Department of Industrial Engineering and Management

The Impact of Knowledge-Intensive Service Provision on SME Performance: A Study in Software Industry

Aku Valtakoski

Aalto University

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The Impact of Knowledge-Intensive Service Provision on SME Performance: A Study in Software Industry

Aku Valtakoski

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Abstract

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Manufacturing firms increasingly include services in their offerings. Despite growing scholarly research on this phenomenon, there are still significant gaps in the current knowledge, particularly regarding the impact of service provision on product firm performance.

This dissertation studies the impact of knowledge-intensive service provision and service capability on the performance of small and medium sized product firms in the context of software industry. Given the lack of prior theorizing about service provision, we used an inductive research design that consisted of three phases: an exploratory in-depth case study of one Finnish enterprise software firm; a comparative multiple case study of nine software firms; and a cross-sectional statistical study of 116 firms based on data from the Finnish software industry.

In the in-depth case study, we identified the knowledge-based view of the firm as a potential theoretical grounding for understanding the impact of service provision. Based on this grounding, and cross-case analysis of the nine case firms, we identified 20 propositions regarding the impact of professional and development service provision on revenue growth and firm profitability, with various organizational and organizational contingencies. The statistical analysis provided weak to moderately significant support for most of these propositions, with contradictory evidence against two propositions. This contradictory evidence lead us to review and revise these propositions, leading to a more coherent theoretical explanation of service provision impact.

The results of the study indicate that knowledge-intensive service provision does have an impact on product firm performance. However, the two types of service had opposite effects on performance. This impact was also moderated by state of competitive environment, offering characteristics, as well as internationalization. We also found that service capability has a significant positive impact on product firm performance if the firm has internationalized or uses service partners.

This dissertation contributes to research on the role of services in product firms by providing additional evidence on service provision in the ICT sector, as well as the impact on firm performance, by developing a theoretical framework for understanding the strategic impact of services, and by studying service provision in the context of small, entrepreneurial firms.

Keywords Integrated solutions, knowledge-intensive services, strategy, SMEs, software industry

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Tiivistelmä

Teollisuusyritykset yhä enenevässä määrin sisällyttävät erilaisia palveluita tarjoomaansa. Vaikka ilmiötä koskeva tutkimus on lisääntynyt huomattavasti viime vuosina, on nykytiedossa vielä huomattavia puutteita, erityisesti koskien palveluiden tarjoamisen vaikutusta tuoteyritysten menestykseen.

Tässä väitöskirjassa tutkitaan tietointensiivisten palveluiden tarjoamisen ja palveluosaamisen vaikutusta pienten ja keskisuurten tuoteyritysten menestykseen ohjelmistoalan kontekstissa. Koska aiempi kirjallisuus tarjoaa vain rajallisesti valmiita teoreettisia selityksiä ilmiölle, käytettiin tutkimuksessa induktiivista tutkimusmetodologiaa. Empiirinen tutkimus koostui kolmesta vaiheesta: eksploratiivisesta, syvällisestä yhden suomalaisen ohjelmistoyrityksen case-tutkimuksesta; yhdeksän ohjelmistoyrityksen vertailevasta case-tutkimuksesta; ja suomalaisesta ohjelmistoalasta kerätyn poikittaisdatan tilastoanalyysistä.

Syvällisessä case-tutkimuksessa tunnistettiin tietämyspohjainen teoria mahdolliseksi teoreettiseksi taustaksi palveluiden tarjoamisen vaikutusten ymmärtämiselle. Tähän teoriataustaan ja vertailevaan case-tutkimukseen perustuen löydettiin 20 väittämää koskien konsultatiivisten ja tuotekehityspalveluiden vaikutusta yritysten liikevaihdon kasvuun ja kannattavuuteen, riippuen lisäksi erilaisista yrityksen sisäisistä ja kilpailuympäristön tekijöistä. Tilastollisessa analyysissä löydettiin heikosta melko vahvaa tukea useimmille näille väittämille. Kahden väittämän kohdalla tilastoanalyysin löydökset olivat ristiriidassa case-tutkimuksen kanssa. Tämän perusteella nämä väittämät revisioitiin, mikä paransi palveluiden tarjoamisen vaikutusta selittävän teoreettisen mallin johdonmukaisuutta.

Tutkimuksen tulokset osoittavat, että tietointensiivisten palveluiden tarjoamisella on vaikutusta tuoteyritysten menestykseen. Tarkastelluilla kahdella eri palvelutyypillä oli kuitenkin päinvastainen vaikutus suorituskykyyn. Vaikutus riippui lisäksi kilpailuympäristön tilanteesta, yrityksen tarjooman piirteistä, sekä yritysten kansainvälistymisestä. Tutkimuksessa havaittiin myös, että palvelukyvykkyydellä on selvä positiivinen vaikutus tuoteyrityksen suorituskykyyn, mikäli yritys toimii kansainvälisesti tai käyttää palvelupartnereita.

Väitöskirja edistää tutkimusta palveluiden vaikutuksista tuoteyrityksissä antamalla tietoa palveluiden tarjoamisesta ICT-sektorilla, sekä vaikutuksesta yritysten suorituskykyyn, kehittämällä teoreettisen mallin palveluiden strategisten vaikutusten ymmärtämiseksi, sekä tutkimalla palveluiden tarjoamista pienten, yrittäjävetoisten tuoteyritysten kontekstissa.

Avainsanat Ratkaisumuotoinen liiketoiminta, tietointensiiviset palvelut, yritysstrategia, PK-yritykset, ohjelmistoala

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Helsinki, April 7th, 2011

Aku Valtakoski

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Focal concepts

Concept	Description
Product firm	A firm who develops and delivers products (standardized packages based on multiple technologies), and whose business is mainly based on this product business. These firms do, however, sometimes also provide various kinds of services as required by customers.
Service	A change in the condition of one economic unit produced by the activity of another agent by the application of competences (knowledge and skills) for the benefit of another party (cf. Hill, 1999; Vargo and Lusch, 2004).
Solution	A combination of products and services that is marketed to customers as an integrated entity that creates value for customers. The solution is usually tightly integrated, and customized to meet customer's unique requirements (cf. Davies, 2004; Sawhney, 2006).
Knowledge-intensive service	Service that affects either the knowledge of customers or create new knowledge-intensive artifacts for customers and require professional knowledge or expertise of a specific domain (Starbuck, 1992; Windrum and Tomlinson, 1999).
Service provision	The act of providing services to customers.
Service capability	How well a product firm is able to provide its services. Can be divided to internal and external perspectives. Internal perspective of service capability refers to the firm's service operations management and competence development capabilities. External perspective, by contrast, refers to the firm's service marketing, quality assurance and communications capabilities. Service capability may also be called *service standardization* or *service productization*.
Organizational innovation	A technical or administrative change in the organizational structure that improves performance (Kimberly and Evanisko, 1981; Damanpour, 1991).

Concept	Description
Knowledge	A critical input in production of a firm that enables firms to combine other resources to provide services effectively. Knowledge originates in individuals, can be *explicit* or *tacit* in nature, and is only partly excludable to the extent it can be kept secret or misunderstood. Explicit knowledge is knowledge that can be expressed in a form understandable by receivers, while tacit knowledge cannot be expressed verbally, and is related to learning-by-doing (cf. Kogut and Zander, 1992; Nonaka, 1994; Grant, 1996b).
Domain knowledge	Knowledge that is related to the product firm's customer's industry. In particular, it is related to the problems faced by the customers in their business environment.
Solution knowledge	Knowledge that is related to the product firm's overall solution methodology. In particular, it is related to the solutions to the problems faced by the firm's customers.
Codification	The process through which previously tacit knowledge becomes more explicit and less ambiguous. Codification has a positive impact on the transferability of knowledge, as it reduces dependence on the sender of knowledge and learning-by-doing.
Replication	The act of organizational expansion through implementing the existing organizational routines, processes and schema with new resources. Requires successful internal knowledge transfer to new parts of the organization and potentially requires the adaptation of the existing schema to suit the particular contingencies (Winter and Szulanski, 2001).

1 Introduction

The importance of services is increasing for contemporary economies and businesses. Instead of standalone products, many firms today also provide services, or an integrated combination of products and services to their customers. This movement towards services is driven by changes in the competitive environment and technologies. In short, businesses today face a new competitive landscape (Bettis and Hitt, 1995; Hitt, Keats and DeMarie, 1998), in which rapid advances in technology and knowledge intensity increase the risks and uncertainties in conducting business.

This trend towards service provision is very prominent in business-to-business markets, where firms producing capital goods are adding services to their offerings (Oliva and Kallenberg, 2003; Cova and Salle, 2007; Jacob and Ulaga, 2008; Brown et al., 2009). Through services provision, firms are trying to fend off increasing competitive pressures due to globalization, increasingly complex customer requirements, and the declining profits of maturing products. As a result, many product firms today often offer comprehensive customer solutions instead of standalone products.

These *integrated solutions* are composed of both products and services, and are seamlessly integrated to form a complete system, and often also customized to meet customers' unique needs (Miller et al., 2002; Davies, 2004; Sawhney, 2006; Cova and Salle, 2007). Rather than products, which seek to deliver functionality, solutions aim at delivering *valuable outcomes* for customers (Vargo and Lusch, 2004; 2008b). These solutions typically constitute a long term investment for the customers. While the phenomenon of service provision in product-based industries has been occurred for some time (cf. Canton, 1988; Quinn et al., 1990; Quinn, 1992; Vandermerwe and Rada, 1988), systematic research into the subject has only gained momentum during the last ten years (cf. Jacob and Ulaga, 2008).

The phenomenon of service provision in product firms has been studied from a large number of different perspectives. As suggested by the prior research most frequently cited in the scholarly literature on service provision, most authors in the research field have studied the phenomenon from a marketing perspective (cf. Anderson et al., 1997; Homburg et al., 2002; Penttinen and Palmer, 2007; Tuli et al., 2007). Yet, there are also examples of studies

based on other management research field traditions, such as general management (Bowen et al., 1989; Smith and Reece, 1999; Bowen and Ford, 2002) and operations management (Fry et al., 1994; Verma et al., 2001; Gebauer, 2007b).

To provide a contrasting view to these existing viewpoints, this study will study the strategic management perspective on service provision. In other words, we seek to understand how the provision of services could provide competitive advantage and thus affect the performance of product firms. Such strategic management research perspective and discussion on the impact of service provision on firm performance in product industries has been mostly limited to a secondary role in the marketing-oriented research on the phenomenon. Given this emphasis on strategic management, we will exclude detailed analysis of marketing-related issues, such as customer relationships and exact composition of the firm's offering.

Despite the lack of direct research on the topic, the extant literature on integrated solution providers is virtually unanimous in suggesting that the provision of solutions offers strategic advantages for product firms (Wise and Baumgartner, 1999; Oliva and Kallenberg, 2003; Davies, 2004). Authors in the research field have argued that solution provision provides competitive advantage in commoditized and saturated capital goods markets in the form of enhanced profitability, growth through selling services to a existing installed base, closer relationship with customers, and more stable revenue stream (Wise and Baumgartner, 1999; Cusumano, 2003; Davies et al., 2006; Oliva and Kallenberg, 2003).

However, the extant literature has mostly, and often implicitly, assumed that the transition towards service provision is *always* beneficial for the performance of the product firm. Correspondingly, much of the extant research has concentrated on the description of the process of transition from a product to a service firm (e.g., Oliva and Kallenberg, 2003; Davies, 2004; Brax, 2005; Matthyssens and Vandenbempt, 2008). Thus, with only relatively few exceptions (Fang et al., 2008; Gebauer, 2008; Gebauer and Putz, 2007), the question of whether this transition toward service provision actually has a positive impact on the performance of a product firm has been largely neglected in the extant literature.

Moreover, extant research on service provision has also been mostly conducted in the context of large, often multinational enterprises (cf. Oliva and Kallenberg, 2003; Matthyssens and Vandenbempt, 2008). Only in few papers (e.g., Ceci and Prencipe, 2008; Gebauer et al., 2010) has the phenomenon been discussed in the context of small and medium sized firms. In particular, there appears to be a shortage of research on the impact of service provision on small and entrepreneurial product firms, even though many small firms, particularly in knowledge-intensive industries engage in service provision. This study will therefore analyze the impact of service provision on small and

medium enterprises (SMEs). This perspective will complement much of the existing literature on the role of services in product industries.

1.1 Purpose of the study

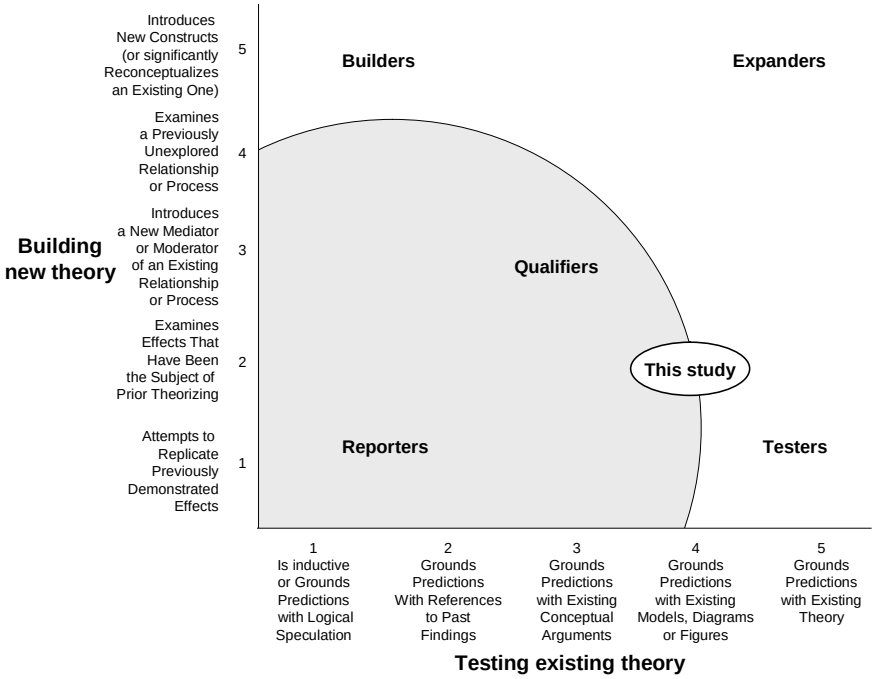
The purpose of this study is to contribute to research on the role of services in product firms by studying the impact service provision has on product firm performance in the context of small and medium sized firms operating in business-to-business markets. Our research problem, on a general level, can thus be stated as

> How does the provision of services affect the performance of small and medium sized product firms?

To study this research problem, we first need to choose an appropriate theoretical grounding for the study. However, there is lack of coherent theoretical development and constructs in the extant literature. Therefore, we cannot take recourse in existing strong theoretical frameworks or constructs. Our first challenge is thus to identify a theoretical grounding for understanding and explaining service provision in product firms. When this goal has been met, the next task is to develop hypotheses regarding the posed research problem. In other words, we need to develop the explanation of the strategic impact of service provision through the establishment of, firstly, constructs that are relevant to such theoretical explanations, and secondly, the relationships and the explanations for these relationships between these constructs.

In this sense, the current study is partly about theory development: identifying suitable theory within management research to explain a phenomenon for which only scarce research currently exists (Whetten, 1989). The study can thus be considered to contribute theory development in the context of service provision literature. Yet, from the point of view of general management research, this study mainly constitutes theory testing, as it tests the applicability of existing organizational theories in a specific empirical context and applied to a specific phenomenon (Berthon et al., 2002).

Hence, the study will mainly consist of finding and explicating the explanation for a relatively understudied phenomenon (service provision) by the means of readily existing theory. However, in order to advance theory, we need to go beyond the mere reaffirmation of existing theory. As suggested by Whetten (1989, p. 493), "it is preferable to investigate qualitative changes in the boundaries of a theory (applications under qualitatively different conditions), rather than mere quantitative expansions [...] Theorists need to learn something new about the theory itself as a result of working with it under different conditions."



Colored area = Low theoretical contribution;
Clear area = High theoretical contribution.

Figure 1.1: Taxonomy of theoretical contributions for empirical articles and the positioning of the current study; adapted from Colquitt and Zapata-Phelan (2007).

This study constitutes such an extension of existing theory to a new context. More specifically, as we will find out, our study makes some modest contributions to the theory on knowledge transfer and theory of the firm by considering the role of non-technological knowledge on knowledge transfer and the boundaries of firms. Furthermore, we will argue as well that in addition to the evolution of a technological innovation, non-technological innovations also have a life-cycle that has an impact on the use of services, and subsequently on the performance of a product firm.

Using the taxonomy of theory building and theory testing proposed by Colquitt and Zapata-Phelan (2007), seen in Figure 1.1, this current study as whole contributes theoretically to existing research by testing effects that have been theorized about in earlier studies (i.e., the strategic impact of service provision) using the conceptual models and theories (the knowledge-based view of the firm and inter-organizational knowledge transfer) to ground predictions about the phenomenon. As such, the study is closest to the "Tester" type of study, and constitutes a borderline case between high and low theoretical contribution as qualified by Colquitt and Zapata-Phelan (2007).

Yet, as the theoretical grounding is not known a priori, there are great differences in the balance between theory building and testing throughout the different parts of the study (cf. Chapter 4 on research design). We will start off with inductive studies to pinpoint this relevant theoretical literature, and finish with theory testing using quantitative methods. As we will see in the review of extant research on service provision, our research approach and goals are appropriate given the generally low level of theoretical, conceptual and methodological development within the research field.

