of the sub-systems were almost ready to be implemented. The project manager of the principal supplier described their working together at the point when the ERP system was almost completed:

> *We took care of the integrations together. We had a hotline open all the time. Our engineer and their personnel had to do that hand-in-hand. When we did something, the integrator supplier had to do something too.*

Heterogeneous human resources, instead, were integrated via interfaces between various services. This meant that actors which developed the services inside the portfolio might not have any interaction with most of the other actors. When Alpha developed their wind power service portfolio, each service module called for different human resources. They were then integrated together via their interfaces. As explained by the sales manager who was a member of the project management team:

> *The responsibilities [for the service modules] were shared according to each person's knowhow. Then every core team member worked with various in-house experts. We tried to build the service modules, and then we presented our results in the core team meeting.*

Table 23 shows how interaction manifested in connection with complementary, supplementary, and heterogeneous human resources in service innovation.

Table 23 Interaction in resource integration

Diversity of integrated resources	Interaction in innovation
Complementary human resources	- Continuous intense interaction
Supplementary human resources	- Intense interaction in planning, testing and launch phases
Heterogeneous human resources	- Intense interaction in service interfaces

The Interaction and Network Approach has found a close connection between interaction and knowledge. It suggests that interactive relationships are the means to create new knowledge resources (Håkansson & Ingemansson 2011). Nonaka et al. (2000) and the extant product innovation research has accordingly referred to the importance of social interaction among individuals and organizations in knowledge creation (Dougherty 1992). Also, the results of the empirical study suggest that interaction is an integral part of resource creation in service innovation.

According to the Interaction and Network Approach, interaction connects two different knowledge bases and occurs at their interface. This indicates that new knowledge might be created in interfaces (Håkansson & Ingemansson 2011). The results of the empirical study, however, suggest that resources are more than connected in resource creation. They are integrated by incorporating the human resources into the process of the focal actor. The results further suggest that diversity of human resources influence the amount of interaction between the actors in service innovation. Table 23 shows how resource creation occurs continuously in intense interaction when integrating complementary human resources for service innovation. When actors have supplementary human resources, resource integration takes place in intensive interaction only in certain phases over the innovation process. The results suggest that planning, testing and launching phases are important in integrating supplementary resources, and when actors have heterogeneous human resources, intense interaction occurs in service interfaces. In the empirical cases, different services were integrated in teams comprising managers from different business fields, each of whom was responsible for some service.

The results of subchapter 5.4.2, which connected various types of service with a diversity of integrated resources, can be combined with the results of interaction in resource integration. The results are shown in table 24.

Table 24 Integration of human resources in service innovation

Type of service	**Diversity of integrated resources**	**Interaction in innovation**
Service or part of it in a specific knowledge field	Complementary human resources	Continuous intense interaction
Service linking different knowledge fields	Supplementary human resources	Intense interaction in planning, testing, and launch phases
Service package comprising various services in different knowledge fields	Heterogeneous human resources	Intense interaction in service interfaces

Table 24 shows how development of a service or part of it in a specific knowledge field calls for complementary human resources from a similar knowledge field. Complementary human resources are integrated in continuous intense interaction. When innovating a service that links different knowledge fields, resource integration takes place through supplementary human resources. They are integrated in intense interaction in the planning, testing, and launch phases. When the aim is to innovate a service package that comprises multiple services in different knowledge fields, actors need to integrate heterogeneous resources. This occurs in intense interaction in service interfaces.

5.4.4 Influence of procedural resources on resource integration

The results of the empirical cases indicate that procedural resources, that is, an organization's routines and procedures, considerably influenced resource integration. Procedural resources that were found critical in the studied cases comprised attitudes towards innovation in the organization, and the ways to organize innovation projects (see appendix 4).

The attitude of an organization towards innovation manifested especially through readiness to provide human resources for innovation in the empirical cases. Understanding innovation as something that is performed in addition to everyday work negatively influenced the possibilities to integrate resources. Alpha had a culture in which innovation was performed in addition to everyday work. This caused a constant lack of human resources in innovation projects for the resource management system and wind power service portfolio. Alpha's business area director said: "Typically, employees aren't freed from their actual work, even if they participate in a large project. It's a true challenge."

The habitual ways to organize innovation projects had similarly clear influence on resource integration. The way to organize innovation projects could either support or hinder resource integration between the actors. In the wind turbine foundation project, the fastening technology firm and Delta acted in a very organized way, as the technology director of the fastening technology firm described:

> *We have a guide that tells us how to proceed. What we'll develop in the next six months. And, at the same time, we have projects or potential projects where we produce material. The guide comes from us, but it's based on cooperation. This means that Delta constantly gives us feedback, and together we think about the direction in which we should go next.*

The resource management system project, instead, lacked systematic organization which would have enhanced resource integration between the suppliers, as the project manager of the asset system supplier noted:

> *I do something here, you do it there, and a third party does it somewhere else. Later, we notice that we have either done the same thing or completely different things. However, the idea was to do something in common. We should have sat down together more often.*

When the ways to organize an innovation project were totally different, resource integration could even be prevented. In the automation solution development, Gamma and the robot systems firm had different ideas on project organizing. This caused many problems in human resource integration. The vice president of the robot systems firm explained:

> *The problem is that Gamma does not have a clear division of tasks. And they don't have one project manager, but three. And we need to contact all of them because we don't know who is responsible for what. And CEOs also discuss with each other … Too many cooks spoil the broth. Our working cultures are too different.*

Table 25 shows how procedural resources influenced resource integration.

Table 25 Influence of procedural resources on resource integration

Procedural resources	Influence on resource integration
Attitudes towards innovation in the organization	- Organizations with positive attitude to innovation integrate more human resources for a longer time period
Ways to organize innovation projects	- Systematic ways to organize innovation projects increase resource integration - Similar ways of organizing innovation projects between actors enhance resource integration; different ways of organizing innovation projects retard or prevent resource integration

Froehle and Roth (2007) have previously studied the influence of organizational resources on service innovation. They state that service innovation can be effective only when the company possesses organizational resources that promote the innovation process. They include management systems and attitudes adopted by a firm. Management systems and attitudes of the firm manifest in innovation practices such as organization structure for development and top management support for innovation. The results of the empirical study found the same procedural resources important in service innovation. The results further propose that procedural resources, especially attitudes towards innovation and ways to organize innovation projects, influence resource integration. Organizations that take a positive attitude to innovation seem to integrate more of their human resources in service innovation and for a longer time period. The results further indicate that organizations pursuing systematic and similar ways to organize innovation projects are able to increase human resource integration in service innovation.

5.4.5 Theoretical continuums for resource integration

The results in subchapters 5.4.2 and 5.4.3 provide a basis for proposing theoretical continuums on resource integration. The first continuum is based on the diversity of human resources that were integrated for service innovation in the empirical cases. Complementary human resources, supplementary human resources, and heterogeneous human resources enable a theoretical continuum of human resource fit to be drawn. This is shown in table 26.

Table 26 Human resource fit in resource integration

Resource category	**Resource type**	**Theoretical continuum:** Human resource fit
Human resources	Complementary resources	High ↕ Low
	Supplementary resources	
	Heterogeneous resources	

Table 26 shows how complementary human resources that refer here to knowledge, knowhow, and skills from a specific knowledge field, have an inherently high fit when being integrated. In the empirical cases this manifested in active, constant integration of complementary human resources between the actors. Actors concentrated on integrating their complementary human resources for most of the time in service innovation.

Supplementary human resources refer to distinct knowledge, knowhow, and skills that should build a coherent service. They seem to have a lower fit, which means that their matching is more demanding than the matching of complementary human resources. This manifested in active integration of supplementary human resources only in particular phases of the innovation process, such as the planning, testing, and launch phases.

Heterogeneous human resources, instead, inherently seem to have a considerably lower fit, which means that they are more challenging to match than complementary or supplementary resources. In the empirical cases, actors integrated their heterogeneous human resources only in service interfaces when innovating a service package.

The results further suggest that intense interaction between actors varies in service innovation from continuous intense interaction to intense interaction in particular innovation phases, and to intense interaction only in service interfaces. This variation is illustrated with the theoretical continuum of the frequency of interaction in table 27. It suggests that the frequency of intense interaction between actors and, simultaneously, the frequency of resource integration can vary from high to low in service innovation.

Table 27 Frequency of interaction in service innovation

Interaction in development	**Theoretical continuum:** Frequency of interaction
Continuous intense interaction	High ↕ Low
Intense interaction in particular innovation phases	
Intense interaction in service interfaces	

Table 27 shows how frequency of intense interaction between the actors can be either continuous, take place in certain innovation phases, or take place only in service interfaces when innovating a service package. The results suggest that continuous intense interaction was specific to actors that integrated complementary human resources. They had similar kinds of knowledge, knowhow, and skills. Intense interaction was pursued by the actors in particular innovation phases, such as the planning, testing, and launch phases, when actors had supplementary resources. Their knowledge, knowhow, and skills were distinct but could be matched to each other to some extent. Actors had intense interaction only in service interfaces when they possessed heterogeneous human resources that were difficult to match to each other, and their integration was therefore not actively pursued. Their heterogeneous resources were integrated only when single developed services had common interfaces.

Results also provide evidence for the notable influence of procedural resources on resource integration in service innovation. When the procedural resources of an organization fit well to the situation in which they are applied, they enhance resource integration. However, if the procedural resources have a low fit to the situation in which they are applied, they negatively influence resource integration. Table 34 illustrates this through a theoretical continuum that is termed procedural resource fit.

