Anna Kyrki

OFFSHORE SOURCING IN SOFTWARE DEVELOPMENT: Case Studies of Finnish-Russian Cooperation

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ABSTRACT

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The study examines international cooperation in product development in software development organisations. The software industry is known for its global nature and knowledge-intensity, which makes it an interesting setting to examine international cooperation in. Software development processes are increasingly distributed worldwide, but for small or even medium-sized enterprises, typical for the software industry, such distribution of operations is often possible only in association with crossing the company's boundaries. The strategic decision-making of companies is likely to be affected by the characteristics of the industry, and this includes decisions about cooperation or sourcing.

The objective of this thesis is to provide a holistic view on factors affecting decisions about offshore sourcing in software development. Offshore sourcing refers to a cooperative mode of offshoring, where a firm does not establish its own presence in a foreign country, but utilises a local supplier. The study examines product development activities that are distributed across organisational and geographical boundaries. The objective can be divided into two subtopics: general reasons for international cooperation in product development and particular reasons for cooperation between Finnish and Russian companies. The focus is on the strategic rationale at the company level, in particular in small and medium-sized enterprises.

The theoretical discourse of the study builds upon the literature on international cooperation and networking, with particular focus on cooperation with foreign suppliers and within product development activities. The resource-based view is also discussed, as heterogeneity and interdependency of the resources possessed by different firms are seen as factors motivating international cooperation. Strategically, sourcing can be used to access resources possessed by an industrial network, to enhance the product development of a firm, or to optimise its cost structure.

In order to investigate the issues raised by the theoretical review, two empirical studies on international cooperation in software product development have been conducted. The emphasis of the empirical part of the study is on cooperation between Finnish and Russian companies. The data has been gathered through four case studies on Finnish software development organisations and four case studies on Russian offshore suppliers. Based on the material from the case studies, a framework clarifying and grouping the factors that influence offshore sourcing decisions has been built. The findings indicate that decisions regarding offshore sourcing in software development are far more complex than generally assumed. The framework provides a holistic view on factors affecting decisions about offshore sourcing in software development, capturing the multidimensionality of motives for entering offshore cooperation. Four groups of factors emerged from the data: A) strategy-related aspects, B) aspects related to resources and capabilities, C) organisation-related aspects, and D) aspects related to the entrepreneur or management. By developing a holistic framework of

decision factors, the research offers in-depth theoretical understanding of offshore sourcing rationale in product development.

From the managerial point of view, the proposed framework sums up the issues that a firm should pay attention to when contemplating product development cooperation with foreign suppliers. Understanding different components of sourcing decisions can lead to improved preconditions for strategising and engaging in offshore cooperation. A thorough decision-making process should consider all the possible benefits and risks of product development cooperation carefully.

Keywords: software development, product development, offshore sourcing, supplier cooperation, network, Russian software industry

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"Wisdom comes from experience. Experience is often a result of lack of wisdom."
-Terry Pratchett

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1. Kyrki, Anna (2005) Inward internationalisation in product development: The strategic role of offshore sourcing in software industry. *Proceedings of the 8th Vaasa Conference on International Business*, 21.-23.8.2005, Vaasa, CD-ROM. Submitted to *Journal of International Entrepreneurship*.
2. Kyrki, Anna and Lindqvist, Jani (2005) Offshore networks in software development – Potential of Russian IT. *Proceedings of the 31st annual EIBA conference*, 11.-13.12.2005, Oslo, CD-ROM.
3. Kyrki, Anna (2006) Software emporium – Russian IT resources in offshore software development. *Proceedings of the 32nd annual EIBA conference*, 7.-9.12.2006, Fribourg, CD-ROM.
4. Kyrki, Anna and Kortelainen, Samuli (2006) The key success factors in product development co-operation – Case Russia. *Proceedings of the Global Conference on Emergent Business Phenomena in the Digital Economy (ICEB + eBRF)*, 28.11-2.12.2006, Tampere, CD-ROM.
5. Kyrki, Anna and Torkkeli, Marko (2006) International product development cooperation in small software firms. *Proceedings of the 13th International Product Development Management Conference*, 11.-13.6.2006, Milan, 713-727. Submitted to *International Journal of Product Development*.
6. Kyrki, Anna (2006) Subcontracting product development – Creating competitiveness through networking. *Proceedings of the Global Conference on Emergent Business Phenomena in the Digital Economy (ICEB + eBRF)*, 28.11-2.12.2006, Tampere, CD-ROM.
7. Kyrki, Anna and Lampela, Hannele (2007) Aspects of learning in offshore software development cooperation. *Proceedings of the 18th ISPIM conference*, 17.-20.6.2007, Warsaw, CD-ROM.
8. Kyrki, Anna and Kinnula, Marianne (2007) Collaborative relationships in Finnish-Russian offshore software development – Selecting the most suitable subcontractor. *Proceedings of the 23rd IMP conference*, 30.8-1.9.2007, Manchester, CD-ROM.

The contribution of Anna Kyrki in the publications:

1. Sole author.
2. Coordinated the writing of the paper. Wrote most of the manuscript, with the co-author being responsible for the software business section. The discussion and conclusions were written jointly.
3. Sole author.
4. Coordinated the writing of the paper. Wrote the section on potential for product development co-operation with Russia. The introduction, discussion and conclusions were written jointly.
5. Sole author of the original conference paper.
6. Sole author.
7. Coordinated the writing of the paper. Interpreted the data and constructed the framework. Wrote most of the manuscript, with the co-author being responsible for the theory review on cooperation and learning. The discussion was written jointly.
8. Coordinated the writing of the paper. The co-author had the main responsibility for the theoretical background. Interpreted the empirical results together with the co-author.

The planning and execution of data collection for all the publications were conducted by the author.

1 Introduction

1.1 Background of the study

Software is an essential part of an ever growing number of products in most industries or as Pressman (1997, p. 3) puts it: "software is virtually inescapable in a modern world". The size and number of software products has been on constant growth and this trend will not change in the future. Software development, like other high-technology industries, suffers from a major pressure of time-to-market. The time between the development of a concept and actual release must be made as short as possible, and at the same time the company has to ensure sufficient quality of the end product. The complexity and turbulence of the operating environment of software firms require them to build, integrate and reconfigure resources to adapt to changing conditions (Kivelä, 2007). Developing all necessary resources and capabilities internally may not prove to be a viable option when combined with the global nature of the software market.

Outsourcing manufacturing to countries with low-level production costs is not a recent phenomenon. On the other hand, offshoring white-collar work is an emerging trend that has not been extensively studied. Offshoring is no longer about moving jobs elsewhere, but sourcing talent everywhere (Couto et al., 2006). With offshoring moving up the value chain, organisational structures and management practices are fundamentally redefined (Ibid.). Another recent trend is the emergence of smaller client firms in offshore sourcing in software development (Carmel and Nicholson, 2005). This is surprising, because it contradicts the assumption that could be made on the basis of their lack of resources to overcome difficulties and costs related to contacting, contracting and controlling their offshore cooperation (Ibid.). Software industry contains a multitude of small firms, making the context of this study interesting and relevant.

As opposed to traditional industries, the geographical distance plays a smaller role for software development because of the immaterial nature of the products, which can be cheaply and easily transported digitally (Nicholson and Sahay, 2001). The information nature of software distinguishes its characteristics from traditional development and manufacturing, and facilitates distributed development (Carmel, 1997). These circumstances, together with regional specifics, explain why software development processes are increasingly distributed worldwide (Prikladnicki et al., 2003). However, a small firm can only capitalise upon the benefits of distributed development by crossing organisational boundaries.

The study was motivated by the author's interest in the organisation of software product development across company boundaries, particularly in the context of international cooperation. It was assumed that simultaneous distribution across geographical boundaries would add complexity to cooperation, which would lower the level of expected savings. This would imply that there should be other added benefits to justify the need for international cooperation. However, little attention has been paid by the existing literature to the question what other factors motivate offshore cooperation in product development besides savings. These combined circumstances motivated the choice of research topic to address decisions about offshore sourcing in software development, with particular interest in multidimensionality of motives for entering offshore cooperation.

The emphasis of the empirical study is on software product development cooperation between Finnish and Russian companies. In seeking competitive advantage and shorter times to market, international cooperation becomes a necessity for firms located in countries where the domestic market is small, such as Finland. The small size of the market means that the Finnish software development organisations are confined not only in the number of customers, but also in the pool of potential suppliers. The scarcity of Finnish programming resources and the broad supply of these resources in near geographic areas, such as Saint Petersburg suggest that cooperation could benefit both sides. Successful cooperation could result not only in improved strength of product development activities, but also open new market possibilities for Finnish companies, through partnerships and joint development activities.

Russia has become increasingly open to international and scientific cooperation, which is evident from the growing number of international research and development (R&D) projects, joint ventures and Russian subsidiaries of multinational companies (Dynkin and Ivanova, 1998). The reform of the Russian innovation system has started only recently, which makes cooperation attractive in terms of prospects, but does not remove uncertainty regarding the outcomes (Boltramovich et al., 2004). Nevertheless, several high-technology companies are already pursuing opportunities provided by access to a large amount of highly educated personnel with a good quality-cost ratio. Especially information and communication technology (ICT) companies have been active in this development. Several major Western companies, including Motorola, Sun Microsystems and Intel, have established R&D centres or dedicated development centres in Russia (Terekhov, 2001). The progress of the software development industry in Russia has attracted substantial interest. Despite its relatively small size and lower cost advantage as compared to some other offshore destinations, the Russian offshore software development industry has succeeded in emerging among the notable ones in the world - according to Gartner (2003), Russia is an outsourcing destination "challenger" together with such countries as Canada, China, Ireland and Israel. The acknowledged advantages of the Russian software development industry include the level of education, personnel quality and certification by international organisations (Pries-Heje et al., 2005). Thus, there appears to be a niche for the competence and resources of the Russian industry in the global marketplace.

Finnish-Russian sourcing has been studied earlier from the viewpoint of productional cooperation taking place, for example, in the metal industry (Karhunen and Kosonen, 2002). However, there is little information on knowledge-intensive product development cooperation. According to a survey commissioned by the Ministry of Trade and Industry of Finland (Market-Visio, 2002), Finnish software companies are interested in sourcing to Russia, but few have any subjective experiences. The survey indicated that over 60 per cent of the interviewed Finnish software companies considered sourcing as a possible option in the future. Nearly half of the firms had also experienced difficulties in finding domestic human resources. Russia was indicated as the most promising offshore location, but only 10 out of the 96 survey respondents had any experience with sourcing to Russia. Both the Finnish and Russian sides believed that the lack of trust toward Russian companies to be the most important factor preventing increase in cooperation (Ibid.). However, Russia's reputation was less important for companies that had experience with cooperation. Unfortunately, such companies are reluctant to divulge strategic information, which was apparent in the process of finding case companies for the present research. However, such references would make it possible to understand the phenomenon more deeply and to strengthen the basis for managerial decision-making regarding this strategic resolution.

1.2 Research motivation

The study examines international cooperation in product development in software development organisations. The software industry is known for its global nature and knowledge-intensity. The strategic decision-making of companies is likely to be affected by the characteristics of the industry, and this includes decisions about cooperation or sourcing.

Successful software product development involves forging and nurturing relationships between various actors – the different operations involved in product development, customers and suppliers, and joint technology partners (Tuunanen and Vainio, 2005). The firms are often small, specialised and operate in a limited domestic market. Therefore, international activities are rather the rule of the trade than an exception. Preece et al. (1999) comment that small technology-based firms are often drawn into international market expansion early in their existence, because of a narrowly-defined market niche, high development costs, and the speed of competition and product obsolescence. Thus, they must simultaneously cope with constantly changing industry trends and technological base of product offerings, the complexity of foreign markets, and global competition (Ibid.). In order to grow and survive in the long run, firms should be able to compete at the international level. This competitiveness is heavily influenced by organisational resources and capabilities (Kuivalainen, 2003). Availability of resources for generating international sales significantly affects both foreign market intensity and diversity (Preece et al., 1999). Small and medium-sized firms have been shown to use international cooperation of various types (e.g. marketing, sales, and distribution) to deal with different resource constraints (Nummela, 2000). Hätönen (2008) provides an extensive discussion on the direct and indirect implications of software development sourcing for firm growth, internationalisation and innovation.

The pace of internationalisation is higher in high-technology firms and does not follow theories of gradual and slow internationalisation processes (Young, 1987). Instead of being deterministic, internationalisation is a complex, dynamic, interactive, and frequently non-linear process (Bell, 1995). Bell (1995) argues that, in case of small firms, the preferred initial entry mode in a foreign market is not necessarily exporting, progression to alternative methods of overseas market involvement is not inevitable, and step-wise expansion to markets with higher psychic distance cannot be assumed. Network relationships affect foreign market selection of entrepreneurial firms (Coviello and Munro, 1995). Similarly, both direct and indirect relationships with other firms have an influence on new market entry strategies. Foreign market selection and entry initiatives are not just results of the strategic decisions of managers in a firm, but they are also affected by opportunities created through network contacts (Ibid.). According to Coviello and Munro (1993), entrepreneurial high-technology firms develop multiple relationships for internationalisation and to use them in parallel across numerous markets. Moreover, international expansion capabilities of small software firms are restricted by the initial choice of an entry mode and size-related human and financial resource constraints (Bell, 1995).

Any business relationship implies an interlinking of resources, which increases their combined effectiveness (Ahokangas, 1998). Partnerships with other organisations provide access to complementary resources and capabilities that may be unavailable otherwise (Barney, 1991). Furthermore, the capabilities of a firm are developed through interaction with customers, suppliers and other institutions that generate knowledge and skills (Metcalfe and James, 2000). As interconnected relationships evolve, increased mutual knowledge and

trust lead to greater commitment between actors (Johanson and Mattsson, 1988). Overall, the advantages of an individual firm are linked to the advantages of its network of relationships, while critical resources may span firm boundaries and be embedded in interfirm routines and processes (Dyer and Singh, 1998). On the other hand, such cooperation has its risks, as a firm becomes dependent on other actors in its network. Thus, cooperation decisions are strategic in nature and require a careful assessment.

The topic of the study is offshore sourcing. Offshoring means relocation of activities to another country. Offshore sourcing refers to a cooperative mode of offshoring, where a firm does not establish its own presence in a foreign country, but utilises a local supplier. The determinants of choice for an offshore location have traditionally emphasised economic factors, such as the salary level and purchase power parity. This approach may be well suited for describing the rationale behind shifting manufacturing activities to countries of lower costs. However, it does not reflect all the diverse factors of the decisions regarding distribution of knowledge-intensive activities to other countries.

Originally, also in the information technology field, offshoring was seen as a tactic to move low-end information technology work to foreign locations in order to cut the costs, but it has increased its importance as a strategic tool for the management of software development and maintenance, becoming a part of mainstream corporate decision-making (Mohan, 2006). Offshore development in information technology services, information systems outsourcing and business process outsourcing has been widely discussed by both researchers and practitioners (see e.g. Aspray et al., 2006; McKinsey Global Institute, 2003; Jennex and Adelakun, 2003; Goldsmith, 1994). Typical offshore sourcing activities include application development, technical support, software testing, network maintenance, and help desk functions. Offshore sourcing of intellectual labor is a relatively recent trend, and despite the challenges of offshoring, there are compelling arguments for exploiting location-specific advantages unrelated to manufacturing capacity or natural resources (Carmel and Agarwal, 2002). Skills, quality and availability of human resources have been cited as increasingly important factors for offshoring (Robb, 2000; Jennex and Adelakun, 2003). The strategic reasoning for offshore activities of software development firms utilising sourcing in their product development is the issue that this study particularly aims to address.

1.3 Objectives of the study

The main research objective of this thesis is to provide a holistic view on factors affecting decisions about offshore sourcing in software development. The objective can be divided into two subtopics: general reasons for international cooperation in product development and particular reasons for cooperation between Finnish and Russian companies. First, I look theoretically at the question of why software firms engage external resources located in other countries in their product development activities. Next, I address one particular manifestation of offshore sourcing in the empirical data of this study, namely cooperation between Finnish software development organisations and Russian offshore suppliers. Finally, combining the theoretical and empirical part of the study, I construct a framework of decisions about offshore sourcing in software development. The study combines aspects of technology management and international business in order to provide a profound review of the topic. The focus of the study is on the strategic rationale at company level, in particular in small and medium-sized enterprises (SMEs). The effect of supplier characteristics on the decisions about offshoring software development in small and medium-sized firms has already been

extensively covered by Coward (2003). Thus, this study concentrates on the different internal characteristics of a firm and their influence on its offshore sourcing decisions.

Contractual agreements, such as sourcing, have become more and more common over the last decades. These arrangements are especially preferred in high-technology sectors typically characterised by rapidly occurring technological change and short life cycles (Narula and Hagedoorn, 1999). The study focuses on joint product development activities on a contractual basis. The cooperating firms do not necessarily have a common goal, as is generally the case with such concepts as partnership and alliance. Furthermore, the outsourcing of service and support functions have been left out of the scope of the study. Instead, it addresses software development sourcing by a firm whose intent is to sell the jointly developed application further to its own customers.

The study examines product development activities that are distributed across organisational and geographical boundaries. It addresses the issue of international cooperation and networking, with a particular focus on cooperation with foreign suppliers. The study proposes that accessing various external resources through contractual cooperation with foreign partners can contribute to product development activities. As an illustration of regional specifics, the empirical study evaluates the present situation and future possibilities of product development cooperation with the Russian software industry.

1.4 Outline of the study

The study consists of two main parts: an introductory part and eight research papers. The purpose of the first part is to provide an overview of the research topic. The first part is organised as follows. Chapter 2 discusses the context of the study: software development, offshore sourcing and Finnish-Russian cooperation. Chapter 3 introduces the theoretical background and research motivation of the study. The theoretical background consists of three themes: resources and capabilities, product development cooperation, and networking and international cooperation. Chapter 4 discusses methodology and research design, including details of the conducted case studies. In Chapter 5, a summary of the publications of the second part is presented, reviewing the content and contribution of each publication. In Chapter 6, the constructed framework on decisions about offshore sourcing in software development is described. Chapter 7 consists of discussion of the results and conclusions.

Appendices 1-4 present the topic guides for the interviews in the Finnish and Russian case companies. Appendix 5 consists of a table with the data from the Finnish case companies. The table summarises the data for each theoretical construct discussed in Chapter 6.

The publications in the second part address the objectives of the study through different research efforts. The papers are complementary and cover particular research areas. Figure 1 illustrates which paper is associated with which part of the literature review. The topic of resources and capabilities is addressed in publications 2, 3, 5 and 6. Product development cooperation is discussed in publications 4-7. Networking and international cooperation are addressed in publications 1-3 and 7-8.

Part I The overview of the research	Part II The publications							
1 Introduction								
2 Research context								
3 Literature review	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
3.1 Resources and capabilities								
3.2 Product development cooperation								
3.3 Networking and international cooperation								
4 Methodology and research design								
5 Summary of the findings								
6 Dimensions of offshore sourcing in software development								
7 Discussion and conclusion								
Appendices: 1. Topics for the interviews in the Finnish companies, in 2003 2. Form for the interviews in the Finnish companies, in 2003 3. Topics for the interviews in the Finnish companies, in 2006 4. Topics for the interviews in the Russian companies, in 2005 5. Factors of decisions about offshore sourcing in software development								

Figure 1: Outline of the study

2 Research context

This chapter describes the three topics seen as the most central ones for the positioning of the study in its context. First, the specifics of software development are discussed, as the nature of software industry and the development process affect the potential for international cooperation significantly. Next, the phenomenon of offshore sourcing is reviewed, along with its terminological antecedents and related terms. In the final section, some earlier studies on experiences of Finnish-Russian cooperation are described.

2.1 Software development

According to the Merriam-Webster Dictionary, software means "the entire set of programs, procedures, and related documentation associated with a system and especially a computer system" (Software, 2008). What really distinguishes software from other artefacts is the fact that software does not evolve into a physical product. Furthermore, software has numerous application areas, and there is no single neat compartmentalisation. Potential application areas include, but are not limited to: system software, real-time software, business software, engineering and scientific software, embedded software, personal computer software, web-based software, and artificial intelligence software (Pressman, 2001). Several of these types are often combined within an actual outcome. Thus, comparing the attributes of different software implementations is more illustrative than a classification of types. Such attributes include: the size of the software, amount of handled information, response time requirements, real time requirements, reliability requirements, distribution, and the degree of productisation (Haikala and Märijärvi, 2004). Moreover, it is common for a total solution to consist of modules provided by multiple firms, which implies a necessity of business relationships in the software value chain (Messerschmitt and Szyperski, 2003). The next sections discuss the technical process aspects of software development, the characteristics of the software business, and the Finnish software industry.

2.1.1 Software engineering

Software is not manufactured, but developed or engineered, which means that also the costs of software are concentrated in engineering (Pressman, 2001). Furthermore, most software is custom-built, despite the fact that the industry is moving toward component-based assembly. IEEE (1993) defines software engineering as follows: "(1) the application of a systematic, disciplined, quantifiable approach to the development, operation, and maintenance of software; that is, the application of engineering to software; (2) the study of approaches as in (1)." This study uses the terms software engineering and software development interchangeably.

Software development is usually organised by projects that follow a processual approach (Warsta, 2001). Software engineering work can be divided into the generic phases of definition, development and support (Pressman, 2001). More precisely, software engineering covers such functions as the quality management system, project management, documentation, configuration management, quality assurance, testing, requirements specification, design, implementation, and maintenance (Haikala and Märijärvi, 2004).

Software process models provide guidance and structure for the software engineering process (Warsta, 2001).

A software process model refers to a development strategy that defines the process, methods and tools to be used, along with the main phases of a development project and the way the phases are linked to each other. The choice of a process model is based on the nature of the project and application, the methods and tools to be used, the required control, and the deliverables. A number of different process models have been proposed, the best-known of which are: the linear sequential or waterfall model, prototyping model, rapid application development model, incremental model, spiral model, concurrent development model, component-based development model, and radical light-weight models (e.g. agile methods). (Pressman, 2001)

According to Parnas and Clements (1986), despite existing models, a rational software engineering process is an idealisation and is impossible to be followed to the letter in actual software projects. In reality, many software projects have trouble with staying on time and within the budget. One of the biggest reasons for such development is the nature of software, which makes it difficult to reliably estimate the amount of work necessary for a particular project (Haikala and Märijärvi, 2004). Brooks (1987) lists complexity, conformity, changeability, and invisibility to be the inherent properties of modern software systems. The high complexity of software entities originates from the scarcity of repeated elements in them and nonlinearity in the interaction among the elements. Much of the complexity comes from the need to conform to other interfaces, and cannot be simplified. Software is under pressure to be frequently modified, because it is perceived to be easy to change. However, the structures of software cannot be visualised, which makes the design process difficult even when using conceptual tools. Haikala and Märijärvi (2004) add three more inherent properties to the list – uniqueness, unscalability of methods, and discontinuation in software-based systems. Due to rapid changes in the industry, new applications and new technology arise frequently and necessitate developing new solutions instead of reproducing existing ones. Proven methods do not necessarily work when the size of a project grows. System malfunction can often lead to discontinuous behaviour, but conducting comprehensive testing is not an option, because all combinations of situational exceptions cannot possibly be tested.

Uncertainty is a constant companion of software development. Customers' needs are difficult to asses, and the requirements are prone to change during the engineering process, design is not entirely predictable, and even the entire technological environments are changing. Successful companies are distinguished by their preparedness to handle uncertainty. Such companies establish flexibility, have a different approach to the creative idea generation phase and the implementation phase in their development projects, and emphasise the importance of the early phases of a project for its overall success. Successful companies have also been noticed to invest in their personnel by striving to attract and hold on to talents, and creating powerful team structures. Similarly, investments in process improvement have been shown to pay off. (Hoch et al., 1999)

Improvements in the software process structure and optimise the processes, enhancing the effectiveness and efficiency of software engineering (Ojala, 2006). Process improvement addresses such issues as product capability, time to market and timeliness of products (Grady, 1997). Thus, it has goals similar to those of cooperation in product development, as discussed in Chapter 3. According to the model for software development process improvement presented by Kinnula (1999), software process engineering activity is

supported by an infrastructure consisting of four elements: people, organisation, technology and knowledge. The organisation element refers to how the resources are organised to carry out the process. The people element refers to the human resources, their personal skills and capabilities used to execute the process. The technology element addresses the technical resources or assets used in the process. The knowledge element represents the information assets used to guide the implementation of the process. Software process improvement actions must take into account all the structural elements and maintain a balance between them (Ibid.).

The task of software process engineering can be further complicated in the case of distributed product development. This can mean either intra-organisational distribution to several locations or inter-organisational distribution. In offshore sourcing, as described in this study, projects cross both country and organisational borders, which makes them especially challenging to execute. The key differences that separate global software development from a centralised approach are distance, time-zone differences, and national culture (Carmel, 1999). These factors have a significant implication on strategic issues, cultural issues, knowledge management, and technical issues (Ibid.).

Global software development causes a profound impact on the way the products are conceived, designed, constructed, tested, and delivered to customers (Herbsleb and Moitra, 2001). The practices needed for cooperating and communicating across distances and organisations are not well established, as illustrated by Paasivaara and Lassenius (2003). Additional challenges may arise if the customer and the supplier employ different process models or if clear requirement specifications cannot be provided at the beginning of a project, as is sometimes case in software development (Ibid.). Several models for global software development have been suggested by researchers (e.g. Karolak, 1998; Carmel, 1999; Evaristo et al., 2003). In addition to a formal structure reflecting the distributed nature of a development project, Prikladnicki et al. (2003) found a number of factors critical for success of global software development: investments in training, thorough initial planning, team integration, communication and feedback.

2.1.2 Software business

Hoch et al. (1999, p. 241) describe software industry as "an industry of extremes – where outstanding growth, wealth, and job opportunities are obtained by only a few real winners; where extreme uncertainty is intermingled with vast technological complexity; where talent is extraordinarily scarce; where low entry barriers constantly attract competitors; where product life cycles are among the shortest of all industries; and where the law of increasing returns allows only the top-product companies to win." Technological changes in the industry reshape not only the business models of software companies, but also their supply value chains and sourcing strategies (Sallinen, 2002).

Rajala et al. (2001) present a framework for analysing the business models of software companies, a business model being defined as an action plan for a company in a given life cycle phase and under certain market conditions. The four elements of the conceptual business model in the core of the framework are: product development, revenue logic, marketing and sales, and servicing and implementation (Figure 2). Product development defines the details of the value proposition and which actors provide them. Revenue logic includes sales revenues and other sources of financing. Marketing and sales reflect the

decisions about the marketing strategy and distribution strategy. Servicing and implementation refer to all the installation and deployment activities necessary to achieve a working solution based on the software product. The suitability of a particular software business model depends on a number of factors: the competing environment, customers, the resource environment, the financing environment and stakeholders' utilities, corporate and business strategies, and the characteristics of the product or service offering (Ibid.).

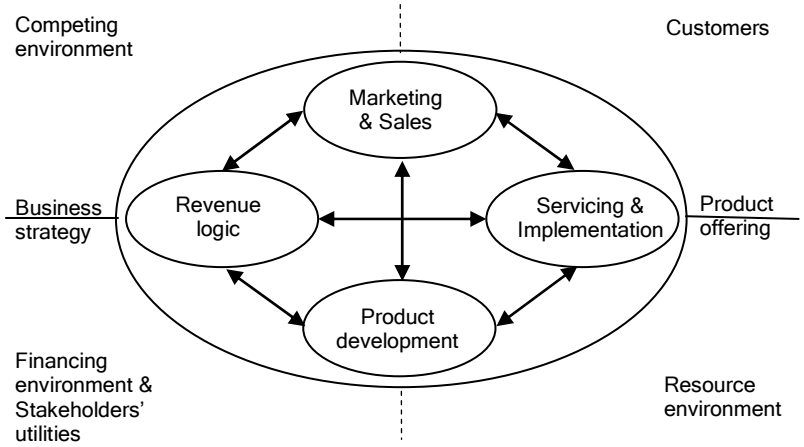

Figure 2: Software business model (Rajala et al., 2001)

Software industry can be divided into three main segments: packaged software, enterprise solutions and professional services related to software. Packaged software has the highest degree of productisation and the highest number of sales units, whereas the professional services segment is at the other end of these scales. Consequently, software products and software services businesses are different in their cost structure, demand volume, competition intensity, geographic presence, and relationship management. Enterprise solutions differ from packaged mass-market software in their need for customisation, lengthy installation, and limited number of sold copies. Thus, companies providing enterprise solutions must take into account aspects of both products and services in their management. (Hoch et al., 1999)

Hoch et al. (1999) describe the characteristic business dynamics of the software product business. Knowledge being a matter of primary importance in the industry, the initial requirements for cash and equipment are low, making the field easy to enter. Low financial entry barriers affect innovativeness positively, which in turn attracts even more new entrants, because they are equally fit to take advantage of new opportunities as established players. In fact, small companies are particularly good at exploiting technological changes, because of their flexibility and fresh approach. Software products have large up-front fixed costs and low marginal costs, as the majority of costs originate from development and only a fraction from production. This cost structure makes internationalisation and targeting foreign markets highly desirable. According to the law of increasing returns that rules the software product business, a product that advances in market share tends to sell even more copies, leading to rapidly occurring high market share concentration. Thus, the product business is strongly dominated by a limited number of big companies. However, a leading position may not last long. Another aggressive player can rapidly seize market share, or an emerging disruptive technology can make the dominant solution obsolete.

The professional services business has its own set of descriptive business dynamics. The cost structure is significantly different from the product business. The fixed costs are lower and the marginal costs are nearly constant. Thus, volume sales and market share have less importance, and the law of increasing returns does not apply. Consequently, even smaller local companies providing professional services can be successful. On the other hand, there are some similarities with the product business, such as low entry barriers, a constant threat of new entrants, and the high pace of innovation. However, the key management areas for professional services are human resources and software engineering, whereas the success of product companies depends more on strategic and marketing issues. (Hoch et al., 1999)

Tähtinen (2001) presents a comparison of tailored software business and product business (Table 1). By tailored software business she means the project business, where the software is developed jointly by the vendor and the customer company, in a manner similar to the professional services business in the classification by Hoch et al. (1999).

Table 1: Project business vs. product business (Tähtinen, 2001, p. 37)

	Project business: Tailored systems	**Product business: Packaged software**
Central capabilities	Constructivist project marketing and project management (including software engineering).	Productisation, channel management, alliance building (e.g. pilot companies), strategic partners in the industry.
Object of exchange	Unique software designed and developed in cooperation with the customer for a specific platform. Can include training and maintenance. Service content high.	Standardised and/or modular products designed for several different platforms. Service content low.
Nature of exchange	Interactive, mutual, multifaceted, long-term oriented, project-related exchange, successive projects with same customer(s).	Opportunistic, simple, short-term oriented, product-related exchange, successive exchanges with new versions (updates).
Production	Activities within projects, sold before produced, connections with all functions of the vendor, deadlines according to project plans, almost constant and high marginal costs, capacity utilisation rate important.	Duplication, version control, sold after being produced, production function is rather independent from other vendor functions, low marginal costs.
Type of organisation	Project organisation, business units specialising in customers' industries.	Market, product, or matrix organisation.
Nature of markets	Familiar, domestic, closed and net-worked, little race for market leadership.	Distant, global, open, competitive, market leadership important
Customer base	Narrow, well-known, and fairly large customer companies.	Broad, faceless end-customers.
Branding	Not important, market assets concentrated in key individuals and their personal relationships.	Central area of interest.

Because the product business and the professional services business differ significantly from each other, they need to be organised differently (Tyrväinen et al., 2004). Taking into account organisational aspects makes it possible to develop a more elaborate segmentation of software companies. Sallinen (2002) provides one such segmentation based on her study of Finnish software supplier firms. Her typology takes into account the different ways of providing software in a subcontracting relationship, as well as the capabilities and resources required of each supplier type. Software suppliers can operate in a number of possible ways. The first option is hiring out human resources to the customer at an hourly rate. The second option is building customised software for the customer in independently managed projects or subprojects. The third option is building software modules independently according to specifications given by the customer. The fourth and final option is building and selling

software products independently. Based on these four ways of operating and the degree of the supplier's dependence on the key customer, Sallinen (2002) divides software companies into five distinct types: resource firm, resource firm with supporting projects and products, software product company, software product company with supporting projects, and system house. Respectively, customers of software suppliers can be divided into five categories: individuals, organisations, service providers, equipment manufacturers, and other software applications (Messerschmitt and Szyperski, 2003).

Partnering is a prerequisite for growth in the software industry, and it excels in the number, equality and importance of partnerships as compared to other industries. Software has become a highly competitive business, its main challenges being cost, timeliness and quality (Pressman, 1997). Partnering helps to fill gaps in technology, speed up the time to market, and increase the market penetration. Each position in the software value chain has its own distinctive set of core competencies (Messerschmitt and Szyperski, 2003). Cooperation makes it possible for a company to concentrate on its key competencies by providing access to competencies in other software segments, as well as the ones outside the software business. What distinguishes software partnerships from traditional supplier-manufacturer relationships is the independency of the partners and the users' ability to assemble a desired combination of partners for the implementation of the entire software solution (Hoch et al., 1999).

Relying on relationships in software development processes presents a challenge from the point of view of control and related contracting process (Warsta, 2001). However, as the relationship matures, the business and contract negotiations become less central and are performed more rapidly. Similarly, the focus of cooperation shifts from contacting to the actual project work. The desired state of cooperation in software companies is to have a long lasting, predictable, stable and business-wise sound relationship in a trustworthy atmosphere. Recurrent transactions enable learning, adaptation and cooperation, as well as lessen needless transaction costs. Thus, they are preferred to single transactions regardless of the employed business model. (Ibid.)