1.2 Practical relevance

As advocated by Van de Ven and Johnson (2006), and Van de Ven (2007), it is advisable to ground the research questions on a real-world challenge faced by managers to ensure the practical relevance of the problem. This requires interaction with practitioners and finding out what they find problematic in their current business activities. This practical grounding of the research questions was achieved by exposing the initial research proposal to practitioners. Qualification of the practical problem is also based on a review of the practically-oriented literature (e.g. Harvard Business Review, MIT Sloan Management Review, and Communications of the ACM).

The provision of services is typically associated with mature markets and products, provided by large manufacturing firms. However, many small and medium sized product firms also engage in service provision. This is particularly common in knowledge-intensive industries, where the complexity of the products required product firms often to provide complementary services (cf. Miller et al., 1995; Davies, 1997; Davies and Brady, 2000). Furthermore, it has been argued that the ICT industries are a representative example of an industry where service provision is prominent (Brown, 2000; Galbraith, 2002; Miller et al., 2002). One example of these is the software industry.

Given the truly global nature of the software industry, prompted by the introduction of internet technologies (cf. Campbell-Kelly and Garcia-Swartz, 2007), and the massive economies of scale on the supply side and network effects on the demand side (Messerschmitt and Szyperski, 2003; Shapiro and Varian, 1999), the software industry is increasingly a winner-takes-it-all industry, dominated by big global corporations with abundant resources, such as SAP, IBM, HP, Microsoft and Oracle.

For software firms with small home market and less resources, the situation is difficult. They are less likely to be able to compete in global mass markets, and hence are more likely to adopt a niche (i.e., focus) strategy (Porter, 1980; Cusumano, 2003), concentrating either on a specific customer segment or a specific geographical market.

Addressing the needs of a narrow customer segment requires building closer relationships with customers (Treacy and Wiersema, 1993). Furthermore, solving increasingly complex problems of tightly specified customer segment requires the software firm to develop deeper expertise in that problem domain. In addition, as the problems grow more complex and they are increasingly unique, it may no longer be possible to solve these problems by only software products. Solving the customer's problem is also likely to require changes to the customer organization and employee competences (Leonard-Barton, 1988a). The software firm therefore needs to provide various services to ensure that customer problem is solved and the software actually provides value for the customer. In short, the offering of a software firm becomes a "hybrid solution" (Cusumano, 2004) or a "socio-technical solution" (Messerschmitt and Szyperski, 2003).

For an enterprise software firm, increasing the extent of services provided represents both an opportunity and a challenge. As indicated by the integrated solutions literature (Davies, 2004; Sawhney et al., 2004), and also suggested by Cusumano (2003) in the context of software industry, increasing services is a potential avenue for further revenue growth, provides more stable revenue stream, and in some case also improves profitability.

However, increasing the share of services in the offering is not without its problems. First of all, increasing employee-delivered services reduces the immense economies of scale inherent in software product business (Shapiro and Varian, 1999). The growth of a service business, by comparison, usually requires hiring new employees and replicating the service organization in new geographical markets (Bharadwaj et al., 1993; Winter and Szulanski, 2001).

Second, adding services to offering potentially reduces the profitability of software firm; as software has nearly zero reproduction costs, a pure software product business is potentially very profitable (Cusumano, 2004; Shapiro and Varian, 1999). Of course, in some cases, such as open source software, services are more profitable than products. Third, services that require local delivery are harder to export than pure products due to cultural and geographical barriers. This creates a significant growth barrier for software firms with small home market. Fourth, the operational logics and hence management of software product and service businesses are different and even contradictory in many ways (Thomas, 1978; Bowen et al., 1989; Anderson et al., 1997; Bowen and Ford, 2002; Nambisan, 2001; Cusumano, 2004). This implies that integrating the two types of businesses within one firm is not easy.

Therefore, the successful management of an enterprise software firm requires a careful balancing of software product and service businesses. While there is literature on both of these "pure" software product and service businesses (cf. Arora et al., 2001; Campbell-Kelly, 2001; Nambisan, 2001; Yoffie and Cusumano, 1999), evidence on software solution firms and their success-

ful management is scarce (e.g., Cusumano, 2004; 2008; Messerschmitt and Szyperski, 2003).

In summary, the experiences from the software industry indicate that the provision of services is important also for small firms competing in an emerging market with new technologies. This indicates the importance of complementing existing research on the phenomenon by explicitly considering the impact of services for SMEs.

1.3 Scope of the study

As noted by Windrum and Tomlinson (1999), the term "services" covers a very diverse set of economic and organizational activities. This conclusion is also supported by the large number of typologies developed for categorizing different services (cf. Lovelock, 1983; Wemmerlöv, 1990; Cook et al., 1999). While a full review of the ontology and taxonomy of the concept of *services* is beyond the scope of this study, we do note that that services are commonly seen as a change in the condition of one economic unit produced by the activity of another unit (Hill, 1999). Moreover, a service is not an entity that can exist independently of its producer or consumer, and hence exists only in the interaction between the producer and the consumer. A service can also be seen as the the application of competences (knowledge and skills) for the benefit of another party (Vargo and Lusch, 2004; 2008a).

While manufacturing firms have indeed begun to provide a wide range of services, most of these services are related to technical aspects of the firms' offering, such as equipment maintenance and operation services, and various system implementation services (Wise and Baumgartner, 1999; Oliva and Kallenberg, 2003; Davies, 2004; Sawhney, 2006). Yet, the importance of non-technical services, such as financial and consulting services is also increasing (Davies, 2004). In particular, *knowledge-intensive services* are becoming crucial in many industries. The trend toward knowledge-intensive service provision is particularly prominent in the more knowledge-intensive industries, such as the software industry (cf. Brown, 2000; Davies and Hobday, 2005; Ceci and Prencipe, 2008).

Knowledge-intensive services are services whose provision is dependent on the professional knowledge or expertise related to a specific technical or functional domain, are typically problem-solving in nature, and exhibit both high variety in output and high level of interaction with customers (Starbuck, 1992; Windrum and Tomlinson, 1999; Muller and Zenker, 2001; Greenwood et al., 2005). More specifically, the knowledge-intensive service concept covers services such as consultancy services, product development services, training, and change management (Windrum and Tomlinson, 1999; Muller and Zenker, 2001), and often equated with professional services (Lahti and Bey-

erlein, 2000; Thakor and Kumar, 2000; Lowendahl et al., 2001; Greenwood et al., 2005; Von Nordenflycht, 2010) In general, the purpose of knowledge-intensive services is to either to develop completely new knowledge (Robertson et al., 2003), or to translate and transfer existing knowledge (Windrum and Tomlinson, 1999; Carlile, 2004).

Our study is limited to the analysis of the impact of knowledge-intensive service provision and service capabilities on the performance of enterprise software product firms. In other words, we address the research problem in the context of business-to-business markets, i.e. firms who serve organizational customers. Firms with consumer products are excluded. We also limit the study to firms whose total revenue is made up of at least half derived directly from the sales of software artifacts, i.e. products.

Furthermore, we limit the scope of the study to the Finnish software firms. While the extension of the study to cover other countries would have improved the external validity of the study, this was deemed unnecessary, given the inductive, theory-developing approach and methodologies of the study. For such studies, the issue of generalizability if usually a secondary concern (Flyvbjerg, 2006; Siggelkow, 2007). We believe that the included firms are representative of the phenomenon under study, and that the chosen firms display sufficient variance to facilitate the identification of empirical patterns and development of theory to explain these patterns. These factors are much more important in an inductive research design than maximizing generalizability. In addition, this decision was also prompted by practical considerations, given the time and resources allocated for the research.

This scoping of this study was also prompted by the research problem at hand; we choose to exclude the detailed analysis of both business networks and internationalization issues facing enterprise software firms. While both these issues are potentially important for enterprise software firms, and repeatedly came up in the case studies, including their detailed analysis in the study would have unnecessarily complicated the research design, and potentially jeopardized the feasibility of the empirical studies within given resources and time limits. While these factors do appear in empirical studies, they are simply considered as characteristics of the case firms and not analyzed to a significant extent. Yet, both these topics seem like fruitful avenues for further research.

The main unit of analysis in this study is a business unit of a software firm. This business unit is integrated under one executive manager with overall financial responsibility. The unit is responsible for developing and delivering the software products, as well as for providing the required complementary professional services. However, given the small size of relevant firms, in most cases, software firms consist of only one business unit. In these cases, the firm and the business unit coalesce and are essentially the one and the same. Yet, one case was an independent business unit within one software firm

that has also other units that have significantly different operational models. Hence, it was necessary to make this definition of the unit of analysis to have comparable cases.

Despite the choice of the business unit as the main unit of analysis, in practice we will mostly use the firm as the level of analysis. However, some limited considerations will be given to business networks, as well as the intra-organizational structure within case firms. Yet, these are clearly secondary to the main focus on the impact of knowledge-intensive service provision at the firm level.

1.4 Thesis structure

The purpose of this study is to find how service provision is related to product firm performance. However, as will be seen in the review of the extant literature on service provision, we have no strong theoretical framework to rely on for the rest of the study. Therefore, the structure of this thesis differs from dissertations based on a hypothetico–deductive mode of management research. In the following, we will lay out the plan for the rest of the dissertation.

The thesis is structured as shown in Table 1.1. First three chapters of the thesis, in addition to the introductory chapter, review relevant literature on service provision in more detail, define the most important constructs, and lay down the detailed research questions for the study. Moreover, we also position the current study with respect to extant research on service provision in manufacturing industries, as well as literature on strategic management.

The next four chapters, chapters 4-7, contains the empirical studies and thus constitutes the main part of this thesis. Chapter 4 first details out the overall research design used in the research, and considers the benefits and potential shortcomings of the selected design. After this, chapter 5 begins the empirical studies with a report of a in-depth single case study that is used to, firstly, ground the research theoretically by identifying a feasible theoretical grounding for the phenomenon. Secondly, the in-depth case study ensures that the constructs of the overall study are grounded in the empirical phenomenon.

The rest of the empirical part of the thesis consists of two studies which discuss the detailed research questions in more detail using both qualitative and quantitative methods. More specifically, in Chapter 6, we first use a comparative multiple case study to create theoretical insights from comparisons between case firms, expressed in the form of formal propositions on the impact of service provision. Secondly, we used cross-sectional quantitative data to test these propositions with statistical analysis methods in Chapter 7.

The last two chapters summarize the findings of the thesis. In particular, we first discuss in Chapter 8 the answers found to the set research questions,

Chapter		Description
1	Introduction	Introduces dissertation topic, scopes the research and describes the structure of the dissertation
2	Extant research	Reviews existing research on service provision in terms of research questions, constructs, and empirical methodologies considered thus far Identifies gaps in the current body of knowledge
3	Research questions	Positions the study in contrast to extant research Introduces key constructs Lays down detailed research questions of the study
4	Overall research design	Describes the overall research methodology Discusses reliability and validity issues
5	In-depth case study	Provides a theoretical grounding for thesis Provides a grounding for the constructs used in the thesis
6	Multiple case study	Develops empirically derived hypotheses based on comparative logic of multiple cases
7	Quantitative analysis	Report empirical research that aims to confirm selected hypotheses derived from inductive case study
8	Discussion	Reviews the empirical findings of the study Introduces a theoretical framework to provide coherent explanation for empirical findings Summarizes the contributions made by the study Discusses the managerial implications of the study Analyzes the limitations of the thesis and identifies avenues for further research
9	Conclusions	Summarizes the research questions, methodologies, main findings and their implications

Table 1.1: Overall structure of the thesis.

and overall theoretical framework emerging from the findings of the empirical studies. This chapter also summarizes the empirical findings and discusses their overall theoretical implications. Next, we present the contributions made in the thesis, considering the literature streams on solution provision and inter-organizational knowledge transfer literature separately. We also discuss the implications of the study to the managers of SME product firms. Next, we review the limitations and constraints of the study, trying to provide an account of the potential impact of these limitations on the credibility of the findings. These limitations also motivate further research questions. Thesis concludes with Chapter 9 that summarizes the entire study.

1.5 Author positioning

As suggested by Pratt (2009), it is preferable to clearly articulate one's position in the field when using qualitative methods – in other words, to fully dis-

close the relationship between the author and the researched phenomenon. To this end, we acknowledge that the author has worked for a total of seven years in two of the case firms included in the multiple case study before starting the research leading to the current study. While this may have induced potential biases in the inference from evidence, it has also provided a sound practical insight into the phenomenon. This practical insight should have a positive impact on the practical relevance of the research problem chosen for the study, as well as improve the grounding of the constructs in real-world issues (Van de Ven, 2007). In addition, the connections available from the past work experience have enabled access to other organizations chosen based on theoretically informed criteria, and have thus significantly contributed to the richness of data available for the study.

While this close personal connection to the studied phenomenon might have suggested choosing an action research approach (e.g., Eden and Huxham, 1996), an observational research design was chosen instead to ensure the theoretical relevance of the study and the generalizability of the findings (cf. Susman and Evered, 1978). Choosing an action research would have likely improved the practical relevance of the study, but potentially at the cost of methodological and theoretical rigor. Given our primary goal of finding a theoretical explanation for the impact of service provision in product firms, we decided against such research approach.

The personal relation to the phenomenon might also have had a negative impact on the objectivity of the study. However, specific measures were taken to make this study as objective as possible. First of all, case firms were purposefully selected from a qualified population rather than purely on convenience to facilitate theoretical sampling. While personal connections helped to gain access to some of the selected firms, more than half of the case firms were unknown to the author prior to research. Secondly, only passive observation methods were used for field studies (cf. Snow and Thomas, 1994); the author did not actively engage or participate in the decisions or activities of the case firms. This should help to maintain the relative objectivity of the observations.

2 Extant Research on Service Provision

As suggested in the introductory chapter, many manufacturers and other product firms are increasingly including services in their offerings. The phenomenon of service provision phenomenon has also attracted increasing attention in the academia, reflected in a growing body of scholarly literature on the topic (Jacob and Ulaga, 2008).

Yet, the idea of mixing products and services is not new; as already noted by Levitt in the 1970s (Levitt, 1972; 1976) and later by Chase and Garvin (1989), many service firms have adopted ideas and methods from traditional manufacturing industries. Moreover, as suggested by Bowen et al. (1989), Chase et al. (1992), and Voss (1992), the opposite scenario is not only possible but also likely: manufacturing firms are increasingly adopting management and operational models previously employed by the service sector (Fry et al., 1994; Johnston, 1994). Indeed, it this latter type of transition has been the subject of a large body of research in recent years (Oliva and Kallenberg, 2003; Brax, 2005; Jacob and Ulaga, 2008).

Despite the growing number of contributions to the literature on service provision in manufacturing industries, research on the topic is far from complete, as suggested by the recent review of the literature by Jacob and Ulaga (2008). First of all, they note that until recently, most of the research in the field has concentrated on the development of taxonomies and typologies. Secondly, Jacob and Ulaga note that most of the research thus far has been descriptive or normative in nature — only limited progress has been made in systematically researching the phenomenon. Third, they also suggest that most of the literature thus far has employed exploratory case studies, and argue that generalizing research in the area is still largely missing. These remarks, taken together, suggest that the research field is at a nascent, early phase.

Furthermore, as indicated by the numerous different terms used to describe service provision in Table 2.1, an obvious problem of the research field is the lack of coherence and common terminology on the phenomenon. As noted by (Oliva and Kallenberg, 2003, p. 163) on manufacturing firm's service provision, "several labels are used in the literature: industrial services, service strategy in manufacturing, product-related services, product-services, or

after-sales services." This is indicative of an emerging field of research where no dominant terminology has yet emerged (Sonpar and Golden-Biddle, 2008).

Due to the lack of a common vocabulary, we will adopt the independent term "service provision" to mean the phenomenon where a firm who both develops and deploys products for business-to-business markets, and also provides various services, provided by its employees, to its customers. We will also use the expression "service provision in product firms" interchangeably to mean the same concept.

The purpose of this chapter is to review the literature on the role of services in product-centric industries, to provide a comprehensive overview of this literature, and to develop a synthesis of the extant body of knowledge. In other words, we seek to connect the various streams of literature related to the phenomenon to provide a common grounding for future research on the topic. We also aim to identify key articles and authors relevant to the study of service provision in product firms. Obviously, we also seek to confirm the gaps in the current knowledge pointed out by Jacob and Ulaga, as well as to identify potential additional gaps.

Specifically, we seek to answer the following questions:

- What is the ontology of the phenomenon, i.e. what are the essential concepts of service provision?
- What research methodologies have been used in the extant literature?
- What is the theoretical background for explaining service provision?
- In what empirical contexts and industries has service provision been studied?

This literature review should thus provide us with an overview of the extant literature and the concepts used to describe the phenomenon of service provision. The review of the theoretical groundings in the literature should help us choose a theoretical grounding for our study, and review of the research methodologies used thus far should help us choose the appropriate methodology for this study.

2.1 Review methodology

To answer these questions, we conduct a literature review of extant literature on service provision based on both *bibliometric* and *systematic review methods*. By employing these two complementary methods, we hope to provide a comprehensive view of both the structure and the content of extant literature on service provision in product-based industries.