Thus, the results suggest that fit between human resources, and the frequency of intense interaction between the actors, have important influence on resource integration in service innovation. High resource fit and a high frequency of interaction enhance resource integration between the actors, while low resource fit and a low frequency of interaction challenge resource integration. The human resource fit is challenged especially with heterogeneous human resources. The results in subchapter 5.4.4 further indicate that procedural resources, and especially attitudes and ways to organize innovation

projects, can either enhance, retard, or even prevent resource integration. When the organization has a positive attitude towards innovation, it provides more human resources for service development and for a longer time period. Organizations that have developed systematic ways to organize innovation projects are able to increase resource integration.

6 TOWARDS AN INTEGRATED UNDERSTANDING ON INTERACTION FOR RESOURCES IN SERVICE INNOVATION

6.1 Resource access in service innovation

This study found that companies sought innovation resources from a broad range of actors, building different types of relationship with them for a shorter or longer time. Actors accessed important resources for service innovation from business units inside a company, and from sister companies, customers, suppliers, consultants, universities, research centers, a public funding agency, and social contacts. The variety of actors that provided resources for service innovation adds notably to current service innovation research. The extant research refers mainly only to cross-functional teams (e.g., Leiponen 2006; Hu et al. 2009) and customers (e.g., Blazevic & Lievens 2008; He & Wong 2009; Magnusson 2009) as actors that provide resources for service innovation.

The extant literature refers to formalized partnerships, such as alliances, joint ventures, and interlocking ties, as typical relationships in service innovation (Goes & Park 1997; Eisingerich et al. 2009). However, few relationships that provided resources for service innovation can be characterized as strategic partnerships in this study. Relationships comprised social contacts, arm's-length relationships, close exchange relationships, and development relationships. New relationships can be established for the purpose of resource access, or existing relationships can be activated for innovation resources. The result of various relationship types in resource access adds to the extant research that mainly discusses the state of the relationship, ranging from a new relationship to dormant or existing relationships (Chou & Zolkiewski 2012).

A noteworthy finding is that only actors with development relationships actively participated in the innovation process. Development relationships provided human and procedural resources for service innovation that were transformed into new resources. Other actors with resources that could be connected to the innovation process or that provided the setting for innovation process or promoted the process, did not need to be actively involved in innovation. The extant innovation research has paid little attention to differences in providing resources for innovation and participating in it, as it has predominantly been interested in formalized partnerships (Goes & Park 1997; Eisingerich et al. 2009) which involves actively participating in innovation.

Although networks are cited as important resources for innovation (e.g., Kandampully 2002; Tether 2002; Perks & Moxey 2011), previous research provides little insight on how resources actually become available to the innovator through relationships. The extant research on resources suggests that actors can access resources through acquisition or mobilizing (Håkansson & Snehota 1995, 143; Coviello & Cox 2006). This study, however, found that actors employ four different strategies to access resources for service innovation, which comprise absorption, acquisition, sharing, and resource integration.

Absorption of resources refers to collecting information from other actors in a unilateral manner. Absorption can occur when the resource is easily transferable, such as general information. Social contacts suffice for resource absorption as it only requires limited and occasional interaction. Technological resources that comprise ready-made equipment can be acquired through market transactions in arm's-length relationships in which the ownership and risk attached to the resource are transferred to the purchaser. Sharing of resources is employed with confidential and valuable information. Similarly, facilities can be shared among actors, which demands close exchange relationships with intense interaction between the actors. Close exchange relationships can also provide funding for service innovation. Human and procedural resources that are inherently tacit and implicit can be accessed only through resource integration in development relationships. Resource integration occurs when actors add their knowledge and expertise to the innovation process, resulting in joint creation of new resources through transformation. Figure 32 provides a theoretical model for resource access in service innovation.

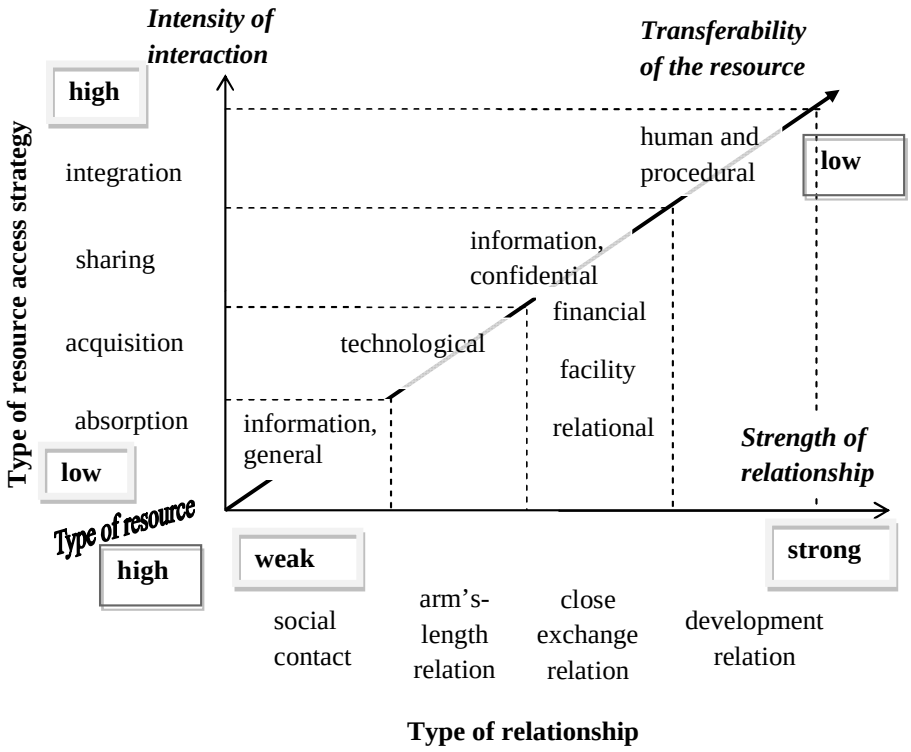

Figure 32 Model for resource access in service innovation

Figure 32 illustrates how actors can easily access transferable resources also in weak relationships without having intense interaction with the actor controlling the resources. However, the more difficult the resource is to transfer from one actor to another, the stronger the relationship and more intense interaction their access requires between the actors. The strength of a relationship refers here to the depth of the relationship between two actors for innovation, depth of involvement in the innovation process, and level of resource commitments for innovation.

Access to tacit human and procedural resources necessitates strong relationships and intense interaction between the actors. The extant research also emphasizes network relationships in resource access (Håkansson & Snehota 1995, 136; Harrison & Håkansson 2006), although the research typically focuses on the division of relationships in terms of their newness (Håkansson & Ford 2002; e.g., Chou & Zolkiewski 2012). However, the extant research provides some indication of the role of strong relationships in resource sharing for innovation (e.g., Elfring & Hulsink 2003; Fritsch & Kauffeld-Monz 2010). Elfring and Hulsink (2003) emphasize strong relationships in the exchange of

tacit knowledge and trusted feedback. Fritsch and Kauffeld-Monz (2010) suggest that strong relationships are important for information and knowledge exchange, but they fail to describe more precisely the nature of these resources. This study adds to the extant research by showing that both the strength of relationship and intensity of interaction influence resource access.

6.2 Resource integration in service innovation

This study adopts the perspective whereby resource integration refers to actively incorporating one's resources into the innovation process of other actors (Gummesson & Mele 2010; Cantù et al. 2012). The findings suggest that resource integration occurs in development relationships that provide human and procedural resources for service innovation, as development relationships are characterized by active incorporation of resources into other actors' innovation processes. Other types of relationships provide resources for innovation purposes without involvement of the actor providing them. This adds to the extant literature on resource integration (Gummesson & Mele 2010; Cantù et al. 2012) that, to date, has scarcely provided knowledge or empirical evidence on integration and relationships needed for it.

This further leads to the conclusion that resource integration is one resource access strategy. Resource integration has, however, specific importance in service innovation as it provides access to resources that can be transformed into new resources. Resource integration is thus the means to create resources for service innovation. This finding adds to the extant research that has referred to resource access and integration as different activities (Håkansson &Waluszewski 2002; Chou & Zolkiewski 2012). The extant research has further scarcely and fuzzily explained the differences between resource integration and resource combining (i.e., connecting) (Cantù et al. 2012; Chou & Zolkiewski 2012).

Several studies have emphasized the value of heterogeneous resources (Corsaro et al. 2012) or complementary resources (e.g., King et al. 2003; Miotti & Sachwald 2003) in innovation. This study found that the nature of the developed service influences the diversity of human resources that are integrated. This study suggests that three kinds of human resource can be integrated for service innovation: complementary, supplementary, and heterogeneous resources. Complementary human resources that refer to similar kinds of knowledge base between actors, enable the innovation of a service in a specific knowledge field. Nambisan and Sawhney (2011) refer here to cognitive embeddedness among network members that comprises shared vocabulary, common interpretation schemes, and overlapping knowledge domains. Emden

et al. (2006) also emphasize similar kinds of knowledge base between actors. They suggest that similar knowledge bases enable utilization of the potential in resource integration, discover complementarities in resources, communicate these between the organizations, and apply the new knowledge.

This study also found that supplementary human resources are called for when innovating a service that links different knowledge fields. These services require distinct human resources to fit each other. Buckley et al. (2009) state that supplementary knowledge enables actors' knowledge bases to be widened.