2.1.3 Finnish software industry

Software industry can be defined as companies that develop and provide either software products or software production services. Software industry is different from most Finnish high technology sectors aiming at global markets in that it has the highest share of small companies, and the companies internationalise early in their existence. The domestic market provides only marginal opportunities for growth. Thus, Finnish software companies need to develop not only technical excellence, but skills for conducting international business, networks on personal and company level, and channels providing access to leading world markets. (Tekes, 2003)

Acquiring extensive statistics concerning Finnish software industry and software development activities is rather difficult. This problem has been discussed in detail in Tyrväinen et al. (2004). Kontio (2008) estimates the Finnish software industry to consist of around 8 500 companies that employed nearly 49 000 people in 2007. Most software companies are small or medium-sized, with 45 % of the companies having less than five employees (Ibid.). The Finnish software industry has traditionally concentrated on business users as customers, and the largest share of revenue has been generated by such tools as

enterprise resource planning (ERP) (Rajala et al., 2001). Even the majority of the large and middle-sized software companies produces both tailored software and modified packages, but only a limited amount of off-the-shelf software packages (Tähtinen, 2001).

Besides the actual software industry, a lot of software is produced in the electronics industry, telecommunications industry, mechanical engineering industry, and services sector (Tyrväinen et al., 2004). For example, in 2003, other industries employed nearly as many software professionals as the software industry, the total volume of employment being around 60 000 people. The software product business employed slightly less than 25 % of the software professionals. The revenue of the software industry of the same time was estimated to be more than 4 000 million Euros, with 1 100-1 400 million revenue originating from software products (Ibid.).

Software product industry refers to "business based on selling software owned by the company either as licenses or as services, and all other services which are tightly linked to this business" (Rönkkö et al., 2007, p. 4). The revenue of the Finnish software product industry and its growth rates for the years 2006-2007 are presented in Table 2. The figures have been taken from the national software industry survey (Rönkkö et al, 2007; 2008) that uses extrapolation for the estimation of the overall situation in the industry. The growth rates of domestic and international revenues are inconsistent with the figures from the previous year, which is due to the use of extrapolation with incomplete data. In 2006, 48 % of the firms participating in the survey operated internationally (Rönkkö et al., 2007). However, there was a large variation in the company-specific share of international sales, as 17 % of the companies generated 75 % or more of their revenue abroad, and 58 % of the companies received only 25 % or less of their revenue from international sales. International sales have not enabled the desired growth rate. In 2007, they grew less than ten per cent per annum, whereas the target growth rate was over twenty per cent.

In 2007, 33 % of the companies had international operations. On average, 32 % of the revenue of internationalised software product companies was generated abroad, which is one per cent less than in the previous year. The average number of targeted foreign markets decreased from 9.9 to 8. (Rönkkö et al., 2008)

Table 2: Indicators of the Finnish software product industry (Rönkkö et al., 2007; 2008)

	2006	**2007**
Revenue (million Euros)	1 408	1 520
Growth rate (%)	13.1	8.6
Domestic revenue (million Euros)	894	840
Growth rate (%)	15.3	5
International revenue (million Euros)	514	678
Growth rate (%)	9.8	12
Employees	13 000	14 400
Growth rate (%)	5.1	9.4

The main weaknesses of the industry are the lack of experience in international sales and markets, lack of capital funding, and the resource and competence gaps of small companies (Rönkkö et al., 2007). Attracting personnel and keeping skilled employees in the company was considered one of the biggest challenges (Rönkkö et al., 2008). This is a common problem in other countries as well, for Hoch et al. (1999) consider the scarcity of qualified software professionals to be one of the key challenges of software leaders and a major barrier to growth. Small companies are particularly vulnerable to this challenge, because they are

highly dependent on their key personnel. Furthermore, the possibilities of a small software firm to exploit an emerging business opportunity may be limited due to its inability to scale up development functions (Kontio, 2008). The same resource scarcity limits the opportunity for process improvement and competence development (Ibid.).

Manninen and Meristö (2004) evaluate recent and future trends in the development of the Finnish ICT companies. They identify eight main trends: 1) concentrating on activities that require high level of know-how and products with high degree of added value; 2) outsourcing of basic functions and non-core activities (including elementary programming and simple technical support on software side); 3) strong research and development activities; 4) constantly growing importance of information and communication technologies in physical products; 5) grown share of services in business operations; 6) grown importance of rationalisation of functions and cost efficiency; 7) grown importance of cooperation (due to networking); and 8) grown importance of customer orientation.

Cooperation with customers and suppliers has become more and more important, which necessitates strong skills in project management and cooperative execution of activities. Companies are already experiencing difficulties in finding specialists in some particular, narrow fields of know-how, as well as project managers with extensive experience of networking and cooperation (Manninen and Meristö, 2004). Furthermore, the know-how base of Finnish ICT firms would benefit from new competencies brought by foreign workforce, but such employees are mainly recruited to the foreign offices of Finnish companies (Ibid.). Attracting foreign workers to move to Finland does not appear to be a plausible solution on a large scale, due to for example the difficult language.

According to Manninen and Meristö (2004), outsourcing of routine work is already rather common among Finnish ICT companies, typically motivated by increase in efficiency and lower costs. The authors predict future increase of outsourcing in software development. So far, the activities most commonly sourced from abroad have been technical support and elementary programming. Offshore sourcing in the form of subcontracting is considered an interesting option, with particular interest in possibilities for cooperation with companies in Saint Petersburg area and Estonia. Also Tyrväinen et al. (2004) consider the most potential for offshoring to lie in product development or subcontracted product development, whereas software development that requires highly specialised know-how or knowledge of customer industry are less likely to be offshored. On the other hand, offshoring development of clearly defined applications may not be just an option, but a necessity imposed by price competition (Kontio, 2008). Companies providing such services or products are under pressure to increase their efficiency by either lowering their fixed costs, which are largely personnel-related, or increasing productivity. However, offshoring adds to managerial complexity and requires a certain level of maturity from the client company (Ibid.). Thus, its benefits can best be taken advantage of through perseverance.

2.2 Offshore sourcing

This section discusses the topic of offshore sourcing. It addresses the diversity of related terminology, general trends in outsourcing, and characteristics of some of the most prominent locations for offshore sourcing of software development.

2.2.1 Terminology

The terminology describing different forms of cooperation is confusing at best. With interaction between companies becoming more and more common, a variety of descriptive concepts have emerged. Depending on the duration, interdependence of the participating firms, voluntariness, and motives for interaction, it has been referred to as subcontracting, sourcing, buyer-seller relationships, cooperation, collaboration, partnership, alliance, or joint venture. Many authors have contributed to this subject, resulting in disparate terms and definitions, as well as various taxonomies of terms (Hellman et al., 1993; Yli-Renko, 1999). The contradictions are partly due to the evolution of practice (Hätönen and Paju, 2009). In this study, cooperation is used as a general term for interorganisational relations. However, in this particular context, a distinction should be made between product development collaboration and cooperation. Collaboration implies partners working for a joint goal, whereas cooperation refers to a broader variety of activities, including contractual customer-supplier relations.

Sourcing is "the set of business processes required to purchase goods and services" (Chopra and Meindl, 2007, 59). Key sourcing decisions include the choice between in-house production and outsourcing, supplier selection, and the design of the desired network of relations (Ibid.; Gadde & Håkansson, 2001). According to Kotabe and Murray (2004), a global sourcing strategy refers to management of logistics, identifying which production units will serve which particular markets and how components will be supplied for production, as well as the interfaces between R&D, manufacturing, and marketing on a global basis. The objective of a global sourcing strategy is to exploit both internal and suppliers' competitive advantages and the comparative locational advantages of various countries in global competition (Ibid.).

According to Hätönen and Paju (2009), the dominant view on *outsourcing* in the business literature is that it involves external resources in conducting functions or processes that have previously been conducted internally (e.g. Ellram and Billington, 2001). Outsourcing occurs on contractual basis with independent suppliers, and it can be further divided into arm's length relationships and strategic partnerships (Kotabe and Murray, 2004). In essence, outsourcing as a concept entails transfer of the ownership of an activity – not only the production of goods and services, but also the responsibilities of the management, development and continuous improvement of the activities (Hätönen and Paju, 2009). Outsourcing has a lot of common with subcontracting and it can even be questioned whether these two are different concepts or merely synonyms. Van Mieghem (1999) distinguishes them by pointing out that subcontracting is acquisition of an item that could be produced in-house, whereas outsourcing is related to not being able to manufacture something internally.

Outsourcing as such does not define the location of an activity. Outsourcing can be executed either domestically or in an international context. International outsourcing is also known as *offshore outsourcing*, and it refers to transfer of ownership combined with a foreign location of operations (Hagel and Brown, 2005). *Offshoring* means relocating activities from one country to another, and need not necessarily be combined with simultaneous outsourcing (Ibid.). Instead, offshoring can refer to using internal resources, for example through foreign direct investment. Furthermore, Prikladnicki et al. (2003) separate offshore outsourcing, which is contracting services with an external organisation located in another country, and

offshore insourcing, which is contracting with a wholly owned subsidiary also located in another country.

Another concept related to international outsourcing is *nearshoring*, which means sourcing from closely located countries. Carmel and Abbott (2006) argue that nearshoring is mainly used to provide competitive differentiation in the offshoring marketplace. The existence of the concept of nearshoring showcases that distance does matter, but the concept lacks in clarity of definition and is underrepresented in academic literature (Ibid.). The most essential aspects appear to be geographical proximity, linguistic similarities, cultural similarity, and close time zones (Carmel and Abbott, 2007). The usage of the word "near" originally referred to proximity to the USA (Carmel and Abbott, 2006). For example Ellram et al. (2008) apply the USA-centric perspective and define offshoring as sending work to countries outside of North America, whereas nearshoring refers to sending work from the USA to Canada or Mexico. For Finnish companies, the geographical focus of nearshoring could be Estonia, Western parts of Russia, and countries of the Central and Eastern Europe. The concept of nearshoring is not applied in this study, because the differences between Finland and Russia make them far more diverse business environments than, for example, countries in North America.

In this study, *offshore sourcing* is used to denote international cooperation between a customer and a supplier in software development. It is a short form for *offshore outsourcing* (Kotabe and Murray, 2004) and refers to a cooperative mode of offshoring, where a firm does not establish its own presence in a foreign country, but utilises a local supplier. Among the practitioners in the information and communication (ICT) industry, outsourcing is frequently used to mean any provision of services by an external company, whether this involves close cooperation or arm's length transactions. The use of the term *offshore* in this study, instead of global or international, is due to the fact that it is widely applied in the information technology field. The use of the terms in the publications in the second part of the study is not entirely consistent due to the long time frame of the research. The terms supplier and subcontractor are used interchangeably.

In the IT field, there are two other commonly used terms, information technology (IT) outsourcing and business process outsourcing (BPO), which both lie beyond the scope of this study. IT outsourcing refers to a situation where a service provider takes over some part of the client's IT operations and runs them on behalf of the client (Hoch et al., 1999). In BPO, the outsourcing provider handles the complete business process on behalf of the client, including everything from IT operations to administration tasks (Ibid.). Because the focus of this study is software development activities, these types of outsourcing are not discussed in more detail.

2.2.2 Trends in outsourcing

Originally, outsourcing has been a strictly cost focused approach. However, since its debut as a practice in the 1950s and more wide adoption in the 1980s, it has evolved into a more cooperative approach, where cost is only one of the decision-making criteria. Hätönen and Paju (2009) present an extensive review of the trends in earlier research and practice of outsourcing. They identify three distinct eras in the development of outsourcing as a phenomenon (Table 3): the era of the Big Bang, the era of the Bandwagon, and the era of Barrierless organisations. The first era, which that began in the 1980s was characterised by

companies farming out call centers and other service-oriented operations (Lacity and Hirschheim, 1993). The dominant practice was outsourcing noncore business process to cut operational costs. The second era dawned with the emergence of core competence thinking in the 1990s (e.g. Hamel and Prahalad, 1990; Porter, 1996), which led to considerable broadening in the goals of outsourcing. With companies concentrating on developing their core expertise, this strategic outsourcing provided access to external skills, competences and knowledge. The third era refers to the current phase in the outsourcing evolution, characterised by new organisational structures and fading boundaries between actors. Transformational outsourcing combines consulting, technology and outsourcing to stimulate and facilitate business change (Mazzawi, 2002). The purpose of transformational outsourcing is to change the paradigm, instead of sweating assets harder, as in traditional outsourcing (Ibid.). It aims at creating a flexible, dynamic organisation that operates in a network of different actors.

Hätönen and Paju (2009) refer to the current highly competitive environment as an outsourcing economy, characterised by increased focus on core organisational activities and simultaneous leveraging of external resources, skills, knowledge, capabilities and competences. According to them, the increased competition in the outsourcing markets has caused a shift towards buyers' markets, enabling companies of all sizes in nearly all industries to capitalise on external sources of knowledge and capabilities. In the current practice, outsourcing encompasses increasingly critical and knowledge-intensive business components that are often developed through cooperative effort (Ibid.).

Table 3: Outsourcing evolution (Hätönen and Paju, 2009)

	Big Bang	**Bandwagon**	**Barrierless Organisations**
Time period	1980s to early 1990s	Early 1990s to early 2000	From early 2000 onwards
Prime motives	Cut costs	Cut costs, capability enhancement, process improvement	Organisational transformation
Buzzword	Outsourcing	Strategic outsourcing	Transformational outsourcing
Outsourcing location	Domestic	International	Global
Management of the outsourcing relations	Arms-length, transactions	Strategic alliances	Collaborative development
Organisation	Efficient organisation	Focused organisation	Virtual organisation
Core organisational competences	Management of key strategic business units (SBUs)	Key strategic competences (Core competences)	Dynamic competences and network competences
Strategic rationalisation	Profit maximising	Strategic and competitive edge	Survival
Outsourcing objects	Structured and well defined turnkey manufacturing processes	Strategically important organisational process	Projects highly knowledge-intensive and creative in nature
Main theories	Transaction cost theory	Resource/competence based view	Organisational theories

Despite the growing adoption of outsourcing, sourcing in R&D activities is a controversial topic. Cooperation in R&D is not a recent phenomenon. The number of strategic alliances motivated by technology increased in the industrial triad US-Europe-Japan already in the 1980s (Granstrand and Sjölander, 1992). In the same decade, R&D subcontracting systems and international R&D consortia were created, especially in Europe (Ibid.). The beginning of

the 21st century has been characterised by the growth of R&D work in smaller firms, R&D contracting and innovation outsourcing (Hirshfeld and Schmid, 2005). Still, the actual volume of offshore sourcing in R&D is difficult to estimate. It is very difficult to compile, statistical data, as statistics mainly focuses on the international R&D investments made by companies, rather than purchased R&D services (Paju, 2007).

So far, the R&D activities have been clearly more concentrated than production, trade or investment, but the growth of the global economy has created incentives for their dispersion as well (Hirshfeld and Schmid, 2005). The central paradox of the new, globalised R&D is that it has become increasingly concentrated and increasingly dispersed at the same time. Concentration is necessary to take advantage of economies of scale and clusters of knowledge, whereas dispersion enables access to well-educated, yet less expensive workers and diffusion of innovations into diverse markets. Moving R&D abroad typically begins with some practical, more product-specific work and less basic research. Advances in the ICT and interactive tools enable sharing and coordinating development efforts on a global basis, making it lucrative to locate an R&D centre closer to either its target market or a pool of specialised, competitively priced technical resources. Despite the advances, distance remains a barrier to the dispersion of innovation. As for location of offshore R&D activities, transnational companies typically set them up in areas with already high concentration of R&D activity, because such locations are most likely to provide increasing knowledge returns. Thus, preferable locations have already established R&D clusters and experience. (Ibid.)

2.2.3 Offshore sourcing in software development

Offshore outsourcing of software development has been a growing trend in the IT field since the middle of the 1990s. Pressman (1997, p. 135) defines outsourcing in the software development context as follows: ”software engineering activities are contracted to a third party who does the work at lower cost, and hopefully, higher quality”. With the nature of software development providing alluring possibilities for distributed development, companies dispersed around a large number of countries compete for attracting foreign clients. According to Herbsleb and Moitra (2001), several trends have accelerated this development: 1) the need to capitalise on the global resource pool to successfully and cost-competitively use scarce resources, wherever located; 2) the business advantages of proximity to the market, including knowledge of customers and local conditions, as well as the good will engendered by local investment; 3) the quick formation of virtual corporations and virtual teams to exploit market opportunities; 4) severe pressure to improve time-to-market by using time zone differences in “round-the-clock” development; and 5) the need for flexibility to capitalise on merger and acquisition opportunities wherever they present themselves.

The outsourcing decision can be divided into two levels. Firstly, there is a macro level decision, the choice of an outsourcing destination country. The influential factors on the macro level are: the political system, the ICT infrastructure, the regulatory regime, the quality and quantity of the workforce, the legal system, and issues related to language and culture (Palvia, 2004). The state of these factors is reflected in the issues of costs, quality and speed, which are essential for companies contemplating offshore sourcing of software development. Secondly, on the micro level, there is the choice of a business model, referring to how outsourcing is organised.

Khan and Fitzgerald (2004) discuss different business models for offshore outsourcing in the context of information systems. The distinguished approaches are: direct offshore outsourcing, third party offshore outsourcing, joint venture offshore outsourcing, and wholly owned subsidiary. Based on four case studies, they introduce a model combining factors that affect the selection of a particular business model. The four dimensions of the model include: organisational factors, technological factors, geographical or environmental factors, and process factors.

It has been acknowledged for some time that software development tasks can be outsourced to low-cost countries, like India, Russia and China. Also the large population and investment in the domestic development of ICT imply that these countries have a growing role as a source of resources for software development (Tekes, 2003). However, cost advantages have to be weighted against obstacles, such as intellectual property disputes, bureaucratic governments, infrastructure limitations, and project management difficulties (Hoch et al., 1999).

Indian software companies have pioneered in offshore outsourcing. They started by providing low level design, coding, testing, maintenance and support services, but have been later trying to move up the value chain into such areas as systems integration, network and infrastructure management, system planning, and design work (Palvia, 2004). However, because of their lower name recognition than that of established Western companies, Indian companies are still mainly seen as low-cost, high-quality providers. The strengths of the Indian offshore software industry include a good educational system (e.g. Indian Institutes of Technology), a large number of graduates with directly related specialisation, the widely adopted use of international quality standards, and a competitively priced workforce. Furthermore, from the point of view of clients from the USA and the UK, India is a natural destination due to similarities in language and the legal system. (Ibid.)

As an outsourcing destination, China has primarily attracted manufacturing activities. However, the Chinese software services industry is interested in reproducing the success of India in attracting offshore outsourcing clients in the IT field. The advantages of China lie in the vast supply of low cost workers and the huge internal market, but they are counteracted by the deficiencies of entrepreneurial, managerial and technical skills. Although the yearly number of graduates is high, the supply of highly qualified software graduates is limited. The background of IT professionals is typically in computer science and mathematics instead of software engineering. Thus, companies are able to provide low-level coding and maintenance of existing programs, but not systematic analysis and design of software. Reported problems include little experience in developing and maintaining complex software, lack of expertise in project management, lack of proficiency in the English language, lack of adoption of quality standards and processes, widespread software piracy, and an authoritarian political regime. (Palvia, 2004)

The main advantage of the Russian offshore industry is the human capital, combined with the scientific and technical orientation and training of the industry (Hawk and McHenry, 2005). Albeit competition on cost alone has become harder with increasing costs, significant savings are still possible. A large share of the Russian software industry sees offshore outsourcing as the prime source for growth, because the domestic market for software development is somewhat limited. Because of the early internationalisation, many companies have adapted Western styles of management and organising (Kärkkäinen, 2008). In comparison to the Indian offshore industry, Russian software companies tend to be smaller because of their entrepreneurial origin and limited external financing. For example the number of employees

in companies in the Saint Petersburg area ranges from fifty to a few hundred (Ibid.). Because of the scale differences, Russian software developers do not directly compete with Indian providers that have a clear advantage in bigger projects (Ibid.). The size limitation hinders firms from going after big global contracts and is the main area for improvement (Hawk and McHenry, 2005). Other shortcomings are the limited external financing and government support for the industry.

2.3 Finnish-Russian cooperation

Economic relations between Finland and the Soviet Union had three main pillars: the bilateral trade agreements, the barter-based border trade, and production cooperation. The bilateral trade agreements mostly meant exchange of oil and gas for Finnish industrial products. Some of the competitiveness of the Finnish machine-building industry and other more technology-intensive branches originates from being part of the bilateral trade, as the Soviet Union had tough technological requirements for the products. The barter border trade involved consumer goods and was geographically limited to Leningrad and the surrounding region. Cooperation in production occurred in various metal related industries with participation of the most prominent Finnish industrial plants. (Kosonen and Heliste, 2006)

Technological cooperation between Finland and Russia has a long history, dating to the Soviet times. Finland and Greece were the only two developed countries taking part in large investment projects on Russian territory during the times when the political regime and closed economy of the Soviet Union prevented international cooperation (Lisitsyn, 2007). Cooperative projects included building an iron mining and processing plant and the reconstruction of a pulp and paper plant in the Russian territory, as well as two joint projects on the Finnish territory. Direct investments became possible only in 1987, and Finns rapidly gained the second place in a number of joint ventures (Kosonen and Heliste, 2006). However, the 1990s in Russia were characterised by political and economic crisis and Finnish firms temporarily withdrew from the country. (Ibid.)

Despite the experience of cooperation in the past, there has not been a boom of economic cooperation between post-Soviet Russia and Finland (Lisitsyn, 2007). Growth can only be observed in the turnover of mutual trade, and the relative importance of this trade for Finland's economy is still much lower than during the Soviet era. The potential for investment and technical cooperation has not been fully exploited (Ibid.). Especially for SMEs, the lack of time and other resources, along with difficulties in finding information on a potential partner, hamper initiation of cooperation (Ivanova et al., 2006).

The Russian exports to Finland are rather low-tech. The commodity structure mainly consists of raw materials: mineral fuel, base metals, wood, and chemical products (Ollus and Simola, 2006). Similarly, Finnish FDI (Foreign Direct Investments) to Russia are dominated by forest industry and publishing, electricity and heat generation, wholesale and retail business, and food industry. Overall, the investment statistics show a large share of traditional industries and only marginal presence of knowledge-intensive industries, such as machinery and equipment manufacturing, and production of electronics and electric apparatus (Lisitsyn, 2007). The low cost of natural resources in Russia has motivated significant share of investments to be cost-driven in certain dominant sectors (e.g. the forest sector). On the other hand, Russian imports from Finland include machinery, equipment and vehicles, chemical

products and foodstuff (Ollus and Simola, 2006). There is even a large share of high-technology products, such as electrical and optical equipment.

Finnish investments in Russia have grown fast in the first decade of the 21st century, although the general level of FDIs in Russia still remains modest. Furthermore, the investment motives have been changing into market-driven due to recent developments in Russia – rising costs, growing income of the population, and increasing political and economic stability (Ollus and Simola, 2006). For example in a study by Ivanova et al. (2006), it was observed that both production and service companies were mainly motivated to cooperate with Russian firms by sales growth. Thus, market potential has outstripped cheap labour and production as the primary incentive for Finnish investments. With time, this trend may result in an increasing share of investments in high-technology sectors, reflecting the structure of mutual trade better (Lisitsyn, 2007). Still, despite the gradual improvement of the investment climate, there are factors hampering FDIs, namely protectionism, an uncertain investment climate and weak legal protection for foreign investors (Ollus and Simola, 2006). Overall, political and economic uncertainties increase risks and lower Russia's attractiveness as a target for investments. From the point of view of Finnish investment in technology-intensive activities in Russia, the main impediments are grey imports, the small company size of potential investors, and state support for development of knowledge-intensive industries, which has only recently started in Russia (Lisitsyn, 2007).

Contrary to FDIs, subcontracting is a non-equity form of cooperation. According to Johanson and Johanson (1999), it was believed in the middle of 1990s that many Russian firms would develop into successful subcontractors for foreign firms. This was considered a likely development due to the low wages, comparatively well educated employees and developed industry. Contrary to the expectations, potential subcontractors showed inability and aversion to this form of operation, as well as lack of understanding and knowledge about how a long-term relationship is developed. Establishing subcontracting relationships were also hampered by fear of exploitation and lack of capital needed to supply to foreign firms. (Ibid.)

The number and value of non-equity relationships are not registered in statistics. According to Karhunen and Kosonen (2002), Finnish-Russian subcontracting relationships were present at least in the metal industry, as well as the furniture and clothing industries. For companies from the metal industry, subcontracting in Russia was mainly motivated by cost reduction, although some companies also used it to get their products on the Russian market (Ibid.). Russia was not considered important as a source of raw material, due to the insufficient quality of Russian metals. The same firms reported modest success of their relationships. The problems were both task-related and partner-related. Overall, the partners often had different perceptions of cooperation regarding contribution, pricing, quality, delivery times, and the meaning of the contract (Ibid.). More recent studies show some positive development in the task-related factors, as the quality of Russian suppliers has been gradually improving (Kosonen and Heliste, 2006). Such continuing improvement increases competition among suppliers, and supports the shift from personalised business networks to more business-oriented competition (Heliste et al., 2008).

One reason for the ambiguity in the perception of cooperation by Russian partners is the relatively young age of the whole concept of cooperation in Russia. In the Soviet Union, the traditional industrial network was tightly structured and the roles of different actors were clearly defined (Salmi, 1996). The governance structures of markets and networks have only been introduced to the Russian economy with the economic reform process that started in the

mid-1980s. This fundamental change brought along such new phenomena as voluntary interaction between actors, diversified enterprise ownership, new types of economic actors, and new forms of coordination of industrial activities (Ibid.). Similarly, entrepreneurial activities and taking customers' needs into consideration became topical issues. Even in the beginning of the 21st century, a large part of companies with background in the Soviet enterprise structure have still been focusing on production and technological issues, and paying too little attention to marketing and customer needs (Salmi, 2004). Another type of survival strategy is taking advantage of the transition in monetary terms and being more active in rent-seeking behaviour than production. Neither one of these cases represents the active, profit-oriented and cooperative behaviour that the companies should strive for to be successful in the market economy. (Ibid.)

The economic transition to a market economy has been a slow and complex process. In relation to formal institutional rules, there have been problems due to the slow process of new legislation, contradictory regulations and enforcement problems (Salmi, 2004). For the informal institutional rules, transition meant disappearance of the existing organisational structures. Companies themselves became responsible for establishing relations with suppliers and customers, which made it necessary to analyse resources and activities of other actors. Critical questions were how to continue, where to find business partners and how to establish relations with them. In Russian companies, the search for suitable business partners and establishment of relations are characterised by the following issues: relevance of geographical distance, need for foreign investments, resorting to existing partners, variance in the attitude and activity concerning adoption of new market-based rules. Overall, companies still seem to resort a lot to old practices and norms. Similarly, business ties inherited from the Soviet times still facilitate a large proportion of transactions. Inter-organisational relations seem to be gradually evolving on the basis of earlier personal and other ties, which means that the informal institutional norms are not necessarily changing automatically as a result of change in formal rules. Change does not occur rapidly in the mental and behavioural models of the business actors, and inertia prevails. However, privately owned companies in the small business sector appear to be forerunners in a new type of thinking. The sector shows some particular characteristics and strategies, despite its small weight for the economy as a whole. Small business is demand-oriented and diversified, operating in the flexible and consumer-friendly industries of trade, public catering and services. Also foreign companies can be a source of influence on informal institution when interacting with business partners from a transitional economy. (Salmi, 2004)

Because of the long common history, Finnish companies in general are well aware of the Russian business environment and the culture of their trade partners (Ollus and Torvalds, 2005). Likewise, the Russians are more familiar with the Finnish culture than that of many other countries. In Russia, Finland has a reputation of being a reliable trade partner. The predominant image of Russia in Finland is less flattering, due to historical tensions and pressure. The overall picture is outdated and affected by stereotypes. Thus, despite the significance of Russia for the Finnish economy, both fear and ignorance about Russia are present in the Finnish business sector. Consequently, many firms are cautiously disposed towards the opportunities presented by Russia. (Ibid.)

The cautious approach is partly due to considerable differences in the Finnish and Russian business cultures. International cooperation often fails, and difference in business norms is one of the most significant reasons behind this tendency, especially taking into consideration the substantial degree of difference between Western and Russian firms (Mashkina et al., 2005). The Russian business environment is characterised by well-established and relatively

closed business networks that are also based on personal connections. During the Soviet times, economic relations and exchange were always agreed on at the state level, which prevented development of horizontal connections between Finnish and Soviet enterprises (Kosonen and Heliste, 2006). The collapse of the Soviet Union and disappearance of the foreign trade organisations left the Finns with nonexistent trading contacts. Consequently, this lowered the competitiveness of the Finnish firms on the Russian market, because of the decisive role of personal relations. The shift from personalised business networks to a more business-oriented exchange is only slowly emerging (Ibid.). Furthermore, networking is complicated by differences in the hierarchical structures of enterprises, as it can be difficult to identify contacts with sufficient authority to negotiate. The formal institutional framework has only limited possibilities to affect problems related to differences in business cultures. However, according to Kosonen and Heliste (2006), it appears that these differences are slowly being moderated by the cooperating firms themselves.

It is important to take into account the context of cooperation. Previous studies on the Finnish-Russian cooperation have typically been conducted in the manufacturing context, whereas the present study concentrates on the knowledge-intensive high-technology context. According to Ollus and Torvalds (2005), only a few Finnish technology companies carry out development work in Russia. Russian manufacturing companies are primarily oriented to the domestic market, and international cooperation practices are not very well established, as illustrated in several studies on Finnish-Russian subcontracting (e.g. Karhunen and Kosonen, 2002; Ahola, 2008). On the other hand, companies providing offshore software development services are strongly oriented towards the foreign market. Thus, they are highly motivated to develop successful cooperation practices with their foreign clients.

3 Literature review

Interdependent ties between organisations and their environment have interested researchers since the 1960s (Yli-Renko, 1999). The related literature is fragmented and there is no consensus on the terminology, units of analysis, or theoretical bases. Management research on interorganisational relationships has mainly focused on three topics: identification of relevant dimensions of relationships (including developing typologies), determining the motivation factors for the formation of relationships, and analysing the factors affecting the outcomes of these relationships (Ibid.). Also the processes of interorganisational relationship formation and evolution have attracted some interest.

The domain of particular interest for this study is the motivation factors for the formation of interorganisational relationships. The chosen focus is the strategic rationale at the company level, in particular in small and medium-sized enterprises. Because the main concern of this study is offshore sourcing as a resource-seeking strategy, the resources and capabilities-perspective was seen as one of the relevant theoretical approaches. However, the resource-based view provides only a limited explanation for interfirm cooperation. Thus, it needs to be combined with other approaches that address cooperative activities of firms better. The theoretical discussion on product development cooperation in the present study describes the specifics related to the object of offshore sourcing. The relevance of networking for this study originates in the Industrial Network Approach, which sees resource ties and activity links as the origin for interrelation between companies (cf. Håkansson and Snehota, 1995).

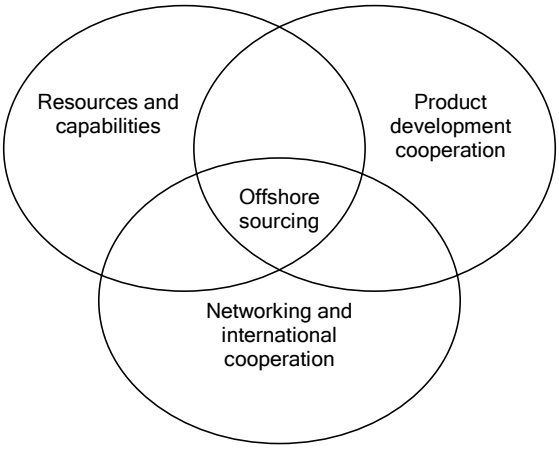

Figure 3: Theoretical background of offshore sourcing

This chapter describes the theoretical background and research motivation of the study. The aim of this section is to position the study through a literature review. The study sees offshore sourcing as a strategic means for accessing additional resources and capabilities for product development. The literature review concentrates on the three central themes of the study: resources and capabilities, product development cooperation, and networking and international cooperation (Figure 3). From the theoretical point of view, the study combines aspects of international business and product development schools of thought, which has been reflected in the choice of publication forums and the perspectives presented in the related works.

Alternatively, offshore sourcing can be inspected in the light of transaction costs theory. Because the study concentrates on holistic motivation of offshore sourcing, the transaction costs approach was considered a secondary option, as this theory assumes costs to be the main explanatory factor. Nevertheless, the transaction costs theory is briefly described at the end of this chapter along with another alternative theoretical approach for study of foreign activities, the eclectic paradigm. The eclectic paradigm was considered a secondary option because it is predominantly concerned with large multinational enterprises, whereas the focus of this study is on the strategic rationale in small and medium-sized enterprises.

3.1 Resources and capabilities

Despite its popularity in the academic literature, there is no consensus on the resource-based theory and even whether it should be labelled theory, view or perspective. It is a topic with heterogeneous character and diverse applications. Acedo et al. (2006) have reviewed focal publications on resources and capabilities, and identified three main trends: the resource-based view, knowledge-based view, and relational view. For the purpose of positioning this study, this section discusses some focal aspects of the resource-based view and the relational view. The knowledge-based view has not been considered particularly relevant in the context of this study. Also the majority of the work on the relational view or the application of the resource-based view to inter-organisational relationships has concentrated on knowledge transfer and learning (Acedo et al., 2006), which are topics outside the scope of this study.