Bibliometric literature analysis analyzes the citation and co-citation structure within the identified body of literature (Cronin, 2001). In other words, its seeks to understand the overall structure of the literature in terms of volume,

Concept	Description
Servitization	Part of the surge in services is a more holistic approach by managers to their businesses and their customers' problems. It is no longer valid for either industries or individual corporations to draw simplistic distinctions between goods and services or assume they can do one without the other. Most firms today are [...] in both. Much of this is due to managers looking at their customers needs as a whole, moving from the old and outdated focus on goods or services to integrated "bundles" or systems, as they are sometimes referred to, with services in the lead role. [...] We call this movement the "servitization" of business. Vandermerwe and Rada (1988, p. 315)
Service orientation	In this configuration a service mentality is the underlying gestalt or management philosophy pervading the interrelationship of strategic, organizational, and environmental elements. Strategic choices are made that emphasize goals of customer responsiveness and high customer contact. These choices are then supported by the adoption of organization arrangements derived from service firms (e.g., integrated production and marketing, management of customer participation) in order to achieve internal consistency within the configuration. Bowen et al. (1989, p. 85)
Service-based strategy	The capacity to command and coordinate service activities, supplier networks and contract relations across the globe has become perhaps the most important strategic weapon and scale economy for many of today's most successful enterprises. Quinn et al. (1990, p. 68)
Complex products and systems	CoPS [complex products and systems] are defined as high cost, engineering-intensive products, systems, networks, and constructs [...] the term 'complex' is used to reflect the number of customized components, the breadth of knowledge and skills required and the degree of new knowledge involved in production. Hobday (1998, p. 690)
Going downstream	The thriving companies [have] gone downstream, toward the customer. While they've built on their core manufacturing capabilities, they've moved beyond the factory gate to tap into the valuable economic activity that occurs throughout the entire product life cycle. Smart manufacturers are moving downstream for a very simple reason: that's where the money is. Manufacturers' traditional value-chain role — producing and selling goods — has become less and less attractive as demand for products has stagnated throughout the economy. Wise and Baumgartner (1999, pp. 133–134)
Solution provision	Although manufacturers have always provided services customer service, their "new service" takes the much broader form of product offerings, generating revenues and profits [...] More and more, firms are becoming "solution providers" on behalf of their customers. To provide solutions of value, most goods-dominant firms must become far more intimate with their customers. Brown (2000, p. 11)

Table 2.1: Concepts used to describe the role of services in manufacturing firms

Concept	Description
Product-service systems	The term “product-service systems” has been defined as “a marketable set of products and services capable of jointly fulfilling a user’s need. The product/service ratio in this set can vary, either in terms of function fulfilment or economic value”[11]. Mont (2002)
Integrated solutions	Recent literature on business strategy argues that firms should concentrate less on making stand-alone physical products and more on delivering high-value services and customer-focused solutions [. . .] competitive advantage is not about simply about providing services, but how services are combined with products to provide high-value ’integrated solutions’ that address customers’ business or operational needs. Davies (2004, p. 727)
Service-oriented strategy	The service orientation of a business strategy [. . .] is related to the extent to which services are an important element of the firm’s marketing strategy. [. . .] adopting a service-oriented business strategy can be a key way for retailers to perform effectively in today’s competitive environment. This requires that retailers more intensively focus their attention on services on a strategic level [. . .]We argue that the service orientation of a business strategy should be defined in terms of three dimensions: 1) the number of services offered, (2) how many customers these services are offered to (broadness), and (3) how strongly these services are emphasized. Homburg et al. (2002, pp. 87–88)
Transition to services	Transitioning from product manufacturer into service provider constitutes a major managerial challenge. Services require organizational principles, structures and processes new to the product manufacturer. Not only are new capabilities, metrics and incentives needed, but also the emphasis of the business model changes from transaction- to relationship-based. Developing this new set of capabilities will necessarily divert financial and managerial resources from manufacturing and new product development, the traditional sources of competitive advantage for the organization. Oliva and Kallenberg (2003, p. 161)
Complete offerings	While every product or service offering is at least partially complete, more complete offerings typically include the bundling of products and services [. . .] and the development of more comprehensive solutions to customer needs [. . .] The degree of completeness of an offering relates to the degree to which customer problems are solved and to the amount of the additional work left to the customer. Penttinen and Palmer (2007, pp. 552–553)
Service transition strategy	Studies in both marketing and strategy literature argue that manufacturing firms should shift to “solution” and/or “service” offerings to improve their competitive position in the era of intense global competition and increasing commoditization that characterizes many product markets [. . .] We refer to these strategic redirections as “service transition strategies” Fang et al. (2008, p. 2)

Table 2.1: Continued

publications, and relationships between contributions without considering the actual contents of the identified papers. Bibliometric analysis is thus useful for identifying key contributions to the development of the literature and to find clusters of similar papers within the extant literature (e.g., Lane et al., 2006; Schildt et al., 2006). The purpose of this bibliometric analysis is to provide an overall picture of the status of research on service provision.

By contrast, a systematic literature review takes a detailed look at the identified literature by analyzing the actual contents of found papers with respect to used concepts and themes (Tranfield et al., 2003). This type of analysis typically uses the methods of content analysis (Krippendorff, 2004) to identify similarities and differences between contributions. Content analysis has been used, for example, to analyze research on product development (Brown and Eisenhardt, 1995) and strategic management (Furrer et al., 2008). In short, these method seeks to identify common themes and concepts used in the identified literature. This detailed content analysis is needed since the lack of coherence in vocabulary requires us to look beyond the face-value concepts in order to identify similarities.

As indicated in the introduction, the pletohra of different descriptions for essentially the same phenomenon leads us to initially suspect that there is a low level of conceptual and theoretical coherence in the research field, as measured by cross-citations and co-citations to earlier literature. This lack of coherence also makes a systematic review of the literature harder, as we have no recourse to a coherent terminology to identify papers that belong to the same body of knowledge. By contrast, we need to use a great variety in terminology in order to form a comprehensive picture of research on service provision.

The initial body of research papers identified as belonging to the research field on service provision was identified using the search engines of ISI Web of Science and Scopus citation databases. We used also the Scopus database since we knew beforehand that several relevant articles were published in journals that are not indexed in the Web of Science. In addition, using two databases improves the comprehensiveness and validity of the literature review.

Tentative search strings were formed based on an initial ad-hoc review of known papers in the field (cf. Tranfield et al., 2003). Based on this review, we identified three key constructs defining the research field: *service, manufacturing, and provision.* Next, we identified synonyms for the key constructs and included these in the final search strings, which can be found in Appendix A. In brief, multiple terms were used for each construct so that at least one of the terms was found in the title, abstract, or keywords of each article for each of the three key constructs. We also included terms that excluded an article from our review. These terms were mostly related to information technology and Internet business. Furthermore, we limited the search to ar-

ticles published in English in the fields of management or business up until the year 2009. We excluded articles from the year 2010, since there was a risk that not all articles would have been included in the databases at the time of conducting the review.

Search in the ISI Web of Knowledge database found 314 articles and search in Scopus database found 157 articles. Altogether, after removing duplicates, the search strings produced a body of literature that amounts to a total of 238 articles. Next, we read the abstracts of found articles to assess the their relevance to the literature review. An article was deemed relevant if it discussed service-related topics in the context of manufacturing firms. Articles that were deemed clearly irrelevant to the current topic were excluded from further analysis. After this exclusion activity, the remaining body of literature consisted of 176 articles.

2.2 Bibliometric analysis of the literature

The sources of included scholarly and practitioner-oriented articles are shown in Table 2.2. This table also shows the number of papers appearing in each journal. From this table we may readily see that only few of the articles have been published in leading management and marketing journals, such as Journal of Marketing or Academy of Management Journal. This was, of course, as expected, given the cross-disciplinary nature of the phenomenon. In other words, as the phenomenon has been studied from multiple different perspectives, it is unlikely that any particular contribution would be published in top journals. From the table we may also infer that research on service provision has been mostly published in service and industrial marketing journals, with *Industrial Marketing Management* being clearly the most popular journal for publishing research related to service provision.

Figure 2.1 shows the evolution of the literature over time during the time period 1975-2008 in terms of number of articles per year for both scholarly and practitioner-oriented papers. From this evolution over time, we may conclude that research on the topic has already appeared in the 1970s, with a clear increase in research output at the beginning of 1990s, and finally a surge in article volume after the year 2005. This temporal pattern seems to indicate that the existence of the phenomenon was recognized early on, but significant and systematic research interest towards the topic did not arise until very recently. The pattern also leads us to anticipate that the literature is likely to be quite incoherent, as contributions seem to have not contributed to the collective research effort towards understanding the phenomenon of service provision, given the initially slow increase in research volume. This conclusion is later confirmed by the bibliometric analysis of the literature.

Scholarly journal	Articles	Practitioner-oriented journal	Articles
Industrial Marketing Management	35	Harvard Business Review	10
Journal of Business and Industrial Marketing	8	MIT Sloan Management Review	6
Service Industries Journal	7	European Management Journal	4
International Journal of Service Industries Management	5	McKinsey Quarterly	4
Research Policy	5	Business Horizons	1
European Journal of Marketing	4	IBM Journal	1
International Journal of Operations and Production Management	4	IEEE Computer	1
Managing Service Quality	4		
European Journal of Innovation Management	3		
Industrial and Corporate Change	3		
International Journal of Production Economics	3		
Journal of Business Research	3		
Journal of Marketing	3		
Journal of Business-to-Business Marketing	3		
8 Journals	2		
14 Journals	1		
Total	*120*		*27*

Table 2.2: Sources of articles on the role of services

With regards to the relationship between the number of articles published in scholarly journals and practitioner-oriented journals, there does not seem to be a clear temporal pattern between these two types of publications. This suggests that the phenomenon of service provision is not simply a fad in management fashion (Abrahamson and Fairchild, 1999), as the pattern academic output does not clearly follow article output in practitioner journals with any specific lag. Furthermore, the small volume of the literature until 2007 indicates that the topic has not been fashionable enough to attract the interest of a larger number of researchers.

Citation data is available in both ISI Web of Science and Scopus databases. Unfortunately the tools available for citation network analysis only supported the ISI citation format. We were thus forced to limit our analysis to the papers found in the ISI database. Yet, as noted above, ISI Web of Science citations accounted for a clear majority of the total number of identified papers (when accounting for duplicates). Hence, bibliometric analysis based solely on the ISI should still provide a reasonably accurate description of the citation structure of the literature.

We used the Sitkis software package to analyze the body of literature (Schildt, 2006). This software analyzes imported ISI data and has the functionality to perform various citation network analyses, including article-to-referenced papers, co-citation and cross-citation analyses. The Sitkis package has been used in multiple rigorous literature reviews with good results (Lane et al.,

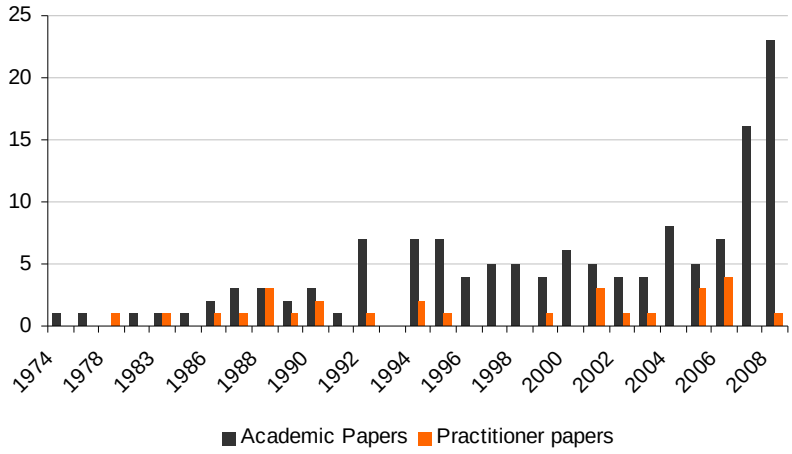


Figure 2.1: Evolution of the literature on the role of services in terms of volume

2006; Schildt et al., 2006). In addition, we used the NetDraw software package to visualize the results of the analysis (Borgatti, 2006).

First, we conducted co-citation analysis. This type of bibliometric analysis seeks to find out which pairs of earlier article (cited articles) are commonly cited together by articles within the identified body of knowledge (citing articles). In other words, a link exists between two cited papers if a paper exists which cites both these articles. The strength of the link depends on the number of such co-citing articles. The results of this analysis indicate which articles are most commonly cited by the analyzed group of citing articles and thus are likely to constitute a common conceptual and theoretical background for the identified articles.

Performing co-citation analysis on all found articles, using the seven-citation minimum threshold for cited papers, and removing articles solely focused on methodological issues, we arrived at the diagram found in Figure 2.2. In the diagram, the size of the symbol depends on the total number of citations to an article, and thus indicates the relative importance of the articles to extant research on service provision. The diagram shows that the bulk of the literature on service provision in fact draws upon a surprisingly small set of earlier research. In particular, the diagram includes earlier papers from contextual research on service provision (Bowen et al., 1989; Mathieu, 2001a; Oliva and Kallenberg, 2003; Stremersch et al., 2001; Vandermerwe and Rada, 1988; Wise and Baumgartner, 1999).

However, more interestingly, papers discussing service provision seem to also commonly draw from the resource-based view of the firm (Barney, 1991), and the service-dominant logic of marketing (Vargo and Lusch, 2004). In addition, the research field seems to draw from general marketing and service marketing literature (Kohli and Jaworski, 1990; Jaworski and Kohli, 1993;

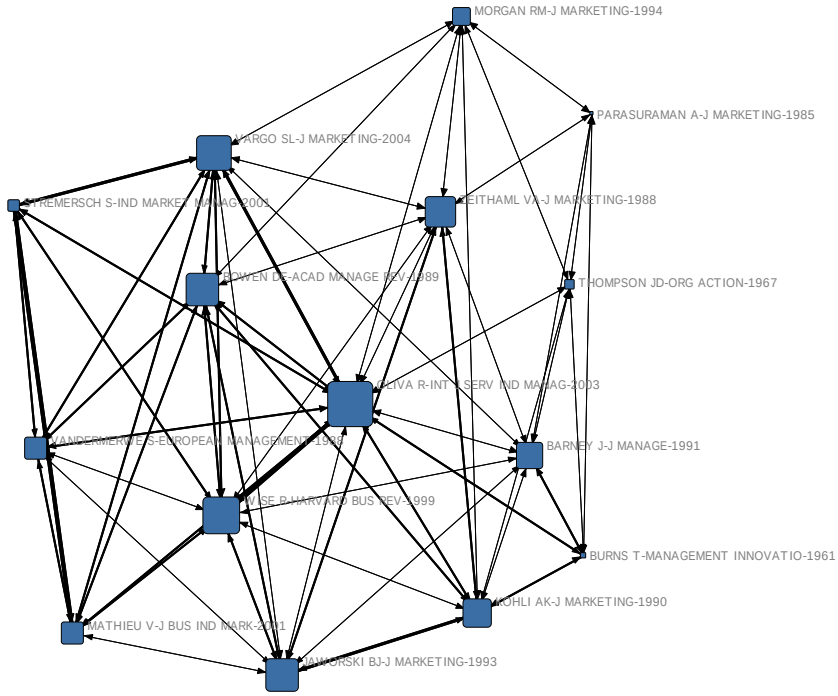


Figure 2.2: Key cited articles identified in co-citation analysis

Morgan and Hunt, 1994; Zeithaml et al., 1988). These findings suggest that the literature is starting to find some common theoretical grounding, based mainly on the insights from the service-dominant logic of marketing (Vargo and Lusch, 2004; 2008b;a), which provides an overarching explanation for economic interaction.

Next, we conducted articles-to-cited analysis. This type of citation network analysis analyzes the explicit individual connections between citing articles and cited articles instead of total numbers, as in the co-citation analysis. The results of articles-to-cited references analysis indicates which articles are central to the literature, and how they are linked to each other.

The referencing network can be seen in Figure 2.3, again using the minimum threshold of eight citations to cited articles. This network consists of two types of entities: cited articles (i.e., commonly referenced earlier articles) and citing articles (i.e., the papers identified in literature review and of our interest). The former are displayed as rectangles and the latter as circles in Figure 2.3. The size of each network node reflects the centrality of the article.

Using the faction discovery function in NetDraw software, we divided the literature into two parts. The papers marked with lighter rectangles and circles seem to be more interesting to our analysis, since they are more central to the body of literature, and includes papers already identified in the co-citation analysis (Wise and Baumgartner, 1999; Stremersch et al., 2001;

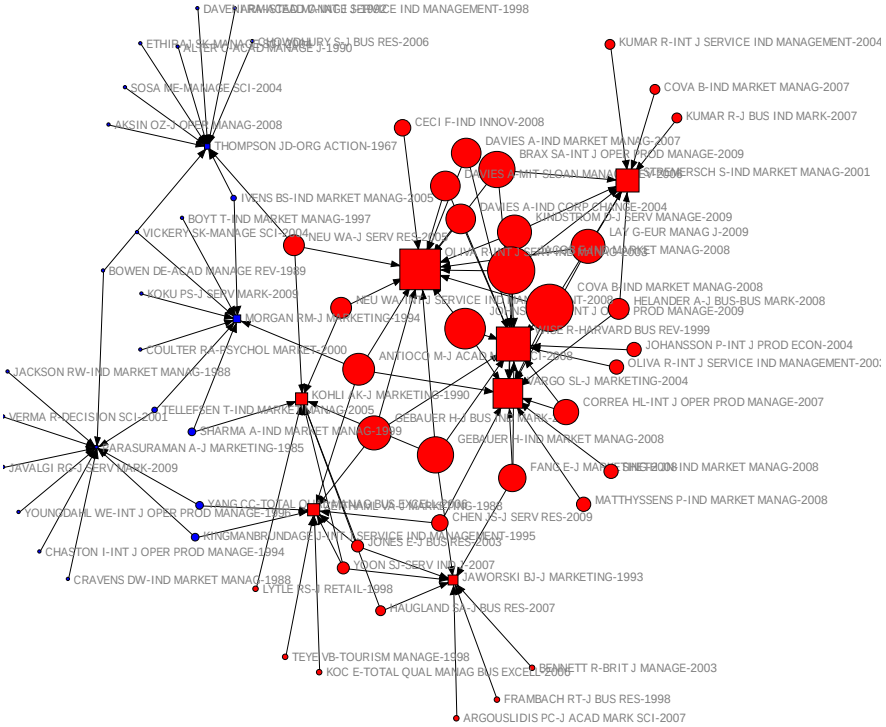


Figure 2.3: Articles-to-cited references structure of service provision literature

Oliva and Kallenberg, 2003; Vargo and Lusch, 2004). By contrast, the articles marked with darker symbols appear to be peripheral to our topic of interest, and given their smaller centrality we can largely ignore them. Overall, the diagram seems to confirm the conclusions drawn from co-citation analysis: the literature seems to have relatively coherent group of cited papers, consisting of the papers identified above.