According to the findings, heterogeneous resources are employed only in development of a service package comprising various knowledge fields. Current research provides some explanations for the more limited utilization of heterogeneous human resources. Cummings and Teng (2003) suggest that significant differences between the actors' knowledge bases require many learning steps before the actors' knowledge can be efficiently employed (Cummings & Teng 2003), and that as resource integration involves coupling and matching resources, a good resource fit provides more value in integration (Gadde et al. 2012).

This study further suggests a connection between the diversity of human resources and the frequency of interaction between the actors during service development. Integration of complementary human resources continuously takes place in intense interaction between the actors during the innovation. Integration of supplementary human resources, instead, occurs in intense interaction in particular innovation phases, such as planning, testing or launch. Heterogeneous human resources are integrated in intense interaction between the actors only in interfaces between various services.

The extant research has scarcely studied interaction together with diversity of human resources. The Interaction and Network Approach suggests only in a general way that interactive relationships are the means to create new knowledge resources as interaction connects two knowledge bases at their interface (Håkansson & Ingemansson 2011). Similarly Nonaka et al. (2000), and the extant product innovation research refers to the importance of social interaction among individuals and organizations in knowledge creation without paying attention to knowledge bases between the actors (Dougherty 1992).

It also appears that procedural resources, that is, organizational procedures and routines, considerably influence resource integration. Especially, attitudes towards innovation in an organization and the ways by which firms organize their innovation projects seem either to positively or negatively influence resource integration. The findings suggest that organizations with a positive attitude to innovation seem to integrate more of their human resources in service innovation and for a longer time period. Further, organizations

pursuing systematic and similar ways of organizing innovation projects are able to increase human resource integration in service innovation. These findings add to the extant service innovation research that has remained at a very general level when studying procedural resources. The extant research states that management systems and attitudes of the firm manifest in innovation practices, such as organization structure for development and top management support for innovation (Froehle & Roth 2007).

Figure 33 provides a model for resource integration in service innovation. It includes the continuums of the human resource fit and frequency of intense interaction between the actors. Together, they influence the possibilities of human resource integration for service innovation.

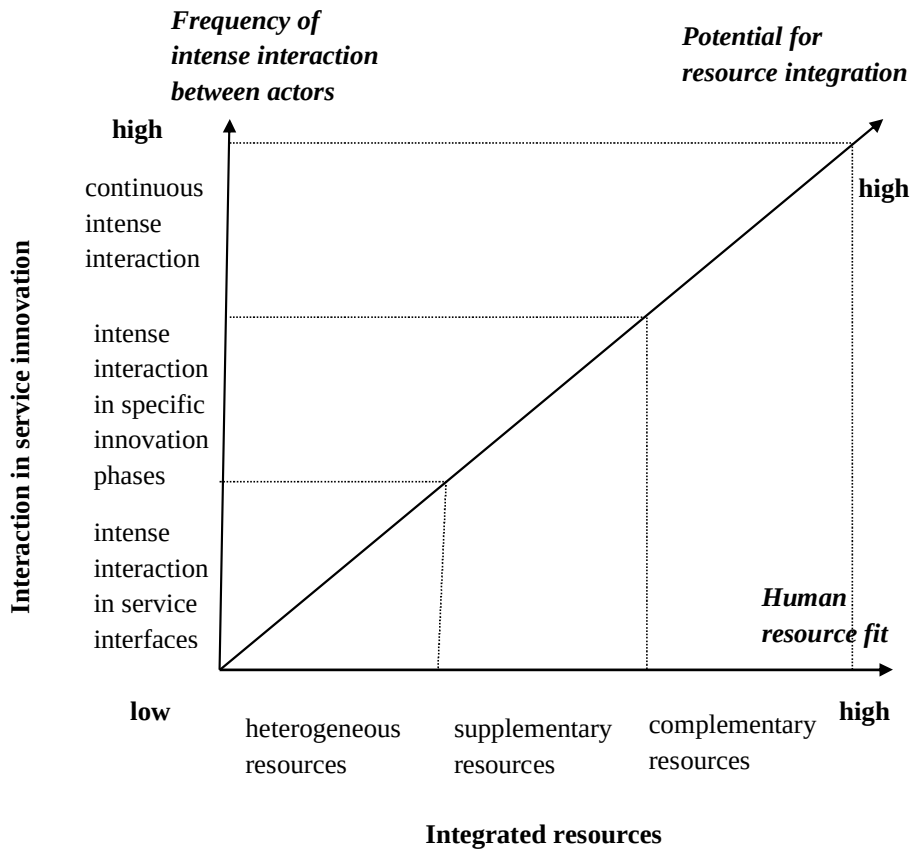

Figure 33 Model for resource integration in service innovation

Figure 33 illustrates how the human resource fit, and frequency of intense interaction between the actors influence the potential for resource integration

in service innovation. When human resources fit quite easily together, and the frequency of intense interaction between the actors is high, there is high potential for resource integration. The lower the human resource fit and frequency of intense interaction between the actors, the greater the effort needed to integrate resources in innovation.

7 SUMMARY AND THEORETICAL CONTRIBUTION

7.1 Theoretical contribution

This study contributes to service innovation research and, more precisely, to service innovation in networks. Its main contribution is in advancing understanding on *interaction for resources* in service innovation. Resources have gained scarce attention in service innovation research, although the relational perspective emphasizes various network actors that contribute to service innovation. Thus, this study lays a foundation for studying service innovation in networks from the interaction perspective highlighting resources that are needed for service innovation.

Interaction for resources was explored by applying a multiple case study research method with embedded cases. The empirical research was conducted at two levels, first in three case firms, and second in five innovation projects that were studied longitudinally. The empirical context was business-to-business service innovation in technical/engineering services. Services comprised design, consultancy, construction, and maintenance, and also technology solutions.

This study applied the IMP Group's Interaction and Network Approach (Håkansson & Snehota 1995; Håkansson & Ford 2002; Waluszewski & Håkansson 2007) as the main theoretical framework to study interaction for resources in service innovation. Although this theoretical school of thought has traditionally not focused on services, it provided a comprehensive theory on resources, networks, interaction and innovation – the main elements in this study. Also, as the IMP Group has conducted extensive studies on the technology field including solutions, their approach was suitable for the engineering services context. Understanding on resources was deepened through the resource classification in the resource-advantage theory (Hunt & Morgan 1995).

Interaction for resources was studied, first, by exploring the resources that actors seek and provide for service innovation in networks. The findings and the current literature on resources (Hunt & Morgan 1995; Hunt 1997b; Waluszewski & Håkansson 2007; Baraldi et al. 2012) enabled provision of a categorization for resources in service innovation, and for the roles of different resource categories in service innovation.

Next, the study explored how the found resources can be accessed in networks for service innovation. The findings and the extant literature discussing resource acquisition and mobilizing (Lundgren 1992; Håkansson & Snehota 1995; Håkansson & Ford 2002) led to the construction of a theoretical model on resource access in service innovation.

On the basis of the above-mentioned categorizations and results on resource access, and also the extant literature on resource integration (Håkansson & Johanson 1992; Håkansson & Snehota 1995; Gummesson & Mele 2010; Snehota 2011; Cantù et al. 2012), it was possible to conceptualize resource integration that has, to date, been a vaguely explained concept. The findings and the extant literature on resource integration resulted in a model for resource integration in service innovation.

The theoretical findings and contribution of this study are summarized in table 28.

Table 28 Research questions and theoretical contribution

Research question	Theoretical findings	Contribution
What kinds of resource network provide for service innovation?	Categorization of service innovation resources. Division of resources into individual and organizational resources. Division of resources according to their roles in innovation.	New understanding on service innovation resources.
How do actors access innovation resources in networks?	Determination of relationship types and access strategies needed for access of resources in different resource categories in service innovation. Creation of theoretical continuums for resources, relationships, and interaction between the actors in resource access. Showing how relationship strength and intensity of interaction between the actors influence resource access.	A model for resource access in service innovation.
How do actors integrate resources for service innovation?	Elaboration of the resource integration concept in innovation. Determination of diversity of human resources employed for resource integration in different service types. Showing the differences in intense interaction when integrating diverse human resources for service innovation. Showing the importance of procedural resources in resource integration. Creation of theoretical continuums for human resource fit and frequency of intense interaction in service innovation.	A model for resource integration in service innovation.

To date, service innovation research has paid scant attention to resources in collaborative service innovation. The extant research discusses knowledge (e.g., Leiponen 2006; Blazevic & Lievens 2008) and ideas (e.g., Magnusson 2003; Magnusson 2009) as resources that actors can share for service innovation. Innovation research in general has mostly perceived knowledge as a

shared resource (e.g., Pittaway et al. 2004; Cassiman & Veugelers 2006). This study, however, shows that a variety of resources are accessed from networks for service innovation. This study further provides a categorization for these resources: human, procedural, technological, financial, facility, relational, and informational resources.

Previous research on resources (e.g., Hunt & Morgan 1995; Waluszewski & Håkansson 2007) was also complemented by dividing resources into individual and organizational resources. Individual resources are bound to individuals and thus require the person possessing the resource to actively participate in service innovation. Such resources are human resources and, to some extent, confidential information from informational resources; others are organizational resources.

As innovation research has focused on limited resources, it has failed to pay attention to various roles of resources in innovation. However, this study shows that different resource categories play different roles in service innovation. Human and procedural resources comprise key resources in innovation as they can be transformed into new resources, thus enabling innovations to take place. New services also take advantage of existing technological resources. They play a role as ready-to-connect resources that are connected to new, created resources. New resources and connected resources form the services. Facility and financial resources provide the necessary setting so that innovation process can take place. Informational resources and relational resources act as promoting resources that advance and facilitate the innovation process.