In the resource-based view, firms are seen as heterogeneous entities differing in capabilities and resources that allow them to implement different strategies (Penrose, 1959; Barney, 1991; Foss and Robertson, 2000). Resources can be defined as "stocks of available factors that are owned or controlled by the firm", whereas capabilities refer to "a firm's capacity to deploy resources, usually in combination, using organisational processes, to effect a desired end" (Amit and Schoemaker, 1993, p. 35). Barney (1991) divides resources into three categories: physical resources, human resources and organisational resources. The potential effects of technology are embedded in the organisational resources by taking into account the internal competencies needed to employ the technology (Coviello and Cox, 2006).

Two types of theorising can be distinguished within the resource-based view (Foss, 2000), namely one building on equilibrium economics (e.g. Barney, 1991) and one that is evolutionary or process-oriented (e.g. Penrose, 1959). The former defines the competitive advantage of a firm in terms of capabilities or competences, instead of products or market structures (Sainio, 2005). As this approach is distinguished from environment-central strategic research (e.g. Porter, 1985), its application often goes to another extreme and assumes firms to operate in isolation without interaction with their environment (Foss and Robertson, 2000). From the point of view of high-technology industries, this interpretation of the resource-based view has an important limitation due to its retrospective character. The approach mainly concentrates on the analysis of existing resources and little attention is paid to the creation of new resources (Foss and Robertson, 2000; Foss, 2000). The latter emphasises the aspects of entrepreneurship, flexibility, change and uncertainty (Foss, 2000). A wide and impregnable base of resources enables a firm to "adapt and extend its operations in an uncertain, changing and competitive world"; thus contributing to profitability, survival and growth (Penrose, 1959, p. 137). Revenue is created not through possessing, but applying resources (Spender, 1994). From the resource-based perspective, the reason for a firm to cooperate is to establish the optimal resource configuration maximising the value of

resources (Das and Teng, 1998). Studies applying the resource-based view to cooperative settings are few in number, but the relational view addresses this limitation.

The central assumptions of the resource-based view about firms are heterogeneous distribution of resources across firms and imperfect mobility of resources, which can be seen as factors contributing to motivation for interfirm cooperation. The relational view differs from the resource-based view in that it considers the dyad or network as the primary unit of analysis and source of rent instead of an individual firm (Dyer and Singh, 1998). Similarly, control and ownership of rent-generating resources are shared with trading partners (Ibid.). For example Laamanen and Autio (2000) propose that resources and competences can be developed either internally, through collaborative arrangements, or through company acquisitions. According to a literature review by Acedo et al. (2006), the central work of the relational view has been composed by Dyer (1996), Dyer and Singh (1998), and Eisenhardt and Schoonhoven (1996). Next, the focal content of each of these publications is discussed.

Dyer (1996) has examined specialised supplier networks in the automobile industry. He suggests that valuable and non-imitable specialised assets can be created not only by an individual firm but also in combination with other firms. Specialisation means that an individual firm performs only a narrow range of activities, but they are embedded in a chain of input-output relations with other firms (Ibid.). Dyer's findings indicate a positive correlation in the relationship between interfirm asset specificity and performance; with interfirm human asset (i.e. transaction-specific know-how accumulated by transactors) co-specialisation leading to improved quality and speed of new product development. On the other hand, it can be assumed that co-specialised transactors are less flexible than independent firms in a volatile industry environment (Ibid.). However, there is also evidence of cooperation providing resources and information that enable effective reaction to exogenous shocks (Saxenian, 1991).

Dyer and Singh (1998, p. 660) have examined the interorganisational rent-generating process and propose that "a firm's critical resources may span firm boundaries and may be embedded in interfirm resources and routines". Interorganisational competitive advantage can originate from relation-specific assets, knowledge-sharing routines, complementary resources and capabilities, and effective governance mechanisms. In order to generate relational rents, complementary resources must be accompanied by organisational complementarity of the cooperating firms, because executing coordinated action is only possible when the systems and cultures are compatible. Furthermore, effective governance (e.g. trust) enables greater investments in specialised assets and increases firms' willingness to combine strategic resources, as it mitigates the fear of partners sharing proprietary knowledge with competitors or becoming future competitors through duplicating the same resources to own advantage. Combining resources and capabilities in a long-term relationship leads to their co-evolution and resource indivisibility, which impedes possible imitation, but also restricts a firm's ability to redeploy the resources and may limit its flexibility. (Dyer and Singh, 1998)

Eisenhardt and Schoonhoven (1996) concentrate on strategic alliance formation, which they illustrate with product development alliances of entrepreneurial semiconductor firms. They describe alliances as cooperative relationships driven by strategic resource needs and social opportunities. The perspective emphasises characteristics of the firm instead of transactions in a manner similar to the conceptual framework of this study. The disadvantages of alliance formation are outweighed by high payoff from cooperation when a firm is in a vulnerable strategic position for which it needs additional resources, for example a difficult market situation or undertaking an expensive or risky strategy (Ibid.). Firms with technically

innovative strategies are especially likely to need alliances because of the substantial amount of resources required for the task. Furthermore, alliances can provide rapid access to necessary skill-based resources (Shan, 1990) that may be slow to develop in-house. In growth-stage markets, cooperation can improve the strategic position of a firm by creating flexibility and lessening the constraints of fixed resources (Eisenhardt and Schoonhoven, 1996). However, in the product development context, gaining the benefits of cooperation requires a substantial amount of interaction and collaborative work among the personnel, which may lower the attractiveness of cooperation due to slower indication of advantages (Ibid.).

A complementary theoretical approach to the topic of resources and capabilities is the resource dependency theory. This approach is related to the organisation theory, whereas the resource-based view is embedded in the field of strategic management. The resource dependency theory is based on the work of Pfeffer and Salancik (1978) suggesting that an organisation cannot develop or internally access all the resources that it needs in order to be competitive. Thus, the approach examines organisations' resource interdependencies with other organisations (e.g. dependence on resource suppliers). The central idea of the resource dependency theory is that organisations are constrained and affected by their environments; consequently, they attempt to manage resource dependencies through their actions (Ibid.). The links between actors are described as a set of power relations based on resource exchange. Managing external interdependencies is seen as a prerequisite for the survival and success of a firm. Transactions are unavoidable, but the firm can strive to increase its control of exchange. This can be achieved by either minimising the dependence on external parties (i.e. acquiring control over the needed resources) or by increasing others' dependence on the firm (Pfeffer, 1981).

The question of how firms decide to use cooperative relationships to access resources instead of creating them internally has not been extensively studied in the context of resources and capabilities. The resource-based view mostly concentrates on aspects internal to the firm. The resource dependency theory addresses resource interdependencies, but not the motivation for cooperation. Different modes of cooperation are used by firms in order to develop a value creating resource that a single firm could not have formed (Blomqvist, 2002). External complementary resources may be necessary to develop new capabilities in order to fill gaps in the portfolio of internal resources (Teng et al., 1995). Furthermore, firms can develop dynamic capabilities allowing them to integrate, build, and reconfigure internal and external resources to address rapidly changing environments (Teece et al., 1997). Cooperation in a particular setting, product development activities, is considered next.

3.2 Product development cooperation

The availability of resources is one of the preconditions of successful product development (Cooper, 1996). With shortening product life cycles and technological convergence, resources and skills should be developed in a significantly shorter time than earlier (Littler et al., 1995; Nummela et al., 2004), which constitutes an additional challenge for internal development. To cope with changing conditions, firms need to resort to flexible organisational solutions, and product development activities are no exception (Brown and Eisenhardt, 1995).

Product development is one of the most complex activities of the firm. There are many related uncertainties: difficulty to estimate the demand, changing markets, new technology fields, and difficulty to estimate the cost and time required (Griffin and Hauser, 1996). The role of flexibility in managing the product development process has increased (Maunuksela, 2003). Especially in industries where high levels of product development flexibility can be necessary, there are new types of contingency requirements for product development processes (MacCormack, 1998; Iansiti, 1998). Similarly, there are many related areas of skill and expertise due to the convergence of markets and technologies (Littler et al., 1995). To preserve its competitive abilities, a firm needs to maintain various types of technological expertise and a broad knowledge base. However, doing everything internally is no longer a feasible solution, as rapid technological advances occur on many fronts simultaneously (Heckman, 1999). In particular, the combination of limited internal development resources and a high rate of technological development within a field add to companies' willingness to cooperate (Axelsson, 1987).

The extent and type of interaction with external actors are decisions of high strategic importance for a company. Various modes of cooperation are often bundled in empirical studies as either strategic partnerships or corporate ventures despite many differences in the organisational and economic effects (Hagedoorn, 1990). Different cooperative agreements can be classified into equity and non-equity forms. Non-equity organisational modes in strategic technology partnering include joint R&D agreements, customer-supplier relations (e.g. subcontracting), bilateral technology flows (e.g. technology sharing) and unilateral technology flows (e.g. licensing) (Narula and Hagedoorn, 1999). Typically, these modes are considered to have a lower level of internalisation or interdependence. Equity agreements include research corporations and joint ventures, and are associated with greater degree of interdependence. Not only do different forms of organisational design have divergent effects on market structures and participating companies, but they are also related to different strategies and economic performance of these companies (Hagedoorn, 1990). The advantages of non-internal research and development activities are: reversibility of investment, smaller capital need, reduced risks, and limited damage on the primary operations of the firm in case of failure or organisational crisis (Narula, 2001). On the other hand, the tacit nature of innovation and the risks associated with loss of technological competitiveness encourage a high level of in-house R&D activity (Narula, 2001).

The trends in technology partnering show a gradual increase in the relative share of non-equity agreements during several decades (Narula and Hagedoorn, 1999). The relative importance of casual agreements has increased, but their real volume is difficult to estimate, because they are scarcely reported publicly (Hagedoorn, 1990). The growth of non-equity agreements can be explained by several factors: growing cross-border economic activity, increasing interdependence of technologies and industries, rapid technological change, improving regulatory frameworks, and organisational learning (Narula and Hagedoorn, 1999). Equity agreements tend to be more complex regarding administration and control, and take longer time to establish and dissolve (Harrigan, 1988). Moreover, it seems that firms are reluctant to use cooperative strategies of high organisational interdependence in matters of strategic importance (Harrigan, 1985). In the choice between internal and non-internal modes of research and development activities, the differences are rooted not only in an individual firm's strategy and size, but also the industry (Narula, 2001). Furthermore, the choice of cooperation mode depends on the technological characteristics of sectors within a single industry. Narula and Hagedoorn (1999) noticed the preference of equity agreements in relatively mature sectors and non-equity agreements in high-technology sectors. When the effect of the evolution of the technological paradigms is taken into account, the choice

between in-house R&D, R&D alliances and outsourcing can be seen to vary with the maturity of the technological paradigm and the distribution of the technological competences of the firm (Narula, 2001).

The main focus of research on product development cooperation has so far been on strategic alliances (Gerwin and Ferris, 2004; Millson et al., 1996; Eisenhardt and Schoonhoven, 1996), joint ventures (Harrigan, 1988) and partnerships (Hagedoorn, 2002; Ingham and Mothe, 1998). Alliances established for product development purposes have been described as "interorganisational arrangements, in which the partnering firms combine engineering and other personnel for the joint design of new products that at least one partner will sell" (Eisenhardt and Schoonhoven, 1996, p. 142). Several elements of this definition are present in software product development sourcing, while at the same time it can be organised through contractual agreements with suppliers, as described in the empirical part of this study. Successful collaboration is rooted in the perception of even benefits by the partners (Littler et al., 1995), which does not apply to supplier cooperation with one party being in a dominant position. Thus, while aiming at the development of a product, this mode of cooperation employs lower organisational complexity than alliances or joint ventures.

In their survey of manufacturers of information and communication technology products, Littler et al. (1995) found several reasons for product development collaboration. The main incentives were satisfying customer requirements, accessing skills and technical expertise in order to take advantage of market opportunities, and responding to changes in technology. Other reasons included reducing the cost and risk of product R&D, improving the time to market, and gaining access to new markets. The potential benefits to the product development process are acquisition of a wider range of skills and competencies, and a reduction in the costs, risks, and time taken to develop products (Ibid.). On the other hand, the strategic motivation of customer-supplier cooperation has traditionally been considered to be cost-centred. The sourcing literature relies especially on the transaction cost analysis theory (Ellram and Edis, 1996) originally described by Williamson (1979) that is discussed in more details in section 3.4. In this study, it is proposed that customer-supplier cooperation in software product development can have many characteristics typically assigned to collaboration, instead of being mainly motivated by transaction costs.

The development and management of a competence-based supplier network has become an important source of competitiveness (McIvor, 2000). The level of interaction may vary between broad utilisation of many suppliers, an intensive relationship with a few suppliers, and restraining any cooperation in development issues. Incorporating foreign suppliers in the firm's resource base is a strategic decision, which requires extensive information to base the decision-making on. Lack of knowledge on international sourcing can be an uncertainty factor leading to a narrow focus on the domestic market and leaving the firm with a potentially lower competitiveness compared to competitors who use foreign suppliers (Servais and Andersson, 2005). Acknowledging variability in resources and capabilities possessed by different actors is critical for the success of a sourcing arrangement. In building a mutually satisfactory sourcing relationship, it is important to find a fit between the strategies of the parties, which is further complicated by the international dimension (Servais and Andersson, 2005). Littler et al. (1995) found the choice of partner to be one of the major factors contributing to the success of product development cooperation. The initial choice is affected by compatibility of the respective organisational cultures, modes of operation, areas of expertise, the need for mutual understanding between partners, and past cooperation experience (Ibid.).

The sourcing decisions of a firm are closely related to its competences: the skills, knowledge and technologies possessed by the organisation (McIvor, 2000). Product development cooperation is always different from internal product development, as it includes a business relationship between the parties (Öhrwall Rönnbäck, 2002). In such a case, not only is process performance driven by the amount, variety, and problem-solving organisation of information and by the resources available to the team within organisation itself (Brown and Eisenhardt, 1995), but it is also affected by the resources and capabilities obtained from its partners and network. High-technology industries are characterised by an intense need for flexibility. The demand for a particular product or technology is highly unpredictable. Thus, there is a considerable need for agility, meaning ability to adjust, refocus and reconstruct the development organisation according to changes in the market (Kinnula, 2006). Volatility in the operating environment of a firm emphasises the importance of flexible organisation of cooperation. When organising development involves some external parties, the cooperation structure needs to reflect changes in direction and priorities as well. Due to change, the nature of the product development cooperation may need to be adjusted or even redirected (Littler et al., 1995).

3.3 Networking and international cooperation

Despite increasing similarities in consumption patterns and technology use across countries, there are still distinct differences in the resources available at different locations (Narula, 1996). For that reason, many firms are interested in exploiting knowledge-based assets of several locations simultaneously (Narula and Hagedoorn, 1999). For small or even medium-sized enterprises typical for the software industry, global distribution of operations is often possible only by crossing the company's boundaries. Thus, it is not surprising that the amount of inter-firm cooperation across national borders has been growing.

3.3.1 Industrial networks and internationalisation

The industrial network approach contributes to the discussion about how firms are able to identify and have access to the resources needed to build up and exploit their competitive advantage (Johanson and Mattsson, 1988). Business relationships between firms are affected by both resource scarcity and resource development (Håkansson and Snehota, 1989). Axelsson (1987) points out that an individual company's resources are generally small when compared with the resources controlled by an industrial network. As the total set of resources available to the firm is seen to be composed of both internal and external resources (Ahokangas, 1998), the firm may need to enter into network relationships in order to access strategic resources. The similarity between the resource-based view and the industrial network approach is that they view a firm as an actor in a web of relationships that influences its conduct (Juntunen, 2005). However, the industrial network approach focuses on accumulating benefits and effectiveness through relationships, whereas the resource-based view advocates increasing the internal resource base of a firm in order to minimise dependence on external actors. The purpose of firms is to mobilise and deploy internal and external resources available to them (Håkansson and Snehota, 1995), and the value of the resources is dependent on how they can be combined with other resources (Ahokangas, 1998).

In a similar manner, product development is seen as a process that exceeds the company's boundaries and involves a network of relationships. Therefore, within the industrial network approach, product development and the development of relationships are seen as connected processes. The decisions of the extent and type of interaction with external actors are strategically important, because they affect the amount of available resources, the intensity of the relationship and the level of dependency on a single supplier. Continuity in relationships enables effective use of resources in business (e.g. Håkansson and Snehota, 1995) and the development of new technical innovations and solutions (e.g. Håkansson and Waluszewski, 2002).

The network approach sees market exchange as the result of interaction in relationships and between actors. Thus, network relationships with foreign individuals and firms lead to internationalisation of the firm (Johanson and Mattson, 1988). Internationalisation has been defined as a process by which firms increase their involvement in international business activities (Welch and Luostarinen, 1988; Johanson and Vahlne, 1993). The network approach views internationalisation as a process of continuous establishment, maintenance and dissolvement of relationships between companies (Johanson and Mattsson, 1988). Especially outward internationalisation through cooperation with different foreign actors has raised the interest of researchers. Inward activities have received less attention in the literature (Welch and Luostarinen, 1993), despite the fact that they can provide a firm with valuable resources and thus enhance internal functions. It has been suggested that inward activities could be of a greater value to a firm were they not typically considered low-status activities (Karlsen et al., 2003; Korhonen, 1999). This study examines the little studied topic of inward internationalisation in the form of cooperation with foreign suppliers in product development activities. Consequentially, it is assumed that such international cooperation holds strategic importance for the firm. It is proposed that inward internationalisation can be used to supplement the strategic competences of a firm. The inward operations can enhance a firm's internal processes, such as product development, and affect the firm's prospects for outward internationalisation, as suggested by Welch and Luostarinen (1993).

The international expansion of innovative small firms has been shown to originate in an entrepreneurial culture, opportunistic strategies and short-term goals, which heavily contradicts the stage model of internationalisation (Boter and Holmquist, 1996). Thus, the network approach has been estimated to be a more suitable model to explain the process of SMEs' internationalisation as compared to sequential stage models (Nummela, 2002). Furthermore, a network of relationships can allow the firm to increase its competitiveness even when there are liabilities of smallness and newness, by providing access to partner resources without internalisation of these resources (Jarillo, 1989).

3.3.2 International entrepreneurship

Another stream of literature that addresses the relationship between resources and networks is international entrepreneurship research. According to Penrose (1959), administrative or managerial talent is one of the most important resources of a firm. The decision to search for opportunity is initially an enterprising decision that is only then followed by the economic decision to proceed with the examination of opportunities. The role of entrepreneurial intuition and imagination in this process is highly important (Ibid.). The entrepreneur's image of the environment defines the set of possibilities and restrictions available for the firm (Foss and Robertson, 2000). Furthermore, social relationships have an important role in

the development of business relationships (Håkansson, 1982). Both formal and informal networks, including personal connections, may contribute to the growth of a firm (Young et al., 2003). Moreover, the entrepreneur has an important role in the internationalisation process of a firm (Mtigwe, 2006).

Mtigwe (2006) describes the international entrepreneurship theory as a mixture of entrepreneurship theory, foreign direct investment theory, internationalisation theory and network theory. Zahra and George (2002, p. 261) define international entrepreneurship as "the process of creatively discovering and exploiting opportunities that lie outside a firm's domestic markets in the pursuit of competitive advantage". According to Coviello and Cox (2006), the aim of international entrepreneurship research is to understand how networks enable the entrepreneurial firm to acquire and mobilise resources for early internationalisation. Network relationships facilitate internationalisation by providing small entrepreneurial firms access to foreign market knowledge, financial, marketing and managerial resources, and competitive advantages (Coviello and Munro, 1997). The resource-based view has also been used to explain internationalisation in small firms. For example, Knight and Cavusgil (2004) argue that the resource-based view explains how an internationalising new venture develops and leverages unique organisational capabilities; whereas Knight et al. (2004) use it as theoretical support for the born-global phenomenon. Rialp et al. (2005) propose that the intangible resource base of a firm significantly affects its internationalisation capability. The intangible resource base consists of organisational, technological, relational, and human capital resources.

The discussion concentrates mostly on firms' expansion to foreign countries, that is to say outward internationalisation (Luostarinen, 1980). Thus, the approach gives a one-sided picture of the international operations of smaller firms by largely ignoring the potential effect of inward internationalisation activities on a firm's resource base and competitive advantage. The benefits to be gained and the value of the network are unique to each firm, making networks heterogeneous and difficult to imitate (Coviello and Cox, 2006). Small firms can improve their competitive position by networking and engaging external resources in product development activities, creating an offering beyond the scope enabled by their internal resource base. Networking capability can in itself become a valuable asset for the company and enhance its competitiveness. Past studies of international entrepreneurship have paid little attention to internationalisation of the firm's value chain, such as R&D activities and cross-border innovation (Zahra and George, 2002). Similarly, the theme of discovery and exploitation of environmental opportunities abroad has been scarcely explored (Young et al., 2003). This notion raises two important themes for future research: 1) the division between domestic and international aspects of different functions (including production, marketing, R&D, and sales), and 2) the selection of location for these aspects of international activities (Ibid.).

3.3.3 Strategic networks

The central construct of the industrial network approach is the ARA-model, which describes network relationships by linking Activities, Resources, and Actors. However, the industrial network approach does not address the actual issue of management of intentional business nets, an area where it can be complimented by the use of the strategic network approach (Svahn, 2004). Different types of networks require different skill sets or managerial capabilities. Möller et al. (2005) propose that strategic value nets and their managements

differ in relation to three factors: 1) the level of determination of the value activities and the actors forming the net (i.e. the nature of the value system embraced by the net), 2) the goal of the strategic net or its hub firm, and 3) the structure of the net. The foundation of the value-system construct is the notion that each product or service requires a set of value activities performed by a number of actors forming a value-creating system (Möller et al., 2002). The characteristics of the value system can be presented in a continuum depending on how well-defined the value system is (Figure 4). The nature of the value system poses different managerial challenges, as cooperation in stable and well specified nets differs significantly from operation in emerging, complex nets with high uncertainty (Ibid.).

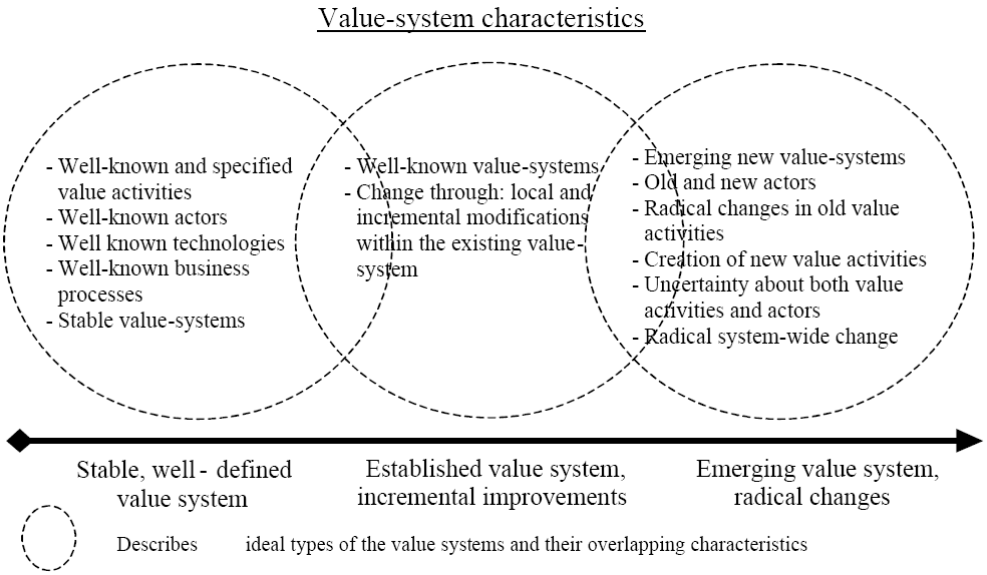

Figure 4: Value-system continuum (Möller et al., 2002)

Based on the three factors mentioned above, Möller et al. (2005) classify different types of strategic networks into vertical value nets, horizontal value nets and multidimensional value nets (Figure 5). The organising logic of offshore sourcing places it into the category of vertical value nets. The dominant goal of such nets is to increase the operational efficiency of their underlying value system.

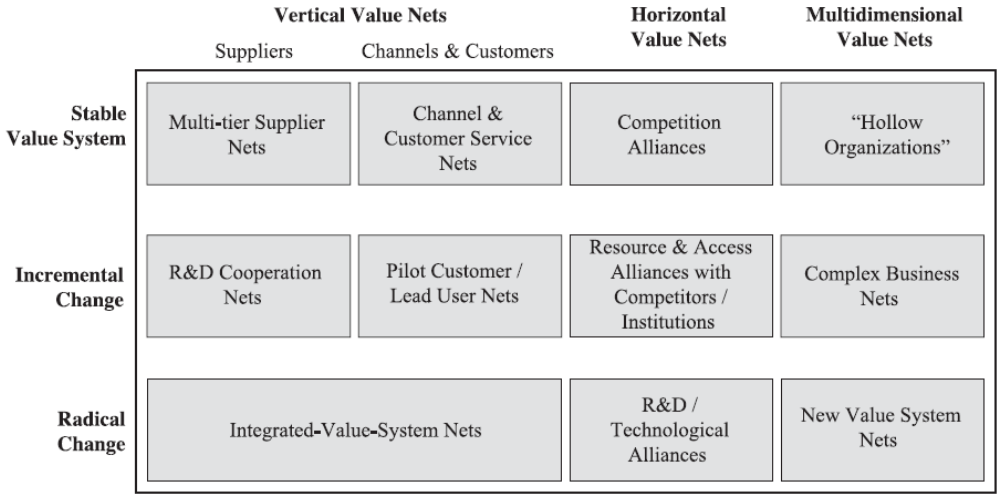

Figure 5: Types of strategic nets (Möller et al., 2005)

Managing in a network is essentially different from intra-organisational management. Möller and Halinen (1999) suggest that the key issues in managing strategic nets can be divided into four interrelated levels: macro networks, strategic nets, net and relationship portfolios, and strategic relationships. This study is mostly related to the strategic nets level and the net portfolio level. The former addresses how a hub company can build value-producing nets, and the latter addresses which activities are to be carried out in-house and which channelled through different nets. Detailed discussion of the key management issues on different levels has been presented in Möller and Halinen (1999), Möller et al. (2002) and Möller et al. (2005). The next section discusses the managerial challenges related to the context of international cooperation.

3.3.4 Challenges of international cooperation

Networks are the outcome of an organisational process where the firm creates a network of relationships by interacting with other organisations and individuals (Coviello and Cox, 2006). Managing these relationships in the international context can prove a challenge that a firm has not foreseen. International cooperation often fails because of differences in business norms, institutional and cultural differences, partners' expectations and consequent economic behaviour (Mashkina et al., 2005). According to McDonough and Kahn (1996), the biggest problems in global new product development are cultural and social. The critical resource of software development is skilled personnel and the work is knowledge intensive, which stresses the significance of successful communication and interaction practices. Other challenges of cooperation with foreign suppliers, such as national and cultural differences, are more comparable to traditional manufacturing.

The presumed cost advantage of offshore development is affected by liability of foreignness that can be related to spatial distance, the foreign firm's unfamiliarity with the local environment, the host country environment, or the home country environment (Zaheer, 1995). It is necessary to acknowledge that coordination of development distributed over both an organisational and a geographical boundary is likely to require additional efforts from the customer side, which can result in lower economies than expected. Crossing organisational

boundaries means that the firm has a lesser degree of control over activities and puts an additional strain on the firm's capability to take risks. According to Zaheer and Zaheer (2006), the nationality of different partners and perception of the legitimacy of their institutional context can lead to asymmetry in trust levels. Co-operation in a strategic function, such as product development, requires trust. As a precondition for trust building, the partners must be conscious of the goals of each other for the cooperation. Personal relationships create opportunities for cooperation, and social interaction contributes to the evolution of awareness, mutual knowledge and trust in the formation of a cooperative relationship (Eisenhardt and Schoonhoven, 1996).

Communication problems may arise whenever interacting companies come from a different cultural environment (Laage-Hellman, 1997). Correspondingly, there may be preference for foreign suppliers from certain countries, due to perceived social distance, differences in language or operating procedures. The distance between the two parties can be seen as composed of several dimensions: social, cultural, technological, time and geographical (Ford, 1982). Social distance, which means the actors' familiarity with each other's way of working, is closely related to cultural distance, which is difference in norms, values or working methods due to national characteristics. Technological distance means differences between the companies' product and process technologies. Time distance refers to the length of period between establishing contract and the actual transfer of product or service. Geographical distance means the physical distance between the companies' locations. In integrating suppliers into product development activities, different operational environments, organisational characteristics and unique histories of firms require differentiated management approaches and organisational structures. Thus, no universally applicable organisation or management approach to guarantee success exists (Wynstra and van Echtelt, 2001).

3.4 Alternative theoretical frameworks

This section presents two of the alternative theoretical approaches that can be used in examining offshore sourcing decisions. The discussed theories are transaction costs economics and the eclectic paradigm. Furthermore, there is a body of research focusing on buyer-seller relationships (e.g. Ford, 1982; Ford et al., 1998) and the development of relationships between firms (e.g. Håkansson, 1982). However, the present study does not look into actual relationships with suppliers. Because of the limited access to such data, this perspective could not have been supported by the empirical evidence. Thus, it was delimited out of the scope of the study.

The economics-based theory most relevant for this study is the transaction costs theory, because of its influence on the make-or-buy discussion and development of the network approach. Transaction costs economics is concerned with the governance structures of economic transactions and factors affecting the choice of structure. The approach sees markets and hierarchies as alternative governance mechanisms for completing transactions (Williamson, 1975). The basic assumption is that market-mediated transactions are preferred to organising internally when transaction-specific investments are below required internal investments (Williamson, 1979). In other words, a firm's goal is to minimise the sum of production and transaction costs. Transaction costs are determined by frequency, specificity, uncertainty, limited rationality, and opportunistic behaviour. Non-specific transactions are efficiently organised by the markets, while recurrent transaction-specific exchanges are more

efficiently governed internally. Thus, highly specific assets are more likely to be internalised or vertically integrated by a firm. Theoretically, volatility of the firm's environment should lead to a situation where the firm avoids ownership and tries to retain flexibility by shifting the risk to outsiders (Ibid.). However, the combination of uncertainty and asset specificity decreases flexibility. Thus, the likelihood of vertical integration increases with the increase of uncertainty in either environmental changes or the parties' compliance with their contractual obligations (Williamson, 1981).

The transaction costs theory has been applied also in the context of international business. Anderson and Gatignon (1986) have used it as a basis for their framework for analysing the efficiency of foreign entry modes. The efficiency of an entry mode depends on four constructs that determine the optimal degree of control: transaction-specific assets, external uncertainty, internal uncertainty, and free-riding potential. The default hypothesis is that low-resource commitment is preferable until proven otherwise. Still, despite these latter applications, transaction cost economics provides only a partial explanation for why firms select partnerships over other agreements (Yli-Renko, 1999).

The transaction costs theory is often referred to as the foundation for the outsourcing strategy. However, because of the evolution of the outsourcing practice, the depicted relationships have moved beyond arms-length transactions this theory addresses. Thus, the transaction costs approach can be seen to be insufficient for explaining the extent of the current state of the outsourcing phenomenon (Hätönen and Paju, 2009). Similarly, cooperation in product development is not a mere arms-length transaction, but it involves continuous interaction among actors. Therefore, the transaction costs theory was not considered suitable as a theoretical basis for this study.

Foreign activities of companies can also be reviewed in the light of Dunning's eclectic paradigm, which provides an analytical tool for reflection on the international allocation of resources and the exchange of goods and services between countries (Dunning, 1995). The explanation of the approach for international economic involvement is based on both the location-specific advantages of countries and the ownership-specific advantages of enterprises.

The eclectic paradigm specifies three different types of advantages: location-specific, ownership and internationalisation advantages. Location-specific advantages are available to all firms, but they have to be used where they are located. Ownership-specific advantages are internal to the enterprise, but can be used with other resources in the home country or elsewhere. They originate from exclusive possession and use of certain kinds of assets, as well as from size, monopoly power, and ability of subsidiaries to benefit from the endowments of the parent company. Internalisation advantages originate from the existence of market imperfections, either structural or cognitive ones. Activities are internalised in order to avoid the disadvantages or to capitalise on the advantages of imperfections or imbalance in external mechanisms of resource allocation, such as the price system and public authority fiat. (Dunning, 1995)

The main focus of the approach is the selection of optimal locations and operation modes. Trade and foreign production are seen as alternative forms of international involvement. Dunning (1988) distinguishes three main types of international production: market seeking, resource seeking and efficiency seeking. Market-seeking production substitutes import. Resource-seeking production is supply-oriented. Efficiency-seeking production is a rationalised investment. However, because of the generality of the eclectic paradigm, it has

only limited power to explain particular kinds of international production or the behaviour of individual enterprises (Ibid.).

The eclectic paradigm is predominantly concerned with the existential matters of multinational enterprises and the reasons behind their expansion and growth. Consequently, research has concentrated on larger companies, and the scope of examined operations has mostly covered foreign direct investments, subsidiary operations and evolution of multinational companies. This approach is especially typical for American researchers, whereas European researchers are more interested in the internationalisation of smaller companies with a limited domestic market (Nummela, 2000). Because the focus of this study is on small and medium-sized enterprises and contractual cooperation, the eclectic paradigm was considered difficult to apply as a theoretical basis for this study.

3.5 Summary of the theoretical background and research gap

Following the preliminary literature review, an a priori conceptual framework for the research was constructed (Figure 6). Although not being all-inclusive, the framework provides a preliminary grouping for the factors relevant in the inspection of the phenomenon. The general factors affecting offshore sourcing decisions have been classified into 1) internal characteristics of the firm, 2) the firm's product development strategy, and 3) aspects of international networks.