Finally, we analyzed the cross-citation structure of the literature. In cross-citation analysis, we explicitly map the citation structure of identified articles in the service provision literature. In other words, we analyze how the identified group of articles cites each other. Cross-citation analysis helps us to draw conclusions about the coherence of the literature, i.e. how much authors in the research field cite each others' work. Figures 2.4 and 2.5 show the cross-citation structure of the identified literature up until years 2006 and 2009, respectively. The size of the symbol in each diagram represents the centrality of the article within the identified body of knowledge.

Several conclusions can be drawn from comparing the two network diagrams. First of all, there seems to be a clear increase in the coherence of the literature, i.e. the articles up to the year 2009 are more connected to each other than those found up until the year 2006. Secondly, the number of articles seems to be quite limited; the 2006 diagram consists of only 27 articles,

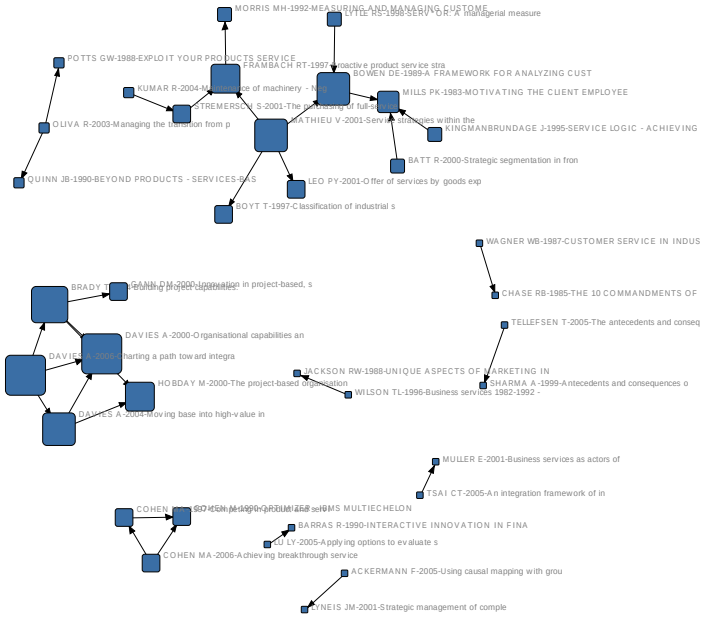


Figure 2.4: Results of cross-citation analysis until 2006

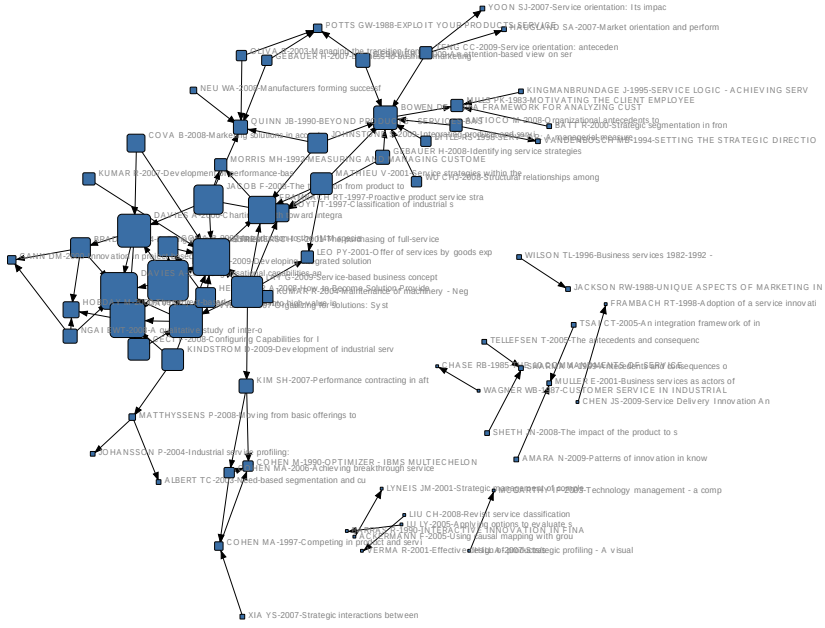


Figure 2.5: Results of cross-citation analysis until 2009

of which 12 belong to the main group (in which the central article is Bowen et al. (1989)). Hence, the volume of the literature is still quite small.

Third, while we can discern two groups of cross-citing articles in the literature until the year 2006 (first group related to service marketing (Frambach et al., 1997; Stremersch et al., 2001; Mathieu, 2001b), and the second to complex products and services (Davies and Brady, 2000; Davies et al., 2006; Davies, 2004)), there does not seem to be significant subgroupings in the identified literature in the overall literature up to the year 2009. It thus appears that the overall research field has started to integrate during the years 2006–2009, indicated by the existence of some kind of connections between much of of the overall literature. However, unlike research on entrepreneurship (cf. Schildt et al., 2006), research on service provision has not yet specialized to a significant degree. This, too, is a sign of a nascent field that is yet to mature, as research typically tends to specialize once there is enough common theoretical ground upon which to found future research.

In summary, the results from the bibliometric analysis has largely confirmed our initial assumptions about the state of the literature on service provision. More specifically, it would seem that there indeed is a literature stream starting to form, but increases in volume and coherence have happened very recently — only after the year 2007 has there been significant movement towards coherent body of literature and use of common citation background.

2.3 Content analysis of the literature

The bibliometric analysis of the extant literature provided us an overall view of the structure and common basis of the literature on service provision in manufacturing industries. However, to study more closely the subject matter and the actual themes recurring in the literature, we need to analyze the identified articles in more detail.

To do this, we employed the systematic review methodology (Webster and Watson, 2002; Tranfield et al., 2003). Similar to Brown and Eisenhardt (1995), we next looked into the actual content of the articles, and analyzed this content to find common constructs and themes in the articles (cf. Miles and Huberman, 1994). Since there is no strong consensus of the concepts used to describe and explain the phenomenon of solution provision, we also used backward and forward citation tracking methods advocated by Webster and Watson (2002). In other words, we checked the articles cited by identified relevant articles, and also articles citing the found articles for whether they were relevant to discussing the phenomenon of solution provision. Our analysis was also informed by the cited articles found during bibliometric analysis. Whenever more relevant articles were found, they were added to the body of articles to be analyzed in more detail. The final list of articles relevant to the

subject consisted of 120 scholarly articles and 27 practitioner-oriented articles.

Our systematic analysis of the research field is based on a closer analysis of the content of a core set of 58 articles that we deemed to be most important in terms of number of citations and centrality in the literature. These articles were identified on the basis of the bibliometric analysis. In selecting these articles, we emphasized the academic papers, and excluded all books and book sections. Selecting a limited number of papers was prompted by limitations in research schedule. The selected articles, together with coding of their content, are listed in Appendix B.

We analyzed the relevant articles using content analysis (Krippendorff, 2004; Duriau et al., 2007). More specifically, we looked for patterns in content across different articles, noting similarities and differences in the use of concepts (cf. Eisenhardt, 1989a; Miles and Huberman, 1994). Our goal was to synthesize the literature regarding the conceptualization of service provision. In other words, we sought to form an ontology of the aspects through which the phenomenon has been discussed in the identified body of literature. Similar to grounded theory approaches (e.g., Strauss and Corbin, 1990), we let our constructs and taxonomies emerge from the empirical evidence rather than prescribing them a priori.

First, we investigated the ontology of service provision in manufacturing industries. In other words, we wanted to know what concepts have been used to describe the phenomenon in the literature. Establishing these central concepts is important since it allows us to improve the coherence of the literature by allowing us to compare the contributions of articles using seemingly different concepts. Obviously, this is a necessary step towards more theoretical sophistication in the research field.

To determine the constructs used to describe the phenomenon of service provision in product firms, we inspected the textual content of all articles for indications about the key constructs in each article. Textual content included the title, abstract, keywords, and the body of each article. Typically, all key constructs were already mentioned in the abstract of the article. Whenever a new construct was mentioned, it was added to a codebook (cf. Charmaz, 2006). Constructs in subsequent articles were compared to the already identified ones, and based on this process of constant comparison, either a new construct was added to the codebook, or the existing construct was revised. Obviously, this process was iterative, requiring us to often go back to previously examined articles and analyze whether new evidence constituted an entirely new construct or not.

For example, the article by Homburg et al. (2002), titled "Service Orientation of a Retailer's Business Strategy: Dimensions, Antecedents, and Performance Outcomes", discusses the role of services in retailer's strategy from the viewpoint of marketing strategy. The article defines the key construct of service

	Number and share of articles							
	1985–1994		1995–2004		2005–2008		Total	
Number of articles in period	13		24		21		58	
Uses concept								
Offering	12	92 %	17	71 %	15	71 %	44	76 %
Customer relationship	6	46 %	15	63 %	12	57 %	33	57 %
Intraorganizational structure	6	46 %	7	29 %	10	48 %	23	40 %
Interorganizational structure	2	15 %	6	25 %	4	19 %	12	21 %
Capabilities	3	23 %	7	29 %	8	38 %	18	31 %
Organizational culture	3	23 %	8	33 %	5	24 %	16	28 %
Discusses theme								
Transition	6	46 %	12	50 %	12	57 %	30	52 %
Impact	5	38 %	8	33 %	4	19 %	17	29 %
Innovation	1	8 %	5	21 %	6	29 %	12	21 %
Uses methodology								
Conceptual	2	15 %	1	4 %	0		3	5 %
Anecdotal evidence	7	54 %	6	25 %	3	14 %	16	28 %
Qualitative methodology	3	23 %	12	50 %	14	67 %	29	50 %
Quantitative methodology	1	8 %	9	38 %	4	19 %	14	24 %

Table 2.3: The concepts and methodology used, and themes discussed in the literature on service provision over the period 1985–2008

orientation in terms of three factors: number of services, broadness of service offerings, and emphasis on services. The first two factors seem to refer to the actual offering of the firm, while the last one appears to describe an intangible characteristic of the organization. Therefore, we would code this article to relate to two concepts in the final taxonomy: offering and organizational culture.

As a result of this content analysis, we found that service provision in manufacturing industries has been discussed using six different concepts: *offering, customer relationship, interorganizational structure, intraorganizational structure, capabilities*, and *organizational culture*. Constructing a data display (cf. Miles and Huberman, 1994) based on these data, Table 2.3 shows the evolution of the literature on service provision in terms of these concepts used in the articles over three periods of time[1].

Similarly, we also analyzed the thematic topic of each article, as well as the methodology and empirical context. The evolution of the literature in terms of these factors is also shown in Table 2.3. In short, we found that the literature has mostly discussed three themes related to service provision in product industries: *the transition from products to service provision, the impact of service provision, and the innovation of new services and solutions.* While a wide array of empirical research methodologies have been used in the literature, we decided, for reasons of simplicity, to use a rough four-type categorization, consisting of conceptual articles (i.e., no empirical study), those with anecdotal evidence (but with no explicitly mentioned research process or

[1]Note that the percentage shares of concept use do not add up to 100% since individual articles may use more than one concept.

	Service provision concept						Total
	OFF	CUS	INT	EXT	CAP	CUL	Articles
Theme							
Transition	83 %	63 %	30 %	23 %	37 %	27 %	30
Impact	82 %	47 %	35 %	18 %	12 %	35 %	17
Innovation	67 %	75 %	50 %	17 %	33 %	25 %	12
Methodology							
Conceptual article	100 %	33 %	33 %	33 %	33 %	67 %	3
Anecdotal evidence	81 %	63 %	44 %	25 %	31 %	19 %	16
Qualitative methodology	66 %	62 %	41 %	17 %	38 %	24 %	29
Quantitative methodology	86 %	36 %	21 %	7 %	14 %	36 %	14

Table 2.4: Crosstabulation of concepts used against themes and methodology in the literature on service provision

method), qualitative methodologies, such as case studies, and, finally, quantitative methodologies.

Finally, we also constructed a cross-tabulated tables based on these categorizations to see whether there were differences in emphasis between articles discussing certain themes or using certain concepts. The results of this cross-tabulation are shown in Table 2.4. The findings reported in these tables are discussed in more detailed in the following sections.

2.3.1 Ontology of service provision

Using content analysis, we found six recurring concepts in the literature on the role of service provision in product industries: offering, customer relationships, interorganizational structure, intraorganizational structure, capabilities, and organizational culture. These concepts of service provision are described in Table 2.5. In the following, we discuss the six concepts of service provision and their role in the literature in more detail.

Offering

As indicated by the common definition of solutions in manufacturing industries, these solutions consist of both products and services that are integrated to form a valuable complete offering, and are customized to meet customers' unique requirements (Davies, 2004; Johansson et al., 2003; Miller et al., 2002; Sawhney, 2006). The provision of solutions thus by definition requires the inclusion of service elements in the manufacturing firm's offering. As argued by Johansson et al. (2003), the dimensions of integration and customization distinguish solutions from simple product bundling (e.g., Adams and Yellen, 1976), in which the integration between products is limited or nonexisting. As described by Shepherd and Ahmed (2000), "solutions comprise a defined group of components (hardware, software, services) which, integrated together, will resolve a customer's business problem." (cf. Johansson et al., 2003)

Concept	Description
Offering	The products and service offered by the focal firm and its business network to the customer organization, usually in the form of an integrated solution.
Customer relationship	The focal firm's relationship with the customer organizations. This is usually built from relationships between individual members of each organization.
Interorganizational structure	The division of labor between various firms contributing to the overall customer solution. For example, who produces required products, and who provides the services. In addition, this dimension also considers how solution provision is governed with regards to the external structure.
Intraorganizational structure	How overall solution provision is arranged *within* the focal firm. In other words, which part of the organization will provide the products, and which the required services. Furthermore, how are the financial and customer relationship responsibilities arranged within the focal firm, and what is the incentive structure.
Capabilities	What kind of skills and competences are required to successfully provide the integrated solution to customers. This takes the form of not only product-related technological capabilities, but also the form of project management and other service-related capabilities.
Organizational culture	The overall organizational ethos regarding service provision. In other words, are the values and other cultural aspects of the organization leaned towards service provision, or are they based on the old, product-centric thinking.

Table 2.5: The concepts related to service provision identified in the extant literature

Obviously, the key issue behind the service provision phenomenon is the introduction of an increasing amount of services into manufacturer's offerings. Therefore, the role of services in these firms' offerings' is increasing. This trend is unambiguous — often a significant portion of the firm's employees work in service functions. In fact, this change in the offering of manufacturing firms ultimately defines the service provision as a phenomenon: the other concepts related to service provision can be considered secondary, and typically only describe how to arrange other organizational factors to support this change in the product firm's offering. This is also reflected in the share of articles using the concept; as seen from Table 2.3, three out of four articles in the research field discuss this concept to some degree. While articles after the year 1994 appear to discuss the offering a little less commonly, it is still clearly the most significant concept in service provision literature.

A wide range of categorizations for services included in these solutions have been proposed on theoretical grounds or derived empirically. The first categorization divides the provided services into those affecting the product and those affecting the customer organization (Boyt and Harvey, 1997; Mathieu, 2001a). The second common categorization is to divide the services according to the solution life-cycle phase (Davies, 2004; Sawhney, 2006; Tuli et al.,

2007) or the product life-cycle (Potts, 1988). More specifically, services are often divided into *pre-sales, implementation phase, and operations phase (or post-sales) services.*

Manufacturing firms are also increasingly moving beyond the provision of simple maintenance and operations services towards knowledge-intensive services (den Hertog, 2000; Davies, 2004). They are now offering services that also help customers optimize the use of the manufacturing firm's technology or help design new technology to customer's requirements (Anderson and Narus, 1995).

Overall, the offering of manufacturing firms who also provide services often constitute so-called complex products systems (CoPS) (Davies and Brady, 2000; Gann and Salter, 2000; Hobday, 1998). These are similar to the integrated solutions described above, but also highlight the uniqueness of each individual solution and the project nature of the delivery. These factors force manufacturing firms to develop new capabilities in project business (Davies and Brady, 2000; Hardstone, 2004).

In addition to the categorization of services and the composition of the overall solution offering, the offering component of service provision has considered the changes in offering offering positioning (Penttinen and Palmer, 2007) and pricing (Galbraith, 2002; Brady et al., 2005).

Customer relationship

As indicated by literature on relationship marketing (Sheth and Parvatiyar, 1995; Wilson, 1995) and industrial marketing (Andersen and Kumar, 2006; Homburg and Garbe, 1999) providing services in a business-to-business product market requires changes in the relationship between the product firm and customers. Instead of selling products in a transactional way, moving to solution provision forces manufacturing firms to engage in relationship building with the customer to much larger degree. In short, the transition to service provision typically involves developing deeper and more long-term relationships with customers.