Innovation research has, similarly, taken a narrow perspective on resource access. Service innovation research has focused on specifying various actors that can provide resources for innovation (e.g., Lievens & Moenaert 2000; Smith & Fischbacher 2000; Tether & Tajar 2008). Broader innovation research has tended to refer predominantly to learning as the means to transfer knowledge resources of other actors (Hagedoorn 2002). This study, however, shows that different kinds of resource can be accessed through various access strategies and through different types of relationship. General information can be accessed through absorption in social contacts. Technological resources are acquired in arm's-length relationships. Close exchange relationships enable sharing of facility, financial, and relational resources, and confidential information. Human and procedural resources are integrated in development relationships.

This study further adds to the extant research by showing the connection between relationship strength, interaction intensity between the actors, and transferability of resources. These relations have been further constructed into the model of resource access in service innovation. The model shows that the more difficult the resource is to transfer from one actor to another, the stronger

the relationship and more intense interaction between the actors their access requires.

Resource integration between actors has gained limited attention in innovation research. Focus has been, instead, mainly on knowledge transfer among actors (e.g., Powell et al. 1996; Dhanaraj & Parkhe 2006). The IMP Group's Interaction and Network Approach has discussed resource combining also for innovation (e.g., Håkansson 1987; Håkansson & Snehota 1995), but the findings tend to remain at an abstract level. Lately, the IMP approach has suggested that resource combining and integration are different concepts (e.g., Gummesson & Mele 2010; Cantù et al. 2012; Chou & Zolkiewski 2012), although this difference has been vaguely clarified. Further, the Interaction and Network Approach has focused on interaction between larger resource entities. It also omits the actor dimension (Baraldi et al. 2012).

Studying interaction for resources from the perspective whereby actors are an important part of the process, and where resources are perceived as single units instead of constellations, enabled the concept of resource integration to be clarified, and created understanding on resource integration in service innovation. This research found that resource integration is a resource access strategy for human and procedural resources, which, importantly, is employed in the creation of new resources in service innovation.

Furthermore, this study shows that different types of service call for integrating diverse human resources. The frequency of intense interaction between the actors further varies in human resource integration. Complementary human resources from similar knowledge fields are integrated especially when innovating a service or part of it in a specific knowledge field. Actors with complementary resources act in continuous intense interaction when integrating their resources in service innovation. Supplementary human resources are integrated when innovating a service that links different knowledge fields. When actors have supplementary human resources, their resource integration takes place in intensive interaction only in particular phases over the innovation process. Heterogeneous human resources are integrated when developing a service package. Actors with heterogeneous human resources act in intense interaction only in service interfaces. The study also proposes that procedural resources, and especially attitudes towards innovation in the organization and ways to organize innovation projects, influence resource integration.

Diversity of human resources and interaction in service innovation are presented as continuums in the study. The continuums show that fit between human resources, and the frequency of intense interaction between the actors, have important influence on resource integration in service innovation. High resource fit and a high frequency of interaction enhance resource integration

between the actors, while low resource fit and a low frequency of interaction challenge resource integration. The continuums have been further constructed into the model of resource integration in service innovation. The model shows that, when human resources fit quite easily together and the frequency of intense interaction between the actors is high, there is high potential for resource integration.

7.2 Managerial implications

Both business and social networks provide considerable opportunities for a firm that seeks resources in service innovation. Networks can provide many resources that a firm might lack, from financing and information to knowhow, marketing skills, and reference customers. Leveraging full benefits from the networks, however, necessitates careful managerial planning, which should be begun by reviewing the entire innovation process until the launch of the service and also considering different kinds of resource that are needed over this process.

Based on this knowledge, managers can consider which relationships are available for them to provide the required resources. These can include various existing relationships of their company, from social contacts to close partners. However, similarly, single managers and other employees, and also existing business relations and social contacts can act as a link to parties with the needed resources. Managers should also employ the opportunities that various business events, such as association meetings, trade fairs, and seminars, might provide in this respect. The management should think of searching widely, both inside and outside current networks, for potential innovation partners as new relationships can provide possibilities to find completely novel resource combinations (Birkinshaw et al. 2007).

Managers then need to consider what actions between the parties will lead to sharing of resources, as a mere relationship does not ensure access to other parties' resources. Here, the characteristics of the resource play an important role. General information that parties can easily share, or ready-made goods that can be purchased and transferred, necessitates fewer actions between the parties. Sharing of confidential information, facilities, or finance, or utilizing relationships with other actors in service innovation, instead, calls for trusted relationships and intense communication between the parties.

As they are the means to create new resources for service innovation, special attention should be paid to the knowledge, knowhow, skills, and experience that the firm needs from other organizations. These resources call for establishing development relationships between the parties as they are difficult

to transfer. Therefore the party that possesses the resource has to be actively involved in the innovation process. Although companies often refer to these resources in their reference lists and presentation materials, they typically represent resources that are bound to individual employees. Therefore, managers are advised to determine who in their organization have the needed resources, and whether they are available for the innovation process. Knowledge and experience become part of the innovation process only when the persons who can provide them are actively involved in innovation.

Managers are also encouraged to determine whether the procedures and routines of organizations possessing the needed resources are suited to collaborative innovation. Of importance are, for example, attitude towards innovation which manifests, for example, through readiness to provide resources for innovation. Similarly, systematic organization of innovation projects increases collaboration for resources in service innovation.

When establishing development relationships to other parties, management needs to pay attention to the goal in innovation. The goal provides important information when determining the kind of knowledge and knowhow that is necessitated by the innovation. Innovation can call for a shared knowledge base between the parties if it focuses on a limited knowledge field, such as a specific technology. When different knowledge bases are needed, managers should consider how easily they need to fit together. Innovation can profit from knowledge on various fields, but this can require considerably more efforts to gain a fit between the resources.

Managers are also advised to consider how interaction between the parties can be kept at a level sufficient to enhance achievement of the goals. The customer or user perspective should not be forgotten either, as services are typically processes within which the customer and/or customer's assets are directly involved (Lovelock 1983; Tether & Hipp 2002). Customers' knowledge and experience can provide important resources for service innovation (Möller et al. 2008).

Managers are further advised to differentiate between a development relationship with one firm and with more firms in service innovation. When more firms are involved in innovation, managers are encouraged to consider the advantages that their acting together and the sharing of their resources can provide to development and the end result.

7.3 Limitations and evaluation of the study

This research has limitations that need to be addressed when evaluating the study. The empirical findings are based on a qualitative case study that was

conducted in the business-to-business context in the engineering service field and, more precisely, in the design, consultancy, construction, maintenance, and technology solutions fields. Concentrating on the engineering service field omits a number of other business-to-business services. Furthermore, all of the cases were from Finland, which might provide some bias to the study, although this is not considered to have inherently impacted the findings.

The empirical longitudinal data has been collected by purposefully choosing cases that potentially provide much information on the focal topics of interest. The empirical research was conducted in three case companies and five networks for innovation. The primary data were gathered through 32 interviews in the case companies in the first phase of the study, and through 25 interviews in the networks for innovation in the study's second phase. The amount of data is thus limited and the cases are purposefully selected. Therefore, the study does not aim to make any statistical generalizations. However, as the research is based on multiple cases, and systematic data collection and analysis, it enables theoretical generalizations. Following the stance of moderate constructivism, the purpose of case studies is to generate context-specific understanding. However, case study-based theories can also be applied in other contexts (Järvensivu & Törnroos 2010).

Focusing on engineering services provides some specific characteristics to the research on innovation. The empirical data comprise innovation projects that focus on service solution and service portfolio development. In the engineering field, innovation means development of solutions whereby physical product development might be a part of service development. One can argue whether solutions and services should be placed in the same category; however, this approach has gained support from several academics (den Hertog et al. 2010). Nevertheless, the reader should be aware of this fact when reading the thesis. Understanding the service in a wide sense, however, provides the opportunity to suggest that the findings of this thesis are applicable for a wide range of business-to-business services.

The research is approached through specific theoretical lenses, through the IMP Group's Interaction and Network Approach (Håkansson & Snehota 1995; Waluszewski & Håkansson 2007). Thus, the findings should be regarded against the specific theoretical framework into which they are bound.

A qualitative study can be approached from different perspectives on reality. This study is based on the constructivist perspective on reality, which gives a specific label to the research. This means that, for example, the empirical cases are constructed on the basis of interviews with multiple informants and do not aim to provide the "truth" in a strict sense. Each informant provided his or her own interpretation of the innovation process, and the case descriptions are a compromise between various perspectives. The researcher

made the final choice of material that was included in the case descriptions with the aim of providing rich data for analysis of interaction for resources in service innovation.

It should be also noted that a qualitative case study provides no single way or exact tools to analyze the data (Eisenhardt 1989); the analytical skills and interpretations of the researcher play a significant role in data analysis. Although the data were categorized with the NVivo10 program, the choices during the data analysis and interpretations of the data were made by the researcher. Thus, the path from the data to the final findings was not straightforward, but involved the researcher in several rounds of analysis and learning by trial and error. Providing a possibly transparent chain of evidence along the path from the data to the final findings, however, provides a means by which the reader can become confident in the analytical process.

The fact that the research topic is new in the service innovation field and, for several parts, also scarcely studied in the R&D and open innovation fields provided many challenges, but also opportunities to the researcher. Conducting the research was not facilitated by the fact that combining services, innovation, networks, and resources leads to multiple theoretical schools of thought, and scattered and conflicting knowledge. The choice of the theoretical framework was far from self-evident. Only through ambitious attempts to combine various theoretical perspectives into the theoretical framework was the research bound to the IMP Interaction and Network Approach. This study, however, has the privilege to open the doors to a new research field, interaction for resources in service innovation, and a network perspective in service innovation research.