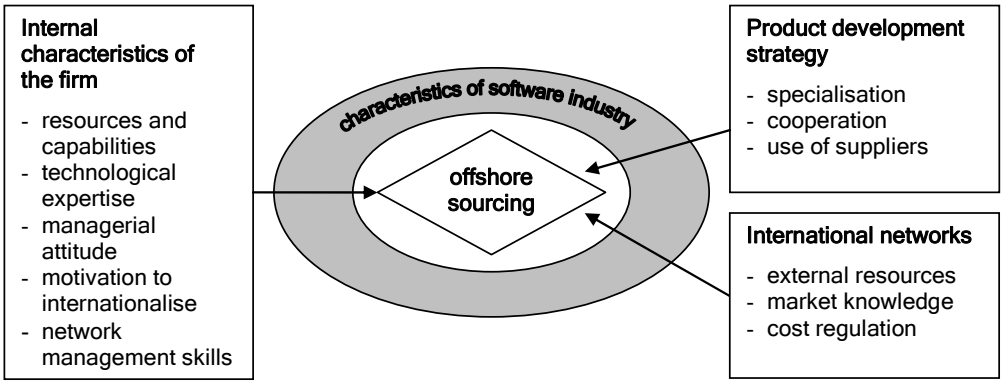

Figure 6: A priori conceptual framework of the study

The internal characteristics of the firm include general concept of resources and capabilities, and more specifically technological expertise of the firm, because of the focus on cooperation in product development activities. The influence of an enterprising decision is acknowledged by including the concept of managerial attitude, which affects motivation for the formation of interorganisational relationships. The motivation to internationalise refers to international cooperation in particular. The concept of network management skills refers to ability to manage relationships with various suppliers. The firm's product development strategy has been singled out as a separate factor, since product development is the object of offshore sourcing in this study. The factor is divided into specialisation, cooperation in general, and use of suppliers (i.e. sourcing). Whereas the first two factors chiefly explain the

motivation for sourcing regardless of the origin of a supplier, the international networks factor was added to explain the motivation for sourcing from foreign suppliers in particular. The reasons for such cooperation include access to specific external resources and market knowledge, as well as cost regulation by sourcing from countries with a lower wage level. When conducting a more extensive literature review, it was decided that the three most relevant streams of academic discussion are the topics of resources and capabilities, product development cooperation, and networking and international cooperation.

The study looks at motivational factors for the formation of interorganisational relationships. Because the objective of the thesis is to provide a holistic view on factors affecting decisions about offshore sourcing in software development, the theoretical background needed to incorporate several theoretical approaches. This chapter proposed that the decision about offshore sourcing can be understood as an intersection of perspectives addressing resources and capabilities, product development cooperation, and networking and international cooperation. The approach of the resource-based view to a firm is that it is a collection of productive resources, which also determine the firm's competitive advantage. The need for resources in product development activities motivates cooperation with external actors. The resource ties and activity links create a network in which the firm operates. The chosen focus of the study is the strategic rationale at the company level, in particular in small and medium-sized enterprises. Thus, international entrepreneurship and strategic networks were also discussed in the literature review. Furthermore, challenges of international cooperation were briefly described, because they were seen to affect the motivation for cooperation with foreign suppliers. Offshore sourcing in product development is a new and relatively little studied field. The novelty of the context of this study comes from the combination of product development, contractual cooperation in the form of sourcing, and cooperation with foreign suppliers.

The resource-based view assumes heterogeneous distribution of resources across firms and imperfect mobility of resources. However, its applicability for this study is limited, as it mostly concentrates on internal development of resources. The relational view presents some applications of the resource-based view in cooperative settings. It suggests that cooperative relationships can provide a firm access to critical resources and create interorganisational competitive advantage. Nonetheless, the question how firms decide to use cooperative relationships to access resources instead of creating them internally has not been extensively studied in the context of resources and capabilities.

Product development is one of the most complex activities of the firm and there are many related uncertainties. The availability of resources for product development is a topic of high strategic importance for a firm, especially taken into consideration the constantly increasing complexity and resource consumption of product development activities. Strategic cooperation in product development has often been thought to be limited to equity forms of cooperative agreements. However, non-equity agreements are becoming more common, which is particularly apparent in high-technology industries (Narula and Hagedoorn, 1999). The trend is motivated by changes in the business and technology environments, as well as lower organisational complexity of such agreements. Based on the literature, it appears possible that cooperation with suppliers providing complementary resources can significantly contribute to product development activities of a firm, while allowing it to retain its flexibility. The study aims to identify if this proposition is a motivational factor in the context of offshore sourcing in software development.

Cooperation in product development leads to a situation where product development can be seen as a process that exceeds the company's boundaries and involves a network of relationships. Network relationships interlink activities, resources, and actors. The industrial network approach addresses the question how firms are able to identify and have access to the resources needed to build up and exploit their competitive advantage (Johanson and Mattsson, 1988). Consequently, the approach sees product development and the development of relationships as connected processes. The decisions about the extent and type of interaction with external actors are strategically important, because they affect the amount of available resources, the intensity of the relationship and the level of dependency on a single supplier.

Inter-firm cooperation across national borders provides firms access to distinct resources available at different locations. By increasing their involvement in international business activities, firms become more and more internationalised. Cooperation with foreign suppliers in product development activities can be seen as a form of inward internationalisation. Inward activities can provide a firm with valuable resources and thus enhance internal functions, but they have typically been considered low-status activities. Similarly, past studies of international entrepreneurship have paid little attention to internationalisation of the firm's value chain (Zahra and George, 2002). However, a network of relationships can allow the firm to increase its competitiveness even when there are liabilities of smallness and newness (Jarillo, 1989). Based on the literature, it appears possible that inward internationalisation in the form of cooperation with foreign suppliers in product development activities can be used to supplement the strategic competences of a firm. Thus, it could provide a motivational factor and affect decisions about offshore sourcing in software development. The study aims to identify if international cooperation holds strategic importance for a firm in the context of offshore sourcing in software development.

4 Methodology and research design

This section concerns the methodology and research design of the study. The chapter also addresses the criteria for judging the quality of the research and discusses the validity, generalisability and reliability of the results.

4.1 Research methodologies

Applying a methodological approach is not straightforward and without conflict. Choice of a particular approach shapes observations, understanding and explanation, for each approach postulates certain constitution of reality. (Arbnor and Bjerke, 1997)

The main philosophical choices underlying management research are inherited from the social sciences. Two focal traditions in the philosophy concerning the research design are positivism and phenomenology. The key idea of positivism is that the social world exists externally, and that its properties should be measured through objective methods rather than be inferred subjectively. Conversely, according to phenomenology, the world and reality are subjective and socially constructed rather than objectively determined. The positivist viewpoint is associated with such propositions as independence of the observer and value-freedom of science. Phenomenology emphasises the observer as a part of what is observed and human interests as the driver of science. Likewise, the positivist and phenomenological paradigms differ in their views on what the researcher should do and which methods use (see Table 4). (Easterby-Smith et al., 1991)

Table 4: Positivist and phenomenological paradigms (Easterby-Smith et al., 1991, p.27)

	Positivist paradigm	**Phenomenological paradigm**
Researcher should:	- focus on facts - look for causality and fundamental laws - reduce phenomena to simplest elements - formulate hypotheses and then test them	- focus on meanings - try to understand what is happening - look at the totality of each situation - develop ideas through induction from data
Preferred methods include:	- operationalising concepts so that they can be measured - taking large samples in order to enable generalisation and cross-sectional analysis	- using multiple methods to establish different views of phenomena - small samples investigated in depth over time

The strength of the positivist paradigm and related quantitative methods is that they can provide wide coverage of the range of situations, as well as being fast and economical. The clarity of the method makes the research transparent and possible replication easier. Furthermore, statistics aggregated from large samples may be of considerable relevance to policy decisions. However, these methods have some weaknesses, as they tend to be rather inflexible and artificial. They are not very effective in understanding processes or the significance that people attach to actions. They are to a lesser degree able to contribute to generating theories. Furthermore, because of their focus on recent or current events, they do not specifically support decision-making on future actions. The phenomenology paradigm and the associated qualitative methods have strengths in their ability to look at change processes over time, to understand people's meanings, to adjust to emerging new issues and ideas, and to contribute to the evolution of new theories. The data gathered with this

approach is seen as natural rather than artificial. On the weakness side, the data collection can take up a lot of time and resources, and the analysis and interpretation of data can prove difficult. In qualitative studies, it is harder to control the pace and progress than in quantitative ones. Furthermore, a phenomenological approach may result in lower credibility of a study for policy-makers. (Easterby-Smith et al., 1991)

The study uses the phenomenological paradigm as a foundation. The aim of the present study is to provide a holistic view on factors affecting decisions about offshore sourcing in software development. In other words, trying to understand what is happening and why. In comparison, the hypothesis testing approach requires that there is initial clarity about what is to be investigated (Easterby-Smith et al., 1991). Pihlanto (1994) argues that action-oriented hermeneutic approach is well suited to management studies with a practical orientation, especially when the aim of a research is to provide profound understanding of management actions. "Why" and "how" types of research questions are likely to lead to the use of qualitative methods, such as case studies, histories and experiments (Yin, 1994).

The case study approach is a suitable method for in-depth investigation of a phenomenon (Yin, 1994). A case study approach was also chosen because of the scarce amount of information on the subject and its complexity, as there are several theoretical disciplines involved (Eisenhardt, 1989). For the purpose of understanding, it is more important to clarify the deeper causes behind a phenomenon and its consequences than to describe the symptoms and their frequency (Flyvbjerg, 2006). Such insight cannot be achieved with random samples. Instead, it requires information-oriented selection of cases (Ibid.). In addition, when seeking case companies for this study, it was noticed that there is reluctance among companies to openly bring forth their experiences in sourcing, which substantially limited the accessibility of potential cases and affected the research design. Especially getting data on failed sourcing arrangements can be difficult due to the problem of gaining access to dying relationships (Tähtinen, 2001).

4.2 Research design

This section describes the details of the conducted case studies and the way the data was analysed. Altogether, there are eight cases in this study, which are grouped into two subsets for clarity. The discussion related to the Finnish case companies is referred to as Study 1 and the one related to the Russian case companies as Study 2.

4.2.1 Case study as a research method

The description of the research process in the next section is structured according to the steps for building theories from case studies (Figure 7). The process presented by Eisenhardt (1989) has a positivist view of research, as it is directed toward the development of testable propositions and theory which can be generalised across settings. Although this study does not aim at such generalisation, it was decided to describe the conducted procedures through the stages of the theory building research due to the clarity and elaborateness of this roadmap.

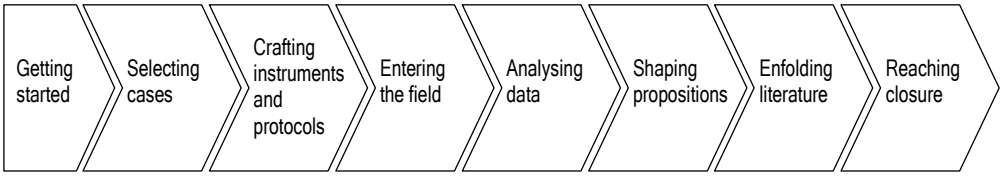

Figure 7: Process of building theory from case study research (adapted from Eisenhardt, 1989)

Definition of the research question
Ideally, in the beginning of a theory-building research, there should be no theory under consideration and no assumptions to test, in order not to bias or limit the findings by preordained theoretical perspectives. Instead, one should formulate a research problem and possibly specify some potentially important variables, with some reference to existing literature. An initial, tentative definition of the research question enables a researcher to specify the kind of organisation to be approached and the kind of data to be gathered. (Eisenhardt, 1989)

Selecting cases
The population defines the set of entities from which the research sample is to be drawn. Furthermore, the selection of an appropriate population controls extraneous variation and helps to define the limits for generalisation of the findings (Eisenhardt, 1989). The selection of cases can aim at replication of previous cases, extending emerging theory, filling theoretical categories, or providing example of polar types (Ibid.). Another point of consideration is the replication logic. Cases should be selected so that each of them either predicts similar results (literal replication) or produces contrasting results but for predictable reasons (theoretical replication) (Yin, 1994).

Crafting instruments and protocols
Case studies typically combine such data collection methods as documents, archives, interviews, questionnaires, observations and physical artefacts (Yin, 1994). Flexible and opportunistic data collection methods allow the investigator to take advantage of emergent themes and unique case features (Eisenhardt, 1989). However, in small business research, it has been noticed that the key decision makers show disinclination for completing questionnaires (Bell et al., 2004). Furthermore, making an enquiry is typically complicated by a lack of published information (e.g. shareholder reports, commercial analyses) and poor recording of internal data (Carson et al., 1995). It was noticed early in the empirical study that the data would be mostly limited to the interviews, because of scarce availability of written material. Observations were excluded because no on-going cooperation decision process was available for inspection at that moment. As a consequence, the study was chosen to be conducted qualitatively through in-depth interviews with the representatives of the selected case companies. The Interview guide approach (Patton, 1990) was chosen over standardised open-ended interviews or questionnaires to ensure richness of material. The goal was not to gather quantifiable data, but to construct a holistic picture of the phenomenon.

Entering the field
Marshall and Rossman (1999) distinguish elite interviewing as one specialised form of interviews. It focuses on a particular type of interviewee – those considered to be influential,

prominent, or well-informed people in an organisation. Elites can usually provide an overall view of an organisation or its relationship to other organisations (Ibid.). Furthermore, they are able to report and elaborate on an organisation's policies, past histories, and future plans from a particular perspective. In theory-building research, data collection frequently overlaps with data analysis, which allows researchers to make adjustments during the data collection process (Eisenhardt, 1989). The researcher is guided by initial concepts and developing understandings, but they are modified alongside the data collection and analysis (Marshall and Rossman, 1999). This can mean addition of questions to an interview protocol or addition of data sources, to take advantage of emerging opportunities. In order to maximally exploit the interviewees' expertise and experience, the topical guides were adjusted during the data collection.

Analysing the data

In qualitative studies, data collection and analysis go hand in hand to build a coherent interpretation of the data (Marshall and Rossman, 1999). According to Eisenhardt (1989), the first stage is within-case analysis. It involves detailed case study write-ups for each site. The idea of this stage is to become familiar with the data and to set up preliminary theory generation (Ibid.). Each case is examined as a stand-alone entity before looking for patterns across cases. The analysis is continued with cross-case comparison. This means looking for the presence of constructs across multiple cases and examining whether similar themes emerge in multiple settings (Miles and Huberman, 1984; Eisenhardt, 1989). The process of category generation involves noting patterns expressed by the interviewees (Marshall and Rossman, 1999). For editing and immersion strategies, the categories are generated through prolonged engagement with the data in text form (Ibid.). The segments of text are then placed into these categories.

Shaping propositions

The purpose of this stage is to sharpen constructs and theory, and verify relationships. Internal validity is built through search for evidence for "why" behind the relationships. The emergent frame should be iteratively compared with the evidence from different cases. (Eisenhardt, 1989)

Enfolding the literature

The emergent concepts and theory need to be compared with the existing literature. Comparison with conflicting literature increases the confidence in the findings and builds internal validity, whereas comparison with similar literature enables wider generalisability and higher conceptual level. This stage is particularly important if the findings are based on a very limited number of cases. (Eisenhardt, 1989)

Reaching closure

Ideally, a research should be continued until it reaches the point of theoretical saturation, but it is not uncommon to plan the number of cases in advance due to the availability of resources and time constraints. Eisenhardt (1989) recommends conducting 4 to 10 cases in order to have a manageable, but convincing level of complexity. The iteration between theory and data has reached its saturation point when the incremental improvement to theory is minimal. The outcome of the process can be concepts, a conceptual framework, propositions, or middle range theory (Ibid.). The latter is a solution to a problem that contains a limited number of assumptions and considerable accuracy and detail in the problem specification (Weick, 1989).

4.2.2 Data collection and analysis

This research was set in motion by observation of cooperation between a Finnish software company and its Russian supplier. Although it was not possible to include the customer company as a case in this study, the apparent success of this cooperation roused the question regarding the scarcity of literature on international cooperation in product development on contractual basis. The research domain was formulated as motivation for offshore cooperation in product development. Software development was chosen because of its informational nature and knowledge-intensity, and the existence of globally dispersed resources. It was decided to limit the current examination to cooperation between Finnish and Russian companies to account for the possible effect of diversity of national origin.

The selection of the companies for Study 1 (Finnish cases) was based on purposeful sampling (Patton, 1990). The criteria were having software product development activities and experience of cooperation with Russian companies. Because it was not possible to inspect the actual decision-making process, it was decided to look at cooperation experiences and the underlying rationale for offshore sourcing. The chosen companies were known to have been utilising sourcing to Russia in their software development activities. This information was acquired from the references of the Russian software companies published on their web sites. As a consequence of the selection method, the sample is in a certain sense biased. It can be assumed that when granting permission to use the company's name in a public reference, a company has a more or less positive attitude towards offshore development. However, according to a survey made for the Ministry of Trade and Industry of Finland (Market-Visio, 2002), the total number of Finnish software companies utilising offshore sourcing is limited and such arrangements are rarely publicised. Therefore, the chosen selection method can be considered justifiable.

Based on Internet references, eight Finnish software development organisations (either software companies or software development units within a company) were approached by phone and asked to participate in the study in autumn 2002. Four of the contacted companies agreed. One company declined because of the strategic importance of the subject to their operations. From their point of view, participation in the research would be considered a breach of security. In another company, the explanation for refusal was that they do not tell about their activities in Russia unless there are some direct benefits for the business. One company was going bankrupt and its managing director refused on the basis that the issue was not current to them anymore. One company was discarded because it proved to be from a different industry. At this point, the representatives of the companies that agreed to participate were asked who would be an appropriate interviewee. The sourcing activities of the companies were briefly discussed in order to provide a basis for composing the actual interview questions.

The case companies in Study 1 (Table 5) represent different kinds of software development organisations, including a communications operator, a mobile technology company, a software project organisation, and an entertainment applications developer. Three of the companies are SMEs. It was decided to have one larger company in the sample to serve as a point of comparison. Thus, the companies represent polar types in regard to firm size. It was expected that small firms would provide literal replication and the larger company possibly some theoretical replication. The experience in sourcing varied between twenty years and a little more than a year. All four companies are familiar with sourcing to several countries, and each of them has at some point used the services of a Russian company for software

development. Due to rearrangements that have taken place after the original interviews in the case companies, the software unit at company Gamma has ceased to exist.

Table 5: Study 1, Finnish case companies

	Company Alpha	**Company Beta**	**Company Gamma**	**Company Delta**
Business offering	Communication	Mobile software	Software projects	Mobile games
Sourcing since	1980s	1994 (domestic) 1997 (offshore)	1995	2002
Domestic sourcing	Yes	Yes	Yes	Yes
Offshore sourcing	Several countries, including Russia	Poland, Serbia, Romania, Russia, USA, Western Europe	Germany, Norway, Russia	Iran, Russia

In order to better understand the motivation for cooperation between Finnish software firms and potential Russian suppliers, it was decided to supplement the research by interviewing representatives of Russian software companies. The material from the four Russian case companies constitutes Study 2. The selection can be described as a convenience sample, because of previous contacts with three out of the four case companies and knowledge of their activities. The fourth case company, Avantlab, was suggested during the interview by the manager of the Scandinavian Group, a virtual community created to promote member companies on the Scandinavian, at the moment particularly Finnish, market. The selected companies (Table 6) constitute a good representation of the type of Russian organisations providing software development services to foreign clients. The companies in Study 1 and Study 2 are treated independently of each other. Thus, the study does not look into actual dyadic relationships between Finnish clients and Russian suppliers.

Table 6: Study 2, Russian case companies

	Arcadia	**AvantLab**	**Digital Design**	**Lanit-Tercom**
Year founded	1993	2003	1992	1991 (originally state enterprise Tercom)
Number of employees	around 100	8 programmers and 3 managers	210	over 700 in offshore development
Office locations	Saint Petersburg Subsidiaries: USA and Finland	Saint Petersburg	Saint Petersburg (3), Moscow	Saint Petersburg, Moscow, Novosibirsk, Minsk
Foreign clients	Finland, Norway, Sweden, UK, USA	Netherlands, Finland, Germany, Switzerland, USA	e.g. Sweden, Finland, Germany, UK, USA	e.g. Germany, Denmark, Finland, Sweden, Switzerland, Japan, USA

The topic guide for the first round of interviews in the Finnish companies (Appendix 1) was based on the following issues emphasised in the preliminary interviews: motivation for sourcing, strategic significance of sourcing, special characteristics of sourcing in knowledge-intensive industry, and possible evolving of sourcing activities into partnership. In order to better comprehend the interviewees' opinions, a form was crafted, juxtaposing different views on sourcing presented in the literature (Appendix 2). The topic guide for the second round of interviews dealt with the same themes, but with more emphasis on international cooperation with suppliers in general (Appendix 3). The topic guide for the interviews in the Russian companies emphasised the aspects of cooperation with foreign clients (Appendix 4).

In Study 1, the first round of interviews was carried out during summer-autumn 2003. In each company, the person responsible for strategic decisions, including offshore development, was interviewed (Table 7). Company Alpha is larger than the others and has a more complicated organisational structure. The person interviewed was an executive, with substantial amount of experience in contracting out different activities. In the rest of the companies, being small in size, the strategic responsibilities were typically accumulated to one person. In company Beta, the person interviewed was both the founder of the company and chairman of the board of directors alike. He was also responsible for operative management. The interviewees in companies Gamma and Delta were the managing directors. Also two follow-up interviews were carried out in Study 1. The representatives of companies Beta and Gamma were interviewed in March 2006 in order to update the data and expand the discussion beyond Russia. The emphasis of this round of interviews was on the use of networks in product development and organisational issues in product development distributed across company boundaries.

Table 7: Interview details, Study 1

Case company	Interviewee	Date of the interview	Duration
Alpha	executive	10.7.2003	40 minutes
Beta	chairman of the board of directors	6.10.2003 27.3.2006	64 minutes 73 minutes
Gamma	managing director	7.10.2003 21.3.2006	56 minutes 49 minutes
Delta	managing director	28.7.2003	48 minutes

The interviews for Study 2 were conducted in 2004 and 2005. Arcadia has been the subject of an extensive case study on Russian offshore software development published by the Northern Dimension Research Centre of Lappeenranta University of Technology (Väätänen et al., 2005). Several interviews were jointly conducted by me and my colleagues with the personnel of the company in autumn 2004 (see Table 8). Supplementary material was obtained from the Chief Executive Officer of Arcadia during 2005. Furthermore, the Northern Dimension Research Centre has published a case study on Digital Design (Selioukova, 2005). The material of these case publications was examined prior to the interviews conducted in December 2005 and taken into account in the analysis for this study. In AvantLab, the interviewee was the Chief Executive Officer. In Digital Design, the International Marketing Director was interviewed. In Lanit-Tercom, interviews were conducted with the Chief Executive Officer, the Chief Operating Officer and the Marketing Director. Each case company had experience of cooperation with Finnish companies in offshore software development activities. Thus, an emphasis was made on cooperation with Finnish companies in the interviews.

Table 8: Interview details, Study 2

Case company	Interviewee	Date of the interview	Duration
Arcadia	chief executive officer CEO and managing director business development manager chief production officer human resources manager administrative manager chief accountant	14.9.2004 30.9.2004 20.10.2004 20.10.2004 20.10.2004 21.10.2004 21.10.2004	95 minutes 104 minutes 82 minutes 55 minutes 76 minutes 74 minutes 40 minutes
AvantLab	chief executive officer	5.12.2005	80 minutes
Digital Design	international marketing director	7.12.2005	112 minutes
Lanit-Tercom	chief executive officer, chief operating officer, marketing director	6.12.2005	110 minutes

In both Study 1 and Study 2, the interviews were conducted in the interviewees' native language in order to reduce ambiguity. All interviews were recorded and transcribed, in addition to notes taken during the interviews. In Study 1, in company Alpha, the interview material was supplemented with two presentations given by the interviewee. In the other Finnish firms, secondary material regarding their offshore development activities was not available. In Study 2, the Russian companies provided an extensive account of their activities in the form of brochures, company presentations and information on web sites.

The data of Study 1 and Study 2 was analysed separately. Due to the small number of case companies in each study, it was not seen reasonable to further divide them into various categories. After conducting the interviews and transcribing them, individual case descriptions were written. In the joint publications, the co-authors were provided with detailed case descriptions. The analysis and conclusions were derived jointly, but the responsibility for the interpretation of the initial transcripts remains with the present author.

In Study 1, the Finnish cases, the next step was to compare the findings across the cases. Especially, I looked for similarities and differences between Alpha and the other companies. The rationale was based on the size difference of the companies. Next, an initial version of the framework presented in Chapter 6 was developed, with main entities being strategy, resources and capabilities, and entrepreneur. The data of the Finnish cases was re-examined in a second detailed analysis in search of within-group similarities and grouped into categories under the three main entities of the initial framework. Iterations of within-case and across-case analysis were continued until dominant findings emerged. The data for each theoretical construct was summarised in a table (Appendix 5), as this is an effective way to present the case evidence (Eisenhardt and Graebner, 2007). The data from Study 2, the Russian cases, was not reanalysed for the framework, but served as background information. The results of the second detailed cross-case analysis and the constructed framework have not been earlier presented in any of the publications of the second part of the study.

The initial framework was modified on the basis of the data analysis. The number of groups in the framework was increased to four, by adding a group labelled organisation. The contents of the groups were refined and some of the titles were revised to reflect the emphases in the data. Detailed descriptions of the groups were composed.

The resource-based view and industrial network approach have been combined by other authors when studying development of new technological solutions (e.g. Juntunen, 2005). Both approaches emphasise the key role of combining heterogeneous resources controlled by different actors in a network. Thus, based on the literature review, it appeared justified for the study to combine the viewpoints of cooperation, product development and resources. The writing of the theoretical background for the first part of the study increased confidence in the scope of the constructed framework and the chosen grouping.

4.3 Judging the quality of the research

According to Arbnor and Bjerke (1997), the research approach is always based on how a problem appears to the researcher. Thus, methodological issues are not just operative activities, but reflect the ultimate presumptions of the person conducting the research. Unless the chosen methods fit with both the problem under consideration and the ultimate presumptions, the employed methods will not be effective in the creation of knowledge.

According to Weick (1989), descriptions of the theorising process typically assume that validation is the ultimate test of a theory. Thus, theorising itself is the more credible the more closely it simulates external validation at every step. However, the concern for accurate representation and close correspondence between concepts and operations can actually be counterproductive to theory generation (Ibid.). Theory building is not a sequential process, but involves simultaneous parallel processing. Furthermore, the theorising process should be seen rather as sensemaking than problem solving. According to Van Maanen et al. (2007), when viewed as a cognitive process, the point of theorising is not to produce validated knowledge, but to suggest new plausible connections and relationships. Eisenhardt and Graebner (2007) stress that a theory is emergent in the sense that it is situated in and developed by recognising patterns of relationships among constructs within and across cases and their underlying logical arguments.

In the case of organisational problems, the theory building has to deal with the fact that organisations are complex, dynamic and difficult to observe. Thus, the thinking is always guided by indirect evidence and visualisations of what organisations may be like. Weick (1989) argues further that interest is a substitute for validation during theory construction. The assessment of interest represents a comparison between previous experience summarised into an assumption and a current experience summarised into a conjecture that questions that summary. Thus, the reaction through interest signifies falsification of an assumption. (Ibid.)

The quality of research can be judged by reviewing its construct validity, internal validity, external validity, and reliability (Yin, 1994). Construct validity refers to establishing correct operational measures for the concepts under study. It can be increased through triangulation and documenting the research process to make a traceable chain of evidence. Internal validity means that a causal relationship is established between explained events. It corresponds with the credibility in the criteria for the judging research, as presented by Lincoln and Guba (1985). External validity or transferability addresses the issue of generalisation. Reliability means that the operations of the study can be repeated with similar results, which corresponds with dependability. Furthermore, the research needs to be confirmable, meaning that the researcher should demonstrate the neutrality of the research interpretations (Ibid.). The different aspects of the validity and reliability of this study are evaluated in the next section.

4.4 Validity, generalisability and reliability of the results

Qualitative methods, including case studies, have been criticised for seemingly allowing more room for the researcher's subjective and arbitrary judgement as compared to quantitative methods (Flyvbjerg, 2006). However, the case study method has its own scientific rigour. In fact, the issue of subjectivism and bias towards verification applies to all methods, for arbitrary subjectivism is similarly present in the choice of categories and variables for a quantitative investigation (Ibid.). The applicability of the case method should be determined by the nature of the problem and its formulation, including low theory development, complex nature, and need to be studied in a natural context (Bonoma, 1985). The decision to use the case study approach in this study was motivated by fulfilment of these conditions. Furthermore, the case study method enables looking at real-life situations and testing views directly in relation to phenomena, which means that the researcher's initial assumptions are more likely to be revised based on the feedback from the study objects (Flyvbjerg, 2006).

Validity is an indication of the soundness of research. It can be divided into construct validity, internal validity and external validity (Yin, 1994). Construct validity evaluates the operationalisation of constructs. It can be improved by triangulation and documenting the research process. The research process of the study was thoroughly documented in Chapter 3 to demonstrate the chain of evidence. Triangulation refers to combination of methodologies or sources of evidence in the study of the same phenomenon (Miles and Huberman, 1994; Yin, 1994). In this study, triangulation proved to be difficult, because of the scarce availability of written material and infeasibility of observing the actual decision-making process. Interviews are subjective, and knowledge is co-produced by the interviewer and interviewee at a particular time and place (Piekkari and Welch, 2004). However, interviews are often the primary data source in research on intermittent and strategic phenomena, such as strategic decision-making (Eisenhardt and Graebner, 2007). Similarly, in-depth interviewing is a well-established method of gaining access to business elites and often used in international business research (Welch et al., 2002). Using corporate elites as informants can provide a rich set of data if the interviewees speak openly (Ibid.). In conducting the interviews for the present study, the role of the researcher was that of an informed outsider, to encourage dialogue and reflection as suggested by Welch et al. (2002). By including Study 2 with a diverse perspective, the aim was to mitigate the potential risk of retrospective sensemaking by the informants.

Cross-cultural interviewing has additional issues, such as equivalence of meaning across cultures, power implications and different interview dynamics (Piekkari and Welch, 2004). The researcher was able to conduct interviews with both Finnish and Russian case companies in the interviewees' native language, with high reliability in understanding the meaning correctly in both cultures, due to the personal background of the researcher. Language affects the entire research process essentially, including the selection of research phenomena, formulation of questions, access to potential interviewees, and translation of data into publication language (Ibid.).

Internal validity refers to the existence of a causal relationship between the explained events. The data analysis underlying the constructed framework has been included in the study (Appendix 5) to show the logic of interpretation. The publications in the second part of the study are highly descriptive. This approach was chosen to make the data intelligible to readers. Descriptiveness adds to the trustworthiness of the study, in other words the question of how an inquirer can persuade the audiences that the research findings of an inquiry are worth paying attention to (Lincoln and Guba, 1985). Another reason was to prevent critique for the lack of insight about context sometimes attributed to studies with multiple cases (Dyer and Wilkins, 1991). The likelihood of causality was improved by the selection of knowledgeable informants who were able to elaborate on motives for cooperation with suppliers, providing examples from their personal experience.

Reliability answers the question of whether similar observations would be made by different researchers on different occasions (Miles and Huberman, 1994). Taking into account the research design, the researcher affected the information-gathering process and influenced the direction of the conversation in the interviews. Due to the organisational context of the study and the employed research design, complete replication of the research process is unlikely to succeed in execution. Despite adding confidence and robustness to the findings, replication as such does not ensure generalisable results (Yin, 1994; Miles and Huberman, 1994). The reliability of the findings can be evaluated by different observers by examining the provided data analysis and the consequent framework. The drafts of several publications of the second part of the study were sent to the interviewees for commenting as a validity check to ensure

the correctness of the interpretation. The received remarks were taken into account in the data analysis and the publications. In the joint publications, the co-authors were provided with detailed case descriptions, and the analysis and conclusions were made jointly.

External validity or generalisability is the degree to which the results of a study are applicable to a wider variety of circumstances. Making generalisations involves a trade-off between internal and external validity (Lincoln and Guba, 1985). The why-nature of the research question motivated the choice of the case study approach. The goal was to shed light on the phenomenon and develop propositions for further inquiry rather than to produce results generalisable to a larger population. The findings of both Study 1 and Study 2 rely on information from several companies. However, the number of case companies is limited and constitutes the main limitation for generalisability. Theoretical sampling means that the cases were selected because of their particular suitability for illuminating and extending relationships and logic among the constructs (Eisenhardt and Graebner, 2007). Analytical generalisation refers to generalising results to some broader theory, as opposed to statistical generalisation to population, which makes it applicable for interpreting the results of case studies (Yin, 1994). I believe that the constructed framework applies to international cooperation in software product development in SMEs. The factors of the framework are likely to apply to even larger companies, but the degree of significance of different factors remains undefined.

Stake (2000) has argued that the purpose of case studies is naturalistic generalisation, where readers can use the results in the context of their interest after being provided with thorough knowledge of the particular object of examination. Such naturalistic generalisation could occur in larger product development context outside the software development industry. Also companies in other industries characterised by a turbulent environment and knowledge-intensive product development activities could display similar multidimensionality of motives in international sourcing decisions. Thus, the ideas and the framework generated in this particular setting could also apply in other settings, making the results generalisable (Easterby-Smith et al., 1991), but this would have to be proved by further research.

Due to the nature of qualitative research, no exact evaluation of the validity and the reliability of the research can be provided. The results of the study have been generated in a specific context and this has to be taken into account in evaluating the generalisability of the findings. By providing detailed information on the research design and the above discussion on the details related to validity and reliability, I believe the study to have wider applicability.