However, as indicated by Tuli et al. (2007), the customer perspective on service provision has been largely ignored in the literature. In other words, most authors have discussed service provision exclusively from the providers' perspective, and mostly using a product-centric view. Yet, as demonstrated by Tuli et al., customers see service provision more from a relationship and process view than from a transaction view.

As seen from Table 2.3, customer relationship is the second most commonly used concept in relation to service provision in product firms. More than half of analyzed papers use the concept. Furthermore, there appears to be a slight increasing trend in the use of the concept after the year 1994. This suggests that authors in the research field have recognized the importance of relationship marketing; and, on the other hand, seem to have understood the

importance of services beyond a simple part of the firm's offering (Grönroos, 1994). In addition, from Table 2.4 we may infer that the concept of customer relationships is particularly important for studies that discuss the innovation of services and solutions, and clearly less important for studies on the impact of service provision.

Interorganizational structure

It is common that, especially in more complex and expensive offerings, the product firm cannot produce the offering alone due to limitations in available resources and competences. In these cases, it needs to employ its business network to access required products, services, and capabilities (Baum et al., 2000; Dyer and Hatch, 2006; Zaheer and Bell, 2005). Yet, the product firm has many options regarding the interorganizational structure of service provision. It may outsource all required services of a solution and act as an integrator, or it may provide all these services internally as a solution provider (Davies et al., 2007).

The interorganizational structure of service provision refers to the division of labor between multiple firms in the focal firm's business network. In particular, it describes each firm's contribution in terms of products and capabilities to the overall solution offered and deliverd to the customer.

On a more abstract level, decisions about service provision consider the organization of production and boundaries of the firm (Araujo and Spring, 2006; Araujo et al., 2003; Santos and Eisenhardt, 2005). In particular, the manufacturing firm needs to decide what functions and activities to internalize and what can be outsourced. While the actual *service* provided to the customer may remain the same (Vargo and Lusch, 2004), this decision of interorganizational structure has significant implications for the manufacturing firm, for example in terms of managing the customer relationship (cf. Wise and Baumgartner, 1999) and developing required capabilities (Ceci and Prencipe, 2008; Hobday et al., 2005).

The literature on this interorganizational structure of solution provision is quite limited; as seen from Table 2.3, only 21% of analyzed articles disucss the concept, making it the least commonly used concept in the study of service provision. This is also reflected in the least sophisticated research methods used to study the concept: data in Table 2.4 shows that the only 7% of all articles have used the concept in relation with quantitative methods.

Yet, there are indications in the literature that this integrative ability may be of great importance to product firms (Hobday et al., 2005). There are also multiple possible ways of arranging interorganizational collaboration: the focal firm may opt to take the role of total systems seller, taking responsibility over the entire solution, or it may only perform the role of systems integration (Davies et al., 2007).

However, as mentioned above, not much is yet known about interorganizational structure and its impact on service provision. It is yet uncertain exactly when and how this internalization should take place. Moreover, in the existing management research literature there are examples of different implications about inter-organizational structure for service provision (cf. Brusoni et al., 2001). This is likely to be a construct for which we need a more profound theoretical grounding to explain adequately this part of the phenomenon.

Intraorganizational structure

Service provision presents a dilemma for the manufacturing firm: how to manage two totally different types of businesses within one organization? Not only are the product and service businesses operationally different, but they also differ in terms of strength of customer relationships and required capabilities (Chase, 1978; Nambisan, 2001; Bowen and Ford, 2002; Anderson et al., 1997). It is therefore no wonder that most manufacturing firms that start providing services experience at least some internal difficulties and contradictions with organizing solution provision (e.g., Brax, 2005; Neu and Brown, 2005).

The intraorganizational structure of service provision describes how service provision, product development, and production within the focal firm have been organized. Obviously, this concept covers tangible organizational topics such as organizational structure, processes, incentives and power relationships.

The literature on service provision in product firms has discussed these issues of intraorganizational structure to some degree. As seen from Table 2.3, 40% of all analyzed articles use the concept to some degree, and the concept is important for all three common themes in the research field, as shown in Table 2.4.

By far the most common model suggested for intraorganizational structure of service provision within the product firm is the *front-end/back-end structure* (Foote et al., 2001; Galbraith, 2002), similar to the front-office/back-office structure in service operations literature (Chase and Tansik, 1983; Silvestro et al., 1992). In the context of service-providing manufacturing firms, this structure means that the front-end units provide the customer solution, using the products and technologies provided by the product units. This front-end/back-end structure can be supplanted by a strong strategic center that provides overall control of the business and sets strategic priorities (cf. Galbraith, 2002; Miller et al., 2002; Davies et al., 2006).

However, there is also contradictory evidence about the optimal internal structure of the manufacturing firm. Research has demonstrated that in some cases it may not be optimal to apply such strict front-end/back-end structure. For example, in the case of technological transition it may be optimal to apply

an integrated organizational model (cf. Brusoni et al., 2001). Unfortunately, the there is only limited literature on the potential contingent factors affecting the internal organization of service provision. In addition, there is also only limited research on the impact of intraorganizational structure on the performance of the product firm.

Capabilities

The capabilities of a firm refer to the set of skills, knowledge and experience the firm possesses that enable the firm to enjoy competitive advantage (Penrose, 1959; Hamel and Prahalad, 1994; Teece et al., 1997). Capabilities go beyond the mere possession of valuable resources; they include the ability to effectively use these resources to attain competitive advantage. The word *competence* is often used synonymously with capabilities (cf. Prahalad and Hamel, 1990).

In order to provide the required services included in the offering, the manufacturing firm must possess capabilities to both produce the products, as well as to deliver the services included in the offering (Davies and Brady, 2000; Miller et al., 2002; Ceci and Prencipe, 2008). In particular, in addition to the usual capabilities related to the core technology of the manufacturing firm, capabilities related to project delivery (Brady and Davies, 2004), service operations management (Morrison and Roth, 1992; Matthyssens and Vandenbempt, 1998), and general integrative function (Hobday et al., 2005; Davies et al., 2007) are needed.

As seen from Table 2.3, capabilities have been used relatively rarely in the literature. However, the data shows that the importance of this concept has been steadily rising[2]. In the last period, already 38% of the articles use the concept. However, somewhat surprisingly, this concept, based in the general management literature, is used to analyze the impact of service provision in only 12% of the literature (cf. Table 2.4. By contrast, approximately one third of articles discussing transition and innovation themes use this concept. Yet, as indicated by the bibliometric analysis of the literature, the proliferation of the service-dominant logic as a theoretical grounding for service provision puts emphasis on capabilities and their use (Vargo and Lusch, 2008b; Cova and Salle, 2008). Hence, it is likely that this concept will become more important in the future, and has already been subject to recent research (Fischer et al., 2010).

Organizational culture

Service provision is also likely to require changes in the organizational culture of product firms. Organizational culture refers to the system of values and assumptions shared by a group of individuals that are developed in response

[2]Obviously, this effect is also partly due to the emergence of the capabilities discourse at the beginning of 1990s.

to external adaptation and internal integration (cf. Schein, 2004). It thus describes the aspects of the focal firm's organization not covered by intraorganizational structure or capabilities, and in general is related to the "soft" or "intangible" aspects of changes required to move to service provision. The data in Table 2.3 show that organizational culture has been used relatively rarely in the literature.

The organizational change required in moving toward service provision in product firms has been most often described with the term *service orientation*. Originally used to describe the psychometric attitudinal characteristics of employees towards service provision (Hogan et al., 1984), this construct has been further develop to describe the service orientation of entire organization in addition to individuals (Bowen et al., 1989; Lytle et al., 1998; Homburg et al., 2002; Lytle and Timmerman, 2006; Antioco et al., 2008). As defined by (Lytle et al., 1998), "an organizational service orientation is the product of enduring organizational policies, practices, and procedures which support, nurture, and reward excellent employee service behavior." Applied to the entire organization, service orientation as a concept is very similar to entrepreneurial orientation (Lumpkin and Dess, 1996) or market orientation (Kohli and Jaworski, 1990), also indicated by citations made to this prior literature.

Yet there are differences between the meanings of the construct between different authors. For example, Homburg et al. (2003) conceptualize service orientation in terms of two dimensions: the number of service offerings, and how strongly they are emphasized to customers. These are very different from purely cultural descriptions of service orientation.

As seen from Table 2.4, unlike some of the other dimensions of service provision in product firms, service orientation has been studied quite extensively using quantitative methods (Lytle et al., 1998; Homburg et al., 2002). Furthermore, the construct has been explicitly linked to firm performance (Lynn et al., 2000; Homburg et al., 2002). Thus, somewhat paradoxically, organizational culture, the least tangible concept related to service provision, has been studied with the most rigorous empirical methodology.

2.3.2 Emerging themes in research

In addition to the ontology of service provision we also assessed the literature with respect to recurring themes in research. These common themes were identified by analyzing the research questions considered in each article. Based on this analysis, three common themes could be identified in the extant literature relevant to the phenomenon: 1) *The transition to service provision*, 2) *the impact of service provision on performance*, and 3) *the innovation of new services and solutions*. Table 2.3 shows the evolution of the

literature in terms of number of articles discussing these themes over the period 1985–2008.

The identified three themes are concurrent with those identified by Homburg and Garbe (1999), with the exclusion of buyer-side analysis of service provision (cf. Burger and Cann, 1995; Stremersch et al., 2001) and detailed analysis of service quality (cf. Morris and Davis, 1992). Given our emphasis on the impact of service provision on product vendor performance, we did not explicitly consider the buyer side literature in detail. Moreover, given our interest in strategic impact of service provision, we also omitted further considerations of service quality.

Transition to service provision

The first recurring theme in the service provision in product firms literature relates to how a product firm can successfully make the transition to a service provider. This theme covers topics such as changes required in the offering (Bell, 1986; Penttinen and Palmer, 2007; Stremersch et al., 2001), organizational structure and culture (Martin and Horne, 1992; Galbraith, 2002; Gebauer, 2007a), and capabilities (Miller et al., 2002; Davies, 2004; Windahl et al., 2004) of the focal firm. In other words, all aspects of service provision have been discussed from the viewpoint of transition to a solution provider. As seen from Table 2.3, this is clearly the most commonly discussed theme in the extant literature, with approximately half of the articles analyzing the topic. The popularity of the theme has been relatively stable over the entire analyzed period.

As indicated by the evidence reported in Table 2.4, all aspects of service provision have been discussed in the literature. However, thus far the emphasis has been on the change required from the product firm's offering and customer relationships. The other four concepts of service provision received significantly less attention in the literature on the transition from product to service firm. In particular, our understanding on how the organizational culture, intraorganizational structure, and interorganizational structure need to be changed during the transition is still somewhat limited.

There is also uncertainty about how exactly a product firm can make the transition; some authors have argued that the transition should be gradual (Oliva and Kallenberg, 2003; Matthyssens and Vandenbempt, 2008), while others have suggested that a discontinuous change may yield better results (Brax, 2005). These varying results indicate that the suitable form of transition is likely to be contingent on organizational and environmental factors. While there is evidence on the fit between service strategies, firm capabilities and the competitive environment (Gebauer, 2008; Gebauer et al., 2010), evidence on how these factor affect the *transition* itself is still missing in the literature.

Another aspect of the transition towards solution provider authors disagree on is the direction of transition: while many early authors emphasized downstream integration towards customers (Wise and Baumgartner, 1999; Oliva and Kallenberg, 2003), more recent research has suggested that upstream integration is also possible (Davies, 2004; Davies et al., 2007). In particular, this latter option applies to service firms who decide to provide solutions through becoming manufacturers (Davies, 2004; Davies et al., 2006). However, there is lack of evidence on how the transition to a solution provider is different from these two contrasting positions.

In summary, our review of the literature on service provision suggests that organizational change from a pure product firm into a solution provider has been studied extensively. Yet, there is still room for further research, in particular on how contingent factors affect the transition.

Impact of service provision

The second theme identified in the literature discusses the impact of service provision. In other words, this theme suggests that changes in the factors related to service provision affect the performance of an offering, a firm, or some part of the organization. As can be seen from Table 2.3, the impact of service provision has been studied much less than the transition from a product firm to a solution firm (17 versus 30 articles). This suggests that we know much less about the actual impact of service provision than about the process of transition to such position. In addition, research into this theme has been relatively stable over the overall period, with surprisingly slight drop in interest during the last years.

The impact of service provision has been discussed on multiple levels of analysis, typically at the level of individual services (Morris and Davis, 1992) or the firm level (Homburg and Garbe, 1999; Youngdahl, 1996; Fang et al., 2008; Gebauer et al., 2010).

Many different measures of performance have been used in the literature. Examples include service quality (Youngdahl, 1996; Morris and Davis, 1992; Donaldson, 1995), customer satisfaction (Burger and Cann, 1995; Homburg and Garbe, 1999), solution effectiveness (Tuli et al., 2007), firm performance (Homburg et al., 2003; Gebauer, 2008; Gebauer et al., 2010), and even stakeholder value (Matthyssens and Vandenbempt, 1998; Fang et al., 2008).

As judged from Table 2.4, there are no significant differences in the use of concepts between articles discussing the impact theme and those discussing the transition to service provision. However, relatively few articles have discussed the impact of service provision in terms of interorganizational structure or capabilities. The lack of research on capabilities is somewhat surprising, given that capabilities have potentially large impact on firm performance (Teece et al., 1997; Prahalad and Hamel, 1990). Moreover, articles analyzing the impact of service provision tend to use the customer relationship concept

less commonly than studies on the transition. This is understandable, given the often strategic level of analysis regarding the impact of services.

In summary, the extant literature indicates that research on the impact of service provision is relatively scarce. In particular, our understanding of the firm-level effects is limited. Thus far, this evidence is mostly limited to the fit between organizational and environmental factors (Gebauer, 2008; Gebauer et al., 2010). The more direct evidence between service provision and firm performance outcomes is also limited (Homburg et al., 2002; Fang et al., 2008). The extant evidence indicates that the impact of service provision depends on contingencies. However, our knowledge of how exactly service provision and firm performance is related is less clear. In particular, some evidence suggests that this relation may also be curvilinear (Fang et al., 2008; Cusumano, 2008).

Innovation of services and solutions

The innovation theme is the least common in the extant literature on service provision; as shown in Table 2.3, only 21% of the analyzed articles the innovation of new services and solutions in product firms. By innovation, we mean analysis how a product firm can successfully develop new services and solutions for its customers. Despite being the least often discussed theme of service provision, the theme has gradually increased in popularity over the observed period.

As indicated above, this theme can be divided into two aspects: the innovation of individual services, and the innovation of entire solutions. The former aspect seeks to improve the product firm's offering through the development of new services for customers (Samli et al., 1992; Frambach et al., 1997; Neu and Brown, 2005; 2008; Gebauer, Krempl, Fleisch and Friedli, 2008), while the latter seeks to create entirely new models of collaboration with customers (Gann and Salter, 2000; Shepherd and Ahmed, 2000; Windahl and Lakemond, 2006). Of course, these two levels of analysis are interrelated, as the innovation of new customer solutions typically includes the innovation of new services.

As indicated by the extant evidence on service innovation, the innovation needs to match customer requirements (Samli et al., 1992; Frambach et al., 1997) and, as also indicated by the literature on transition, that the organizational structure and other organizational factors need to be aligned with the solution (Neu and Brown, 2005; 2008; Gebauer, Bravo-Sanchez and Fleisch, 2008). Innovation of services may also require changes in the interorganizational structure (Windahl and Lakemond, 2006). However, our understanding of how these contingency factors affect the success of service innovation is somewhat limited. Moreover, we do not have much evidence on the actual innovation process used to develop new services and solutions.

Somewhat interestingly, as suggested by the evidence in Table 2.4, offering is *not* the most commonly used concept when analyzing service innovation. Unexpectedly, customer relationship is the most often used concept in this theme. Moreover, the intraorganizational structure of the product firm has also been emphasized when discussing innovation. In summary, it seems that offering is the outcome rather than antecedent to innovation, and that innovation is based on the ability to utilize input from sources such as internal organization and customers.

2.3.3 Theoretical development

A research field defined by a common phenomenon typically allows multiple research traditions and perspectives to study the same phenomenon. In other words, it is perfectly possible and expectable that the phenomenon of service provision to be discussed from multiple, somewhat incompatible theoretical groundings.

Our analysis of the literature on service provision confirms this assumption; the phenomenon has been studied from at least the viewpoints of business and industrial marketing (Homburg et al., 2002; Gebauer, Bravo-Sanchez and Fleisch, 2008), operations management (Chase et al., 1992; Voss, 1992; Johansson and Olhager, 2004; 2006; Correa et al., 2007), management science (Cohen and Whang, 1997), and industry evolution (Hobday, 1998; Hobday et al., 2000; Davies et al., 2007; Ceci and Prencipe, 2008). Since these research fields follow their own research traditions, the theoretical background of these different perspectives are not perfectly compatible.

As a result, and confirmed by the bibliometric and content analysis of the research field, service provision literature has remained relatively dispersed, with isolated areas of research that have not been connected to a significant degree. In particular, it seems that there are clusters of industrial marketing, innovation, and project-based contributions to the literature. Yet, as indicated by comparison of literature until 2006 and 2009, the cross-citations within the literature have begun to increase. This indicates that a more unified research field is starting to emerge. This is also suggested by the co-citation analysis, which confirmed that the articles in the literature have some common ground.