7.4 Further research

This research focuses on the topic that has gained little attention in the service innovation literature, and it takes new perspectives to research on innovation in networks. This also provides opportunities for future research. Various actors have been discussed separately in the extant service innovation research (e.g., Magnusson et al. 2003; Perks & Riihela 2004; Tether 2005). However, research has neglected the network perspective on innovation, and remained at the level of single actors and dyads. This study shows the importance and usefulness of exploring innovation in the network, and also from the perspective of various actors in the future.

This study focuses on the innovation process instead of only the end result. Previous studies on process have typically concentrated on describing the various stages in service innovation (Froehle & Roth 2007). Academics are,

however, encouraged to explore the innovation process from a broader perspective. Interaction between the actors and various events over the innovation process will provide new insights for service innovation research. Especially, challenges faced by innovation processes will provide interesting research avenues. Capabilities that are required from actors in interaction for resources are an important issue for future study. The extant research has focused predominantly on managing and orchestrating networks when describing capabilities needed in collaborative service innovation (Heikkinen et al. 2007; Ritala et al. 2012), leaving individual actors unaddressed. Researchers are encouraged to study capabilities also from perspectives of individuals in networks who participate in service innovation.

The empirical cases further suggest that firms also establish new relationships for service innovation. As the extant research indicates that innovating with parties that have no common history can be challenging (Birkinshaw et al. 2007; Story et al. 2009), this will be an interesting research topic in the future.

The empirical cases of this study suggest that dynamics is characteristic to service innovation networks, and has many effects on the innovation process. However, network dynamics has scarcely been studied in innovation to date. Research on network dynamics might provide interesting future avenues. In this regard, there is also a need to know more concerning the means with which to make the innovation process efficient and effective in networks.

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APPENDIX 1
INTERVIEW THEMES AND EXAMPLE QUESTIONS IN THE FIRST STUDY PHASE

General information on the firm and the services it provides:

What kinds of service do you provide, and to whom?
Strategically, what are the most important services you offer?
Which are your key customers?
For what benefits do customers look when they buy services from you?
What do customers expect from your services?
What kind of experience do customers have from your services?
How do you collect information on your customers and potential customers?
Which firms are your main competitors?
How do you differentiate your firm from your competitors and other actors in the field?

Information on service development in general:

Please describe your service development. How do you develop new services?
How systematic is your service development?
How have your services changed over recent years?
What are the drivers of service development in your firm?
Currently, what are the most important development objectives?
How do you find new ideas, and how do you develop them further into new services?
Which kinds of challenge have you had in service development?
What are your firm's strengths and weaknesses in service development?

Information on acting in networks for service development:

Have you developed services or solutions with other departments or BUs in your firm?
Have you developed services/solutions with your customers?
Have you developed services/solutions with other firms (e.g., with partners)?
Have you developed services/ solutions with universities or a public research center?
Why have you/have you not sought cooperation with other parties?

If the informant gives a positive answer to some of the questions above:

What, when, and with which actors have you developed services?
At what point of development have you worked with other parties?
What did you do in practice with the other party/parties?
What was the target of co-development?
How did you choose to co-develop with these parties?
What did the parties provide for the development?
Please give examples of positive and negative experiences in development collaboration.
What things have advanced the collaboration? What kinds of challenge have you met?
Do you provide the services in the same network in which they are developed?

APPENDIX 2
INTERVIEW THEMES AND EXAMPLE QUESTIONS IN THE SECOND STUDY PHASE

Please describe the innovation project: What did you innovate and why?
When did you begin the development? What is the current situation of the project?
Which actors have been involved in the project to date?
How did cooperation begin with each actor?
What was their role in innovation? What did they provide for the project?
How was your co-development? What did you do together, and how?
How is the project organized: did the parties also interact with others in the project, and how?
How has the project gone to date? What kind of steps has the project had? How has cooperation with each actor been? What positive or negative events have occurred?
What did you expect from the project and each party in it? How have your experiences met the expectations?
What have you learned during the project?

What would you do differently now?

APPENDIX 3
TABLE SUMMARIZING THE EMPIRICAL RESEARCH

Resource category	Detailed description of the resource	Way of employing the resource in service innovation	Relationship between the actors	Means to access the resource	Empirical indicators
Informational resources: General information	Industry information	Promoting the innovation process	Social contact	Absorption	*We participated in some wind energy fair. It encouraged us to believe that this could be a real business for us. (Technology director, fastening technology firm, Project 3[1])*
Informational resources: General information	Industry information and information on firms	Promoting the innovation process	Social contact	Absorption	*We didn't have any existing business with the firms from which we sought information. We just went and talked to them. We told them that we aimed to develop a business in this market, and then we tried to identify the variables. So we progressed further and further. Each meeting led to a new meeting with another party, and a new bit of information. (Technology director, fastening technology firm, Project 3)*

[1] The innovation projects have been identified here in the following way: Project 1 = Resource management system development at Alpha; Project 2 = Development of the wind power service portfolio at Alpha; Project 3 = Foundation solution development for wind turbine towers; Project 4 = Automation systems development; Project 5 = Development of the wind power service portfolio at Delta. Citations without project identification refer to data at the company level.

Resource category	Detailed description of the resource	Way of employing the resource in service innovation	Relationship between the actors	Means to access the resource	Empirical indicators
Informational resources: General information	Industry information and information on firms	Promoting the innovation process	Social contact	Absorption	*The regional development company arranged a trip to Germany where we learned about the local wind power business and industry. Various firms participated in this trip from Finland … Everybody introduced themselves and spoke about their company. (Business area director, Alpha, Project 2)*
Informational resources: General information	Information on firms	Promoting the innovation process	Social contact	Absorption	*And we had the Wind Power Association from which you can find the names of their members. And as we were a member too, I naturally went to some of their meetings to investigate.(Business area director, Alpha, Project 2)*
Informational resources: General information	Information on firms	Promoting the innovation process	Social contact	Absorption	*And then I visited some trade fairs … to see which Finnish companies were represented there, and what's taking place. This way, I got an overall picture of the whole business. (Business area director, Alpha, Project 2)*
Informational resources: General information	Information on firms	Promoting the innovation process	Social contact	Absorption	*I made a market study on the firms that are active in wind power field in Finland, and found out what kinds of service they provide. As a matter of fact, I visited all of these firms. I phoned them, and asked if I could visit and ask some questions. (Business area director, Alpha, Project 2)*

Resource category	Detailed description of the resource	Way of employing the resource in service innovation	Relationship between the actors	Means to access the resource	Empirical indicators
Informational resources: General information	Information on research results	Promoting the innovation process	Social contact	Absorption	*But now they've [The Transport Agency] ordered an international report from us that examines how close to roads other countries have built their windmills, what kinds of risk they might cause, and so on. (Regional unit manager, Delta, Project 5)*
Informational resources: General information	Information on customer needs and challenges	Promoting the innovation process	Social contact or close exchange relationship	Absorption	*We had existing customers and potential customers. We went to meet several of them and tried to find out what's important in wind power, and what things are challenging. This way, we gathered information and knowledge. (Sales manager, member of the core team, Alpha, Project 2)*
Informational resources: General information	Information on customer needs and challenges	Promoting the innovation process	Social contact or close exchange relationship	Absorption	*It [the wind power portal] originated from our discussion with the wind power actors and producers. In many firms, they told us that they didn't know what actually happens at their wind power plants. (Sales manager, member of the core team, Alpha, Project 2)*
Informational resources: General information	Information on events and their contents, and information on projects	Promoting the innovation process	Development relationship	Absorption	*We inform others of the projects in which we're involved. We decide who will market to whom, and who's responsible for what. And we inform others of seminars and events, and who will attend them. Afterwards, we explain to the team members what we've learned there. (Regional unit manager, Delta, Project 5)*

Resource category	Detailed description of the resource	Way of employing the resource in service innovation	Relationship between the actors	Means to access the resource	Empirical indicators
Technological resources	Ready-made software	Connected as such to the offering	Arm's-length relationship	Acquisition	*It was an easy project. It was their standard product. It didn't require any changes. A ready-made package. It was a specialist application, similar to many others that we acquired. (Head project manager, Alpha, Project 1[2])*
Technological resources	Ready-made equipment	Connected as such to the offering	Arm's-length relationship	Acquisition	*We carry out more one-time transactions with the measuring device suppliers [for the real-time electricity consumption measuring project]. We purchase meters from them, and deliver them during the next four years to our customers. Then we will maintain them. (Divisional director, Alpha)*
Technological resources	Ready-made equipment	Connected as such to the offering	Arm's-length relationship	Acquisition	*We acquired, for example, condition monitoring equipment from the online systems firm for our wind power plant project. (Business area director, Alpha, Project 2)*

[2] The innovation projects have been identified here in the following way: Project 1 = Resource management system development at Alpha; Project 2 = Development of the wind power service portfolio at Alpha; Project 3 = Foundation solution development for wind turbine towers; Project 4 = Automation systems development; Project 5 = Development of the wind power service portfolio at Delta. Citations without project identification refer to data at the company level.