5 Summary of the findings

The main research objective of this thesis is to provide a holistic view on factors affecting decisions about offshore sourcing in software development. The publications in the second part of the study discuss motivation for offshore sourcing with different theoretical focuses. This section contains clarification of the objectives of individual papers, review of the results and assessment of their contribution to the research topic. Research papers 1 and 2 are based on the material from the first interview round in the Finnish case study. Research paper 5 was written on the basis of combined materials of the two interview rounds with the Finnish case companies, this time examining the development of cooperation over time. The results of the interviews with Russian companies are presented in paper 3. They are further discussed, together with the earlier findings of the Finnish case study, in research papers 6, 7 and 8. Paper 4 is a more general description of Russia as a potential location for product development cooperation, and it does not contain material from the cases. In relation to the theoretical background of the study, individual publications are positioned as presented in Figure 8. The detailed themes of individual publications are presented in Table 9.

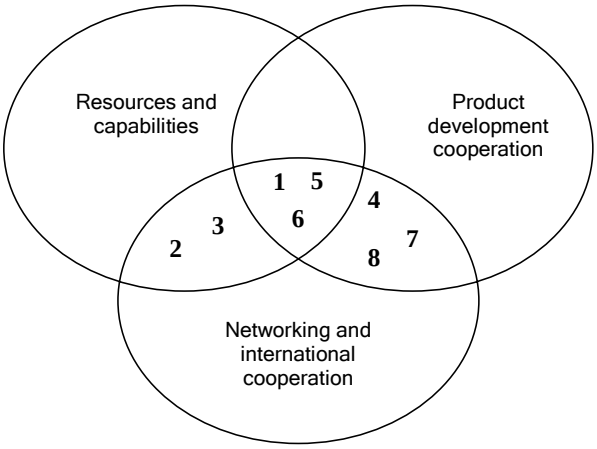

Figure 8: Publications in relation to the theoretical background

Table 9: Themes of the publications

	1	2	3	4	5	6	7	8
Resources and capabilities	■	■	■		■	■		
Product development				■	■	■	■	
Cooperation	■		■	■		■	■	■
Networking		■			■	■		
Internationalisation	■	■						
Russian software industry		■	■	(x)			■	■
Offshore software development	■	■	■		■		■	■

This chapter discusses each publication individually. A synthesis of the publications will be discussed in the next chapter. The framework presented in the next chapter is based on the findings of the publications in the second part of the study.

5.1 International cooperation in product development as a source of competitiveness

Product development has become increasingly complex and resource-consuming. Consequently, internal development capabilities can prove to be insufficient for maintaining a firm's competitive position. To preserve its competitive capabilities, a firm needs to maintain various types of technological expertise. However, doing everything internally is no longer feasible, as rapid technological advances occur on many fronts simultaneously (Heckman, 1999). The natural consequence of such a tendency is for a firm to specialise in limited areas of development. Thus, building a competitive advantage requires a firm to be able to supplement its internal resources with external ones, by engaging in relationships with various domestic and foreign actors. With the increasing amount of uncertainties related to the product development process, there is a growing need for flexibility and interorganisational cooperation even within this core activity. Especially for small firms, cooperation can be the key to improving their competitiveness against large firms. The ability to coordinate and manage this kind of network can in itself become a firm's core competence.

Publications #6 and #5 discuss how supplier networks are used to complement internal product development in software development organisations. In these papers, cooperation is seen as the key to improving competitiveness, especially in the case of small firms. The findings of both papers illustrate diversity in the sources of motivation for international cooperation in product development.

Publication #6, "Subcontracting product development – Creating competitiveness through networking", builds upon the network approach to supplier cooperation and the discussion on supplier cooperation in the ICT industry, concentrating on the role of external cooperation and networking as means for accessing complementary knowledge or resources. The focus is on understanding the motivation behind cooperative efforts between firms producing digital products or services. This approach differs from the more commonly presented discussion on manufacturing firms and the traditional view of the flow of materials from suppliers to manufacturers. Furthermore, the paper addresses contractual cooperation as opposed to ownership-based cooperation, more commonly discussed in the context of international relationships between firms.

The paper illustrates software product development cooperation with foreign suppliers through case studies on four Finnish software development organisations. It analyses the principal reasons for supplier cooperation in the case companies, and how cooperation has affected the internal processes and operational models of the firms. Despite the general assumption of cost minimisation as the main incentive for international subcontracting, the case studies bring forward several other incentives, such as accessing complementary resources, increasing flexibility and dealing with the turbulence of the industry.

The paper questions the assumption that contractual relationships are used only as short-term or tactical arrangements. Instead, it is suggested that the contractual supplier relationships of a firm can be divided into two kinds of networks, strategic and tactical. Retaining relationships on a contractual level provides manoeuvrability, by having access to a pool of external resources and capabilities. The paper describes the relationship between a firm's competencies and networking strategy, along with examples of complementarity of different types of supplier networks to a firm's activities. It is suggested that the capability to develop networks can in itself become a valuable asset for the company and improve its

competitiveness. *The paper clarifies different motivational aspects behind international networking in software product development and contributes to a better understanding of organising product development across a network of suppliers.*

Publication #5, "International product development cooperation in small software firms", continues in the similar line of argument. The paper concentrates particularly on international relationships and networks as sources of external resources. The theoretical part describes product development in a dynamic environment, as well as the relationship between product development cooperation and firms' resources and capabilities.

The paper discusses the rationale behind international networking in small firms, and contributes to a deeper understanding of the organisation of software product development across company boundaries. Specialised high-tech companies are compatible with a limited number of suppliers, which can be seen as an incentive for cooperation and use of suppliers in software development. The reasons behind cooperation with foreign actors, in particular, often include seeking for expertise or lower level of costs. These benefits are counterweighted by increased dependencies between firms, more complicated development processes and a grown need for communication.

Longitudinal case studies on two software development organisations are used to investigate the utilisation of external resources in software product development. The paper describes *how the firms' relationships with foreign partners have evolved over time and how this cooperation has affected the internal processes and operational models of each firm*. Especially for small companies, achieving product development goals can mean obtaining resources and capabilities through partners and networks. For the case companies, it has proven a functional solution to build their supplier network around complementary competences and technical know-how. Especially the high level of complexity in technical knowledge makes cooperation more attractive than developing all necessary capabilities in-house. However, the knowledge related to customers is more viable when maintained in-house to ensure the creation of long-term relationships with the clientele and a better commitment to joint projects. Due to the specialisation of suppliers, finding a suitable partner is likely to lead to international cooperation. On the other hand, if a company is experienced in operating in the global environment, this can also add to its competitiveness. The networking capability can in itself become a valuable asset for the company.

The findings of the case studies support the argument that distributed product development can contribute to the competitiveness of a small firm. The data illustrates how, through their network-like organisational structure, the two companies have been able to concentrate on their core competences and create an extensive offering of integrated products and services at the same time. The findings indicate that *the distribution of product development across organisational boundaries provides small companies with the means to mitigate the effects of uncertainty and turbulence*. Case companies have used a network of actors to access resources or capabilities rather than internalising them as the internalisation would require significant investments. If a capability is not focal, it is considered a better option to leave the capability to supplier, who is able to maintain its technical level and further develop it. Although the cooperation in the case companies is based on contractual agreements, it is of long-term nature. Furthermore, the importance of trust was emphasised in the relationships with strategic suppliers.

5.2 Offshore sourcing as a facilitator of a firm's internationalisation – The link between inward and outward internationalisation

Specialisation and scarcity of domestic resources can be seen as natural stimuli for international activities in terms of offshore sourcing. The main body of internationalisation research has concentrated on firms' expansion to foreign countries, that is to say outward internationalisation. Several researchers (e.g. Karlsen et al., 2003; Korhonen, 1999) have suggested that inward connections could be of a greater value to a firm were they not typically considered low-status activities. It can prove to be a short-sighted decision to ignore the potential contribution of inward activities to a firm's competitiveness, especially in global industries. New product development can often be an essential prerequisite to internationalisation of knowledge-intensive firms (Bell et al., 2004), but a firm may still lack some resources needed to execute the development. Thus, in certain situations, obtaining necessary resources through inward internationalisation can become a precondition for outward operations. The role of inward internationalisation is addressed in publication #1, the findings of which illustrate how offshore sourcing can contribute to a firm's internal processes and consequently affect its competitiveness on foreign markets.

The paper, entitled "Inward internationalisation in product development: The strategic role of offshore sourcing in software industry", examines the use of inward internationalisation in product development with the specific focus on offshore sourcing of software development. The perspective is founded on the literature on internationalisation and offshore sourcing. The theoretical premise of the paper is that inward internationalisation can be used to replenish the strategic competences of a firm. Similarly, the findings indicate that when sourcing is used for the product development purpose, it can become a substantial component of outward activities. If the inward activities are an essential part of product development, their effectiveness can indeed determine the success of outward internationalisation, as brought forward by Welch and Luostarinen (1993).

The emphasis of the empirical part of the paper is on software product development cooperation between Finnish and Russian companies. The data consists of case studies of offshore sourcing arrangements of four Finnish software development organisations. The findings indicate that offshore sourcing is a strategic activity instead of a clerical activity or a purely cost-driven phenomenon. The main incentive behind offshore sourcing has often been claimed to be cutting down costs. However, this argument is not so unequivocal when sourcing is used for product development purposes. Instead, according to the empirical study, the main goal of a sourcing arrangement can be to provide a firm with complementary resources and capabilities, or to shorten the development time through more extensive availability of similar resources. Sourcing can also be used to reduce the overall development costs, but there are additional costs of coordination and communication that have to be taken into account. On the whole, if successful, offshore sourcing can provide the flexibility needed to cope with the turbulence of the industry and the market. Moreover, when contributing to the quality of the final product or speeding up its development process, sourcing contributes to the outcome of the outward internationalisation activities. The data also emphasises the benefits of long-term relations with foreign suppliers, as it would appear that a long-term cooperation focus can mitigate some of the complications of communication between firms from different countries.

The main contribution of the paper is the insight that *the inward operations can enhance a firm's internal processes, such as product development, and affect the firm's prospects for*

outward internationalisation by enhancing its internal processes and improving its competitiveness. The findings deviate from the dominant view on offshore sourcing as a mainly cost-driven phenomenon. They emphasise the strategic aspects of sourcing and long-term relations with foreign suppliers instead.

5.3 Customer's and supplier's motivation for cooperation through offshore sourcing

The strategic rationale for cooperation is further discussed in publication #7, which provides a more extensive view on cooperation by incorporating motivational aspects from both the customer and the supplier side of a sourcing relationship. These motivational aspects are combined in a framework describing the selection of the preferred mode of cooperation. The paper, entitled "Aspects of learning in offshore software development cooperation", examines the selection of the cooperation mode in product development in the context of offshore sourcing in software development. The strategic decision-making of software companies, including decisions on cooperation patterns, is likely to be affected by the global nature and knowledge-intensity of the industry. The argumentation is based on the literature on cooperation and learning, as well as discussion on decision-making about the cooperation mode in software development.

The paper questions the applicability of the reasoning based on transaction costs in the context of product development activities. The suggested approach is to look at cooperation incentives other than costs, namely the strategic importance of the task on the customer side and learning necessity on the supplier side. The choice of the examined factors was motivated by an interest in the strategic decision-making of a firm. Whereas cost considerations are generally more short-term oriented, strategic aspects encompass the future development of a firm more extensively. The factors are combined into a framework describing the selection of the preferred mode of cooperation from the viewpoint of both the customer and the supplier. In building a mutually satisfactory sourcing relationship, it is important to find a fit between the strategies of the parties. Acknowledging different motivation of the parties provides important information for the decision-making on product development cooperation. In addition to theoretical viewpoints, the framework is based on observations in two empirical studies. The customer side is represented by four cases of Finnish software development organisations. The supplier side is illustrated by four cases of Russian companies representing the Russian offshore software industry.

The framework proposes that the customer's willingness to engage in a cooperation mode with higher commitment grows with the growth of the strategic importance of the joint activity for the customer. Thus, volume goals are sought through short-term cooperation and arm's length contracts, whereas complementary resources are more likely to be obtained through continuous cooperation or partnerships. However, if there is large number of potential suppliers, the customer may be more prone to changing suppliers and keeping to a cooperation mode with a lower commitment level. From the supplier's perspective, preference for cooperation with higher commitment increases with increase in the learning necessity. Thus, tasks based on repetition or requiring only minor learning can be handled through arm's length contracts, but tasks that require more learning are more likely to call for continuous cooperation or a partnership. However, the supplier needs to evaluate the technical attractiveness and future potential of a proposition. If there is large potential for applying newly learned skills or knowledge in other projects, the supplier may be more prone to agreeing to cooperation with a lower level of commitment.

The paper argues that *incorporating foreign suppliers in the firm's resource base is a strategic decision, which requires extensive information to ground the decision-making on. Finding a fit between the strategies of the parties is important for building a mutually satisfactory sourcing relationship, which can be further complicated by the international dimension.* The complementarity of goals in the cooperating firms is likely to lead to a more satisfactory outcome for both the customer and the supplier. The proposed framework takes into account a variety of factors affecting the cooperation rationale, in order to build a more holistic view of a cooperative relationship than presented earlier. The paper also provides a new approach to offshore software development by taking into account the perspective of organisational learning.

5.4 Potential for product development cooperation with the Russian high-technology sector

Any discussion on product development cooperation in offshore context has to take into consideration locational specifics. Thus, the potential for cooperation between Finnish and Russian organisations is rooted in the Russian innovation system and business environment. Publication #4, "The key success factors in product development co-operation – Case Russia", proposes that for product development cooperation to be successful, both organisational and cultural factors need to be acknowledged and managed.

The paper discusses the key success factors for cooperation in new product development with foreign partners. First, the paper provides a theoretical synthesis of critical success factors for distributed product development in cross-country settings. The success factors are elaborated further in the context of the Russian innovation system to illustrate challenges and opportunities in international cooperation. So far, the main interest of academic examination on Russia has dealt with access to market, productional cooperation and subcontracting. We argue that the potential of product development cooperation in innovative fields could be better exploited with acknowledging the critical success factors.

Distributed product development offers lucrative benefits, such as cost efficiency, sharing of financial risk of development, and access to specific know-how. It provides flexibility by extending the resource base for the firm's activities. In addition, international cooperation can offer strategic opportunities by enabling access to market-specific knowledge that can be used in search for new technological solutions or as route to new market entry. Nevertheless, there is strong debate over the strategic implications of distributed product development, including for example the risk of losing valuable knowledge to a partner and absence of learning in product development work. Although distributed product development offers tempting opportunities, implementation of the concept has been scarce, as it creates many managerial challenges. Changing markets are likely to force organisations to utilise joint development increasingly, but such endeavours should be carefully planned and executed to avoid potential risks.

The evaluation of the potential for product development cooperation between Western firms and the Russian high technology sector is based on an overview of the Russian innovation system, business environment and characteristics of Russian high-technology firms. The Russian national innovation system holds a lot of untapped potential for foreign firms, because of its strong science and technology base. On the firm level, the picture is less clear because of gross regional and firm-by-firm differences in regulation, customs, knowledge,

resources and willingness to cooperate. Russian firms' capability for long-term cooperation in product development is hard to evaluate. Because of limited internal finances and difficulties in getting external financing, the focus of management is mostly on day-to-day operations. Thus, it can be questioned if they are able to commit sufficiently to longer cooperative efforts. The cooperative arrangement should be designed in such a manner that there are also short-term returns, which enhance commitment and motivation. These peculiarities need not be obstacles for international cooperation, but they must be acknowledged and taken into consideration when planning distribution of product development. Nonetheless, there are great opportunities in product development cooperation despite the challenges in implementation. Especially the post-Soviet, technology-driven SMEs appear to be promising cooperation partners for Western companies.

The paper concludes that *in the context of international cooperation, both organisational and cultural factors need to be acknowledged and managed, as they dictate the rules of cooperation and determine the success of distributed product development.* Furthermore, the paper contributes by discussing the possibilities for cooperation in the field of technology and product development as opposed to the more common discussion of subcontracting in the manufacturing context.

5.5 Russian offshore networks as external resource pool for software development in Finnish IT companies

Publications #2 and #3 provide more details on Russian offshore software development industry. The main empirical focus is on the resources and capabilities that Russian companies are able to offer to their customers in the context of offshore software development. The extent and potential complementarity of offshore resources are topical issues that bring a valuable insight into software firms' product development process. Based on the industry data and the empirical studies reported in the publications, it appears that the Russian software industry has a good pool of resources and competences, combined with an attractive price-quality level.

Publication #2, entitled "Offshore networks in software development – Potential of Russian IT", bases its argumentation on the resource-based view of the firm and the network approach. Networking, in the context of the paper, refers to obtaining external resources for product development and engaging in relationships with other actors. The specific emphasis of the empirical part of the paper is on software product development cooperation between Finnish and Russian companies. The paper presents case studies of four Finnish software development organisations. It provides a description of the case companies' utilisation of external resources and cooperation practices with Russian companies. Furthermore, the paper reviews the general state of the Russian software industry. It analyses the resources available in the Russian software development industry and their potential for use in offshore sourcing.

The potential is evaluated by comparing the resources and qualification for cooperation of the Russian software industry to the needs of product development in the Finnish case companies. *The expectations that Western companies have about a high level of mathematical and scientific resources in Russia appear to be justifiable. For the four companies presented in the empirical study, this was one of the main reasons for subcontracting to Russia or cooperating with Russian individuals.* Other reasons included better availability of resources, lower level of costs and need for temporary increase in the

work force. Engaging external resources, instead of hiring own staff, was also a way of minimising risks related to changing economic trends and turbulence of the industry. The quality of the outcome was of high importance. Considering that the jointly developed software product is to be sold further to the firm's customer and will affect its sales and reputation, this inclination is rather natural. It is concluded in the paper that the Russian software industry has a good pool of resources and competences, combined with an attractive price-quality level. From the point of view of Finnish companies, a clear advantage of Russian sourcing firms is their near location and cultural proximity, despite some negative attitudes due to the past misfortunes. When the Russian companies gain more references, it will become easier for them to prove their trustworthiness and ability to work according to Western practices.

Publication #3 is entitled "Software emporium – Russian IT resources in offshore software development". The theoretical review consists of the aspects of international sourcing and the relationship between internal capabilities and external resources. The potential of the Russian industry is illustrated through a description of the business practices and models of four Russian offshore software companies. The needs of foreign companies are presented from the perspective of Finnish software development organisations, based on the results of an empirical study. Through the provided examples, the paper aims to gain a deeper understanding of the resources available in the Russian offshore software industry and their potential for use in offshore sourcing.

The determinants of choice for an offshore location have traditionally emphasised economic factors, such as salary level and purchase power parity. This approach may be well suited for describing the rationale behind shifting manufacturing activities to countries of lower costs, but it does not reflect all the diversity of decision-making regarding the distribution of knowledge-intensive activities to other countries. As illustrated in both the Finnish and Russian case studies, the decisions are based on combined incentives of resource availability, quality, specialised capabilities, efficiency, and cost.

Based on the empirical study, as well as the industry description, the main advantages of the Russian offshore software development industry are the availability of qualified technical personnel and experience in complicated projects. The reasons for cooperating with Russian firms included access to talented (scientific and mathematical) resources, the quality of work, and low costs. As compared to other potential outsourcing destinations, Russia may not be the cheapest, but it has an extensive pool of human resources with technical inclination. The capabilities in mathematical modelling are also high. Hence, there are good preconditions for cooperation in the development of high-end, complex software. However, prejudices concerning Russian firms are still a major obstacle for cooperation. The companies have traditionally been technology-oriented and only recently awoken to the need to market their services. This approach has not been particularly efficient in improving the image of the industry in the West.

The paper evaluates the compatibility of Russian offshore software development providers with the needs of their foreign customers. The main contribution of the paper is the presented illustration that *the Russian offshore software development industry lives up to its reputation in terms of availability of qualified technical personnel and experience in complicated projects, whereas marketing and specialisation would require additional efforts to make the offering more appealing for foreign customers.* Finnish software firms have for some time expressed interest in international sourcing, and Russia has often been nominated as a highly viable offshore location. However, despite the potential of the Russian offshore software

industry and the need for resources in Finnish firms, there appears to be a mismatch that originates partly in the perception of risk rather than actual experiences.

5.6 Supplier selection in Finnish-Russian offshore software development

Publication #8, "Collaborative relationships in Finnish-Russian offshore software development – Selecting the most suitable subcontractor", discusses supplier selection in the software development industry. The theoretical review describes different aspects of cooperation, including partner selection criteria, the selection process, and relationship types. The paper provides a preliminary insight into the selection criteria and the process in international cooperation in a knowledge-intensive industry, based on cooperation experiences in two countries. It is proposed that the supplier selection criteria in offshore sourcing in software development resemble those presented in the previous literature, but the selection process is not as straightforward as suggested earlier.

In the empirical part, the customer side is represented by four cases of Finnish software development organisations. The supplier side is illustrated by four cases of Russian companies representing the Russian offshore software industry. The paper does not inspect the actual selection process, but is based on material regarding existing relationships with suppliers, due to inaccessibility of material on the selection process. As many software companies are small in size, their decision-making on cooperation is rather informal, which justifies the qualitative research approach.

The supplier selection in the Finnish case companies was based on a combination of both task-related and partner-related criteria. The most important task-related criteria were skills and technological capabilities. The aspects related to markets were not considered important, as the case companies were not aiming for the Russian market. Typically, companies cooperated with different parties in development and sales tasks. The origin or location of development suppliers was considered to have lower significance as compared to the technical and organisational characteristics of an individual supplier. The quality of the work was rated high as a decisive factor. Even though the cost of the work was not considered to be the main decisive factor when choosing a supplier, it was also mentioned as affecting the decision. The most frequently mentioned partner-related criteria were ones related to the ease of cooperation, such as the compatibility of the organisational culture, trust, commitment, ease of communication, and prior ties of the company.

The supplier selection criteria in Finnish-Russian offshore software development cooperation resemble those presented in the previous literature. However, the paper questions the straightforward view on the selection process that presumes a clear definition of tasks and goals on the customer side. Similarly, in the discussion on offshore software development, it is generally thought that specification of requirements is the responsibility of the clients and the offshore supplier is only responsible for programming according to specifications. However, in software development, assignments are not necessarily clearly defined, but specification is refined as a joint effort between the customer and the supplier. Thus, the paper concludes that *partner selection in software development sourcing is not as straightforward an activity as could be assumed on the basis of previous research.* Furthermore, *decision-making in the customer company can be affected by both the nationality and institutional context of a potential supplier*, but it is difficult to evaluate their

importance if the company does not use formal criteria in the selection, as is often the case with small companies.

5.7 Concluding remarks

The main research objective of this thesis is to provide a holistic view on factors affecting decisions about offshore sourcing in software development. The objective can be divided into two subtopics: general reasons for international cooperation in product development and particular reasons for cooperation between Finnish and Russian companies. The key findings on these two topics are summarised in Table 10.

Table 10: Summary of key findings

Research topic:	**Main reasons affecting decisions:**
Why software firms engage external resources located in other countries in their product development activities?	• own specialisation • improving competitiveness • accessing complementary resources and technical know-how • shortening product development time • adding flexibility • dealing with uncertainty and the turbulence of the industry • regulation of fixed costs • limited availability of domestic suppliers
Why Finnish software development organisations cooperate with Russian offshore suppliers?	• high level of mathematical and scientific resources • availability of qualified technical personnel • experience in complicated projects • quality of work • lower level of costs • close location

The study questions the relevance of the transaction costs approach in a knowledge-intensive high-technology industry. Instead, it is proposed that offshore sourcing decisions can also be seen in the context of resources and capabilities. Based on the findings, offshore sourcing can enhance product development function and provide a firm with valuable resources. It is suggested that external resources obtained through offshore cooperation can be used to complement a firm's internal product development in a strategic way. Utilising an external resource pool can speed product development or provide complementary resources to reinforce a firm's own capabilities and competitiveness. Especially for small firms, sourcing is often a long-term engagement instead of a market transaction or an arm's length relationship.

6 Factors of offshore sourcing in software development

This chapter presents the framework, which was constructed based on the individual publications presented in Chapter 5, the detailed data analysis of Study 1 (Finnish cases) and the supporting material from Study 2 (Russian cases). The main research objective of this thesis is to provide a holistic view on factors affecting decisions about offshore sourcing in software development. The framework clarifies and groups the factors that influence offshore sourcing decisions. The framework is based on both theoretical discussion presented earlier and empirical evidence in the form of the data from the case companies (see Appendix 5 for data analysis of the Finnish case companies). Due to the availability of the data, the framework consists of factors that were considered significant in ongoing cooperation, as compared to inspecting factors taken into account during the actual decision-making process. In that sense, the research partly relies upon the retrospective contemplation of the interviewees. Detailed descriptions of offshore sourcing in the Finnish case companies are provided in the publications in the second part of the study (publication 1, 2 and 5) and this chapter provides only excerpts from the data. In the next sections, the terms *case study* and *case company* refer to Study 1 and the Finnish case companies.

6.1 Description of the framework

The goal of the framework is to form a holistic view on factors affecting the decisions about offshore sourcing in software development, capturing the multidimensionality of motives for entering offshore cooperation (Figure 9). The main contribution of the framework is in combining aspects presented in different theoretical approaches into one extensive model. Both theoretical considerations and empirical evidence are used in constructing the presented grouping of factors affecting the decisions about offshore sourcing. It is suggested that combining several perspectives increases the understanding of offshore sourcing in software development as a phenomenon.

The framework provides a detailed account of each group and the reasoning why each factor can motivate offshore sourcing, supported by the empirical evidence. The framework takes into account the fact that the decision-making is further influenced by the characteristics of the software industry, on both a general and a national level.

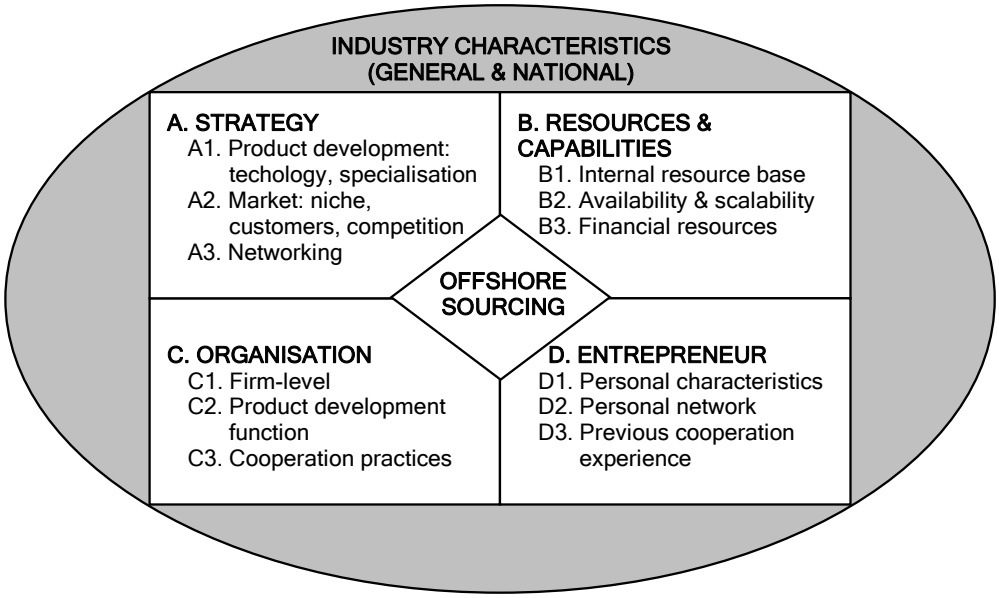

Figure 9: Factors of decisions about offshore sourcing in software development

Strategy-related aspects
This group consists of factors related to the product development strategy (A1), market strategy (A2) and networking strategy (A3) of a firm. The group has some common features with the ideas on strategic positioning of a firm and the principles of competitive advantage presented by Porter (1985). The networking factor is rooted in the industrial network approach (section 3.3.1). Excerpts of evidence from the data are presented in Table 11.

The product development strategy (A1) defines the firm's technological orientation and degree of specialisation. It reflects the firm's core activities and know-how in contrast to cooperative product development activities and the role of suppliers. Also the aspects of quality are included in this factor. Based on the data analysis, the firm's product development strategy is an important driver for sourcing. The case companies stressed that a firm cannot be internally skilled in everything, and the decision about what to concentrate on determines what to source externally. The supplier's capabilities and possible specialisation are more decisive than its location. Thus, offshore sourcing is preferred to domestic sourcing if it provides a better contribution to the features and quality of a product. The quality requirements for the suppliers originate from the price-quality relation defined in the product development strategy. Changes in product development strategy are reflected in the changing portfolio of suppliers or extent of sourcing. For example, an increasing degree of focus in technological competencies will lead to adjustments in the supplier network.

The market strategy (A2) answers the question of how the firm is positioned in terms of the targeted niche, customers, and competitors. It reflects the suppliers' role as a source of market-related information. The possibility of a supplier becoming a competitor is also taken into consideration in this factor. The case companies stated that the rationale for some sourcing relationships was access to the suppliers' knowledge of the target industry or local market. The actions of competitors can also motivate offshore sourcing. It was stated that there is pressure to use offshore sourcing because the competitors already have production in

countries with a lower wage level. On the other hand, there was a fear that by sourcing, the company would create a new competitor for itself. However, the risk was considered smaller if the company already had a strong position on the market as compared to the suppliers.

The networking strategy (A3) defines how the firm sees itself in relation to other parties, in terms of its networking policy and attitude to cooperation. It describes the role of networking and cooperation in the firm's development. The factor addresses the issue of dependency on partners. For the case companies, networking was not an option, but a normal modus operandi. Similarly, future plans involved some kind of networking and offshore sourcing. Cooperation fulfilled several needs. Some relationships were based on added value provided by suppliers; other relationships were a source of efficiency. In some cases, operating in a network had created certain dependencies on the suppliers, which was seen inevitable. Trust is an essential ingredient of successful cooperation. Long-term cooperation was generally preferred as it enabled development of the relationship to fulfil the firms' needs better.

Table 11: Strategy-related aspects

Excerpts of interviewees' comments
A1. Product development strategy:
Subcontracting is a source of technical competencies and supplementary skills. (Alpha) The goal is to concentrate on core activities and source supplementary skills from suppliers for whom they are core activities and who are able to invest into improving the efficiency and quality of their activities. (Alpha) Foreign suppliers are a source of both programming skills and some special technical skills and experience. (Beta) Earlier, technical development was given to partners with knowledge of certain software technologies and clientele. Currently, the focus has shifted more to research, and the pronounced role of technical and mathematical skills affects the current choice of partners. (Beta) A network is a team, where each strategic partner has its own defined area of expertise. (Gamma)
A2. Market strategy:
Suppliers can provide a possibility for entering a new market. (Alpha) Foreign suppliers' knowledge of a target market has been the reason for some subcontracting relations. (Beta) Because the firm provides solutions for a number of different industries, it needs a partner who knows the industry and clientele. (Beta) Finnish product development is not enough – you need to know that the concept will work globally. (Beta) The biggest risk is the supplier developing an exact copy of a game for a competitor. The danger of a supplier becoming a competitor has decreased because of the strengthened market position. (Delta)
A3. Networking strategy:
This branch of industry has operated in a network environment for a hundred years, being a part of a larger network is natural. (Alpha) The volume of sourcing has grown, more responsibilities are shifted and bigger entities are subcontracted. (Alpha) Networked operations have improved the firm's competitiveness by creating a readiness to operate internationally. (Beta) The risks must be balanced. Cooperation scatters knowledge and causes dependency, but controls the risks related to costs. (Beta) Network formation has been coincidental, but it will be more carefully planned in the future. (Beta) Subcontracting has evolved into networked operations, and the suppliers into strategic partners. (Gamma) We have decided to downsize the supplier network and concentrate more on internal development. However, we will continue to cooperate with two of the current suppliers. Things have worked out well and we have already invested in these relationships. (Delta)

Aspects related to resources and capabilities

This group consists of the internal resource base (B1), the availability and scalability of resources and capabilities (B2), and financial resources (B3). The three factors are highly interrelated, as the internal resource base is affected by both the financial resources and the availability and scalability of resources. Theoretically, this group is mostly related to the

resource-based view (section 3.1). Excerpts of evidence from the data are presented in Table 12.

The internal resource base (B1) in the context of this study primarily concerns resources related to product development. According to the case companies, internal development would normally be preferred because it is easier to execute, and product development has a decisive influence on the value of a product. On the other hand, it is costly and inflexible, which can motivate sourcing. Furthermore, it may not be possible to incorporate all necessary resources into the internal resource base, as illustrated by the next factor.

The availability and scalability factor (B2) determines the type, amount and location of accessible resources and skills. This factor takes into account the scattered location of specialised suppliers that motivates cooperation with suppliers from different countries. It also considers the time frame of resource access, as internal development of certain skills can be theoretically possible but too time-consuming. According to the data, small firms have a limited ability to scale their internal resource base up or down according to the demand. A turbulent environment and fluctuating demand make it risky to grow internally. One benefit of offshore locations, as mentioned in section 2.2.3, is large pools of human resources. Besides volume, resources with narrow specialisation are more likely to be located abroad.

The financial resources (B3) have been singled out from the general resource base in response to the cost-centred discussion on offshore sourcing. The amount of financial resources defines the level of product development expenses conceivable for the firm. The factor also reflects the cost structure of the firm and the division between fixed and variable costs. For the case companies, regulation of fixed costs was very important because of their small size, and it provided a significant motivation for offshore sourcing. Similarly, the pressure on pricing meant that they have to be either more productive or use cheaper labour for simple tasks.