However, outside the isolated areas of research the level of theoretical development has thus far remained relatively low. This is indicated by the lack of common theoretical grounding, as well as the descriptive nature of many of the contributions thus far. So far, only a limited number of studies have sought to develop explanatory theory of service provision (cf. Jacob and Ulaga, 2008). Thus, from the viewpoint of theory development, the research field on service provision is clearly still in a nascent phase.

Yet, as indicated by our analysis of the literature, some common theoretical themes are beginning to materialize. In particular, the service-dominant logic of marketing (Vargo and Lusch, 2004) appears to provide one potential theoretical framing of the service provision (Cova and Salle, 2008; Vargo and Lusch, 2008b). Related to service-dominant logic, the resource-based view (Barney, 1991) and dynamic capabilities (Teece et al., 1997) appear to provide some common theoretical grounding. Despite this progress, these theories may not be relevant (nor applicable) to all perspectives on service provision; for example, the management science perspective clearly does not require these theoretical concepts. In summary, the theoretical grounding of the phenomenon still depends largely on the chosen research perspective.

2.3.4 Research methodologies

In addition to the common themes and theoretical groundings found in the identified literature, we also compared the empirical methodologies used in the extant literature to study service provision. This analysis was based on the inspection of the research methodology as reported by the authors in the articles. Since very few of the practitioner-oriented actually included a detailed discussion of empirical methodology, they were excluded from this analysis. We looked for three things related to methodology in each article: 1) the methodologies used in the article; 2) the sample size used (if applicable); and 3) the specific context of the empirical study.

Table 2.3 shows the evolution of the empirical methodologies employed in the service provision literature[3]. Conceptual articles refer to purely theoretical contributions that contain no empirical research. Articles using anecdotal evidence use empirical evidence mainly to embellish conceptual arguments, but do not explicitly describe where and how the data were collected or analyzed. Qualitative research refers to small-N empirical articles which rely mainly on qualitative data; most of these articles used some type of case research methodology (Yin, 2003). Finally, quantitative studies use quantitative data and statistical methods, and typically test hypotheses derived from previous research and theory. Regression analysis was the most typical statistical analysis method used in the articles.

As seen from Table 2.3, the use of anecdotal evidence was obviously at its greatest in the first observed period, accounting for over half of articles. Since then, the use of only anecdotal evidence has steadily declined, and has nearly vanished in the last observed period. This can be interpreted as a natural maturation of the research field, with an evolution towards more rigorous research methods. Correspondingly, the use of qualitative methods has increased during the period, accounting for two thirds of articles in the last pe-

[3]Note that, again, each article could employ more than one type of empirical research methodology, and therefore the shares do not add up to 100%.

riod. These observations confirm the argument by Jacob and Ulaga (2008), who claimed research on service provision has thus far mainly relied on descriptive methodologies.

The use of quantitative methods shows an interesting pattern. Unsurprisingly, the earliest period saw nearly no application of these methods. For the middle period, quantitative methods became relatively widely used — only to be ignored again in the last period. It thus appears that quantitative methods have already been used in the field, but for some reason have not been applied lately. In any case, the pattern suggests that it is possible to use quantitative methods to study the phenomenon of service provision. Interestingly, as seen from Table 2.4, quantitative methods have been used to study organizational culture, a quite inobservable construct, more often than other methodologies (excluding purely conceptual articles).

In summary, the results of our analysis of methodology seem to support the conclusion from the bibliometric analysis that research on service provision is in an emerging phase. A reliance on descriptive and qualitative studies is usually associated with a research field that is in an early phase of development (Christensen, 2006; Buchanan and Bryman, 2007; Edmondson and McManus, 2007; Parkhe, 1993). However, as indicated by recent research on the phenomenon (Gebauer, 2008; Gebauer et al., 2010), statistical methods are increasingly being used to study the phenomenon. As quantitative methods typically require some level of prior theoretical development (cf. Shah and Corley, 2006), it seems that the field is showing development towards more coherence also in this terms of methodology.

2.4 Discussion and conclusions

The current literature review has surveyed the literature related to a phenomenon of increasing interest, the role of services in product firms. The review has uncovered a view of the extant literature as having low but increasing coherence in terms of terminology and theoretical groundings. Despite the relative incoherence of the research field, the number of articles discussing the topic is significant and, more importantly, growing rapidly. The comprehensive view of the extant research view provided by this review thus seems timely and will hopefully help subsequent research to locate aspects of service provision that still require further research.

For this purpose, our review has identified a six-component ontology of the phenomenon, consisting of the offering, customer relationship, interorganizational structure, interorganizational structure, capabilities, and organizational culture. While all these aspects of service provision have been researched to some degree, there are great differences in their level of conceptualization and applied methodologies. For example, service orientation

as a part of cultural change has been studied extensively using quantitative methodologies, while no equivalent research can be found on the offering. Much still remains to be done to fully understand the role of services in product firms.

The review of relevant literature on service provision suggests that the phenomenon has been around and studied to some degree already for over twenty years. However, our findings also suggest that systematic research of the phenomenon is still at its infancy. This is indicated by the level of conceptual incoherence in extant literature. Multiple different conceptualizations and descriptions have been proposed for the same phenomenon. Furthermore, much of the extant literature has remained mainly descriptive in nature and has not sought to develop a theoretical understanding of service provision.

The general conclusion of this review is, therefore, that the literature on service provision is starting to form a more coherent body of literature. Yet, the research field needs to step up the level of abstraction and start to look for explanatory theoretical frameworks instead of purely descriptive studies. Without such effort, the research field could be dismissed as anecdotal evidence rather than rigorous research into the phenomenon.

3 Research Questions

As stated in Chapter 1, the research problem addressed in this study is to understand the impact of knowledge-intensive service provision on SME performance. As we saw in the literature review of Chapter 2, there are still significant gaps in the extant knowledge on the role of services in product firms, confirming the academic motivation for the current study.

In this chapter, we further clarify the positioning of the study with respect to existing research on the role of services in manufacturing industries and management research in general. Our goal is to explicitly indicate the connections with extant research, as well as lay down the detailed research questions addressed by the study.

3.1 Positioning the study within research on service provision

This study seeks to contribute primarily to the emerging research field on the role of services in product-based firms; therefore, we will first discuss the positioning of the study with respect to this literature.

First of all, as indicated by the review of the extant literature on the role of services in product firms, a number of different perspectives have been used in this research. As suggested by prior research most frequently cited in the service provision literature, most authors in the field have studied the phenomenon from a marketing perspective (cf. Anderson et al., 1997; Homburg et al., 2002; Penttinen and Palmer, 2007; Tuli et al., 2007). Yet, there are also examples of studies based on other management research field traditions, such as general management (Bowen et al., 1989; Smith and Reece, 1999; Bowen and Ford, 2002) and operations management (Fry et al., 1994; Verma et al., 2001; Gebauer, 2007b).

To provide a contrasting view with these existing viewpoints, this study will take the perspective of strategic management on service provision. As indicated by the literature review, such strategic management perspective on service provision in product industries has thus far been limited to secondary role in the marketing-oriented research on the phenomenon. Given this em-

phasis on strategic management, we will exclude detailed analysis of marketing related issues, such as customer relationships and exact composition of the firm's offering.

Second, the literature review also suggested that there are three recurring themes in the research on service provision: *impact of service provision, transition to service provision, and innovation of new services and solutions*. Our study will analyze the strategic impact of service provision. More precisely, our purpose is to study the impact of knowledge-intensive service provision on firm performance. Therefore, we will not discuss the transition process from a product firm to a solution firm, nor do we analyze the innovation of new services. Choosing the impact perspective complements existing research on the topic, improving the chances of making a contribution to the research. Furthermore, an analysis of this perspective is required if we are to develop a theory for fully understanding and explaining the strategic impact of service provision.

Third, we will explicitly seek to identify a coherent theoretical basis for understanding the service provision phenomenon. Such undertaking has been quite rare in the extant literature (Jacob and Ulaga, 2008). Even though descriptive typologies, common in the extant research, can be useful as an early step towards theory development (Doty and Glick, 1994), they are still limited in the extent they elaborate theory. Therefore, rather than being content with a descriptive study, we try to go beyond the descriptive level by identifying potential theoretical basis for the phenomenon.

3.2 Positioning the study within management research

As stated in the research problem, this study explores the relationship between service provision and firm performance. Considering first the construct to be explained, firm performance, leads us to conclude that the study is mainly relevant from the perspective of strategic management research, as one of the key questions studied within the strategic management field is what explains differences in firm performance (Rumelt et al., 1991; Hoskisson et al., 1999).

There exists abundant research on business strategies in the manufacturing context (Wheelwright, 1984; Swamidass and Newell, 1987; Miller and Roth, 1994; Ward et al., 1996; Schroeder et al., 2002), and substantial amount of research on strategies in the service sectors (Thomas, 1978; Bharadwaj et al., 1993; Carman and Langeard, 1980; Brush and Chaganti, 1999; Hitt et al., 2001; O'Farrell et al., 1993). However, there is only limited knowledge on the strategic impact of services provision in manufacturing industries (Gebauer, 2008; Fang et al., 2008). If we also exclude articles that discuss the role of services only as a component of generic manufacturing strategies, and comparative

studies on the differences between the two sectors (Habib and Victor, 1991; Song et al., 1999; Kathuria et al., 2008), the number of relevant papers is relatively small (e.g., Fry et al., 1994; Mathieu, 2001b; Homburg et al., 2002). In the following, we position the study with regards to the strategic management field in more detail.

First of all, superior firm performance is usually explained by the existence of some kind of a *competitive advantage* (e.g., Porter, 1985). Furthermore, competitive advantage may be analyzed from two different but complementary perspectives: the static, cross-sectional problem of strategy, and the dynamic, longitudinal problem of strategy (Porter, 1991). The cross-sectional problem of strategy analyzes what factors lead the focal firm to have competitive advantage at a single point in time, and is exemplified by the Porterian approach to strategy formulation (Porter, 1980; 1985). By contrast, the longitudinal problem analyzes how competitive advantage is developed and maintained across a period of time.

In this study we concentrate on the cross-sectional problem of strategy. In other words, we seek to develop theory that will allow us to explain how the current organizational and environmental factors affect the performance of the focal firm at one point in time. We do not explore in detail the issues of competitive dynamics over time related to service provision, nor the attainment of long-term strategic goals.

Secondly, as indicated by Mintzberg and Waters (1985), and Venkatraman (1989b), the construct of strategy may be divided into intentions and realizations. As the phenomena of interest in this study, service provision in product firms, reflects mainly realized services, we will concentrate on constructs related to the realized strategies — the outcomes of strategic choices made earlier. In other words, we see strategy as a decision about resource use, and our constructs will mostly measure the outcomes of such resource distribution decisions.

Third, strategy research may also be divided into strategic planning and strategy execution (or implementation) (Mintzberg, 1994; Steiner, 1997). While this study does not specifically belong to either of these, we are more interested in the strategic planning perspective, and in the end the outcomes of such planning. The execution of these strategic plans is abstracted away.

3.2.1 Variance study

The research is cast as a *variance study* (Mohr, 1982; Van de Ven and Poole, 1995; 2005). In other words, we aim to develop a theoretical model which predicts the changes in outcome constructs as a function of change in the explaining constructs (cf. Bacharach, 1989; Whetten, 1989). This is in contrast to a process study, which seeks to understand the details of the process how a certain outcome emerged. We are interested in the identification of

factors that affect firm performance and the direction of these effects. Given the scarcity of prior research on the topic, we will thus only try to identify the presence and directionality of relationships between theoretical constructs.

The current study aims to provide an explanation for the impact of service provision in product industries based on contingency theory (Drazin and Van de Ven, 1985; Ginsberg and Venkatraman, 1985; Donaldson, 1987). In other words, we anticipate that the performance impact of service provision is likely to depend on a number of organizational and environmental factors. Indeed, one purpose of this study is to explicate what these factors are and what is their impact on the relationship between service provision and firm performance.

According to the contingency theory, a "fit" needs to exist between the organization, strategy and its environment to yield high firm performance. Multiple types of this fit exist within management research, depending on how we conceptualize the organization and its environment (cf. Drazin and Van de Ven, 1985; Venkatraman and Camillus, 1984; Venkatraman, 1989a). We aim to study the impact of service provision based on the *fit as moderation* concept (Venkatraman, 1989a). In this concept, the context can moderate the relationship between outcome and explaining variables. Analytically, this means discovering interactions between variables. Thus, to develop a contingent theory of service provision impact beyond the holistic *fit as gestalt* approach (cf. Gebauer, 2008; Gebauer et al., 2010), we need to explicitly delineate and explain in detail what factors of service provision are important, and how they affect each other and the performance of the product firm (cf. Venkatraman, 1989a).

3.2.2 Ontology and epistemology

Our study is based on a realist (i.e., postpositivist) ontological and epistemological position (Guba and Lincoln, 1994; Johnson et al., 2006; Van de Ven, 2007). In other words, we assume that the reality is ultimately objective (i.e., it exists independently of observers), but it can only be perceived with limited precision and certainty due to our limited capability to observe the reality, as well as due to the complexity of the phenomena observed.

We suggest that the realist epistemological position is suitable for this study, since most aspects of the studied phenomenon of service provision are "objective" in nature; for example, the question of whether or not a firm has provided certain services can be observed beyond doubt, and in a way that all observers can agree on. Moreover, as we concentrate on the strategic management level of analysis, issues related to organizational culture and differences in cognition within the organization are not likely to have a significant impact on our study.

Furthermore, it would seem unnecessarily complicated and arduous to consider more subjective epistemological positions, such as constructivism (Tsoukas, 1996; Mir and Watson, 2000), given the research setting and the chosen research problem. Moreover, the realist perspective is also a commonly adopted epistemological position in mainstream strategy and management research (Godfrey and Hill, 1995) Therefore, our selected position ensures the compatibility of this study with mainstream strategic management research and extant theoretical frameworks.

The choice of a realist epistemological position has significant implications for the research design, and ultimately for the goal of theory development. The assumption of a realist epistemology is behind, for example, the conceptualizations of theory suggested by Bacharach (1989) and Whetten (1989). Even though these are definitely not the only feasible ways to conceptualize theory and theorizing in management research (e.g., Weick, 1989; 1995), they are a commonly assumed position within mainstream strategy and management research (cf. Hoskisson et al., 1999; Furrer et al., 2008). Therefore, adopting such positions enables easier integration of the research findings with extant research on service provision and strategic management.

As described by the position to theory described by Bacharach (1989), and by Johnson et al. (2006) as the realist perspective to qualitative research, our study thus seeks to explain, first, what theoretical constructs can be used to describe the phenomenon, and secondly, the possible relationships between these constructs; in other words, the hypothesized causal structure of the emerging theory. This point of view also integrates quite well with the chosen approach of a variance study, as these studies also seek to explain the change in organizational entities by causal analysis of independent variables that explain change in entity (Van de Ven and Poole, 2005).

3.3 Research questions

Given that we have chosen to study the phenomenon of service provision in product-dominated SMEs from the perspective of the cross-sectional problem of strategic management, using the variance study approach, and adopted the realist epistemological position, we may now proceed to develop the detailed research questions of the study. However, we must first elaborate the constructs whose variance we need to explain, as well as the constructs we hypothesize to have an impact on the outcome constructs.

3.3.1 Constructs to be explained

As stated in the research problem, we seek to explain the performance of product firms who also provide knowledge-intensive services to their cus-

tomers. We must therefore define in more detail what we mean by firm performance. As indicated by Venkatraman and Ramanujam (1986), it is important to delineate firm performance and its dimensions. This perspective is also supported by Richard et al. (2009), who argue that firm performance must be clearly described in terms of context, environment, and relevant stakeholders.

First, we note that given our perspective of strategic management, our emphasis is on financial measures of performance. In other words, we exclude notions of performance relating to operational efficiency. Secondly, given the relatively narrow scoping of this study, we need not worry about wide differences in the way firms themselves measure their performance. However, we do acknowledge that for many small firms and new ventures sales growth is the most important performance measure (Bloodgood et al., 1996; Chandler and Hanks, 1993), yet some of these firms may opt to emphasize profitability. Third, we will concentrate on performance from the perspective of the management of the firms. More precisely, we will thus ignore measures of the firm's total value to its owners.

The review of the extant research on service provision indicates that most studies thus far have been interested only in profitability as a measure of performance of the product firm providing services (cf. Gebauer, 2008; Gebauer et al., 2010). This is partly explained by the fact that these studies have been conducted in the context of large, multinational corporations, most of which are publicly listed, and to which sales growth is typically only a secondary goal. By contrast, this study considers mostly small and medium sized enterprises (SMEs), for which profitability is usually not the primary performance criteria, as they are often still in the rapid growth phase and have not yet gone public — in other words, financial market measures cannot be obtained for most of the firms under study. Therefore, we will operationalize firm performance in terms of both revenue (i.e. total sales) growth and profitability.

We measured revenue growth as the difference in the total sales of the firm between two points in time; typically, this refers to year-to-year growth of sales. Revenue growth roughly describes how quickly the focal firm has been able to grow its business in its relevant markets, and obviously also indicates the growth of the firm organization in general. This is particularly true for software firms, who nearly exclusively use human resources.

We measured profitability in terms of profit margin. In other words, we measure profits as the net operating profits (or earnings) of the focal firm, which equal to total revenues minus the cost of goods sold and selling, general and administrative expenses. Profitability is the ratio of these profits to total revenue, and is calculated per fiscal year.

3.3.2 Explaining constructs

Our research problem asks how does service provision affect the firm performance of product firms. Hence, we must now describe what we mean by service provision. In principle, we may delineate three possible constructs in service provision: *what kind* of services the firm provides, *in which scale* does it offer them, and *how well* does the firm provide them. Based on this insight, and an preliminary review of the extant literature, as well as empirical evidence from the single in-depth case study, we operationalize service provision mainly by using two distinct construct.