Resource category	Detailed description of the resource	Way of employing the resource in service innovation	Relationship between the actors	Means to access the resource	Empirical indicators
Technological resources	Ready-made machine	Connected as such to the offering	Arm's-length relationship	Acquisition	*We acquired the machine vision from a Dutch firm. It's a ready-made commercial product, similar to the one we used in our original robotics solution. (Senior vice president, robot systems firm, Project 4)* *The laser technology firm … takes care of some equipment purchasing. We do most of the purchasing on the basis of the design documents … The laser technology firm has contacts in the firm that supplied the laser equipment. They are standard components. (Project manager, production systems firm, Project 4)*
Technological resources	Ready-made machine	Connected as such to the offering	Close exchange relationship	Acquisition	*This solution is bound to one robot brand, which the robot systems firm imports into Finland. (Divisional director, Gamma, Project 4)*
Facility resources	Plant	Providing the setting for the innovation process	Close exchange relationship	Sharing	*We maintain a customer's wind power plant, where we also take care of energy management. So we installed the portal in that power plant and tested it.(Business area director, Alpha, Project 2)*
Facility resources	Project environment	Providing the setting for the innovation process	Close exchange relationship	Sharing	*These two projects that we've undertaken together have been the most challenging ones that can be found in Finland. We've reached a high level of learning because of these projects. (Divisional director, EIA consultant, Project 2)*

Resource category	Detailed description of the resource	Way of employing the resource in service innovation	Relationship between the actors	Means to access the resource	Empirical indicators
Facility resources	Project environment	Providing the setting for the innovation process	Close exchange relationship	Sharing	*We've a wide experience in noise issues, and we try to develop solutions together with our customers so that we can avoid the problems with noise. (Regional unit manager, Delta, Project 5)* *[In our customer projects] we've collected a large amount of data that show how the Finns react to wind power. We know a lot about these things.(Manager, EIA and land use planning, Delta, Project 5)*
Facility resources	Project environment	Providing the setting for the innovation process	Development relationship	Sharing	*Then we contacted the Finnish sister company of one of those top firms. And we began to work with them. In fact, they didn't have that kind of knowhow in Finland. But we could learn together. (Technology director, fastening technology firm, Project 3)*
Facility resources	Premises	Providing the setting for the innovation process	Development relationship	Sharing	*Alpha rented premises for the project, which sped up development in the first three months. We and Alpha's main users worked together there … And when we tested the system, we did it together in our premises. We had the premises there for two weeks. Alpha's main users and other necessary people were there, and our technical support and consultants. (Project manager, principal supplier, ERP, Project 1)*

Resource category	Detailed description of the resource	Way of employing the resource in service innovation	Relationship between the actors	Means to access the resource	Empirical indicators
Facility resources	Building site	Providing the setting for the innovation process	Development relationship	Sharing	*They've been willing to act as the platform on which we produce a solution. They needed to find a solution without investing money in its development. (Technology director, fastening technology firm, Project 3)*
Facility resources	Building site	Providing the setting for the innovation process	Development relationship	Sharing	*We thought of continuing the development work when we've got new foundation construction projects. Without a concrete project the development work doesn't pay. (Business area director, Alpha, Project 3)*
Facility resources	Virtual environment	Providing the setting for the innovation process	Development relationship	Sharing	*We had a virtual task manager tool. We used it actively, and gave the rights to Alpha's main users, the asset management system developers, and the integrator. We documented everything there, and could give a task to anybody in it … All the changes were made in the task manager, where we also tested the changes ourselves. (Project manager, principal supplier, ERP, Project 1)* *We partly manage the project through a virtual project management tool. There, we have all of the documents and correspondence, where almost everybody can read them … The customer uses this tool in all of its projects … I even put photos of the machine there every week, so that everybody can see how it is developing … All the relevant data is there. (Project manager, production systems firm, Project 4)*

Resource category	Detailed description of the resource	Way of employing the resource in service innovation	Relationship between the actors	Means to access the resource	Empirical indicators
Financial resources	Financing by a public funding agency	Providing the setting for the innovation process	Close exchange relationship	Sharing	*In the fall of 2008 we made plans to start a development project in the wind power business. We also drew a business plan for it. Then we applied for funding from Tekes, and they provided us with funding for two years. (Business area director, Alpha, Project 2)*
Financial resources	Financing by a public funding agency	Providing the setting for the innovation process	Close exchange relationship	Sharing	*The only way a low-margin company can actively influence change in the markets is a joint project. We can't use much money for development and then go to markets. It's natural for us to have a common theme with some other actors and involve external funding into the project. (R&D director, Alpha)*
Financial resources	Financing by a customer	Providing the setting for the innovation process	Development relationship	Sharing	*Our main interest was to have a reference customer that provides us with finance for development. (Project manager, asset management system, Project 1)*
Financial resources	Financing by a supplier	Providing the setting for the innovation process	Development relationship	Sharing	*They needed to find a solution without investing money in its development. (Technology director, fastening technology firm, Project 3)*
Financial resources	Financing by a supplier	Providing the setting for the innovation process	Development relationship	Sharing	*This IT company was willing to develop the software for us as their own development project. We wouldn't have had the possibility to invest several hundred thousands of euro for software development.(Divisional director, Gamma)*

Resource category	Detailed description of the resource	Way of employing the resource in service innovation	Relationship between the actors	Means to access the resource	Empirical indicators
Informational resources: Confidential information	Information on trusted relationships	Promoting the innovation process	Close exchange relationship	Sharing	*When I ask in our present supplier network, they'll surely recommend firms that can help us.(Head project manager, Alpha, Project 1)* *We have so many products by Microsoft that they give us hints concerning suitable partners in their partner network. (Head project manager, Alpha, Project 1)*
Informational resources: Confidential information	Customer intelligence	Promoting the innovation process	Close exchange relationship	Sharing	*I was listening to and discussing with Alpha's supervisors when they had a staff training day, and our product development manager observed the work of supervisors at two of their offices.(Project manager, asset management system, Project 1)*
Informational resources: Confidential information	Customer intelligence	Promoting the innovation process	Development relationship	Sharing	*The main reason why the robot systems firm wanted to cooperate with us was to make use of our customer knowledge. (Divisional director, Gamma, Project 4)*
Informational resources: Confidential information	Information on future plans of an actor and feedback from customers on the service under development	Promoting the innovation process	Close exchange relationship	Sharing	*Similarly, I visited our customers from the energy industry. I asked about their plans to build wind power and about the services they would need. This way I was able to reflect their thoughts to our ideas on the service portfolio … With them you can throw in questions such as 'If we could provide this kind of service, how would you like it?' or 'Would you be interested in this kind of service?' (Business area director, Alpha, Project 2)*

Resource category	Detailed description of the resource	Way of employing the resource in service innovation	Relationship between the actors	Means to access the resource	Empirical indicators
Relational resources	Well-known, esteemed and trusted actor as a partner	Promoting the innovation process	Close exchange relationship	Sharing	*The wind turbine supplier knew that they could only have business in Finland if they have connections to a firm with the capability to deliver the total project. (Business area director, Alpha, Project 3[3])*
Relational resources	Well-known, esteemed and trusted actor as a partner	Promoting the innovation process	Development relationship	Sharing	*We wanted to have a sales channel to the metal industry, but we're an unknown actor there. Gamma, instead, is one of the best known firms there. (Senior vice president, robot systems firm, Project 4)*
Relational resources	Well-known, esteemed, and trusted actor as a partner	Promoting the innovation process	Development relationship	Sharing	*When we told about our relationship with the public research center while creating contacts to other parties, they understood that we've really invested in the development project. (Divisional director, Gamma)*
Relational resources	Reference customer	Promoting the innovation process	Development relationship	Sharing	*Our main interest was to have a reference customer … We found Alpha very interesting as it was a high-profile and large company. It would make a good reference firm. They were involved in many types of business. (Project manager, asset management system, Project 1)*

[3] The innovation projects have been identified here in the following way: Project 1 = Resource management system development at Alpha; Project 2 = Development of the wind power service portfolio at Alpha; Project 3 = Foundation solution development for wind turbine towers; Project 4 = Automation systems development; Project 5 = Development of the wind power service portfolio at Delta. Citations without project identification refer to data at the company level.

Resource category	Detailed description of the resource	Way of employing the resource in service innovation	Relationship between the actors	Means to access the resource	Empirical indicators
Relational resources	Reference customer	Promoting the innovation process	Development relationship	Sharing	*The idea wouldn't work that we'd develop something only in theory and start selling it. Our customers are very practical. And they require a reference. Nobody wants to buy a first trial which they don't know at all. (Divisional director, Alpha)*
Relational resources	Reference customer	Promoting the innovation process	Development relationship	Sharing	*We should have involved some customer in the development process from the beginning.… And a good reference customer where we could bring potential customers to see. (Divisional director, Gamma, Project 4)*
Human resources	Educational knowledge	Transformed into new resources	Development relationship	Resource integration	*We had four theses written on wind power during the development project, and then we've had those people planning the service concept. (Business area director, Alpha, Project 2)* *In his thesis, the student suggested that there's a need to develop condition monitoring … I've experience in working with these kinds of things, so I could contribute to this thesis. I told the student also to investigate this thing, and this led us, for example, to acquire condition monitoring equipment for one power plant.(Business area director, Alpha, Project2)*