Table 12: Aspects related to resources and capabilities

Excerpts of interviewees' comments
B1. Internal resource base:
The reason for starting subcontracting was a lack of internal resources. (Beta) The firm size is still not sufficient for long-time planning of human resources. (Beta) Internalising complicated technology development would involve significant investments, and there is risk of personnel turnover. (Beta) Subcontracting is used when there is need for some specific knowledge to fulfil the goals of a project, but it is unavailable internally. (Gamma) We decided to give subcontracting a try due to an internal resource shortage. (Delta)
B2. Availability and scalability of resources and capabilities:
It is easier to find partners with complementary skills abroad. (Beta) Subcontracting is likely in case of rapid growth or increase of cost pressure. (Beta) Cooperation is necessary to be able to provide customers specialised knowledge. (Gamma) The supplier's knowledge base is more important than geographical location or origin. (Gamma) It is tempting to subcontract to countries with lower costs and good talent availability. (Delta)
B3. Financial resources:
Cost regulation is one of the central reasons for cooperation. (Beta) Basic tasks can be subcontracted to improve the firm's price competitiveness. (Beta) In the beginning, our financial resources were not sufficient for investing in internal development to the necessary extent. (Delta)

Organisation-related aspects

The group refers to how the firm is organised on different levels – the firm level (C1), the product development function level (C2), and its cooperation practices (C3). The most

relevant theoretical considerations were presented in the sections dealing with software engineering and challenges in international cooperation (sections 2.1.1 and 3.3.4). Excerpts of evidence from the data are presented in Table 13.

Table 13: Organisation-related aspects

Excerpts of interviewees' comments
C1. Firm-level organisation:
Too many employees and too few clients is an unstable situation. You can end up losing know-how due to dismissals. It can be less risky to keep knowledge through the partners. (Beta) The network has to have a manageable number of actors. (Beta) A small internal organisation is a strategic choice. The rest of activities is organised through contractual cooperation. (Gamma) We cooperate primarily with strategic partners; tactical suppliers are used if a partner is not capable of executing some functions. (Gamma)
C2. Product development function:
Subcontracting for resources through an unknown supplier requires detailed specifications, cannot involve brain storming or creative freedom. (Beta) In product development activities, you have to spend a certain amount of time to learn to know your partner and how to work together, before assigning more demanding tasks to the supplier. (Beta) Networking in product development works, but you have to agree upon the rules. (Gamma) Distributing one project to multiple actors is undesirable, preferable suppliers are able to execute a whole project. (Delta)
C3. Cooperation practices:
Physical distance between the client and the provider – differences in operative culture, communication and flexibility. (Beta) The fluency of cooperation increases with trust and familiarity with each other's ways of working. (Beta) Problems are most strongly related to the organisational culture and rarely due to generalisable location issues. (Beta) There is no difference between domestic and foreign partners if both parties are sufficiently mature, have similar values, and accept joint principles and rules. (Gamma) Networks are built on trust and working relationships, creativity is impossible without trust. (Gamma) Active communication and keeping the schedule keep projects from drifting into conflicts. (Gamma) Communication problems stem from not seeing or knowing the other party. Cooperation is easier with domestic suppliers because of the language, similar culture and possibility for frequent meetings. (Delta) The biggest issues are communication and keeping the quality level up. (Delta)

The firm-level factor (C1) includes the structure of the firm, the personnel structure and the network structure. The factor also pays attention to possible adjustments of the organisation in response to industry turbulence. Based on the data, the number of simultaneously manageable relationships has its limits, because cooperation involves managerial overhead. Thus, the size of the supplier portfolio has to be carefully weighted in terms of additional resources and additional management. Changes in the industry typically require changes in the way firms are organised, including both their internal structure and network structure.

The organisation of the product development function (C2) reflects the division of development tasks between the firm and the suppliers, the responsibilities of the parties, and the formality of the process (e.g. how detailed the requirement specifications are). The organisation of product development is more complicated in the case of distributed development, as also indicated in the literature presented in this study (section 2.1.1). Changing requirements and specifications are an additional challenge to the execution of the distributed process.

The issues related to the organisation of cooperation practice (C3) include the practical implementation of cooperation, supplier interaction and communication. The factor also reflects the issues of organisational culture and trust. In the case companies, it was seen that fluency of communication is very important in cooperation. On the other hand, increased

need for communication and coordination of activities could increase the costs of offshore sourcing beyond the expected level. Also trust is essential for the success of sourcing. The opinions differed on whether cooperation is different with domestic and foreign suppliers. In general, trust, mutual values and effective communication were seen as more important than the origin of the supplier.

Aspects related to the entrepreneur or the management
The data indicates that the group contains the personal characteristics of the entrepreneur (D1), his personal network (D2), and previous cooperation experience (D3). Despite titling the group as entrepreneurs in the framework, the factors also apply more generally to the managing personnel in a small firm. Theoretically, this group is mostly related to the discussion on international entrepreneurship (section 3.3.2). Excerpts of evidence from the data are presented in Table 14.

Table 14: Aspects related to the entrepreneur or the management

Excerpts of interviewees' comments
D1. Personal characteristics of the entrepreneur:
Tight control of suppliers does not fit my temper or my firm's working culture, it is unsuitable for product development activities. (Beta) Cooperation requires such an attitude that everyone will benefit as soon as the work is done. (Beta) Strategic partnerships are weighted in defeat, but it doesn't mean you have to die with your partner. (Gamma) I don't want to keep quiet about the supplier's origin regardless of whether it is approved or not because of historical background – those with a positive attitude will see how everything works as normal. (Gamma)
D2. Personal network:
Suppliers have been found through academic links, trainee exchange, and connections via EU projects. (Beta) Typically personal connection precedes cooperation on a firm level. (Beta) I founded the company because I wanted to act at the intersection of academia and business. (Gamma)
D3. Previous cooperation experience:
Typically, the future supplier's personnel spend some time in Finland or have participated in a joint EU project. (Beta) Cooperation is easier after a honeymoon period – you learn to communicate with each other, get familiar with each other's working methods, know what they are capable to produce, and get to know people. (Beta) It is easier to work with a familiar culture. (Beta) Prejudices diminish with experience and proof. (Gamma) Supplier cooperation has worked rather well so far, but problems are always more difficult to solve with foreign parties because of the distance and different language. (Delta)

The personal characteristics factor (D1) reflects the personal set of values and attitude of the entrepreneur. The inclusion of this factor was motivated by the empirical observation that not only rational considerations affected decision-making. In SMEs, the organisational rationale and personal rationale of the entrepreneur are intertwined. For example, trust between organisations cannot exist without trust between people. Personal preferences affect a firm's inclination for sourcing, as well as cooperation patterns.

The personal network factor (D2) includes individuals, other companies, research institutes or various communities (e.g. professional forums). SMEs are more likely to find their suppliers through personal networks than by formal tenders typically executed by large companies. Formal screening would require a large amount of internal resources and a level of organisational involvement beyond the possibilities of small companies. Among the origins of personal connections mentioned by the interviewees were academia, joint third-party projects, trainee exchange programs, and industry associations.

The previous experience factor (D3) refers to both experience of cooperation in general and familiarity of cooperation with a certain actor. Familiarity and willingness to cooperate with

different cultures are reflected in this group. Based on the data, cooperation is more fluent when the parties are accustomed to each other's working practices. Thus, the decision to source can be linked to not just a general need for sourcing, but sourcing from a particular supplier with whom the firm has cooperated earlier. The origin of the preferred supplier was not necessarily a decisive factor, if the organisations were otherwise compatible with each other. On the other hand, familiarity with a culture could influence the decision-making in favour of a certain location. For example, one interviewee commented that he cooperated with Russians because he liked the Slavic mentality. Naturally, this was not the only reason for cooperation, but it clearly affected the selection of the offshore supplier. One of the interviewees stated that the foreign origin of a supplier does not matter as long as the cooperation runs smoothly, because problem-solving is more difficult in offshore sourcing than in domestic sourcing.

Discussion

The framework has been constructed using an explanation-building strategy (Yin, 1994), in which theoretical aspects are matched against empirical findings. In the a priori conceptual framework (Figure 6), the factors affecting offshore sourcing decisions were classified into internal characteristics of the firm, the firm's product development strategy, and aspects of international networks. In comparison to the a priori model, the a posteriori framework presents a data-based, refined analysis of the factors of decisions. The framework consists of four groups of factors related to a firm's strategy, resources and capabilities, organisation, and entrepreneur or management personnel. Thus, the concepts of the a priori model have been regrouped. The internal characteristics of the firm are reflected in the aspects related to resources and capabilities, as well as the aspects related to the entrepreneur. The focus of the framework is on the SME level and the decision-making of a small firm is to a large extent entrepreneurial decision-making. Consequently, the aspects related to the entrepreneur were found to be of a significant importance in decisions about offshore sourcing and separated to their own group. The product development strategy is contained within the aspects related to strategy, because the empirical evidence indicated that offshore sourcing is affected by other dimensions of strategy as well. Thus, based on their importance in the data, the strategic aspects were seen to deserve a group of their own. On the other hand, the aspects of international networks from the a priori model were not seen as significant, as it became apparent that despite operating in a network, the sourcing decision is rather related to a buyer-supplier relationship than networking. Thus, different aspects of networking were not separated as a group, but distributed into factors within the other groups. In the initial version of the framework that followed the first round of data analysis, the factors were divided into three groups: the firm's strategy, the firm's internal resources and capabilities, and entrepreneurial attributes. The second, more detailed data analysis (see Appendix 5) indicated that the clarity of the grouping would increase if the aspects related to the organisation are treated as a separate group rather than a part of the group dealing with resources and capabilities. The importance of the organisation-related aspects originates from the observation that the fluency of the practical implementation of distributed development activities largely defines perceived success and future desirability of offshore sourcing.

6.2 The framework in the context of previous research

This section discusses the differences and similarities between the presented framework and previous studies. The framework is also compared to the theoretical concept of distances, another holistic framework explaining interfirm relationships.

The main contribution of the framework is in combining aspects presented in different theoretical approaches into one extensive model. The individual factors constituting the framework have been presented and discussed in previous studies. However, the internal rationale of a firm for offshore sourcing has not been addressed in a holistic way, as suggested in this study. Instead, the existing literature is fragmented in addressing the motivation. The studies on offshore cooperation typically emphasise the cost factor, whereas the literature on product development cooperation has mainly a strategic focus. The empirical data of this study shows several complementary reasons for offshore sourcing, including making the organisational structure more flexible, mitigating the effect of the industry turbulence, regulation of the personnel structure, regulation of fixed costs, and scaling up product development. Consequently, the components of the framework reflect this diversity.

The framework has some common features with the model presented by Khan and Fitzgerald (2004). Their model addresses decision-making on offshore outsourcing, but the focus is mainly on the selection of a supplier and offshore location. In comparison, the framework presented in this study concentrates on analysing organisational factors prior to the decision about offshore sourcing. Furthermore, the model of Khan and Fitzgerald does not concentrate on software product development, but on a more general context of information systems and cost-focused outsourcing. In addition, only one of their case companies is a software development firm.

Next, the relationship between the proposed framework and the related theoretical concept of distance is described. The concept of distance refers to a difference in perception in various contexts (Hallén and Wiedersheim-Paul, 1979). Distance can be seen as a relevant aspect affecting firms' decisions about offshore sourcing, because the impression of distance can create liability of foreignness and prevent or impede cooperation. For example, many empirical studies on foreign direct investments have shown that cultural distance affects the entry mode decisions (Lee et al., 2008). O'Grady and Lane (1996) provide a detailed discussion on the concept of psychic distance in the internationalisation context.

The holistic concept of distance between the cooperating parties (Ford, 1982) presented in Chapter 3.3.4 can be compared to the constructed framework in order to evaluate which groups of factors in the framework are most likely to affect which dimension of distance (see Table 15). The following propositions are made on the basis of the data of this study and the discussion in the previous section. It is proposed that the factors of the framework affect the impression of distance for all other types, apart from geographical distance. Social distance relates mostly to the previous cooperation experience of the entrepreneur or the management. The organisation of the firm on different levels mostly affects the impression of cultural distance. Technological distance can originate from the firm's product development strategy, internal resource base, and availability and scalability of resources and capabilities. The influence of distance and cultural differences increases when the product development process is not well structured or it involves a lot of creativity. Possible time distance is

related to the networking strategy of a firm, availability and scalability of resources and capabilities, and the organisation of the cooperation practice. Geographical distance mostly affects the available variety of cooperation practices, as it can decrease possibilities for face-to-face communication.

Table 15: The relation between the concept of distance and the factors of decisions about offshore development sourcing

Distance	A. Strategy	B. Resources & capabilities	C. Organisation	D. Entrepreneur
Social				D3. Previous cooperation experience
Cultural			C1. Firm-level C2. Product development function C3. Cooperation practices	D1. Personal characteristics D2. Personal network
Technological	A1. Product development	B1. Internal resource base B2. Availability & scalability		
Time	A3. Networking	B2. Availability & scalability	C3. Cooperation practices	
Geographical			C3. Cooperation practices	

It is important to be conscious of different types of distance and their origin, as the impression of distance can diminish the fluency of cooperation. On the other hand, cooperation may decrease the sense of distance between a target market and a firm, when a supplier is also used to access market-related knowledge.

6.3 Application of the framework

This section discusses some ways for application of the proposed framework from the managerial point of view. The framework provides firms contemplating product development cooperation with foreign suppliers with a list of issues that should be taken into consideration in their sourcing decisions. With the help of the framework, a firm can systematically assess its readiness for offshore cooperation in product development or evaluate strategic value and fluency of an ongoing offshore cooperation. The firm could use the framework to systematically go though the factors of each group and assess their current state in the organisation. The next sections provide some possible questions for such an assessment. The questions are based on the evidence from the case companies that is discussed in the section 6.1. Furthermore, the firm should deliberate the significance of different factors and their desired state in the long run. The emphasis placed on different groups and factors of the framework is reflected in the choice of an offshore location and a particular supplier. The framework does not address the actual supplier screening process or the assessment of a potential supplier. Selection criteria for software development suppliers are discussed in, for example, Kinnula (2006) and Publication 8 in the second part of the study.

Strategy-related aspects
Decisions about cooperation should take into account the effect of sourcing on a firm's strategy. Does product development sourcing bring some added value to the firm's activities? How does possible cooperation affect the product development strategy and the market strategy of the firm? What is the desired extent of cooperation and relationships with other firms? How is cooperation expected to contribute to the competitiveness of the firm? Software product development suppliers can have different roles from the point of view of their customers: resource-hiring supplier, supplier with task or project responsibility, and supplier with module responsibility (Leppälä et al., 2001). Strategically, each category contributes to a firm in a different way and this difference should be reflected in the decision-making.

Aspects related to resources and capabilities
The evaluation of the internal resource base clarifies the degree of correspondence of internal resources with the strategy-related aspects. What necessary components are missing from the portfolio of resources and capabilities? Would it be strategically important to develop these resources internally or could they be accessed through cooperation? Is it possible to develop the lacking resources internally in terms of time or available financial resources? Is there a pressure on the firm to be able to quickly resize the resource base available to it? Could cooperation make the use of current internal resources more efficient, for example by enabling concentration on core skills? What kind of cost structure is acceptable for the firm in terms of fixed costs of product development investments and personnel?

Organisation-related aspects
The way a firm is organised on different levels affects its readiness for product development cooperation. Is the networking strategy reflected in the organisational structure? What are the needs for flexibility of the organisational structure? Does the firm need to be able to quickly adapt its product development structure due to, for example, demand fluctuation or industry turbulence? Does the way the product development function is organised allow for possible distribution of activities? Does the firm have existing cooperation practices and have they proven to be successful?

Aspects related to the entrepreneur or the management
The previous personal experience and connectedness can affect the range of potential partners. Familiarity and mutual background can diminish the feeling of cultural and social distance, contributing to formation of trust and fluency of cooperation. What kind of connections does the entrepreneur or the management team have? Could some existing network ties be utilised to launch a new kind of product development cooperation? Does previous cooperation experience create preference for cooperation with suppliers with a certain background?

7 Discussion and conclusion

The main research objective of this thesis was to provide a holistic view on factors affecting decisions about offshore sourcing in software development. The publications in the second part of the study provide insight into the use of offshore sourcing in product development and illustrate some actual outcomes of international cooperation in software development activities. Based on these insights, a framework depicting the factors of decisions about offshore sourcing in software development was constructed. This section contains evaluation of the results and conclusion of the study.

7.1 Theoretical contribution

The research objective can be divided into two subtopics: general reasons for international cooperation in product development and particular reasons for cooperation between Finnish and Russian companies. The study first addressed the theoretical question of why software firms engage external resources located in other countries in their product development activities. The involved theoretical approaches included the resource-based view, product development cooperation, the industrial network approach, international entrepreneurship research, and challenges of international cooperation. The empirical part of the study looked at offshore sourcing in the specific context of software development and Finnish-Russian cooperation. Finally, the theoretical considerations and empirical observations were combined in a framework on decisions about offshore sourcing in software development. The main contribution of the framework is in combining aspects presented in different theoretical approaches into one extensive model. The framework consists of four groups of factors related to a firm's strategy, resource base, organisation, and management personnel. The study proposes that combining several perspectives increases the understanding of offshore sourcing in software development as a phenomenon.

International cooperation in product development
In order to reflect the supposed diversity of aspects of offshore cooperation rationale, the study combined three different theoretical considerations: the resource and capabilities view, product development cooperation, and international cooperation. The following data collection and analysis made it possible to integrate these perspectives and construct a framework reflecting the multidimensionality of motives for entering offshore cooperation. According to the data, decisions about offshore sourcing in software development are far more complex than generally assumed. The findings justify combining several theoretical approaches, as no single perspective would seemed to be sufficient to explain the phenomenon extensively. Some motivational issues, such as concentrating on core competencies, have already been brought up by the literature. Other, more surprising, reasons for cooperation included making the organisational structure more flexible, mitigating the effect of the industry turbulence, regulation of the personnel structure, and scaling up product development. Consequently, it was proposed that by taking into consideration factors related to a firm's strategy, resource base, organisation and management personnel, it is possible to construct a more realistic picture of actual decision-making criteria than by relying mainly on the economic rationale. By developing a holistic framework on decision factors, the research provided more in-depth theoretical understanding of offshore sourcing rationale in product development.

Discussion on offshoring and outsourcing has been dominated by a focus on larger corporations, whereas this study addresses the phenomenon from the viewpoint of small, entrepreneurial firms. Flexibility is a key issue for small software firms, as they operate in a knowledge-intensive global industry characterised by technological change and short product life cycles. Small size causes unavoidable limitations for product development in terms of internal resources and capabilities. The study discussed how a small firm can increase the flexibility of the internal product development activities by networking. In the contemporary global business environment, the worldwide market is not an exclusive privilege of multinational enterprises, but accessible to smaller firms as well, provided that they have enough resources for the task (Wright and Dana, 2003). On the other hand, openness of the market means that a firm must achieve world-scale efficiencies to remain competitive and viable even if it prefers not to enter international markets (Ibid.). Thus, inward internationalisation need not necessarily be linked to outward activities, but instead it can be used to help a firm to compete on the domestic market.

The publications in the second part of the study examined the role of external cooperation and networking as means for accessing complementary knowledge or resources. They illustrated how even a small firm can have a disperse network of suppliers contributing to various aspects of product development activities. Besides its potential, cooperation in product development activities has certain risks and disadvantages. Using network of actors to access resources instead of creating them in-house provides quicker access to resources, but does not contribute to organisational learning internally. Cooperation may lead to under-investment in competencies and weaken the competitive position of a firm in the long run (Simonen, 2007). Thus, it is risky to rely solely upon external linkages to provide new technological knowledge and know-how (Ibid.). Furthermore, cooperation builds dependencies on suppliers. In joint product development, there is a reduction in direct control over the direction of product development and a risk of company skills and assets leaking to a partner (Littler et al., 1995). Thus, organising product development through a network of international partners requires thorough consideration of different aspects.

In order to be able to evaluate and select potential suppliers, a firm should be aware of its objectives and opportunities regarding its products and development of own resources (Leppälä et al., 2001). Furthermore, a firm should consider its long-term plans and intentions regarding the potential partners (Ibid.). Tähtinen (2001) separates continuous and episodic relationships. In continuous relationships, the actors share the relationship for the time being, whereas an episodic relationship is established for a certain purpose and time period. However, the actors involved in the relationship do not necessarily share a common view on the nature of the relationship. Seppänen (2002) divides software development organisations that use sourcing into focused buyers and broad cooperators. The first kind seeks narrow skills from suppliers, whereas the second kind is interested in wider capabilities. Long-term cooperation, linking activities and establishing long-lasting resource ties would be particularly useful for focused buyers, with the arrangement resembling a strategic alliance (Ibid.).

Integrating a strategic perspective into product development decision-making is a challenge for small companies, and deliberate planning is seldom employed (Vähäniitty, 2003). Similarly, small knowledge-intensive firms rarely use a thorough cost-benefit analysis in their cooperation decisions (Varis, 2004). Both these observations were common with this empirical study. Despite the lower cost of software development in countries with a lower wage level, there are other considerations that must be taken into account when calculating the overall cost effect of cooperation. For example, distributing product development across

organisational boundaries generates financial and temporal costs of administering cooperation (Littler et al., 1995), due to the inevitability of communication and interaction with a supplier. These expenses are not necessarily considered in the initial assessment of possible savings, which explains why companies occasionally express dissatisfaction with the level of savings in offshore sourcing. Furthermore, if offshore cooperation provides cost advantage only, it can be easily copied by competitors. Thus, it does not provide a lasting source of competitive advantage. Whereas, enhancing product development by engaging external resources can contribute to the competitiveness of the firm in the longer run. The holistic approach to sourcing presented in the study is likely to grow in applicability as offshoring continues its expansion from manufacturing to development and expert services.

Part of the novelty of the results comes from the context of contractual cooperation that has rarely been regarded as strategic. The cases illustrated the use of contractual networks in product development in a knowledge-intensive industry as opposed to cooperation in production. Warsta (2001) addresses contracting dynamics of software development with his model that takes into account the elements, interdependencies and governance structures of the contracting process, and the relationship development between cooperating companies. The data indicated that contractual cooperation with suppliers can be executed on strategic as well as tactical level, depending on the firm's networking strategy.

Cooperation between Finnish and Russian companies

The empirical data of this study addressed the question of why Finnish software development organisations cooperate with Russian offshore suppliers. The discussion on offshore sourcing is dominated by the cost perspective both in academia and among practitioners. The initial assumption of this study was that despite the significance of the cost issue, there are likely to be other factors motivating offshore cooperation in software firms. Similar observations have been made in an exploratory study on outsourcing and offshoring software development to Indian companies operating in Finland (Ali-Yrkkö and Jain, 2005). Ali-Yrkkö and Jain noted that besides potential cost savings, another motive for sourcing was lack of in-house resources, which was addressed by using external resources for support activities, such as maintaining and sustaining existing products. Trade journals provided only scarce evidence, but suggested that additional motivation for cooperation could be rooted in access to skills and market knowledge. The empirical study supported the assumption that the financial aspect is only one motivating factor in offshore cooperation, and several other factors are significant.

The main advantages of the Russian offshore industry are the level of education and personnel quality, combined with the scientific and technical orientation and training (Hawk and McHenry, 2005; Pries-Heje et al., 2005). The findings of this study support the above statement. According to the findings, cooperation with the Russian offshore industry was mainly motivated by the fact that it has a good pool of resources and competences, combined with an attractive price-quality level. The main reasons for cooperation that emerged from the empirical data were: high level of mathematical and scientific resources, availability of qualified technical personnel, experience in complicated projects, quality of work, lower level of costs, and close location.

The statements presented in the empirical material in regard to quality differ from the results of the previous studies on the Finnish-Russian cooperation. The difference originates in the context of cooperation. Previous studies have typically been conducted in the manufacturing context, whereas the present study concentrates on the knowledge-intensive high-technology context. Russian companies providing offshore software development services are strongly

oriented towards the foreign market. Thus, they are highly motivated to develop successful cooperation practices with their foreign clients.

The issues related to geographical distribution of cooperative relationships demonstrated an interesting duality. On one hand, it was stated that the origin of a supplier is not decisive, more important are the supplier's resources, skills and organisational culture. In line with this statement, the companies in the Finnish case had a geographically extensive network and cooperated with suppliers from various countries, choosing a supplier according to prevailing needs and situation. On the other hand, the interviewees brought forward the importance of communication and face-to-face interaction with suppliers, which are easier to manage with domestic or closely located suppliers. Offshore suppliers of the case companies were either resource firms or resource firms with supporting projects and products (Sallinen, 2002), which explains the need for extensive communication and interaction between the client and the supplier.

Despite the study being conducted in the context of Finnish-Russian cooperation, I believe the developed framework to be applicable to offshore sourcing from various countries. Similarly in the empirical part of the study, the discussion with the Finnish case companies was not limited to cooperation with the Russian suppliers, but covered motivation for cooperation with suppliers from different countries. Thus, the context of small and medium-sized enterprises is more substantial for applicability of the findings than the context of Finnish-Russian cooperation.

7.2 Managerial implications

Entrepreneurial or managerial aspects are rarely taken into consideration in discussion of strategic rationale at company level, despite the significant impact of the manager on the decision-making in a small firm. Based on the data of this study, it appears that in their offshore sourcing and partner selection, small software firms execute a part-rational and part-intuitive approach similar to the pursuit of outward internationalisation, as described by Spence (2003) – when opportunities present themselves, little in-depth evaluation or scanning of alternative strategies is carried out. Another example of the bounded rationality of managers has been provided in the study on foreign direct investment location choice by Buckley et al. (2007), which shows that while applying fairly rational rules in their initial consideration of location, managers' final investment decisions are highly idiosyncratic and subject to biases, both conscious and subconscious.

From the managers' point of view, the proposed framework summed up the issues that a firm should pay attention to when contemplating product development cooperation with foreign suppliers. Understanding different components of sourcing decisions can lead to improved preconditions for strategising and engaging in offshore cooperation. The choice of an offshore location and a particular partner is affected by the emphasis that is placed in the firm on different factors of the framework. Section 6.3 provides a list of possible questions that can be used to systematically go though the factors of each group in the framework and assess their current state in the organisation. The empirical study showed how offshore software development cooperation can be motivated by resource availability, quality, specialised capabilities, costs, and efficiency of a potential supplier. On the other hand, the decisions regarding offshore sourcing affect the factors in the proposed grouping in the framework. A thorough decision-making process should carefully consider all the possible

benefits and risks of product development cooperation. Furthermore, in order to contribute the most to the competitiveness of a firm, the portfolio of suppliers should be updated to reflect possible changes in the factors of the framework.

7.3 Limitations of the study and suggestions for further research

As with all research, there are limitations inherent to the chosen research method. There are multiple ways to implement the design and realisation of empirical investigations. The case study approach was employed in this study and the data was gathered through in-depth interviews. To increase the reliability and validity of the study, if it had been possible to employ multiple data collection methods, they could have been used to provide means for triangulation of the evidence, making cross-case comparison easier and stronger in argument. Similarly, more extensive researcher triangulation would have made the research less prone for critique on the researcher's subjective judgement. On the other hand, engaging multiple researchers in data collection in both countries would have been difficult to execute due to the intercultural context and requirements on language skills.

Due to the qualitative approach and limited number of case companies, one should be cautious in making generalisations beyond the companies studied. Both Study 1 and Study 2 contained four case companies, which has been suggested to be sufficient for theory building (Eisenhardt, 1989). The companies in the two presented studies are independent of each other. The approach can be considered justified, because the main interest of the study is on decisions taken by the buyer organisation. However, one logical extension of this study would be to take the examination to the dyadic level, inspecting cooperation in a buyer-supplier relationship.

The study examined cooperation between Finnish and Russian companies. Different combination of countries of origin could possibly lead to different emphases in the cooperation decisions. I tried to attend to this limitation in the second round of interviews in Study 1 (Finnish cases) by putting more emphasis on international cooperation with suppliers in general. In the data, the country of origin of the supplier did not seem as significant as its resources and organisational culture. The possible effect of national origin is one of the topics for future research, and it could be addressed by inspecting customer-supplier pairs from diverse countries. A larger cross-national research would strengthen the argument and allow more extensive generalisation. Furthermore, the review could be extended to examine the decision-making process regarding the choice of offshore location. Such research should take into account the effect of the liability of foreignness and trust across borders.

The research targeted software development organisations. Besides software industry, there are other research contexts where the framework could be applicable. It would be interesting to inspect for which industries offshore sourcing would be particularly attractive and then evaluate the fit of the framework in that context. Widening the firm size criteria could be another premise for future research. Juxtaposing firms of different sizes could provide more insight into the differences and similarities of decision-making on cooperation. In the interviews, the manager's perspective as informant was relied on, which was particularly motivated by the small firm size and centralised decision-making. In bigger companies, the interviewing could be extended to personnel on several organisational levels (e.g. managing directors, middle management, project managers), which would provide more multifaceted information and contribute to the holistic view on corporate decision-making. The next

logical step would be creating tools to support the corporate decision-making process regarding offshore cooperation in product development. The constructed framework could serve as a starting point for such a project.

Although the interviewees were critical in evaluating the fluency and success of their cooperation, their attitude to product development sourcing was positive. Only one company in the sample described their cooperation experience with a Russian supplier as a failure. As an extension to this research, it would be interesting to compare the findings to data from companies that have withdrawn from cooperation with foreign suppliers. In addition, the results of such further study could also be compared to the existing studies on relationship dissolution in the software development context (e.g. Tähtinen, 2001). The reasons for ending offshore sourcing would expand the understanding of offshore sourcing decisions.

Despite the limitations, the findings of the study demonstrate the relevance of studying international contractual cooperation in product development. The study suggested that accessing various resources through cooperation with foreign suppliers can contribute to product development activities. The relationship between international cooperation in product development and the competitiveness of a firm would be an interesting topic for further research.

References

Acedo, F. J., Barroso, C. and Galan, J. L. (2006) The resource-based theory: Dissemination and main trends, *Strategic Management Journal*, 27(7), 621-636.

Ahokangas, P. (1998) *Internationalisation and resources: An analysis of processes in Nordic SMEs*. Ph.D. dissertation, Universitas Wasaensis, 64, University of Vaasa.

Ahola, I. (2008) *Outsourcing challenges in Russia*. Master's thesis, Lappeenranta University of Technology.

Ali-Yrkkö, J. and Jain, M. (2005) *Offshoring software development – Case of Indian firms in Finland*. Discussion papers, No. 971, ETLA, The Research Institute of the Finnish Economy, Helsinki.

Amit, R. and Schoemaker, P. J. H. (1993) Strategic assets and organizational rent, *Strategic Management Journal*, 14(1), 33-46.

Anderson, E. and Gatignon, H. (1986) Modes of foreign entry: A transaction cost analysis and propositions, *Journal of International Business*, Fall, 1-26. Reprinted in Buckley, P. J. and Ghauri, P. N. (eds.) *The internationalization of the firm*. London: Thomson Learning, 185-207.

Arbnor, I. and Bjerke, B. (1997) *Methodology for creating business knowledge*. 2nd ed. Thousand Oaks, CA: Sage publications.

Aspray, W., Mayadas, F. and Vardi, M. Y. (eds.) (2006) *Globalization and offshoring of software: A report of the ACM job migration task force*. Association for Computing Machinery. Available online http://www1.acm.org/globalizationreport/

Axelsson, B. (1987) Supplier management and technological development. In H. Håkansson (ed.), *Industrial technological development*. London: Croom Helm, 128-176.

Barney, J. (1991) Firm resources and sustained competitive advantage, *Journal of Management*, 17(1), 99-120.

Bell, J. (1995) The internationalisation of small computer software firms: A further challenge to stage theory, *European Journal of Marketing*, 29(8), 60-75.

Bell, J., Crick, D. and Young, S. (2004) Small firm internationalization and business strategy: An exploratory study of 'knowledge-intensive' and 'traditional' manufacturing firms in the UK, *International Small Business Journal*, 22(1), 23-56.

Blomqvist, K. (2002) *Partnering in the dynamic environment: The role of trust in asymmetric technology partnership formation*. Ph.D. dissertation, Acta Universitatis Lappeenrantaensis 122, Lappeenranta University of Technology.

Boltramovich, S., Filippov, P. and Hernesniemi, H. (2004) *The innovation system and business environment of Northwest Russia*. Discussion papers, No. 953, ETLA, The Research Institute of the Finnish Economy, Helsinki.

Bonoma, T. V. (1985) Case research in marketing: Opportunities, problems, and a process, *Journal of Marketing Research*, 22(2), 199-208.

Boter, H. and Holmquist, C. (1996) Industry characteristics and internationalization processes in small firms, *Journal of Business Venturing*, 11(6), 471-488.

Brown, S. and Eisenhardt, K. (1995) Product development: Past research, present findings, and future directions, *Academy of Management Review*, 20(2), 343-378.

Brooks, F. P. (1987) No silver bullet: Essence and accidents of software engineering, *Computer*, 20(4), April, 10-19.

Buckley, P. J., Devinney, T. M. and Louviere, J. L. (2007) Do managers behave the way theory suggests? A choice-theoretic examination of foreign direct investment location decision-making, *Journal of International Business Studies*, 38(7), 1069-1094.

Carmel, E. (1997) Thirteen assertions for globally dispersed software development research, *Proceedings of the Thirtieth Hawaii International Conference on System Sciences*, 7-10 January 1997.

Carmel, E. (1999) *Global software teams – Collaborating across borders and time-zones*. New Jersey: Prentice Hall

Carmel, E. and Abbott, P. (2006) Configurations of global software development: Offshore versus nearshore, *International Conference on Software Engineering, Proceedings of the 2006 international workshop on Global software development for the practitioner*, Shanghai, China. Available online http://portal.acm.org/citation.cfm?id=1138509

Carmel, E. and Abbott, P. (2007) Why 'nearshore' means that distance matters, *Communications of the ACM*, 50(10), 40-46.

Carmel, E. and Agarwal, R. (2002) The maturation of offshore sourcing of information technology work, *Management Information Systems Quarterly Executive*, 1(2), 65-77.