First, we use the construct of *service offering* to describe the breadth of service provision activity in a product firm both in terms of service variety (what kind of services), as well as their economic significance in terms of revenue generation (in what scale). Both these approaches have been used in extant research to denote the extent of a firm's service offering (Homburg et al., 2002; Gebauer, 2008), indicating the validity of such approach.

Second, we use the construct of *service capability* to describe the level of how well a product firm is able to market its services and manage its service operations. In other words, service capability as a whole is related to the general service management competences of the firm, and indicates how well the firm is able to deliver its services. This construct may be further divided to two distinct perspectives: external and internal service capability.

The external aspect of service capability corresponds roughly with service marketing and communication competences of the firm, including ensuring service quality (cf. Parasuraman et al., 1985; Rust et al., 2002), while the internal aspect of service capability corresponds with competences in service operations management, including effective human resource use (Roth and Menor, 2003; Rust and Metters, 1996; Aranda, 2003; Johnston, 2005) and human resource development competences (Schneider and Bowen, 1993; Winter and Szulanski, 2001; Xue and Field, 2008; Goldstein, 2003). However, for the most part of the study we will consider service capability as a one-dimensional construct.

3.3.3 Detailed research questions

Based on the above conceptualizations of the constructs to be explained and explaining constructs, we may now lay down the detailed research questions as seen in Table 3.1. We have thus four main research questions to consider. In detail, we seek to understand how the variance of revenue growth and firm profitability can be explained by the constructs of service offering and service capability.

In addition, as indicated by our contingency approach to strategy, all the four stated research questions are supplemented with the additional research

Explaining construct	Construct to be explained: Revenue Growth	Construct to be explained: Profitability
Service provision	RQ1. What is the impact of service provision on revenue growth?	RQ2. What is the impact of service provision on firm profitability?
	RQ1.1. How do organizational and environmental factors affect this relationship?	RQ2.1. How do organizational and environmental factors affect this relationship?
Service capability	RQ3. What is the impact of service capability on revenue growth?	RQ4. What is the impact of service capability on firm profitability?
	RQ3.1. How do organizational and environmental factors affect this relationship?	RQ4.1. How do organizational and environmental factors affect this relationship?

Table 3.1: Detailed research questions of the study

questions regarding the impact of organizational and environmental contingency factors. These are marked in Table 3.1 as RQ1.1.-RQ4.1.

4 Overall Research design

As noted in the review of extant literature on service provision, research on the role of services in product-based industries is still at its infancy. This was indicated by the lack of coherent vocabulary and concepts used to describe the phenomenon, partly due to differing research traditions and backgrounds, as well as the relative absence of significant theoretical progress and theorizing about the phenomenon (cf. Jacob and Ulaga, 2008).

This pattern is also repeated in terms of research methodology used in the extant research. While there have been many studies that apply quantitative methods (e.g., Homburg et al., 2002; Gebauer, 2008; Fang et al., 2008), the vast majority of the current research on the topic is based on qualitative methods, mostly case studies (e.g., Windahl et al., 2004; Neu and Brown, 2005; Brax, 2005; Tuli et al., 2007). In addition, much of the prior research has been descriptive in nature (cf. Mathieu, 2001a; Windahl et al., 2004; Helander and Möller, 2008b). In addition, most contributions to the literature have discussed the transition from a product manufacturer to a solution provider, with significant emphasis put on the organizational changes required for service provision rather than the performance impact of service provision (cf. Oliva and Kallenberg, 2003; Penttinen and Palmer, 2007; Miller et al., 2002; Matthyssens and Vandenbempt, 2008).

In summary, extant research does not provide a very solid grounding for a pure hypothetico–deductive research approach based on the development of a priori hypotheses and quantitative empirical methods. This is implied by the lack of consensus on the important constructs that would explain the phenomenon of service provision in manufacturing industries, and subsequently also the lack of ready measurement frameworks for potential constructs. These facts indicate that an inductive research design based on qualitative methods is more appropriate for addressing the stated research questions (cf. Edmondson and McManus, 2007; Sonpar and Golden-Biddle, 2008).

4.1 Choosing Research Methodology

The purpose of this study is to discover theory that helps to explain the phenomenon of service provision and its consequences in product industries. As

we have seen, research on this phenomenon is still in an emergent phase, which indicates that inductive, qualitative theory-building approaches are likely to be more appropriate than hypothetico–deductive research methods (Edmondson and McManus, 2007; Siggelkow, 2007; Parkhe, 1993; Buchanan and Bryman, 2007). As indicated by Shah and Corley (2006), a cross-sectional, survey-based research can ultimately only be used to test hypotheses based on existing theory. Since we have no recourse to solid *a priori* theoretical grounding on the phenomenon, we need to engage in some level of theory development. The key characteristic of theory-building research is that no hypotheses are developed before conducting empirical research (Eisenhardt, 1989a; Yin, 2003), and in some extreme cases even no a priori theoretical background, such as in grounded theory approaches (e.g., Glaser and Strauss, 1967).

The choice of an inductive research design is thus prompted by the lack of a clear theoretical grounding in the solution provision literature. In addition, since very few of these studies have used quantitative measures, only few ready and tested instruments exist for measuring constructs. These additional factors also favor the choice of an inductive, mainly qualitative approach for the study. Qualitative methods are often in a better position to provide the rich empirical evidence to support such inductive reasoning (Mintzberg, 1979). However, we also note that the phenomenon and the selected perspective of strategic management would, in principle, enable the choice of a realist epistemological position and quantitative methods. The choice of qualitative methodology is thus not due to mismatch between the studied phenomenon and quantitative methods.

An example of this type of research in an emerging research field is Hamel's study on learning in international alliances (Hamel, 1991). He begins the paper by stating that the research field is only in an emerging phase. The paper then continues by first performing inductive study akin to grounded theory, and then proceeds to develop the emerging theory further by conducting additional case studies. This approach is very closely what Parkhe (1993) suggests for approach in such situations. Furthermore, Leonard-Barton (1990) also uses similar research design, by first conducting an in-depth longitudinal case study of one firm and then using other cases to provide complementary evidence in a cross-sectional approach. Similar research design has been used in the context of service provision by Neu and Brown (2005; 2008).

The main goal of this study is to identify a theoretical framework for understanding the impact of service provision and service capability on the performance of small and medium sized enterprises who develop and produce products (defined as an SME having at least 50% of their revenues coming from directly product-related sources). Most of the empirical research in this study is inductive in nature; in other words, we seek to develop rather than

test theory (Colquitt and Zapata-Phelan, 2007). Therefore, much of the research effort is directed towards describing the studied phenomenon, identifying key constructs that describe the phenomenon, finding and articulating an appropriate theoretical background, and building a theoretical model of the phenomenon.

While contemporary research in management research tends to be dominated by quantitative methods (Hitt, Gimeno and Hoskisson, 1998; Hoskisson et al., 1999; Scandura and Williams, 2000; Ketchen et al., 2008), qualitative methods are still seen as a credible alternative when the research questions calls for them (Snow and Thomas, 1994; Siggelkow, 2007; Eisenhardt and Graebner, 2007; Gibbert et al., 2008). Some of the major contributions to research on strategic management have used qualitative methods to build theory in situations where previous research and theories inadequately explain the phenomenon at hand (e.g., Eisenhardt, 1989b; Gersick, 1988; Ozcan and Eisenhardt, 2009). Indeed, papers that build theory based on case methodology are often considered the most interesting (Bartunek et al., 2006).

In summary, while the use of qualitative methods is relatively rare in management research, these methods are seen as a credible and viable, and sometimes even recommended alternative to quantitative methods (Mintzberg, 1979; Van Maanen, 1979; Morgan and Smircich, 1980; Daft and Lewin, 1990; Bettis, 1991; Gephart, 2004). However, the lack of a common template for conducting and reporting qualitative research implies that using these methods usually requires significant skill and is often difficult (Amis and Silk, 2008; Pratt, 2008; 2009).

4.2 Research Process

The empirical part of this study is divided into three phases (cf. Parkhe, 1993; Hamel, 1991; Leonard-Barton, 1990): an *in-depth case study* of one representative firm and its business network; *a comparative case study* of multiple enterprise software firms; and *a quantitative analysis* of selected parts of the emerging theoretical model using cross-sectional data. Table 4.1 summarizes the goals, methodologies, and measures used by these individual studies. Below, the key methodological aspects of these empirical studies are described in brief; more detailed descriptions of methodologies used can be found in their empirical research chapters.

While the empirical studies are fairly independent, they do build on the results of preceding studies. Figure 4.1 shows the logical connections between the empirical studies. The in-depth case study lays the foundation for further research by grounding the concepts used in following studies, and by identifying a suitable theoretical framework for analyzing data in the rest of the studies. The multiple case study compares the case firms and develops sev-

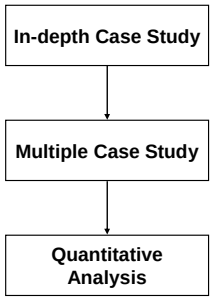


Figure 4.1: Logical order of empirical studies

eral hypotheses regarding the impact of services through comparative case analysis. Finally, the quantitative analysis study tests the hypotheses identified in the multiple case study.

The main research methodology used in this study is the case study research strategy. Case studies seek to understand contemporary phenomena in their natural environment (Yin, 2003), and is particularly well suited for providing a detailed description and explanation of a phenomenon. Of course, there are many interpretations of this strategy (Piekkari et al., 2009). Case studies, as well as many other qualitative research methodologies, are often used without clearly stating their assumptions and exact meanings (Suddaby, 2006). We have tried to provide as transparent description of the methodological choices made in this study as possible. Furthermore, we have tried to provide a clear description of what was actually done during data collection and data analysis. These two phases in the research process are often perceived as a weakness and source of subjectivity bias in qualitative methods (Pratt, 2008).

The first empirical study, an in-depth case study, is based on a general methodology resembling the grounded theory approach as described by Strauss and Corbin (1990). In practice, we start off with as few theoretical assumptions as possible and aim to develop an intermediate theory of the phenomenon of solution provision through the process of constant comparison of theory and empirical evidence (Dubois and Gadde, 2002). The case study is based on the close and thorough analysis of one Finnish enterprise software firm and its business network, including both service partners and customers of the focal firm. The case firm was chosen as a representative case since its business displayed all the characteristics of the solution provision phenomenon identified in the review of the service provision literature. As indicated in Table 4.1, the second purpose of this empirical study was to ensure that the constructs used in further research were grounded in empirical evidence.

The second empirical study builds on the first case but uses a different case study approach. Instead of studying one firm and its business network in detail, we now perform a similar analysis of multiple firms, and develop the

	In-depth case study	Multiple case study	Quantitative analysis
Purpose	Provide a tentative empirical grounding for theoretical constructs Identify key managerial challenges in solution provision Identify a theoretical framework for further research	Provide empirical support for the tentative theoretical framework Establish propositions based on patterns found in empirical evidence	Improve external validity of conclusions by testing hypotheses
General methodology	Grounded theory	Comparative multiple case study	Statistical analysis
Level(s) of analysis	Firm; business network; individuals	Business unit/firm	Firm
Unit of analysis	Firm	Business unit/firm	Firm
Sampling/ case selection	One representative case	Theoretical sampling Selection based on key factors identified in the in-depth case study Industry database used to identify suitable case firms	Random sampling Firms with reported product revenue share over 50 %
Data collection	Interviews with three levels of organization: management team, sales personnel and consultants Firm web site Firm financial data	Interviews with three levels of organization: management team, sales personnel and consultants Firm web site Firm financial data Industry survey data	Industry survey data
Data analysis	Inductive coding of interview data Pattern recognition and constant comparison with theory	Interview data coding Building conceptual network diagrams Building tabular displays of data Cross-case comparison	Exploratory factor analysis Multiple regression analysis

Table 4.1: Research design, methodology and specific methods

theory of solution provision further through a theory-building case study approach and comparison between firms, mostly as described by Eisenhardt (1989a). Instead of concentrating on the analysis of individual firm, the focus is on the comparison between different firms. For this purpose, we have used theoretical sampling: selecting case firms based on their potential contribution to theory development (Yin, 2003).

In one sense, the initial in-depth case study is replicated in further firms based on literal and theoretical replication (Leonard-Barton, 1990). A literal replication means that the study is repeated in an environment with similar face-value characteristics, and should thus produce similar results. A theoretical replication, by contrast, means conducting a study in differing circumstances that should provide predictable results based on theoretical grounds (Yin, 2003). This approach of moving from the detailed analysis of one firm to comparative case analysis of multiple firms has also been suggested by Parkhe (1993). One further major difference between this multiple case study and the in-depth case study of one firm is that here we enter the field with an a priori theoretical perspective and readily defined initial constructs. We also include various quantitative measures in the case analysis, which lends additional credibility to the conclusions.

The third and final empirical study also uses data from the Finnish software industry surveys (Rönkkö et al., 2008; 2009), as well as financial data available from Finnish government agencies and firm's financial reports. The purpose of this quantitative analysis is to provide tentative generalizable empirical evidence for the theoretical propositions derived in previous empirical studies. For this purpose we use multivariate statistical analysis methods, including factor analysis and multivariate regression models (Hair et al., 2006).

While these three empirical studies are in principle independent, their results build on each other. More specifically, the multiple case study uses the results of the in-depth case study. The same set of statistical data is used in multiple case study, qualitative comparative analysis, and the quantitative analysis. Furthermore, the hypotheses tested in the quantitative study are largely derived from the results of the in-depth case study, multiple case study and qualitative comparative analysis.

The chosen research process has similarities with several research designs used or proposed in the extant literature. First, similar to Leonard-Barton (1990), we have chosen to first conduct an in-depth case study whose results are then further refined and tested in a multiple case study that uses theoretical sampling (cf. Yin, 2003), i.e. the purposeful selection of cases to test the implications of the emerging theory. However, unlike Leonard-Barton, we have not used a longitudinal approach for the single case, owing to the constraints in time and resources available for the research. Furthermore, we argue that such approach was not strictly necessary given the initial research problem of this study.

Secondly, the used research design also closely follows the process proposed by Parkhe (1993), by first using a single case study to ground the constructs and theory of overall study on empirical findings, and then using this basis to expand it using multiple case study, and ultimately quantitative methods. Such approach is demonstrated, for example, by the study of Hamel (1991) on international strategic alliances.

Third, the multiple case study part of the selected research design closely follows the research process suggested by Eisenhardt (1989a). More specifically, we use Eisenhardt's advice for crafting the research tools and methods, including interview questionnaires and other data collection tools. Moreover, as advocated by Eisenhardt, we also used some level of a priori theoretical development to make the data collection and analysis phase more efficient and to provide better focus for theory development. However, we did not conclusively fix our theoretical constructs used during the research process to maintain flexibility.

The chosen research design is an inductive one; in other words, our aim is to develop theory based on empirical evidence. Of course, we could have chosen alternative research designs. First of all, a hypothetico–deductive research design might have been feasible. In this design, explicit propositions are developed based on extant theoretical literature, and subsequently tested statistically using quantitative data. However, as noted above, this design was contraindicated by two factors. First, the theoretical basis for the phenomenon was deemed too vague to allow straightforward theory and proposition development. Second, the lack of tested measures for many of the constructs in this study would have potentially reduced the construct validity of the subsequent empirical study.

Another alternative research design for the research problem would have been to conduct a purely inductive, interpretive qualitative study. However, given the objective nature of the phenomenon, the selected epistemological position, and the chosen level of analysis on the level of firm and firm strategy, we deemed that this research design would have missed the opportunity to make more generalizable propositions. In addition, given the plethora of descriptive studies in the extant literature on service provision in manufacturing industries, such study would no longer have made a significant contribution to the literature. By contrast, the chosen combination of inductive case study based methods and quantitative methods should provide a valuable alternative empirical view into the phenomenon.

4.3 Validity and reliability of the research design

Most of the empirical research in this study uses qualitative research methods. Furthermore, since our purpose is to provide a theoretical explanation

for the service provision phenomenon and its strategic impact, our study is necessarily inductive in nature. Therefore, we will discuss the a priori quality of the research design mainly from the view point of qualitative research.

A well-known complaint about qualitative research methods is the lack of clear criteria for assessing their quality (Johnson et al., 2006; Amis and Silk, 2008; Easterby-Smith, Golden-Biddle and Locke, 2008; Pratt, 2008). For this reason, we have tried to use methodological triangulation to provide further evidence in addition to the case study strategy. This section discusses the overall a priori quality of the selected overall research design. A discussion of the quality of the methodologies employed in individual empirical studies can be found in their respective chapters.

As indicated by Yin (2003) and Gibbert et al. (2008), quality of research in an epistemologically realist study may be assessed using four criteria: *reliability*, *construct validity*, *internal validity*, and *external validity*. These are criteria often used to evaluate the quality of quantitative research (Pratt, 2008; Easterby-Smith, Golden-Biddle and Locke, 2008), and constitute an orientation described as foundationalism by Amis and Silk (2008), or neo-empirism as suggested by Johnson et al. (2006). Even though these criteria are only one possible orientation for evaluating qualitative research (Lincoln and Guba, 1985; Flyvbjerg, 2006; Johnson et al., 2006), we argue that this approach is in concord with the realist epistemological position taken in this study, and further with the strategic management research field. This argument supported by the contingency approach proposed by Johnson et al. (2006), which basically states that the evaulation criteria applied on qualitative research should depend on the epistemological and ontological assumptions taken in the research, as well as on the specific field of research.