Resource category	Detailed description of the resource	Way of employing the resource in service innovation	Relationship between the actors	Means to access the resource	Empirical indicators
Human resources	Educational knowledge	Transformed into new resources	Development relationship	Resource integration	*Delta even had two theses written on our case. This project also includes two collaborative theses. (Technology director, fastening technology firm, Project 3)*
Human resources	Professional knowledge, technical knowhow	Transformed into new resources	Development relationship	Resource integration	*The team members especially provided their knowledge and knowhow for the development project. We reflected on various things that have to do with wind power, and it soon became evident that the team comprised the correct people. We indeed needed the knowhow of each member. (Sales manager, member of the core team, Project 2)*
Human and procedural resources	Professional knowledge, technical knowhow	Transformed into new resources	Development relationship	Resource integration	*We need knowledge from our network partners, such as Delta. (Technology director, fastening technology firm, Project 3)*
Human and procedural resources	Professional knowledge and scientific knowledge	Transformed into new resources	Development relationship	Resource integration	*I have just returned from a video meeting. Something like 25 employees participated in it from seven locations in Finland. We discussed the latest achievements in noise research on wind turbines, and how we should react to them. A noise expert gave a lecture, and then we discussed the topic.(Manager of the EIA and land use planning, Delta, Project 5)*

Resource category	Detailed description of the resource	Way of employing the resource in service innovation	Relationship between the actors	Means to access the resource	Empirical indicators
Human and procedural resources	Technical knowhow and experience	Transformed into new resources	Development relationship	Resource integration	*Actors with different strengths form a good team. The robot systems firm is a strong technology enterprise. (Group president, Gamma, Project 4)* *We went through the requirements together. Then, together we made capacity calculations. We tried to avoid a situation in which we duplicated the same work. We had very open cooperation.(Divisional director, laser technology firm, Project 4)*
Human and procedural resources	Technical knowhow and professional skills	Transformed into new resources	Development relationship	Resource integration	*The robot systems partner provided the design knowhow and design tools. They also took care of production. We provided the ideas for the robotics system. We also provided the entity between the machine and robot. (Divisional director, Gamma, Project 4)* *Programming of the machine is an extremely critical part of the project. (Project manager, production systems firm, Project 4)*
Human and procedural resources	Knowhow on solutions and projects	Transformed into new resources	Development relationship	Resource integration	*Automation solutions and projects are not part of Gamma's core capabilities. Thus, we've got knowhow that Gamma lacks. (Senior vice president , robot systems firm, Project 4)*
Human and procedural resources	Expertise in specific tasks and in specific field	Transformed into new resources	Development relationship	Resource integration	*We were searching for wind power firms that had been involved in this kind of business. (Technology director, fastening technology firm, Project 3)*

Resource category	Detailed description of the resource	Way of employing the resource in service innovation	Relationship between the actors	Means to access the resource	Empirical indicators
Human and procedural resources	Expertise in specific technology, professional skills	Transformed into new resources	Development relationship	Resource integration	*Later, also a third firm joined us for development … They are experts in system configurations. With their help we can transform dimensioning decisions into systems. Delta hasn't got the necessary knowledge for that. They work daily in cooperation. When the system configurator develops the system model, Delta continually provides input. And then the system configurator might, in turn, comment that "your thoughts don't match here". Sometimes they need to change something simple and, another time, some larger entity. It evolves gradually. (Technology director, fastening technology firm, Project 3)*
Human and procedural resources	Experience in specific operations, spec. business field, and spec. customers	Transformed into new resources	Development relationship	Resource integration	*In the customer integration field they've [system integrator] got our competitor as a customer. They therefore have a lot of experience in those interfaces. They don't need to learn every interface any more. They've already done that. (Head project manager, Alpha, Project 1)*
Human and procedural resources	Professional knowledge and skills, technical knowhow	Transformed into new resources	Development relationship	Resource integration	*We took care of the integrations together. We had a hotline open all the time. Our engineer and their personnel had to do that hand-in-hand. When we did something, the integrator supplier had to do something too. (Project manager, principal supplier, ERP, Project 1)*

Resource category	Detailed description of the resource	Way of employing the resource in service innovation	Relationship between the actors	Means to access the resource	Empirical indicators
Human and procedural resources	Professional knowledge, expertise in a specific field, project manage-ment skills	Transformed into new resources	Development relationship	Resource integration	*We manage the project. We then explain our needs to the technology firm, and why we would like to have things done in a particular way. For example, we tell them how a control screen should look; they then implement it, and also try to improve the result. (Sales manager, member of the core team, Project 2)*
Human and procedural resources	Knowhow on projects	Transformed into new resources	Development relationship	Resource integration	*They wanted to proceed with their technology. And they had a need to find a wind turbine supplier with which they could apply their technology. (Business area director, Alpha, Project 3)*
Human and procedural resources	Experience in specific operations	Transformed into new resources	Development relationship	Resource integration	*Then I phoned another country. I heard that they don't coordinate their wind power business like us. They said that we could bring our coordination experience there … But they have long-term experience in environmental impact assessment. They might sometimes come to discuss these things with us, or we could visit them … (Wind power specialist, Delta, Project 5)*
Human and procedural resources	Experience in project management	Transformed into new resources	Development relationship	Resource integration	*We expected professional project management from them; that they could manage the project because of their experience also in difficult situations, and that they would take a strong hold over the project. (Head project manager, Alpha, Project 1)*

Resource category	Detailed description of the resource	Way of employing the resource in service innovation	Relationship between the actors	Means to access the resource	Empirical indicators
Human and procedural resources	Experience in project management	Transformed into new resources	Development relationship	Resource integration	*We had a virtual task manager tool. We used it actively, and gave the rights to Alpha's main users, the asset management system developers, and the integrator. We documented everything there, and could give a task to anybody in it … All the changes were made in the task manager, where we also tested the changes ourselves. (Project manager, principal supplier, ERP, Project 1)*
Human and procedural resources	Reflective skills	Transformed into new resources	Development relationship	Resource integration	*When discussing a topic from different perspectives, one learns to understand the perspectives of other technical fields. (Regional unit manager, Delta, Project 5)*
Human and procedural resources	Professional knowledge, technical knowhow, knowhow on solutions, analytical skills	Transformed into new resources	Development relationship	Resource integration	*We worked together during the solution planning because we had common interfaces. We discussed and had meetings several times a month … It resulted in specific technical solutions. It led us even to change the contents of the delivery to some extent. (Divisional director, laser technology firm, Project 4)*
Human and procedural resources	Technical knowhow, and professional, analytical and reflective skills	Transformed into new resources	Development relationship	Resource integration	*We talked on the phone with the site supervisors and Alpha's project managers every day during the most hectic building phase. And we built four windmill foundations … We also developed things further during that time. We built three foundations in a similar manner; by the fourth, we had already changed things. (Project manager, Delta, Project 3)*

Resource category	Detailed description of the resource	Way of employing the resource in service innovation	Relationship between the actors	Means to access the resource	Empirical indicators
Human and procedural resources	Technological knowledge, technical knowhow, analytical skills	Transformed into new resources	Development relationship	Resource integration	*Our task was to define the requirements for the system; that is, which processes we needed and how we wanted to run them. And our supplier's consultants presented us with alternative solutions from which we then chose. (Head project manager, Alpha, Project 1)*
Human resources	Professional and technological knowledge, analytical and reflective skills	Transformed into new resources	Development relationship	Resource integration	*We have a guide that tells us [Delta and fastening technology firm] how to proceed. What we'll develop in the next six months. And, at the same time, we have projects or potential projects where we produce material. The guide comes from us, but it's based on cooperation. This means that Delta constantly gives us feedback, and together we think about the direction in which we should go next. (Technology director, fastening technology firm, Project 3)*
Human and procedural resources	Technical knowhow, experience in a specific business field	Transformed into new resources	Development relationship	Resource integration	*And then we combine the knowhow that comes from the customers, from the foundation plans, and our own experience with the components. (Technology director, fastening technology firm, Project 3)*

Resource category	Detailed description of the resource	Way of employing the resource in service innovation	Relationship between the actors	Means to access the resource	Empirical indicators
Human and procedural resources	Technological knowledge, technical knowhow, professional skills, knowhow on projects	Transformed into new resources	Development relationship	Resource integration	*We and Alpha's main users worked together there. It was a good place, as we could concentrate on advancing the project. And when we tested the system, we did it together in our premises … Alpha's main users and other necessary people were there, and our technical support and consultants. We could make corrections quickly when needed. (Project manager, principal supplier, ERP, Project 1)*
Human and procedural resources	Expertise in specific product types	Transformed into new resources	Development relationship	Resource integration	*So we've tried to find suppliers who are specialized in specific types of software. (Head project manager, Alpha, Project 1)*
Human and procedural resources	Expertise in specific tasks and in specific field	Transformed into new resources	Development relationship	Resource integration	*We sought an engineering partner among the top firms abroad. (Technology director, fastening technology firm, Project 3)*
Human and procedural resources	Expertise in specific tasks and in specific field	Transformed into new resources	Development relationship	Resource integration	*They are our customer and we provide them with our expertise. At the same time, of course, we learn more when we develop new things… We design and prepare the project documents. The fastening technology firm brainstorms and produces the solution.(Project manager, Delta, Project 3)*

Resource category	Detailed description of the resource	Way of employing the resource in service innovation	Relationship between the actors	Means to access the resource	Empirical indicators
Human and procedural resources	Technical knowhow, professional, analytical and reflective skills	Transformed into new resources	Development relationship	Resource integration	*One could even say that we can phone each other at any time of the day … Our suppliers ask us and we ask them whenever we face some problems or something needs to be done … We have work pairs who communicate very actively. (Head project manager, Alpha, Project 1)*
Human and procedural resources	Technical knowhow, professional knowledge, analytical and reflective skills	Transformed into new resources	Development relationship	Resource integration	*The new project manager [of Alpha] has technical knowhow and is very analytical. He can suggest changes that affect different operations: what is worth doing, what isn't worth doing. He knows the system so well. He can use it, test it, and seek knowledge from there. (Project manager, principal supplier, ERP, Project 1)*
Human and procedural resources	Knowhow on marketing	Transformed into new resources	Development relationship	Resource integration	*The consultant was involved in productizing the service entity … The consultant was a good idea as Gamma had sold machines for 100 years, but hadn't invested much in various services to date. (Senior vice president, robot systems firm, Project 4)* *We planned especially marketing together. Our marketing people were involved. We discussed how we should approach different customers. (Divisional director, Gamma, Project 4)*