Carmel, E. and Nicholson B. (2005) Small firms and offshore software outsourcing: High transaction costs and their mitigation, *Journal of Global Information Management*, 13(3), 33-54.

Carson, D., Cromie, S., McGowan, P. and Hill, J. (1995) *Marketing and entrepreneurship in SME's: An innovative approach*. Hemel Hempstead: Prentice Hall.

Chopra, S. and Meindl, P. (2007) *Supply chain management: Strategy, planning, and operation*. 3rd ed. Upper Saddle River, New Jersey: Pearson Prentice Hall.

Cooper, R.G. (1996) Overhauling the new product process, *Industrial Marketing Management*, 25, 465-482.

Couto, V., Mani, M., Lewin, A. Y. and Peeters, C. (2006) *The globalization of white-collar work: The facts and fallout of next-generation offshoring*. Offshoring Research Network. Available online https://offshoring.fuqua.duke.edu/research.jsp

Coviello, N. E. and Cox, M. P. (2006) The resource dynamics of international new venture networks, *Journal of International Entrepreneurship*, 4(2-3), 113-132.

Coviello, N. E. and Munro, H. J. (1993) Linkage development and the role of marketing in the internationalization of the entrepreneurial high technology firm. In Hills, G., LaForge, R. W. and Muzyka, D. F. (eds.) *Research at the Marketing/Entrepreneurship Interface*, University of Illinois Chicago, IL, 342-355.

Coviello, N. and Munro, H. (1995) Growing the entrepreneurial firm: Networking for international market development, *European Journal of Marketing*, 29(7), 49-61.

Coviello, N. and Munro, H. (1997) Network relationships and the internationalization process of small software firms, *International Business Review*, 6(4), 361–386.

Coward, C. T. (2003) Looking beyond India: Factors that shape the global outsourcing decisions of small and medium sized companies in America, *The Electronic Journal on Information Systems in Developing Countries*, 13(May). Available online http://www.ejisdc.org/ojs2/index.php/ejisdc/issue/view/73

Das, T. K. and Teng, B.-S. (1998) Between trust and control: Developing confidence in partner cooperation in alliances, *Academy of Management Review*, 23(3), 491-512.

Dunning, J. H. (1988) The eclectic paradigm of international production: A restatement and some possible extensions, *Journal of International Business Studies*, 19(1), 1-31.

Dunning, J. H. (1995) Trade, location of economic activity and the multinational enterprise: A search for an eclectic approach. In Drew, J. (ed.) *Readings in international enterprise*. Reprinted in Buckley, P. J. and Ghauri, P. N. (eds.) *The internationalization of the firm*. London: Thomson Learning, 61-79.

Dyer, J. H. (1996) Specialized supplier networks as a source of competitive advantage: evidence from the auto industry, *Strategic Management Journal*, 17(4), 271-291.

Dyer, J. H. and Singh, H. (1998) The relational view: cooperative strategy and sources of interorganizational competitive advantage, *Academy of Management Review*, 23(4), 660-679.

Dyer, W. G. and Wilkins, A. L. (1991) Better stories, not better constructs, to generate better theory: A rejoinder to Eisenhardt, *Academy of Management Review*, 16(3), 613-619.

Dynkin, A and Ivanova, N. (1998) Technological innovation in Russia, *Journal of Product Innovation Management*, 15(5), 476-477.

Easterby-Smith, M., Thorpe, R. and Lowe, A. (1991) *Management research: An introduction*. London: Sage.

Eisenhardt, K. M. (1989) Building theories from case study research, *Academy of Management Review*, 14(4), 532-550.

Eisenhardt, K. M. and Graebner, M. E. (2007) Theory building from cases: Opportunities and challenges, *Academy of Management Journal*, 50(1), 25-32.

Eisenhardt, K. M. and Schoonhoven, C. B. (1996). Resource-based view of strategic alliance formation: Strategic and social effects in entrepreneurial firms, *Organization Science*, 7(2), 136-150.

Ellram, L. and Billington, C. (2001) Purchasing leverage considerations in the outsourcing decision, *European Journal of Purchasing & Supply Management*, 7(1), 15-27.

Ellram, L. M. and Edis, O. R. V. (1996) A case study of successful partnering implementation, *International journal of purchasing and materials management*, Fall, 20-28.

Ellram, L. M., Tate, W. L. and Billington, C. (2008) Offshore outsourcing of professional services: A transaction cost economics perspective, *Journal of Operations Management*, 26(2), 148-163.

Evaristo, J. R., Scudder, R., Desouza, K. and Sato, O. (2003) A dimensional analysis of geographically distributed project teams: A case study, *Journal of Engineering Technology and Management*, 11(4), 58–70.

Flyvbjerg, B. (2006) Five misunderstandings about case-study research, *Qualitative Inquiry*, 12(2), 219-245.

Ford, D. (1982) The development of buyer-seller relationships in industrial markets. In Håkansson, H. (ed.). (1982) *International marketing and purchasing of industrial goods: An interaction approach*. John Wiley & Sons, New York, 288-304.

Ford, D., Gadde, L.-E., Håkansson, H., Lundgren, A., Snehota, I., Turnbull, P. and Wilson, D. (1998) *Managing business relationships*. London: John Wiley & Sons Ltd.

Foss, N. J. (2000) Equilibrium vs. evolution in the resource-based perspective: The conflicting legacies of Demsetz and Penrose. In Foss, N. J. and Robertson, P. L. (eds.) *Resources, technology and strategy*. London and New York: Routledge,.

Foss, N. J. and Robertson, P. L. (eds.) (2000) *Resources, technology and strategy*. London and New York: Routledge.

Gadde, L.-E. and Håkansson, H. (2001) *Supply network strategies*. London: Wiley & Sons.

Gartner (2003) *The changing shape of outsourcing*. Presentation by Ian Marriott at Software Outsourcing Summit 2003.

Gerwin, D. and Ferris, S. J. (2004). Organizing new product development projects in strategic alliances, *Organization Science*, 15(1), 22-38.

Goldsmith, R. F. (1994) Confidently outsourcing software development, *Journal of Systems Management*, April, 12-17.

Grady, R. B. (1997) *Successful software process improvement*. New Jersey: Prentice-Hall.

Granstrand, O. and Sjölander, S. (1992) Internationalization and diversification of multitechnology corporations. In Granstrand, O., Håkanson, L. and Sjölander, S. (eds.). *Technology management and international business: Internationalization of R&D and technology*. Chichester: John Wiley.

Griffin, A. and Hauser, J. R. (1996) Integrating R&D and marketing: A review and analysis of the literature, *Journal of Product Innovation Management*, 13(3), 189-279.

Hagedoorn, J. (1990) Organizational modes of inter-firm co-operation and technology transfer, *Technovation*, 10(1), February, 17-30.

Hagedoorn, J. (2002). Inter-firm R&D partnerships: An overview of major trends and patterns since 1960, *Research Policy*, 31(4), 477-492.

Hagel, J. and Brown, J. S. (2005) *The only sustainable edge: Why business strategy depends on productive friction and dynamic specialization*. Boston, MA: Harvard Business School Press.

Haikala, I. and Märijärvi, J. (2004) *Ohjelmistotuotanto (Software engineering)*. Helsinki: Talentum.

Håkansson, H. (ed.) (1982) *International marketing and purchasing of industrial goods: An interaction approach*. New York: John Wiley & Sons.

Håkansson, H. and Snehota, I. (1989) No business is an island: The network concept of business strategy, *Scandinavian Journal of Management*, 5(3), 187-200.

Håkansson, H. and Snehota, I. (eds.) (1995) *Developing relationships in business networks*. London: Routledge.

Håkansson, H. and Waluszewski, A. (2002) *Managing technological development: IKEA, the environment and technology*. London: Routledge.

Hallén, L. and Wiedersheim-Paul, F. (1979) Psychic distance and buyer-seller interaction. In *Organisasjon, Marked og Samfund*, 16(5), 308-324. Reprinted in Buckley, P. J. and Ghauri, P. N. (eds.) *The internationalization of the firm*. London: Thomson Learning, 349-360.

Hamel, G. and Prahalad, C. K. (1990) The core competence of the corporation, *Harvard Business Review*, 68(3), 79-91.

Harrigan, K. R. (1985) *Strategies for joint ventures*. Lexington: Lexington Books.

Harrigan, K. R. (1988) Strategic alliances and partner asymmetries. In Contractor, F., Lorange, P. (eds.), *Cooperative strategies in international business*. Lexington: Lexington Books, 205-226.

Hätönen, J. (2008) *Managing the process of outsourcing – Examining the process of outsourcing product-development activities in software firms*. Ph.D. dissertation, Publications of the Turku School of Economics and Business Administration, Series A-8:2008, Turku School of Economics and Business Administration. Available online http://info.tse.fi/julkaisut/vk/Ae8_2008.pdf

Hätönen, J. and Paju, T. (2009) 30+ years of research and practice of outsourcing – Exploring the past and anticipating the future, *Journal of International Management*, forthcoming.

Hawk, S. and McHenry, W. (2005) The maturation of the Russian offshore software industry*, Information Technology for Development*, 11(1), 31-57.

Heckman, R. (1999) Organizing and managing supplier relationships in information technology procurement, *International Journal of Information Management*, 19(2), 141-155.

Heliste, P., Karhunen, P. and Kosonen, R. (2008) Managing foreign business operations through institutional change from transition to post-transition: Finnish firms in Russia and Estonia, *Journal of East-West Business*, 14(1), 65-99.

Hellman, P., Hovi, N. and Nieminen, J. (1993). *Conceptualization of the terms used in interfirm cooperation research*. Publications of the Turku School of Economics and Business Administration, Series Discussion and Working Papers 1:1993, Turku.

Herbsleb, J. D. and Moitra, D. (2001) *Global software development*, IEEE Software, 18(2), 16–20.

Hirshfeld, S. and Schmid, G. (2005) *Globalization of R&D.* Technology Review 184/2005. Helsinki: Tekes.

Hoch, D. J., Roeding, C. R., Purkert, G., Lindner, S. K. and Müller, R. (1999) *Secrets of software success: Management insights from 100 software firms around the world*. Boston (MA): Harvard Business School Press.

Iansiti, M. (1998) *Technology integration: Making critical choices in a dynamic world*. Cambridge: Harvard Business School Press.

IEEE (1993) *IEEE standards collection: Software engineering.* IEEE Standard 610.12-1990. IEEE.

Ingham, M. and Mothe, C. (1998). How to learn in R&D partnerships? *R & D Management*, 28(4), 249-261.

Ivanova, O., Kaipio, H., Karhunen, P., Leppänen, S., Mashkina, O., Sharafutdinova, E. and Thorne, J. (2006) *Potential for enterprise cooperation between Southeast Finland and*

Northwest Russia. Northern Dimension Research Centre, Publication 28, Lappeenranta University of Technology.

Jarillo, J. C. (1989) Entrepreneurship and growth: The strategic use of external resources, *Journal of Business Venturing*, 4(2), 133–147.

Jennex, M. E. and Adelakun O. (2003) Success factors for offshore information system development, *Journal of Information Technology Cases and Applications*, 5(3), 12-31.

Johanson, J. and Johanson, M. (1999) Developing business in Eastern European networks. In Törnroos, J.-Å. and Nieminen, J. (eds.) *Business entry in Eastern Europe*. Helsinki: Kikimora Publications, 46-71.

Johanson, J. and Mattsson, L. G. (1988) Internationalisation in industrial systems - A network approach. In Hood, N. and Vahlne, J. E. (eds.), *Strategies in global competition*, London: Croom-Helm, 287-314.

Johanson, J. and Vahlne, J.-E. (1993) Management of internationalization. In Zambou, Z. L. and Pettigrew, A. M. (eds.) *Perspectives on strategic change*. Boston: Kluwer Academic Publishers, 43-78.

Juntunen, A. (2005) *The emergence of new business through collaborative networks – A longitudinal study in the ICT sector*. Ph.D. dissertation, Acta Universitatis oeconomicae Helsingiensis, A-256, Helsinki School of Economics.

Karhunen, P. and Kosonen, R. (2002) *Determinants of Western-Russian production alliances - The case of Finnish metal industry SMEs' subcontracting in Russia*. Proceedings of the University of Vaasa, Reports 87, 151-168.

Kärkkäinen, R. (2008) *Clustering and international competitiveness of information technology industry in the Saint Petersburg area*. Department of Industrial Management, Research report 199, Lappeenranta University of Technology. Available online http://www.lut.fi/fi/nordi/publications/publicationslist/2008/Sivut/researchreport199.aspx

Karlsen, T., Silseth, P. R., Benito G. R. G. and Welch, L. S. (2003) Knowledge, internationalization of the firm, and inward–outward connections, *Industrial Marketing Management*, 32(5), 385-396.

Karolak, D. W. (1998) *Global software development – Managing virtual teams and environments*. Los Alamitos, CA: IEEE Computer Society.

Khan, N. and Fitzgerald, G. (2004) Dimensions of offshore outsourcing business models, *Journal of Information Technology Cases and Applications*, 6 (3), 35-50.

Kinnula, A. (1999) *Software process engineering in a multi-site environment*. Ph.D. dissertation, Universitatis Ouluensis A333, University of Oulu. Available online http://herkules.oulu.fi/isbn9514253035/isbn9514253035.pdf

Kinnula, M. (2006) *The formation and management of a software outsourcing partnership. A case study*. Ph.D. dissertation, Acta Universitatis Ouluensis A451, University of Oulu. Available online http://herkules.oulu.fi/isbn9514279832/

Kivelä, M. (2007) *Dynamic capabilities in small software firms*. Ph.D. dissertation, Acta Universitatis Oeconomicae Helsingiensis, A-301, Helsinki School of Economics.

Kontio, J. (ed.) (2008) *Kasvufoorumi 2008 loppuraportti (Growth Forum 2008 final report)*. Ohjelmistoyrittäjät ry. Available online http://www.sbl.tkk.fi/oskari/Publications.html

Korhonen, H. (1999) *Inward-outward internationalization of small and medium enterprises*. Ph.D. dissertation, Acta Universitatis Oeconomicae Helsingiensis, A-147, Helsinki School of Economics.

Kosonen, R. and Heliste, P. (2006) Bilateral economic relations between Finland and Russia: Finnish firms' experiences in Northwest Russia. In Smith, H. (ed.) *The two-level game: Russia's relations with Great Britain, Finland and the European Union*. Aleksanteri Series 2/2006. Helsinki: Aleksanteri Institute, 205-224.

Kotabe, M. and Murray, J. Y. (2004) Global sourcing strategy and sustainable competitive advantage, *Industrial Marketing Management*, 33(1), 7-14.

Knight, G. A. and Cavusgil, S. T. (2004) Innovation, organizational capabilities, and the born-global firm, *Journal of International Business Studies*, 35(2), 124–141.

Knight, G., Madsen, T. K. and Servais, P. (2004) An inquiry into born-global firms in Europe and the USA, *International Marketing Review*, 21(6), 645–665.

Kuivalainen, O. (2003) *Knowledge-based view of internationalisation – Studies on small and medium-sized information and communication technology firms*. Ph.D. dissertation, Acta Universitatis Lappeenrantaensis 156, Lappeenranta University of Technology.

Laage-Hellman, J. (1997) *Business networks in Japan*. London and New York: Routledge.

Laamanen, T. and Autio, E. (2000) Dynamic complementarities and technology acquisition. In Foss, N. J. and Robertson, P. L. (eds.) *Resources, technology and strategy*. London and New York: Routledge.

Lacity, M. and Hirschheim, R. (1993) The information systems outsourcing bandwagon, *Sloan Management Review*, 35(1), 73-83.

Lee, S.-H., Shenkar, O. and Li, J. (2008) Cultural distance, investment flow, and control in cross-border cooperation, *Strategic Management Journal*, 29(10), 1117-1125.

Leppälä, K., Sallinen, S. and Seppänen, V. (2001) Partner selection for product development: Theory, models and practicing. *Proceedings of the 7th International Conference on Concurrent Enterprising*, 27-29 June, 2001, Bremen, Germany, 109-118.

Lincoln, Y. S. and Guba, E. G. (1985) *Naturalistic inquiry*. Beverly Hills, CA: Sage Publications.

Lisitsyn, N. (2007) *Technological cooperation between Finland and Russia: Example of technology parks in St. Petersburg*. PEI Electronic Publications 3/2007, Turku School of Economics. Available online http://www.tse.fi/FI/yksikot/erillislaitokset/pei/Documents/Julkaisut/Lisitsyn03_07.pdf

Littler, D., Leverick, F. and Bruce, M. (1995) Factors affecting the process of collaborative product development: A study of UK manufacturers of information and communications technology products, *Journal of Product Innovation Management*, 12(1), 16-32.

Luostarinen, R. (1980) *Internationalization of the firm.* 2nd ed. Helsinki: Helsinki School of Economics, Series A:30.

MacCormack, A. (1998) Towards a contingent model of product development: A comparative study of development practices, *Proceedings of the 5th International Product Development Management Conference*, May 25-26, Como, Italy, 653-670.

Manninen, A. and Meristö, T. (2004) *Tulevaisuuden ICT-osaaminen – Yritysten ja yksilöiden strateginen haaste (Future ICT know-how – Strategic challenge for companies and individuals)*. Corporate Foresight Group report 1/2004, Institute for Advanced Management Systems Research, Åbo Akademi University, Turku.

Market-Visio. (2002) *Suomalaisten ja venäläisten ohjelmistoyritysten offshore-yhteistyö – Kokemukset, kiinnostus, valmiudet (Offshore cooperation of Finnish and Russian software companies – Experiences, interest, readiness)*. Research report.

Marshall, C. and Rossman, G. B. (1999) *Designing qualitative research*. Thousand Oaks, CA: Sage Publications.

Mashkina, O., Kosonen, R. and Heliste, P. (2005) Bridging the cultural gap: Comparison of business norms in Finnish–Russian operations. In Liuhto, K. and Vinze, Z. (eds.), *Wider Europe*. Jubilee Publication in Honor of Urpo Kivikari. Turku: Pan-Europe Institute, 255–280. Available online http://www.tse.fi/FI/yksikot/erillislaitokset/pei/Documents/Julkaisut/Liuhto_Vincze_22005.pdf

Maunuksela, A. (2003) *Product development practices and their organisational information requirements - An explorative case study of product development management in some Finnish companies*. Ph.D. dissertation, Acta Wasaensia, Industrial Management 5, University of Vaasa.

Mazzawi, E. (2002) Transformational outsourcing, *Business Strategy Review*, 13(3), 39-43.

McDonough, E. and Kahn, K. (1996) Using "hard" and "soft" technologies for global new product development, *R&D Management*, 26(3), 241-253.

McIvor, R. (2000) A practical framework for understanding the outsourcing process, *Supply Chain Management – An International Journal*, 5(1), 22-36.

McKinsey Global Institute (2003) *Offshoring: is it a win-win game?* Available online http://www.mckinsey.com/knowledge/mgi/reports

Messerschmitt, D. G. and Szyperski, C. (2003) *Software ecosystem*. Cambridge, Massachusetts: The MIT Press.

Metcalfe, J. S. and James, A. (2000) Knowledge and capabilities: A new view of the firm. In Foss, N. J. and Robertson, P. L. (eds.) (2000) *Resources, technology and strategy*. London and New York: Routledge.

Miles, M. B. and Huberman, A. M. (1994) *Qualitative data analysis: An expanded sourcebook*. Newbury Park: Sage Publications.

Millson, M. R., Raj, S. P. and Wilemon, D. (1996). Strategic partnering for developing new products, *Research-Technology Management*, May-June, 41-49.

Mohan, B. K. (2006) Globalization and offshoring of software, *Ubiquity*, 7(43), 3 p.

Möller, K. and Halinen, A. (1999) Business relationships and networks: Managerial challenge of network era, *Industrial Marketing Management*, 28(5), 413-427.

Möller, K., Rajala, A. and Svahn, S. (2005) Strategic business nets – their type and management, *Journal of Business Research*, 58(9), 1274-1284.

Möller, K., Svahn, S., Rajala, A. and Tuominen, M. (2002) Managing value nets: A capability perspective, *Proceedings of the 18th IMP Conference*, Dijon, France.

Mtigwe, B. (2006) Theoretical milestones in international business: The journey to international entrepreneurship theory, *Journal of International Entrepreneurship*, 4(1), 5-25.

Narula, R. (1996) *Multinational investment and economic structure*. London: Routledge.

Narula, R. (2001) Choosing between internal and non-internal R&D activities: Some technological and economic factors, *Technology Analysis & Strategic Management*, 13(3), 365-387.

Narula, R. and Hagedoorn, J. (1999) Innovating through strategic alliances: Moving towards international partnerships and contractual agreements, *Technovation*, 19(5), 283-294.

Nicholson, B. and Sahay, S. (2001) Some political and cultural issues in the globalisation of software development: Case experience from Britain and India, *Information and Organization*, 11(1), 25-43.

Nummela, N. (2000) *SME commitment to export co-operation*. Ph.D. dissertation, Publications of the Turku School of Economics and Business Administration, Series A-6:2000, Turku School of Economics and Business Administration.

Nummela, N. (2002) Change in SME internationalization – a network perspective. *Proceedings of the 28th EIBA Conference*, December 8-10, 2002, Athens, Greece.

Nummela, N., Saarenketo, S. and Puumalainen, K. (2004) Core competence and co-operation of rapidly internationalising SMEs. In Larimo, J. and Rumpunen, S. (eds.), *Recent European research on SME export behavior and internationalisation*, Proceedings of the University of Vaasa, Reports 111, 47-61.

O'Grady, S. and Lane, H. W. (1996) The psychic distance paradox, *Journal of International Business Studies,* Second quarter, 309-333. Reprinted in Buckley, P. J. and Ghauri, P. N. (eds.) *The internationalization of the firm*. London: Thomson Learning, 394-414.

Ojala, P. (2006) *Implementing a value-based approach to software assessment and improvement*. Ph.D. dissertation, Acta Universitatis Ouluensis A470, University of Oulu. Available online http://herkules.oulu.fi/isbn9514282124/isbn9514282124.pdf

Öhrwall Rönnback, A. (2002) *Interorganizational IT support for collaborative product development*. Ph.D. dissertation, Linköping Studies in Management and Economics, 54, Linköpings Universitet.

Ollus, S.-E. and Simola, H. (2006) *Russia in the Finnish economy*. Sitra Reports 66. Helsinki: Sitra. Available online http://www.sitra.fi

Ollus, S.-E. and Torvalds, N. (2005) *From trade to partnership: Finland's economic strategy for Russia*. Sitra Reports series. Helsinki: Sitra. Available online http://www.sitra.fi/fi/Ohjelmat/PaattyneetOhjelmat/venaja/venaja_tulokset_ja_julkaisut/tulokset.htm

Paasivaara, M. and Lassenius, C. (2003) Collaboration practices in global inter-organizational software development projects, *Software Process Improvement and Practice*, 8(4), 183-199.

Paju, T. (2007) Conceptual model of R&D offshore outsourcing, *Journal of Global Business and Technology*, 3(1), 49-61.

Palvia, S. C. J. (2004) Global outsourcing of IT and IT enabled services: Choosing an outsourcing destination country, *Journal of Information Technology Cases and Applications*, 6(3), 1-20.

Parnas, D. L. and Clements, P. C. (1986) A rational design process: How and why to fake it, *IEEE Transactions on Software Engineering*, 12(2), 251-257.

Patton, M. Q. (1990) *Qualitative research and evaluation methods*. Newbury Park: Sage Publications.

Penrose, E. T. (1959) *The theory of the growth of the firm*. Oxford: Oxford University Press.

Pfeffer, J. (1981) *Power in organizations*. Marshfield: Pitman.

Pfeffer, J. and Salancik, G. (1978) *The external control of organizations*. New York: Harper & Row.

Piekkari, R. and Welch, C. (2004) Language dynamics and strategies in cross-cultural interviewing, *Proceedings of the 1st International Co-sponsored Conference Research Methods Division, Academy of Management USA*. Crossing Frontiers in Quantitative and Qualitative Research Methods, ISEOR, March 18-20, Lyon, France, 1505-1522.

Pihlanto, P. (1994) The action-oriented approach and case study method in management studies, *Scandinavian Journal of Management*, 10(4), 369-382.

Porter, M. (1985) *Competitive advantage: Creating and sustaining superior performance*. New York: Free Press.

Preece, S. B., Miles, G. and Baetz, M. C. (1999) Explaining the international intensity and global diversity of early-stage technology-based firms, *Journal of Business Venturing*, 14(3), 259-281.

Pressman, R. S. (2001) *Software engineering: A practitioner's approach.* 5th ed. Boston: McGraw-Hill.

Pressman, R. S. (1997) *Software engineering: A practitioner's approach.* 4th ed., European adaptation. New York: McGraw-Hill.

Pries-Heje, J., Baskerville, R. and Hansen, G. I. (2005) Strategy models for enabling offshore outsourcing: Russian short-cycle-time software development, *Information Technology for Development*, 11(1), 5-30.

Prikladnicki, R., Audy, J. and Evaristo, R. (2003) Global software development in practice lessons learned, *Software Process Improvement and Practice*, 8(4), 267-281.

Rajala, R., Rossi, M., Tuunainen, V. K. and Korri, S. (2001) *Software business models: A framework for analyzing software industry*. Technology Review 108/2001. Helsinki: Tekes.

Rialp, A., Rialp, J. and Knight, G. A. (2005) The phenomenon of early internationalization firms: What do we know after a decade (1994–2003) of scientific inquiry?, *International Business Review*, 14(2), 147–166.

Robb, D. (2000) Offshore outsourcing nears critical mass, *InformationWeek*, June 12, 89-98.

Rönkkö, M., Eloranta, E., Mustaniemi, H., Mutanen, O.-P. and Kontio, J. (2007) *Finnish software product business: Results of the national software industry survey 2007*. Helsinki: Helsinki University of Technology.

Rönkkö, M., Ylitalo, J., Koivisto, N., Mutanen, O.-P., Poikonen, P. and Adamsson, A. (2008) Finnish software industry: The national software industry survey 2008. Helsinki University of Technology and University of Turku. Available online http://www.sbl.tkk.fi/oskari/Press_slides_2008 %20ENGL.pdf

Sainio, L.-M. (2005) *The effects of potentially disruptive technology on business model – a case study of new technologies in ICT industry*. Ph.D. dissertation, Acta Universitatis Lappeenrantaensis 217, Lappeenranta University of Technology.

Sallinen, S. (2002) *Development of industrial software supplier firms in the ICT cluster: An analysis of firm types, technological change and capability development*. Ph.D. dissertation, Acta Universitatis Ouluensis G12, University of Oulu. Available online http://herkules.oulu.fi/isbn9514267095/isbn9514267095.pdf

Salmi, A. (1996) Russian networks in transition: Implications for managers, *Industrial Marketing Management*, 25(1), 37-45.

Salmi, A. (2004) Institutional change of business networks: Russian transition revisited, *Proceedings of the 20th Annual IMP-conference*.

Saxenian, A. (1991) The origins and dynamics of production networks in Silicon Valley, *Research Policy*, 20(5), 423-437.

Selioukova, Y. (2005) *IT market growth centers in Russia: Moscow, St. Petersburg and Novosibirsk*. Northern Dimension Research Centre, Publication 20, Lappeenranta University of Technology.

Seppänen, V. (2002) Evolution of competence in software subcontracting projects, *International Journal of Project Management*, 20, 155-164.

Servais, P. and Andersson, S. (2005) Combining industrial buyer's and seller's international strategies, *Proceedings of the 31th EIBA Conference*, December 10-13, 2005, Oslo, Norway.

Shan, W. (1990) An empirical analysis of organizational strategies by entrepreneurial high-technology firms, *Strategic Management Journal*, 11(2), 129-139.

Simonen, J. (2007) *The effects of R&D cooperation and labour mobility on innovation*. Ph.D. dissertation, Acta Universitatis Ouluensis G27, University of Oulu. Available online http://herkules.oulu.fi/isbn9789514284083/isbn9789514284083.pdf

Software (2008) In *Merriam-Webster Online Dictionary*. Retrieved October 23, 2008, from http://www.merriam-webster.com/dictionary/software

Spence, M. (2003) International strategy formation in small Canadian high-technology companies – A case study approach, *Journal of International Entrepreneurship*, 1(3), 277-296.

Spender, J.-C. (1994) Organizational knowledge, collective practice and Penrose rents, *International Business Review*, 3(4), 353-67.

Stake, R. E. (2000) The case study method in social inquiry. In Gomm, R., Hammersley, M. and Foster, P. (eds.) *Case study method*. London: Sage Publications.

Svahn, S. (2004) *Managing in different types of business nets: Capability perspective*. Ph.D. dissertation, Acta Universitatis oeconomicae Helsingiensis, A-243, Helsinki School of Economics.

Tähtinen, J. (2001) *The dissolution process of a business relationship - A case study from tailored software business*. Ph.D. dissertation, Acta Universitatis Ouluensis G10, University of Oulu. Available online http://herkules.oulu.fi/isbn9514265300/isbn9514265300.pdf

Teece, D. J., Pisano, G. and Shuen, A. (1997) Dynamic capabilities and strategic management, *Strategic Management Journal*, 18(7), 509-533.

Tekes (2003) *Ohjelmistotuotteet SPIN 2000-2003 –teknologiaohjelma (Software products – SPIN 2000-2003)*. Teknologiaohjelmaraportti 15/2003, Loppuraportti. Helsinki: Tekes.

Teng, J., Cheon, M. and Grover, V. (1995) Decisions to outsource information systems functions: Empirical tests of a strategy-theoretic model, *Decision Sciences*, 28(1), 75-103.

Terekhov, A. (2001) The Russian software industry, *IEEE Software*, 18(6), 98–101.

Tuunanen, T. and Vainio, A. M. (2005) Communication flows between product and software development processes: A case study of two mobile software companies, *Journal of Information Technology Theory and Applications*, 7(3), 27-48.

Tyrväinen, P., Warsta, J. and Seppänen, V. (2004) *Toimialakehitys ohjelmistoteollisuuden vauditajana (Industrial development as a source of efficiency for software industry).* Technology review 151/2004. Helsinki: Tekes.

Väätänen, J., Ivanova, O., Kyrki, A. and Lindqvist, J. (2005) *Case study on Russian offshore software development – Strategy in the making*. Northern Dimension Research Centre, Publication 12, Lappeenranta University of Technology.

Vähäniitty, J. (2003) Key decisions in strategic new product development for small software product businesses, *Proceedings of the 29th Euromicro Conference*, 375-383.

Van Maanen, J., Sørensen, J. B. and Mitchell, T. R. (2007) The interplay between theory and method, *Academy of Management Review*, 32(4), 1145-1154.

Van Mieghem, J. A. (1999) Coordinating investment, production and subcontracting, *Management Science*, 45(7), 954-971.

Varis, J. (2004) *Partner selection in knowledge intensive firms*. Ph.D. dissertation, Acta Universitatis Lappeenrantaensis, 199, Lappeenranta University of Technology.

Warsta, J. (2001) *Contracting in software business: Analysis of evolving contract processes and relationships*. Ph.D. dissertation, Acta Universitatis Ouluensis A379, University of Oulu. Available online http://herkules.oulu.fi/isbn9514266005/isbn9514266005.pdf

Weick, K. E. (1989) Theory construction as disciplined imagination, *Academy of Management Review*, 14(4), 516-531.

Welch, L. S. and Luostarinen, R. (1988) Internationalization: Evolution of a concept, *Journal of General Management*, 14(2), 34-64.

Welch, L. S. and Luostarinen, R. (1993) Inward-outward connections in internationalization, *Journal of International Marketing*, 1(1), 44-56.

Welch, C., Marschan-Piekkari, R., Penttinen, H. and Tahvanainen, M. (2002) Corporate elites as informants in qualitative international business research, *International Business Review*, 11, 611-628.

Willamson, O. E. (1975) *Markets and hierarchies*. New York: Free press.

Williamson, O. E. (1979). Transaction-cost economics: The governance of contractual relations, *Journal of law and economics*, 22 (2), 233-261.

Williamson, O. E. (1981) The economics of organization: The transaction cost approach, *American Journal of Sociology*, 87(3), 548-577.

Wright, R. W. and Dana, L.-P. (2003) Changing paradigms of international entrepreneurship strategy, *Journal of International Entrepreneurship*, 1(1), 135-152.

Wynstra, F. and van Echtelt, F. (2001) Managing supplier integration into product development: A literature review and conceptual model, *Proceedings of the 17th Annual IMP-conference*.

Yin, R. K. (1994) *Case study research, designs and methods*. Thousand Oaks, CA: Sage Publications.

Yli-Renko, H. (1999) *Dependence, social capital, and learning in key customer relationships: Effects on the performance of technology-based new firms*. Ph.D. dissertation, Acta Polytechnica Scandinavica, Industrial Management and Business Administration Series, No. 5, Espoo: The Finnish Academy of Technology.

Young, S. (1987) Business strategy and the internationalization of business: Recent approaches, *Managerial and Decision Economics*, 8, 31-40.

Young, S., Dimitratos, P. and Dana, L.-P. (2003) International Entrepreneurship Research: What Scope for International Business Theories?, *Journal of International Entrepreneurship*, 1(1), 31-42.

Zaheer, S. (1995) Overcoming the liability of foreignness, *Academy of Management Journal*, 38(2), 341-364.

Zaheer, S. and Zaheer, A. (2006) Trust across borders, *Journal of International Business Studies*, 37(1), 21-29.

Zahra, S.A. and George, G. (2002) International entrepreneurship: The current status of the field and future research agenda. In Hitt, M. A., Ireland, R. D., Camp, S. M. and Sexton, D. L. (eds.), *Strategic entrepreneurship: Creating an integrated mindset*. Oxford: Blackwell Publishers, 255-288.