Resource category	Detailed description of the resource	Way of employing the resource in service innovation	Relationship between the actors	Means to access the resource	Empirical indicators
Human and procedural resources	Marketing and selling skills	Transformed into new resources	Development relationship	Resource integration	*Alpha convinced the turbine supplier that our firm's solution was the correct one in this case. (Technology director, fastening technology firm, Project 3)*
Human and procedural resources	Marketing and selling skills, experience in specific types of customers, experience as a user	Transformed into new resources	Development relationship	Resource integration	*At that time, when there was not much to see, Alpha was already explaining the asset management system to potential customers. Later, they visited potential customers and presented the system to them. (Project manager, asset management system, Project 1)*
Human and procedural resources	Expertise in specific field and technology, analytical skills, project management skills	Transformed into new resources	Development relationship	Resource integration	*We don't sell something that we customize only to some extent. Instead, we develop the entire system together with our customer, Alpha. (Project manager, asset management system, Project 1)*

APPENDIX 4
PROCEDURAL RESOURCES INFLUENCING RESOURCE INTEGRATION

Procedural resource: Attitudes towards innovation in the organization		
Empirical indicators		
When the project had been going on for about a year, almost all of the project people had changed at the customer side. (Business area director, principal supplier, Project 1[1])	*They [business units] think that we do everything from beginning to end. And that we also take care of the change project in the organization. And that we handle the customer integration process too. Our business units don't understand that they must participate in the project. It affects business processes. It's been really difficult to get the necessary resources. (Head project manager, Alpha, Project 1)*	*We had ended up with a plan to start the second phase of the project immediately after the first phase was ready. But it didn't succeed. Alpha had no resources to get fully involved in the project then. We had to postpone the second phase for a period of three months because of that … But they told us that we needed to be ready according to the original time schedule. The timetable was halved again. (Project manager, principal supplier, Project 1)*
I had to sell the idea of joining the development team to these people. They had all kinds of other things to do. So I had to persuade them. It even required pestering, such as "Couldn't you please help us in this project in some way?". (Business area director, Alpha, Project 2)	*Almost the entire two years passed with nobody building any wind power in Finland. Only some discussions took place at that time. Therefore, most of the managers didn't get interested in the whole thing at our firm. You need to convince people that firms are really going to build something, and that this will be a real business for us. (Business area director, Alpha, Project 2)*	*Typically, employees aren't freed from their actual work even if they participate in a large project. It's a true challenge. ((Business area director, Alpha, Project 2)* *Each team member had some tasks to complete according to a given timetable, but they couldn't necessarily finish them in time. It's normal when you participate in a project in addition to your actual work. Urgent operative tasks are given priority. (Sales manager, Alpha, project 2)*

[1] Project 1 = Resource management system development at Alpha; Project 2 = Development of the wind power service portfolio at Alpha; Project 3 = Foundation solution development for wind turbine towers; Project 4 = Automation systems development; Project 5 = Development of the wind power service portfolio at Delta.

We had three levels in the wind power service portfolio development: a steering group, a project group, and employees who prepared process specifications. Those who prepared process specifications got new positions in the organization. Thus, they were torn away from this project. (Business area director, Alpha, Project 2)	*Everyone understands that if we work hard for three months on a development project, our actual work will suffer a bit. This means that we need to work evenings and weekends to get the development project ready. But that's all right if we see that our effort provides us and other people with good things and advantages … (R&D coordinator, Delta, Project 5)*	*For nearly two years, I've repeatedly said that we should pay attention to construction services, so that we could start marketing them … But it hasn't progressed at all. The reason is that we all do this alongside our actual work. (Team coordinator, Delta, Project 5)*

Procedural resource: Ways to organize projects		
Empirical indicators of retarding and preventing ways		
Alpha demanded that we apply a project method that we didn't know at all. And neither did Alpha … This in a situation where we didn't even know each other. And then we have an unfamiliar method of project management. (Business area director, principal supplier, Project 1[2])	*We specified a lot of things in the new system; although none of us had ever seen it. (Head project manager, Alpha, Project 1)*	*In retrospect, it was not a wise decision for the principal supplier to perform the integrations by themselves. We have practically made it all over again during the project. (Project manager, system integrator, Project 1)*
The customer acted directly with some of the suppliers, although we had the total responsibility for the project. It became a true hotchpotch. (Business area director, principal supplier, Project 1)	*When we had meetings, a huge number of Alpha's people were present and everybody wanted to express their ideas. (Project manager, asset management system, Project 1)* *We were doing specifications at that time … The project began with people thinking of all the possible things that an ERP could do for them. (Business area director, principal supplier, Project 1)*	*The principal supplier acted pretty much by themselves. They even largely determined how the integrations would function; whereas our view was that we should have done things differently. And before we had the chance to say anything, things were already decided. (Project manager, system integrator, Project 1)*

[2] Project 1 = Resource management system development at Alpha, Project 2 = Development of the wind power service portfolio at Alpha; Project 3 = Foundation solution development for wind turbine towers; Project 4 = Automation systems development; Project 5= Development of the wind power service portfolio at Delta.

A good example was when one partner had made some changes in the program. We then needed a similar price list retrieval system for Alpha that this firm had already made. We wanted to copy it into the system. We told them that Alpha had ordered the retrieval system once, and that they didn't want to pay twice for it … But they answered: 'No, we aren't going to give it to you. We've done this. It's ours.' (Project manager, asset management system, Project 1)	*We had weekly conference calls with project managers. People listed what they had been doing. I didn't know what they were talking about. (Project manager, asset management system, Project 1)* *Meetings didn't deal with planning. Planning was settled between Alpha and the principal partner. And they decided between themselves things that belonged to our scope. Although we had weekly conference calls, things were discussed elsewhere. (Project manager, system integrator, Project 1)*	*I do something here, you do it there, and a third party does it somewhere else. Later, we notice that we have either done the same thing or completely different things. However, the idea was to do something in common. We should have sat down together more often. (Project manager, asset management system, Project 1)*
Both the customer and we should have familiarized the new people with the project. And we should have discussed the goals and responsibilities with them. But, instead of taking that step backwards, the project kept proceeding rapidly. (Business area director, principal supplier, Project 1)	*Four firms dealt with the software issues. And we had two separate contracts with the project's customer. It meant that everybody took care of the things up to their own interface. Maybe we should have had more meetings and collaboration. (Divisional director, laser technology firm, Project 4)*	*The problem is that Gamma does not have a clear division of tasks. And they don't have one project manager, but three. And we need to contact all of them because we don't know who is responsible for what. And CEOs also discuss with each other … Too many cooks spoil the broth. Our working cultures are too different.(Senior vice president, robot systems firm, Project 4)*
I wish that our new wind power specialist could better tie all this together. We haven't really had resources to organize our collective work. Key persons are too busy. (Manager of the EIA and land use planning unit, Delta, Project 5)		

Procedural resource: Ways to organize resource integration		
Empirical indicators of advancing ways		
Alpha rented premises for the project, which sped up development in the first three months. We and Alpha's main users worked together there. It was a good place, as we could concentrate on advancing the project. And when we tested the system, we did it together in our premises. We had the premises there for two weeks. Alpha's main users and other necessary people were there, and our technical support and consultants. We could make corrections quickly when needed. It was really efficient, and everybody liked it. (Project manager, principal supplier, Project 1)	*We had a virtual task manager tool. We used it actively, and gave the rights to Alpha's main users, the asset management system developers, and the integrator. We documented everything there, and could give a task to anybody in it … All the changes were made in the task manager, where we also tested the changes ourselves. Then the changes were moved to the test environment, where we and Alpha tested them. Only after Alpha had accepted the changes, were they taken into use … It was a good tool for me as a project manager. (Project manager, principal supplier, Project 1)*	*One could even say that we can phone each other at any time of the day … Our suppliers ask us and we ask them whenever we face some problems or something needs to be done … We have work pairs who communicate very actively. (Head project manager, Alpha, Project 1)*
After we met in the project group, the business area director gave a report to the steering group. If the steering group was not satisfied with our work, they gave us feedback. And if it seemed that we were going in the wrong direction, they advised us. (Sales manager, Alpha, Project 2)	*Quite soon, we had planned the service structure. Then we prepared a task list, schedule, and targets. We agreed on regular meetings, and built intranet pages for wind power where everything was documented. Every member took responsibility for some part of the development project, and I supervised the entity. When some part was nearly ready, we tested it. (Business area director, Alpha, Project 2)*	*We have a guide that tells us how to proceed. What we'll develop in the next six months. And, at the same time, we have projects or potential projects where we produce material. The guide comes from us, but it's based on cooperation. This means that Delta constantly gives us feedback, and together we think about the direction in which we should go next. (Technology director, fastening technology firm, Project 3)*
We constantly talked with the site personnel … Then we had meetings with the steel fixers. Everyone considered whether something was sensible … And, in between, we talked on the phone with the fastening technology firm, and sent e-mails back and forth. (Project manager, Delta, Project 3)	*We went through the requirements together. Then, together we made capacity calculations. We tried to avoid a situation in which we duplicated the same work. We had very open cooperation. (Divisional director, laser technology firm, Project 4)*	

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