Appendix 1

Topics for the interviews in the Finnish companies, in 2003 (translated from Finnish)

Company information

- Name
- Industry branch
- Size (turnover, personnel)
- Customers (type, size)

Background information

- How long has the firm used subcontracting
- Reasons for subcontracting, why it was decided to start doing it
- Has subcontracting changed over the years
- How many suppliers does the firm have
  - In Finland and abroad (where)
  - Centralised or distributed
- How many projects
- How do you decide what to subcontract
  - Do you perform the same activities in-house
- Duration of relationships (one project -> continuous cooperation)
- How easily do you change the supplier
- How does the use of a foreign supplier differ from the use of a Finnish supplier
- Personnel's opinion
- Customers' opinion, communicating subcontracting to customers
- Public information

Beginning

- How did you find the supplier
- What criteria were used in selection
  - Formal and informal
  - Market test / tenders
- How did you start subcontracting, what was decided to begin with
- Agreeing upon practical matters

Process

- Planning
  - Product
  - Process
  - Contribution by the parties
  - Life cycle (specification, design, execution, implementation, maintenance)
- Coordination / organising operations
- Responsibilities
- How often do you communicate and how
  - Does the amount of communication differ in different stages of the project
- Official and unofficial practices
- Flexibility of operations, adjusting
- How tightly do you follow the supplier's processes
- How do you control progress
- Do you use indicators
  - What indicators

- Evaluating success at the end of the process
- Quality assurance
- Supplier-related after-care
- Obstacles and faced problems
- Positive experiences
- Negative experiences

Strategy

- Goals of the subcontracting activities
  - Long term and short term
  - Expected benefits
  - Concentrating on core activities
  - Economy of scale
  - Access to market
  - New business opportunities
- Classic market transactions or strategic partnerships
  - Relation or network
  - Value of relation
  - Closeness of the parties, integration
  - Efficiency of the network
  - Trust, is it visible in operations or decision-making
- Sharing and transfer of knowledge
  - Technology
  - Business know-how
- Costs
  - Transaction costs and external costs versus internal development and investments
  - Possible effect on internal R&D investments
- Resources and competencies
  - Competitive advantage
  - Innovativeness
  - Supplier's skills (technology, processes)
- Risks
  - Opportunistic behaviour
  - Does the supplier compete with the firm
- Planning the future, continuity
  - Developmental potential in the future
- Satisfaction with the supplier
  - Operations / process
  - Product
  - Relationship
  - Effectiveness = achieving the desired outcome
  - Efficiency = good input-output ratio
- What will you need for successful subcontracting in the future
- Current strategic view
  - Why abroad / from Russia

- What essential questions have not been asked

Appendix 2

Form for the interviews in the Finnish companies, in 2003 (translated from Finnish)

Which option describes subcontracting in your firm best?
Mark your opinion on sourcing in general (from the point of view of your company) with X
Mark your opinion on foreign sourcing (from the point of view of your company) with O

			neutral			
Operational function						Business activity
Lowering costs						Creating value
Control						Tolerating uncertainty
Unchanging processes						Changing goals and processes
Operational efficiency						Strategic efficiency
Utilising inputs						Problem solving
Manpower						External experts
Temporary relations						Partner network
Separate						Integrated
Strict						Flexible
Rationalisation						Competitive advantage
Contracts						Trust
Routine						Innovation
Indispensable						Profitable
Turnover						Constancy
Safe						Risky
Support function						Core function
Production capacity						Knowledge
Drifting						Planning
Detailed indicators						General evaluation
Positive						Negative
Optimistic						Pessimistic

Appendix 3

Topics for the interviews in the Finnish companies, in 2006 (translated from Finnish)

Product development

- Product and service range
- What is the role of software development in the final product
- Internal development resources, segmentation of personnel

Network

- Cooperation with domestic and foreign partners
- Scope of the current network
- Type of cooperation (equity versus contracts)
- Goals of cooperation / network
- Finding partners
- Roles and scope of services of different partners
- Duration of cooperative relationships
- Effect on availability of resources
- Effect on cost structure of product development
- Effect on product development time and product quality
- Protecting intellectual property rights
- Trust and risk
- Dependence on partners

Organising

- Coordinating product development
- Formality of the process
- Communication
- Solving conflict situations
- Cultural differences between organisations

How has networking affected the firm's:

- Product development process
- Development in general

How has the situation changed during the last two years?
Future prospects?

Appendix 4

Topics for the interviews in the Russian companies, in 2005

Company information

- Name
- Size:
  - Personnel
  - Turnover
- Industry branch
- Degree of specialisation:
  - Doing everything --- specialised
  - What kind of specialisation (technology / industry)
- Clients:
  - Industry
  - Size
  - Share of Russian / international clients
  - Single projects --- continuous cooperation
  - Duration of projects
- Projects:
  - Type
  - Size
  - Number of simultaneous projects

International cooperation

- Starting in Russia and proceeding to foreign market / international from the start
- How do you obtain your international clients
  - Personal networks, university cooperation etc.
  - Summits, road-shows etc.
  - Cooperation with other Russian firms
  - Cooperation with some foreign actors
  - Number of interested contacts / actual projects
  - Criteria used by potential clients (eg. formal tender, trial project)
- What countries are your clients from
  - Do you have a main target market
- What kind of cooperation do you have with Scandinavian / Finnish firms
  - ICT / other industries
- Clients' reasons for offshore development (expected benefits)
  - Economy of scale
  - Lack of resources / knowledge and competence
  - Concentrating on core competences
  - Shortening development time
  - Access to market (country / industry)
- What services do you offer them
  - Selling work hours --- product development
  - Short notice (urgent need for up scaling resources) --- long term
  - Product life cycle: specification – design – implementation – maintenance
- Development process:
  - Participation of different parties
  - Responsibility for organising tasks
  - Official / unofficial practices

    - Degree of initial specification
    - Communication practices, amount of communication at different stages of process
    - Follow-up
- Particular challenges in cooperation
    - Communication
    - Trust (fear of competition, opportunistic behavior, IPR)
- Are there differences in working with partners from different countries
    - Eg. as compared to working with Russian clients

Future

- How has international cooperation developed over years
- How do you see the future trends in international cooperation in software development
- In what direction would you like to develop your international cooperation
- Price level (rising in Russia, compared to other offshore countries)
- Quantity and quality of specialists

Appendix 5

Factors of decisions about offshore sourcing in software development

Strategy-related aspects

Factor	Alpha	Beta	Gamma	Delta
Technology: product development, specialisation <u>Product development: technology, specialisation</u>[1]	- concentrating on core activities - you cannot be internally skilled in everything - decision about what to concentrate on determines what to subcontract - needs: not just mass-producing code, but product development (from idea to completed program) - subcontracting is a source of technical competencies and supplementary skills - successful suppliers are able to add value with their own ideas to solve problems (previous experience, cost effectiveness) - the goal is to concentrate on core activities and source supplementary skills from suppliers for whom they are core activities and who are able to invest into improving efficiency and quality of their activities - many tasks require creation of new solutions with the help of modeling and mathematical skills	- suppliers: same type of know-how as B, some special areas - foreign suppliers: programming skills, technical skills/experience - supplier's experienced personnel involved in technical management and implementation decisions (after customer interface specification) - product development cooperation has risks as some core competences are external, but internalising those competencies is too costly (operating on many areas/markets) - innovativeness is one of preconditions for suppliers (need for creative activities, especially when the goal is to evaluate launch potential of a new product) --[2] - focus has shifted strongly to forest industry applications - customised products for large customers - competitive advantage comes from core technology (mastering production technology better than competitors enables quality and competitive pricing) - only few of emerging technologies grow to be successful, one should find the growing one among variety	- network as a team: each strategic partner has its own defined area of expertise -- - involvement in software development: interaction with the customer, defining customer's needs and software structure, actual implementation by the Russian supplier - [joint product development, innovation] typically, each partner commercialises its share of a jointly developed product family (based on a certain model) – easier to cooperate on a model level than in actual product development - if product development is the only source of competitiveness, you have to keep it inside the firm (but the original model can come from a joint project)	- preference for development of internal personnel's skills (knowledge transfer to outsiders is much slower) - importance of internal investments for future development - subcontracted tasks similar to internally conducted ones - product quality has always been important for Delta (firm pride), done well in game development competitions - internal personnel is more critically disposed to supplier's output than internal development (demand for higher quality than internally) - in the pilot project, Delta provides the concept for the supplier, if cooperation continues it is seen as a big advantage if supplier can bring in own concepts for games (ideally, a whole project is provided by supplier)

[1] Underlined text indicates the changes made to the grouping of the factors or the titles of the groups after the detailed data analysis (the final version is underlined).
[2] The data from the two interview rounds are separated by two hyphens.

		- integrating different knowledge from different actors into a product - swd intertwined with mathematical know-how, understanding underlying algorithms → competitiveness - no downright products left, instead providing software-enabled services and related integration projects; might be necessary to productise and brand services in the future - likely to contract out some software development in the future - without venture financing, the firm has shrunk and focused, the goal is to be technological leader - seeking technological leadership → more cooperation with research facilities - earlier technology was too obscure – no obvious needs, difficult to find partners and clients - earlier, technical development was given to partners with knowledge of certain technologies and clientele - current pronounced role of technical and mathematical skills affects the choice of partners (research focus)		
Market: niche, customers, competition	- foreign subsidiaries are preferably using suppliers from the same country - suppliers adjusting products to local market - suppliers can provide a possibility for entering a new market - the role of new markets in partnerships: considering possibility of tapping into each other's clientele (on national or global level) - constant changes in the industry necessitate creating innovative new solutions and this is also sought	- foreign suppliers' knowledge of a target market (reason for sourcing) - small Western-European suppliers handle interaction with local clients - market situation → subcontracting intensity (need for growth/cost cuts) - the market is growing faster in the East than in Western Europe, but the firm lacks market knowledge and contacts (an already established local partner would be needed) - solutions for different industries – need a partner with industry and clientele knowledge (feedback on customer needs, co-implementation)	- trend: strategic partner both supplies to G and sells domestically (royalty) - initially product development projects, with time more business focus (from technology to sales) - no interest in foreign markets (strategic choice, too much growth undesired) -- - [being a software development broker] more flexible and profitable arrangement for end customer, better competitiveness	- assets: quality of products, excellent distribution channels (widely spreading products) - good game visibility – contacts from game developers inquiring for possibility to publish their products through D's channels - different types of game developers: those with distribution channels (direct contacts to significant mobile operators, 5-15 firms in Europe) and those who develop for others or wholesale (small teams, no distribution, over 100 firms) - mobile game market hasn't yet

	through suppliers (seeking suppliers with certain skills to improve own competitiveness) - changing industry structure, unclear future roles (fear of suppliers becoming competitors)	- implementing a new innovative concept calls for a partner familiar with the market (sufficient network for covering the desired market) - not sourcing regressive or routine operations, cooperating to provide integrated solutions for the client - vertical diversification - global focus in each market – Finnish development is not enough, you need to know that the concept will work globally - in the long run, operations in Russia are induced by both cost incentives and skills related to a certain market - lacking insight about Russia despite having Russian workers, some language skills and proximity – unable to see what model could work in Russian market -- - earlier venture investment put emphasis on standardised products, finding customers, sales and marketing functions - new technology create pull, illusion of importance of "first mover advantage", stressing growth and expansion, venture capital equals both pressure and opportunities - the target market has become more clear, the actors are known - deepening customer relations, more projects with key customers - [vertical pipeline thinking] has strengthened: technology-focused firm (& technology maturation) → increased customer-orientation - potential customers have become aware of solution/technology benefits; client's readiness for technology has increased (internal processes, need awareness)		developed in Russia, otherwise it might have effected partner selection criteria - several suppliers would have wanted their name mentioned in the final product, but this has been accepted only in some exceptions (negative attitude) - the danger of a supplier becoming a competitor has decreased because of the strengthened market position (risk exists still, but lessened) - the biggest risk is supplier developing an exact copy of a game for a competitor (image damage) - subcontracting enabled rapidly growing game portfolio – sufficient portfolio needed for opening doors to market - a game is currently developed in about 1,5 month, mostly internally or through a couple of closest suppliers - some good products were obtained through suppliers and it has clearly been an advantage

		- refined segmentation of the market (plural segments instead of one), each of the new segments is global - most current activities related to one industry (diverse customers/needs) - current networking centered around key customers (certainty of sales reduces own stakes) - target market – vital to know your customer or customer knowing you - not competing with customers anymore (earlier as information systems integrator), knowingly shifting focus towards know-how related to mathematical algorithms - lately hasn't lost a tender (partly effect of right pricing – with enough demand in the main sector, there is no need to try to broaden operations - the importance of customer-centred projects has increased, long client relationships → the role and need for people in such projects has increased (internal development) - the most significant sourced product development project has been on-hold (lack of clients for the product) - more focused approach on target market, less need for external market knowledge - giving up on segments that do not appear to take on (resource constrains – both conscious and unconscious decisions) - knowing the customers vs. finding a partner who knows customers - competitors have production units in countries with lower wage level		
Cooperation <u>Networking (policy/attitude)</u>	- different types of subcontracting, at least 20 years - clearly you cannot do everything yourself, nor is it economically sensible	- primarily using internal resources, next in priority are existing partners - operating in a network with predefined roles (not entering a network because of prior	- networking as foundation for operations - not subcontracting for volume - subcontracting has evolved into networked operations and suppliers	- not systematically searching for suppliers - few foreign suppliers, positive experiences led to finding some domestic suppliers as well

	- the volume of subcontracting has grown, more responsibilities are shifted, bigger entities - roughly estimated hundreds of suppliers - many simultaneous projects, several projects with a supplier - several suppliers, supplier tenders - suppliers are found based on their promotion efforts (knowing where to look when you need a supplier) - sometimes individual projects, but more often continuous relationships (several over 10 years supplier relationships) - this branch of industry has operated in a network environment for 100 years, being a part of a larger network is natural - value added by supplier – no formal way of measuring, but a relevant factor when considering cooperation (especially strategic value) - trust is critical in this branch of industry, formal regulations - close interaction with supplier – supplier must develop its functions and comprehension to make giving assignments easier - decisive in supplier choice: how easily and quickly the task is grasped - two different types of subcontracting: productional (clear practices, stable processes, tight control) and high-quality special skills (organised on case by case basis) - the goal is to have cooperative network of top specialists in large companies worldwide	acquaintance, but based on target clients, product goal etc.) - the whole network suffers if a product does not find clientele - foreign partners mostly small - jointly increasing value through cooperation with related industries - balancing risks: cooperation scatters knowledge and causes dependency, but controls risks related to costs -- - the network has become sturdier, bigger and older partners (B's desirability as a partner has increased, the size is not a limitation anymore, more respect for technical know-how, fair negotiations) - the goal is to become world leader in a defined market niche, outlined path - strategic partner choice (fewer and more robust), defined goals for development of a relationship - network and customer relations have both become tighter and more concise (development has not been conscious) - sought partners are mainly foreign - growing network, but with fewer actors - sourcing is central in avoiding rise of fixed costs, existing good subcontracting relations – trust in suppliers' capabilities and skills - basic model for moving into a new client branch: need for someone from inside with experience - more cooperation with research institutes (structural change); global nature of science – narrow niches, best experts scattered, accessing knowledge through network - difference between a start-up and an	into strategic partners - around ten strategic partners, additional operational and tactical partners depending on a project - cooperation with research institutions - linking different actors: universities, research institutions, and firms - subcontracting grew into strategic partnership when suppliers started bring forward innovative ideas and think about overall benefit for the network, suppliers importance for competitiveness has increased with this development - nothing works 100%, but generally speaking subcontracting has been a positive experience, general impression must be positive for cooperation to work -- - internal personnel is fixed and specialised in certain tasks, entrepreneurial firms are more dynamic - each partner has a clearly defined area of expertise; one partner per area to avoid competition, evasion or information withholding - not seeking partners for the sake of networking, projects are proposed and appropriate partners are sought with the money of the proposer - networks are built on trust and working relationships, creativity is impossible without trust - different firms and countries have different cultures that affect things, but work has still been done (if not on the phone, then through discussion in situ) - deterioration in strategic nature of	(applying same working principles) - planning to downsize number of suppliers (not an optimal model for game development) - potential suppliers are more likely to find D than vice versa (tried through Internet after some positive experiences) - suppliers are of the same size or smaller (typically 2-5 persons), one exception - cooperation will end after an unsatisfactory project - change of preferences: albeit building internal teams is more expensive and slower in the beginning, it pays off in the end - downsizing supplier network, internal development, keeping two suppliers with whom things have worked out well - remaining suppliers: cost effectiveness, longest experience of cooperation, familiar with desired routines, would be foolish to drop them when things have started working, satisfaction with products and relations (some occasional problems with communication), desired outcome has usually been achieved one way or another - bilateral relation with suppliers - subcontracting relations are not that important, nice to have as they already have been created, but it would not bring the firm down if they ended - impossible to cooperate without trust, smallest suspicion would end - suppliers should learn to think about game development process (no need to repeat the same things over and over), understanding what

		older partner is clients' familiarity - important to know what is going on, network as source of information - accepting unavoidable dependencies (partners, clients, personnel); balancing dependencies – no single dependency grows too strong (stable organisation) - now it would be easier to use suppliers (growth of formality), but no need for added capacity - search for partners starts from domestic actors (B is better known here); origin is not decisive, looking for the right role in the industry - currently, mostly domestic key clients and mostly foreign partners - networked operations→ competitiveness (readiness to operate internationally: experience of multicultural context, company background and culture) - in the future, networking with clients and few key partners, less directionless exploring	network due to fixation on financial results of an ongoing quarter on behalf of clients - current organisational structure creates flexibility (independent of orders) and lowers entrepreneur's risk - clearly defined own niche to ensure that you have enough competencies to mitigate partner dependency risk (able to execute the project if a partner fails you) - networking is going to be widespread in the future, Finnish manufacturing decreases, society needs to develop new networks	makes a good game - existing supplier relations have been invested in, worth continuing (also financially) - supplier's origin is not decisive (entity)

Aspects related to resources and capabilities

Factor	Alpha	Beta	Gamma	Delta
Internal resource base		- sourcing due to lack of resources - individual personal resources define the efficiency of programming - effective team: skills & preferences -- - internal skills: core algorithms, customer interface - improved economic situation → growth of internal personnel, less subcontracting - internal development operationally easier than cooperation (reachable) - personnel turnover (either bad or good)	- subcontracting is used when there is need for some specific knowledge to fulfill the goals of a project, but its unavailable internally -- - resource base of a project consists of customer's resources, Gamma's resources (internal and network) and occasionally resources provided by a research centre or a unit of higher education - resource shortage leads to longer product development time	- subcontracting due to internal resource shortage - internal development team significantly contributes to the value of the product and the firm - best knowledge is internal (market, technology etc.), impossible for a supplier to have comparable know-how

		- internal growth → credibility in the eyes of larger customers - firm size is still not sufficient for longer time planning of personnel - moving from products to services (quality of service important) - internalising complicated technology development involves significant investments, risk of personnel turnover		
Availability and scalability of resources and skills	- Russian mathematical and modeling education is of high level, but they haven't yet been able to apply it in business ventures, potential for some firms to specialise - Russian suppliers have a lot to learn in understanding assignments on a sufficiently high level	- availability of project management skills - local human resource availability - easier to find partners with complementary skills abroad – narrow markets and narrow expertise result in scattered networks - Eastern Europe (Russia, Serbia, Poland) has skilled programmers - subcontracting likely in case of rapid growth or increase of cost pressure - complementary resources in related industries are sourced externally - foreign origin of specialised suppliers -- - Open Source decreases the relevance of supplier's origin - supplier's technological base is more important than geographical proximity - Eastern Europe and CIS: good level of technical and mathematical education, competitive software development skills, organisational modes still unpredictable and seek shape (prevents building more complicated operational patterns) - different specialised suppliers: technology, market and customers, complementary skills	- cooperation is necessary to provide customers specialised knowledge - supplier's knowledge base is more important than geographical location or origin - network provides resources and enables shortening development time -- - providing bigger entities and diverse expertise through network	- enlarging product portfolio through volume subcontracting - cooperation propositions from external providers - tempting to subcontract to countries with lower costs and good talent availability - in Russia, price-quality relation is rather good (not just cheap price, but quality) - Russian programmers are skillful - suppliers are skilled technically but lack in creativity and visualising the whole, tasks have to be clearly defined

Costs Financial resources	- if everything but the coding is done internally, the price is decisive; thus coding will be executed through the cheapest option - a large range of subcontracting activities (starting from pure execution, where the goal is lowering the costs)	- cost regulation is one central reason for sourcing (especially fixed costs) - selling value to a client, while producing it with minimum expenses -- - unit price of quality work – many tasks are not worth performing in Finland - level of profitability does not allow hiring additional personnel - production in countries with lower cost/wage level is significant investment, financing decisions jointly with partners - fluctuation in demand reverberates on labour cost – foreign cooperation provides lower costs and flexibility - basic tasks can be subcontracted to improve price competitiveness - pressure on pricing (small firm size), keeping unit prices low through better productivity (being more skilled) or using cheaper labour for routine tasks - not possible to plan long term personnel allocation (small firm size); location of personnel (internal/network) would be greatly affected by effect on price	- pilot project is evaluated on price and quality, it is always worth paying for a good level of quality - 20% commission on supplier's work - market price combined with cheap Russian programming enabled attractive discounts for clients -- - setbacks and amount of fixed personnel costs forced to reorganise - because of commission arrangement, the rising prices of suppliers have little significance - networking has improved the contribution margin - internal personnel has become a risk due to economic fluctuations and customers' sensitivity to them	- limited financial resources for sufficiently investing in internal development – cost efficiency essential in rapidly growing game portfolio - attractive idea to contract to countries with low wage level and a lot of talent - besides lower cost level, existing subcontracting arrangements have shown potential in quality aspect - price-quality ratio decisive, low quality would not have been accepted even for free - expensive to train new subcontractors, so no new cooperation is planned - lower internal training expenses - higher cost of internal development vs. cost of communication – cheaper to develop entirely internally

Organisation-related aspects

Factor	Alpha	Beta	Gamma	Delta
Firm-level	- restrictions on distribution of work to suppliers have eased with time - nowadays distributing tasks is a natural way to operate - subcontracting is a matter-of-course, currently and in the future	- minimum internal personnel to limit fixed costs, flexibility through suppliers (based on situation and volume needs) - network has to have manageable number of actors (3 typical, 5 max) - industry turbulence reduces continuity - small scale projects (<20 people)	- capacity of networking partners restricts the number of simultaneous projects, internal project management capacity limit 5-10 projects - the hub firm must know the industry and understand the whole picture (to find the right actors and manage the execution)	- not looking for any new suppliers, internal development preferable

		- industry turbulence → rapidly raising and lowering volume, liquidity problems forced payment postponements, but suppliers have been understanding - too much personnel and too few clients is an unstable situation, losing know-how due to dismissals – can be less risky to keep knowledge through the partners - know-how related the early stages of product development does not generate cash flow -- - around 5 simultaneous projects, on average 3 persons per project (small projects, cannot be divided into parts) - nothing is done alone, >50% of projects are executed in cooperation (client-led/ jointly with partners) – partners have clearly defined roles in PD	- exchanging information among partners in drawing up a saleable project - biggest projects last for 3-5 years - small internal organisation is a strategic choice, limiting internal management - contractual cooperation (strategic partnerships), no ownership links - cooperation primarily with strategic partners, tactical suppliers are used if a partner is not capable of executing (communicating the reason right to strategic partner) -- - restructuring: downsizing organisation, employees are now part of the network as independent actors - need to find a more dynamic way to organise and manage projects - having internal software development unit did not work (could be wrong choice of a person – no perseverance) - risk in networked product development should be divided between partners, otherwise it hits hard on the hub firm	
<u>Product development function</u>	- different ways of organising cooperation: from internal presence of external providers to sourcing out - useful suppliers should have competence to participate in all stages of the process, starting with planning - preferably, supplier is not only responsible for coding, but the responsibilities are shifted already in earlier stages - the ease of specification (incl. requirements, inspection, testing)	- level of specification often does not enable straightforward actions - internally: project management, client interaction, product planning - the ability to operate according to formal specifications has increased - making flexible contracts - the definition of the customer interface is executed internally (practical and strategic reasons) - resource sourcing through unknown suppliers requires detailed specifications, cannot involve brain storming or creative freedom (lack	- core competence: industry knowledge and network management - customers contract out both a project and its management - G creates the initial framework for a project, partners expected to contribute to its further development - G's responsibilities in a project: control, guidance, support and problem solving - actors in a network work independently, information	- contacted by a Russian firm proposing cooperation – continuum: supplier's impressive quality of work, mutual interest for cooperation, finding a suitable business model, trial project, continuing cooperation - distributing one project to multiple actors undesirable, preferable suppliers are able to execute a whole project - relations are continued if everything is in order, long relations are desired (expensive to

	varies depending on the domain and amount of accumulated experience – newer domains are more difficult to outline, a lot has to be agreed upon in the process, partnership (jointly developing product and creating a model for cooperation)	of familiarity), potential mismatch between undefined order and delivered product - in development activities, you have to spend certain amount of time to learn to know your partner and how to work together, before assigning more liable tasks to supplier -- - nowadays thorough specification-writing (affects billing, customer satisfaction and general quality) - customer-centred development requires constant presence (concrete problems, easier to communicate to programmers on-site than specify in email)client's involvement is best precondition for a project's success, requires direct communication between technical personnel (easier to manage with internal development) - any project big enough to be divided into parts could be executed in cooperation - applications must be developed with specifications and documentation to ensure transferability and maintenance - sourcing fits better in one time projects / buying a whole product	distributed through project portal - the measures for success are clearly defined beforehand -- - G deals with the customer interface - partners are free in their interaction with customers, but that information should be provided to G to ensure wholeness of the project (final project responsibility) - networking in product development works, but you have to agree upon the rules	teach a supplier to work according to one's methods) - with games, end product specification are difficult to write; difficult and/or slow to explain corrections in an email - informal working procedures, learning by doing, no specifying documentation - milestones are project-specific, no general template - some supplier integration: basic technology, working procedures - typically games have to be adapted for new phone models, preferably done by the same supplier - suppliers' efficiency is moderate, but could be improved
<u>Cooperation practices</u>	- informally narrowing the group of potential suppliers, followed by structured tender for the best three (comparison based on task, costs, timetable) - laborious to carry out a structured tender for a larger group - a lot of cooperation is done in close interaction	- physical distance between the client and the provider – differences in operative culture, communication and flexibility - some project responsibilities could be shifted to a supplier closer (culturally/ geographically) to the client - positive subcontracting experiences, main problems related to personnel turnover and blurred responsibilities	- potential partners are evaluated based on pilot project - no difference between domestic and foreign partners if both parties are sufficiently mature, similar basic values, accepting joint principles and rules - there are always some cheaters that must be gotten rid of - basic values are essential, papers and contracts do not build trust - frequent communication in early	- cooperation with domestic suppliers easier (language and similar culture, meeting frequency) - communication problems - not seeing or knowing the other party - weekly interaction with a dedicated D's employee - intensive communication in early (concept development) and final stages (testing, final polish), less frequency in the middle of a project - decisive criteria: most important is

		- Russian supplier – single project, moderate success (unprepared for formal cooperation with unknown supplier) - fluency of cooperation increases with trust and familiarity with each other's ways of working (time and learning) - lack of uniformity in European legislation (status of foreign workers) - when hastily changing supplier relations, organisational cultures are unlikely to match straight away (takes time) - problems are most strongly related to organisational culture, rarely due to generalisable location issues - problems arise from a concrete specific situation, require mutual compromises	stages, later on less frequently (e.g. project meetings four times a year) - constant follow-up not possible or desirable, requires trust between partners - well-organised networking should not impose extra management efforts - dislike for tenders, especially in case of academic experts - contracts are made to secure oneself in case of a crisis (not having to defend a verbal contract in court) - precise contracts protect if project is delayed because someone withheld information on his slowed progress - cooperation is not based on tight control, but independency and shared basic values and trust, deviation from agreed must be informed (timetable, costs, goals etc.) - internal dynamics of a network is highly important, teaching shared working methods to foster shared values -- - active communication and firmly keeping schedule keep projects from drifting into conflicts	an existing reference (playable demo), fluency of communication (becomes rapidly clear) - supplier is easily changed if there are problems in quality or communication - supplier's ability to adapt varies (e.g. earlier internal procedures or working for another client) - follow-up concerns the end product, not supplier's process - efficiency is brought by fast programming, execution and price-quality ratio, but is lost with endless emails and discussion that require both time and energy - face to face communication much more efficient - the biggest issues: communication and keeping the quality level up - successful subcontracting: more communication or more frequent contact, both sides must trust each other, onsite visits if possible - communication is the most decisive success factor, but it takes time (timing communication right to lessen its amount at the end stages), understanding the concept helps in communication - tight contracts have been made, but you have to make relationship work other way (referring to contract means something has gone wrong) - to ease cooperation, it is beneficial to visit supplier or ask its staff over - communication is very important for a relationship, especially in difficult situations (e.g. approaching deadlines), contracts do not mean a thing – personal relations, mutual trust

Entrepreneur/management-related aspects

Factor	Alpha	Beta	Gamma	Delta
Personal characteristics		- tight control of suppliers does not fit my temper or my firm's working culture, unsuitable for development activities (more applicable for production) - initially assuming suppliers to be able, understanding and flexible; need for control would soon end cooperation, required attitude – everyone will benefit as soon as the work is done - fair pay policy (not the cheapest price), equally applied in sourcing -- - keeping an employee for as long as possible, supplier has to take the role of the buffer (cannot be responsible for supplier's employment) - ended owing money to supplier during crisis, but paid everything with time (withholding own salary)	- personal values: strategic partnerships is weighted in defeat (doesn't mean you have to die with your partner) - no need to conceal supplier's origin regardless of whether it is approved (historical background) - those with positive attitude will see how everything works as normal - openness led to bumping into prejudices, even in large customer organisations - having a Russian partner has been difficult (especially in the beginning of 1990s), getting easier all the time - firm's size is kept small because I want to participate in actual development, no need for organisational overhead - emotional thinking before being rational, fondness for Slavic mentality - cheaters can be found everywhere, but you cannot let a few rotten apples define the cooperation potential for everyone	
Personal network		- suppliers in Western-Europe are small entrepreneurial firms (former trainees) - longest cooperation with the Serbian supplier, long history of trust - learning to know each other: beneficial to spend time together with the supplier in the beginning (e.g. supplier's key personnel working for B in Finland or joint project run by a third party) - in one case sourcing failed due to lack of familiarity with the supplier - good experience of individual	- cooperation with a Russian university department since 1995 and a Russian firm since 1998 - entrepreneur's desire to act at the intersection of academia and business, learning opportunities - mapping interesting research partners in own niche (skills, reliability) - personal contacts – visiting an institution, pilot project -- - creating innovative solutions requires trust and social interaction	

		experts (formal arrangements change, but cooperation continues) - finding suppliers: academic links, trainee exchange, connections via EU projects - knowing each other - typically personal connection precedes cooperation on a firm level (with exception of the failed subcontracting/ Russian supplier) -- - coincidental network formation (meeting good people or firms), firm's small size as an underlying reason; more carefully planning cooperation at the next stage - good relation with the Serbian supplier, but currently inactive (project setbacks) - network and suppliers' roles abstract concepts – in practice matching tasks and actors (whether supplier or not), still primarily trying to employ own staff (upgrading know-how, familiarity with routines and clients) - relationship is kept alive by trust in skills and working ethics (even with temporary pause in orders) - earlier relations were too based on sociology, trusting that finding good people would suffice (applicable in research context, but not firm), EU project network still useful - network provides opportunities, but not necessarily in line with focus - cooperation is not just about personal relations anymore, but strategic alliances (need for organisations with certain know-how), able to wait if personal chemistry does not match right away - employees: 2/3 Finnish and 1/3 Russians (e.g. via a trainee program)	- further changes in the business plan, allying with another firm, considering different options	

Previous co-operation experience		- typically future supplier's personnel spends some time in Finland or has participated in a joint EU project (learning to communicate, familiarity with each other's working methods, knowing what they are capable to produce, knowing people) - failed subcontracting: supplier's staff hadn't spent longer than a week in Beta - use of Serbian supplier depends on orders (possible scaling up), good team, long history together, always easier with a familiar supplier who's technical equipment and skills are in similar areas - becoming familiar with a supplier – honeymoon, joint experience, reaction patterns, co-evolution -- - setbacks in international projects – possible causes could be cultural differences, physical distance, firm size (difficult for a small firm far away from home to express reliability and stability); not on interpersonal but interorganisational level (typically when responsible personnel changes) - easier to work with a familiar culture	- prejudices diminish with experience and proof, finding first projects extremely tough, easier when enough references - to get a good reference Russian party has to do particularly good work (does not apply to European nations) - one negative turn with a Russian party would be much more dramatic than with actors from other countries - cooperation failures have caused more disappointments than actual business losses (using minimal effort, causing uncertainty), mostly when the other party doesn't tell openly about problems - ability to take a match when there is trust between parties, without trust no further cooperation is possible - strategic partners are those that are easy to cooperate with -- - tactical partners can become strategic if they prove themselves, pilot projects - high dependency on partners, some risks have materialized (even with strategic partners) and added own work load	- supplier cooperation has worked rather well so far, but problems are always more difficult to solve with foreign parties (distance, different language) - downsizing supplier network: keeping two foreign suppliers (long experience of cooperation) and one Finnish - subcontracting is difficult in game development (nature of the industry) - with problems, subcontracting starts to take too much efforts from the firm - in game industry, it is difficult to get subcontracting to work profitably - some cultural differences naturally exist, you have to be precise with the Russian supplier (when you don't say something it will not be done), not assuming the other to understand or rationalise - in good communication everything should be clearly stated also from the client side