Assuming this position for evaluating qualitative research in the field of strategic management is also supported by Gibbert et al. (2008). Furthermore, they also argue that the three types of validity are not independent: in their evaluation criteria, without internal validity and construct validity, it is impossible to attain satisfactory external validity. Even though some authors refuse to use these names for the dimensions of validity (e.g. Miles and Huberman, 1994; Lincoln and Guba, 1985), we believe that the chosen dimensions are useful when analyzing the validity of this study and measures taken to mitigate potential problems with validity and reliability.

Following the advice of Parkhe (1993), who bases his arguments on Eisenhardt (1989a) and Yin (2003), we assess the rigor of the research design using the strategies reported in Table 4.2. This assessment is based on the aforementioned factors of quality: reliability, construct validity, internal validity, and external validity.

Of course, as noted by Johnson et al. (2006), the criteria presented in Table 4.2 are based on the notions of research quality in quantitative studies based on positivist epistemology (cf. Gibbert et al., 2008). Depending on the cho-

Criterion	Proposed strategy	How this is achieved in this study
Reliability	Develop a case study database	A database was built that combines qualitative data, inferences from within and cross-case analysis, and quantitative data on constructs
	Use case study protocol	The same interview guide was used for all interviews Rules were adopted for establishing the reliability of within-case conclusions based on interview data
Construct validity	Triangulate multiple sources of evidence to test for convergence	Interviews with key informants, qualitative and numerical archival data from firms, and survey data validated with public databases were used
	Establish chain of evidence	Informant quotes were recorded in case database and linked to inferred value of constructs Inferred values from within-case analysis were used in cross-case analysis
	Have key informants review draft	Results from case studies were presented to key informants on two occasions for feedback A written case report with full case data was sent for review before second feedback session for inspection
Internal validity	Do within-case analysis, then cross-case pattern matching	Within-case analysis was done first to infer the value of constructs for each case, and to cover the history and case idiosyncranities Cross-case analysis was based on construct values inferred in within-case analysis, and included comparison of cases
	Do explanation building: shaping hypotheses by searching evidence for the "why" behind relationships	Patterns in data were identified based on cross-case analysis Explanations were sought for these patterns based on informants' accounts and extant theoretical frameworks
	Do time series analysis	Quantitative data for period 2003–2008 was collected and used in analysis
External validity	Theoretical (not random) sampling of cases from specified population to constrain extraneous variation and focus on theoretically useful categories	Cases were chosen from a population of firms with known characteristics The characteristics of case firms were consciously varied in terms of outcome and explaining variables to create variance and contrasts between firms
	Use replication (not sampling) logic in multiple-case studies	A representative firm that displays all the characteristics of the phenomenon was selected for in-depth case study Firms selected for multiple case study were purposefully varied in terms of independent and dependent variables for theoretical replication
	Comparison of evidence with extant literature	Empirical findings were compared with theoretical literature at multiple points of the study: in in-depth case study to identify a theoretical basis for the phenomenon, and in multiple case study to provide a theoretical rationale for the found relationships between constructs

Table 4.2: Research quality criteria; adapted from Parkhe (1993)

sen epistemological perspective, these criteria may not be applicable to all types of qualitative research. An alternative framework of evaluating qualitative research is based on Lincoln and Guba's (1985) concept of "trustworthiness". The framework of Lincoln and Guba, instead of using positivist notions such as external validity, uses the criteria of *credibility, transferability, dependability* and *confirmability* to assess quality of research. However, in practice this alternative evaluative framework differs only slightly from the introduced four-criteria framework. Therefore, we will discuss our research design quality in terms of validity and reliability.

Internal validity

Internal validity, or "logical validity" refers to the validity of the causal relationships between variables and outcomes (cf. Bacharach, 1989; Gibbert et al., 2008). Establishing internal validity requires the researcher to provide plausible explanations for the conclusions drawn from the case study. In other words, the researcher needs to connect the findings of the case study to extant theory. Three potential strategies for establishing internal validity include choosing a clear and explicated research framework, pattern matching, and theory triangulation (cf. Eisenhardt, 1989a; Gibbert et al., 2008).

In this study, we have developed our research design to include various potential different moderating contingency factors for explaining firm performance, such as financing, internal capabilities and competitive environment. By controlling these factors, we seek to isolate the impact of service offering on firm growth and profitability. Pattern matching is achieved by employing a comparative multiple case research design and using cross-case analysis to uncover similarities and differences between the cases. Moreover, we will also use longitudinal case data, as well as quantitative cross-sectional data to facilitate this pattern matching. Lastly, in addition to the perspective of knowledge-based view of the firm, we also consider resource-based view and transaction cost economics as alternative explanatory theories to achieve theory triangulation.

Construct validity

Construct validity refers to the quality of the operationalization of relevant concepts (Gibbert et al., 2008). Two strategies for enhancing construct validity are indicated by Gibbert et al.: establishing a clear chain of evidence (cf. Parkhe, 1993), and using various methods of triangulation (cf. Jick, 1979). As we will follow Eisenhardt's (1989a) approach to case study, establishing a clear chain of evidence is a key task in the case study (cf. Pratt, 2009).

In this study, construct validity is achieved by providing contextual data, tabular displays of case data (cf. Miles, 1979), and including direct quotes from interviewees in case reports to allow readers to draw their own conclusions. These were facilitated by a systematic collection of case data, including the transcriptions of interviews and the establishment of a case study

database that includes all relevant case data. Method triangulation is achieved by using both qualitative (interview) and quantitative (both archival and survey) data in case analysis, as well as using statistical methods to test emerging theory with cross-sectional survey data.

External validity

External validity, often called *generalizability*, refers to the degree to which the conclusions of the research can be argued to apply in contexts other than the one used for the immediate empirical study (Yin, 2003). Even though case studies cannot provide generalizability in the statistical sense (Flyvbjerg, 2006; Eisenhardt and Graebner, 2007; Siggelkow, 2007), most case studies can be applied to other contexts through the process of *analytical generalization* (Yin, 2003; Flyvbjerg, 2006). This refers to the applicability of the theoretical results in other, potentially unrelated empirical contexts. As our purpose in this study is to identify an theoretical explanation for the impact of service provision, we rather seek to explicate theory rather than to maximize the empirical generalizability of the results. Obviously, this indicates that external validity, in particular in statistical sense, is not a priority for the current study.

As argued by Eisenhardt (1989a) and Yin (2003), increasing the number of cases generally does improve the external validity of the case study results through enabling cross-case analysis. This analysis enables comparisons, which potentially also leads to more detailed and richer theory development. In particular, researchers should provide a clear rationale for case study selection and ample details on the case study context (Gibbert et al., 2008; Pratt, 2009). This study is mainly based on a multiple case study, and thus potentially provides a moderate basis for generalizable conclusions about the strategic impact of service provision and service capabilities. Case study selection is based on purposeful sampling from the Finnish software industry, based on dimensions identified in an in-depth case study of a single enterprise software firm.

Potential biases due to reliance on a single informant from each case are mitigated by using multiple informants from each firm (Kumar et al., 1993; Sharfman, 1998). This is linked to the reliance on the both retrospective and speculative nature of the informant accounts (Huber and Power, 1985; Golden, 1992; 1997). We will use informants from multiple organizational levels in the case firms, and select informants who potentially have divergent views on the topic of service provision (Huber and Power, 1985; Kumar et al., 1993).

Disincentives to participation were lowered by conducting interviews at case firm sites, and making them as short as possible while ensuring the sufficient topical coverage of each interview. Follow-up probing questions were used to elucidate more information about issues emerging during interviews (Huber and Power, 1985). The questionnaire used in interviews was also reviewed and potentially revised after each case to provide a better selection and word-

ing of questions used in interviews. However, care was taken to ensure consistency and comparability of data collected from different cases. This was done by covering all selected topical areas in all interviews, as well as by retaining the most important questions.

Reliability

Reliability refers to how certainly the research process leads to particular outcomes — it describes the degree of replicability of the process (Winter, 2000). A research process is reliable if another researcher would end up with same outcomes by following the same research process (Denzin and Lincoln, 1994). From the perspective of analysis, reliability describes how accurate the research results are in comparison to empirical observations. Of course, the notion of reliability ultimately depends on the chosen research paradigm (Stenbacka, 2001; Johnson et al., 2006)

In this study we have attempted to improve reliability by adopting two primary measures. First of all, we used a central case study database to combine all data, both quantitative and qualitative, from the case studies. In practice, all qualitative data was included in the NVivo software program, including notes on interviews and coding structure. NVivo was used for coding and within-case analysis. For cross-case purposes, we built the case study database with Microsoft Excel that included both quantitative and qualitative data. This central case study database ensures the traceability of all data, as well as the documentation of all inferences made during the research process.

Secondly, we have attempted to follow a clear protocol for both data collection and data analysis (cf. Eisenhardt, 1989a; Gibbert et al., 2008). For data collection, we used the essentially identical interview guide for all multiple case interviews. Furthermore, we have documented how the case firms and informants were selected, and how the recordings and transcripts were processed. For data analysis, we have adopted rules for inferring within-case values based on the informants' accounts. In addition, we also used a clear procedure for establishing the relative reliability of the values of constructs for each case. This reliability is based on the concurrence of the informants' accounts or contradictions in these accounts. This documentation improves the transparency of the process, and enables other researchers to judge whether and how all necessary steps were taken during the research process.

4.3.1 Triangulation

Another strategy for improving the quality of qualitative methodologies is the use of *triangulation* (Jick, 1979). This strategy uses alternative sources of data, theory and methodologies to improve the construct, external and internal

validity of a study. This approach is also advocated by Eisenhardt (1989a). Triangulation improves construct validity by ensuring that a construct is coherent when measured from multiple points of view. Internal validity is improved by offering additional, complementary evidence for the inferences made from existing data.

The selected research design uses three types of triangulation. First, the case study parts use both qualitative and quantitative data in the form of interview data using informants, quantitative data from the Finnish software industry survey, and data collected from the financial statements of these firms. In addition, more than one informant are used per case firm, reducing the reliance on one person's perception of the firm's situation (Kumar et al., 1993; Sharfman, 1998). These alternative measures enable data triangulation for many constructs and thus improve the construct validity of the study. This also reduces the reliance on the retrospective accounts of past which are subject to informant and recollection biases (Golden, 1992; 1997; Doty et al., 2006).

Secondly, by employing two different empirical methodologies, namely multiple case study strategy and quantitative analysis, the selected research design uses method triangulation. This should improve the validity of the made inferences, i.e. the internal logic of the study (Jick, 1979; Gibbert et al., 2008). Furthermore, the chosen methodologies complement each other well: case studies provide a detailed description of the phenomenon, as well as a limited longitudinal perspective on service provision, while quantitative data allows for testing emerging hypothesis on a larger sample, improving the external validity of the results.

Third, the study also employs a limited level of theory triangulation; by considering several alternative theoretical explanations for the phenomenon, the nomothetical validity of the study may be improved. In other words, by ruling out competing theoretical explanations for the observed results, we may improve the credibility of the findings and the emerging theoretical framework. This method of triangulation is also suggested by Eisenhardt (1989a).

4.3.2 Software Tools

The use of software tools for qualitative research can potentially improve the quality of such research, since these tools help the research to systematize data collection and analysis, and provide a common database for all case-related data (cf. Miles and Huberman, 1994). We have used several software tools for various purposes during the research process. In the following, we discuss how these tools were applied to enhance the quality of this study.

Throughout the study, the NVIVO software program was used to facilitate qualitative data analysis (Welsh, 2002). In practice, we imported all transcripted texts from interviews and additional sources into the software tool

and performed various types of content analysis using the texts as basic material. A more detailed description of the use of the software in each individual empirical study is included in their respective chapters.

All regression analyses and factor analyses were performed on statistical software package Stata (Stata, 2009). This software package includes all standard statistical tests and analysis methods, including regression analysis, t-tests, factor analysis and cluster analysis. The detailed analysis of interaction terms was facilitated by the web-based tool for calculating the simple slopes of interaction terms (Preacher et al., 2006), and using the R software package (R, 2009) for plotting these slopes to provide a graphical representation of the interaction effects.

Selected parts of the literature review were conducted using bibliometric analysis methods, more specifically co-citation and cross-citation analysis. This analysis was facilitated by the Sitkis software program (Schildt, 2006) which uses ISI Web of Science data and performs various kinds of bibliometric analysis on a group of references, including co-citation analysis, cross-citation analysis and keyword analysis. The NetDraw software package Borgatti (2006) was used to visualize the results of these bibliometric analyses.

5 In-Depth Case Study: Explaining the Role of Knowledge-Intensive Services

Before being able to answer our main research questions, we needed first to identify a suitable theoretical framework for understanding and explaining the phenomenon of service provision in manufacturing industries. While the extant literature, reviewed in Section 2, is abundant with descriptive studies of the phenomenon, very few studies have ventured to explain the it in theoretical terms. In other words, extant research provided a rich face-value description of the phenomenon, but relatively little prior theorizing upon which to build an a priori theoretical framework. These factors prompted us to choose an inductive approach to the research problem (Parkhe, 1993; Hamel, 1991).

Theoretically, the fundamental question is why is there a need for services, if the main technology (i.e., the product of the software firm) has already been codified and thus possible to transfer to customers in a transactional manner? Extant research has demonstrated that the vertical integration and disintegration in industries is often driven by the emergence of technological standards (Anderson and Tushman, 1990; Teece, 1986; Zahra and Nielsen, 2002; Nelson, 1994; Teece, 1996), and in general by the degree of codification of the technological knowledge (Grimaldi and Torrisi, 2001; Balconi, 2002; Martin and Salomon, 2003b). In summary, prior evidence suggests that we should not see service provision at the currently seen scale, given that the relatively high level of standardization in product technology.

The purpose of this in-depth case study was to, first, provide an empirical grounding for the constructs to be used in further studies. Secondly, and more importantly, our purpose was to identify a potential theoretical basis for explaining the phenomenon of service provision. The explicit research question pursued in this study is

> How can we explain the role of knowledge-intensive services in the business of product firms, and why can these services have an impact on firm performance?

5.1 Methodology

We chose an exploratory, inductive case study approach to study the research question. An in-depth case study seeks to understand contemporary phenomena in their natural environment (Yin, 2003). It particularly well suited for providing a detailed description and explanation of a phenomenon, especially if the phenomenon cannot be controlled by the researcher, which is often the case with many management research topics. By exploratory case study we mean that our approach seeks to develop new theoretical insights based on empirical findings, and letting the theory emerge from these findings, rather than using strong *a priory* theory (Eisenhardt, 1989a; Yin, 2003) The approach is thus inductive in nature. However, in comparison to Eisenhardt's prescription of case study, we do not choose or develop any explicit theory prior to conducting empirical research. In this sense, our approach is closer to grounded theory approaches to qualitative field studies (Glaser and Strauss, 1967; Strauss and Corbin, 1990).

As indicated by Parkhe (1993) in the context of international joint ventures, when studying a topic in an emerging research field with limited coherence in terms of theory, it is preferable to start with one in-depth case study to situate the problem and the constructs in real problems faced by practitioners. This approach of engaging practitioners early in a research project is also advocated by Van de Ven (2007). Furthermore, this approach ensures that the found constructs are grounded in the reality as seen by practitioners (Glaser and Strauss, 1967), and also avoids the potential problems of "shallowness" and preoccupation with construct definitions with multiple case studies conducted using strong a priori constructs (Dyer and Wilkins, 1991).

Our choice of an exploratory case study approach was also prompted by, firstly, that qualitative research is better suited to answer "why" and "how" questions than quantitative methods (Yin, 2003; Snow and Thomas, 1994). The research questions considered in this study are of this type. Secondly, in a field of research that is still at its infancy, with limited conceptual and theoretical development, qualitative methods are likely to yield more better results (Buchanan and Bryman, 2007; Edmondson and McManus, 2007) in terms of theory development in the research field (cf. Sonpar and Golden-Biddle, 2008).

5.1.1 Exploratory case study

In this study, we employed an exploratory case study research design that resembles the grounded theory approach as described by Strauss and Corbin (1990). Similarily, we seek to derive theoretical insights that are grounded in empirical data. However, as indicated by Suddaby (2006), the term "grounded theory" is quite loaded and hence we will refrain from calling our methodol-

ogy "grounded theory". Instead, we have attempted here to make the research process as transparent as possible by describing each step of the research process in as much detail as possible. The key methodological approach is that we seek to derive theoretical insights from empirical data.

The representative case considered in this study expands beyond the focal firm's formal boundaries to the business network of the focal firm. The suitability of a qualitative research strategy (e.g., case study) for researching complex and dynamic contemporary business network has been suggested by multiple authors (Halinen and Törnroos, 2005; Dubois and Araujo, 2004).

While we do not choose any particular theoretical grounding prior to empirical research, we do wish to fix some of the face-value constructs used to describe the phenomenon. As reported in Chapter 2, based on a review of the extant literature, we have identified six key characteristics of the solution provision phenomenon. These are offering, customer relationship, interorganizational structure, intraorganizational structure, capabilities, and organizational culture. We used these face-value dimensions of solution provision as the starting point for data collection.

5.1.2 Case selection

A single representative case was chosen for the in-depth case study. A representative case is usually a "typical" case which displays all characteristics of the studied phenomenon (Yin, 2003). In this study, we selected a firm which displayed all the characteristics of solution provision as indicated by the solution literature. In other words, we wanted to select a firm whose offering included both software products and knowledge-intensive services, who had faced the challenge of internal organization between product and service businesses, who had service partners, and hence had had to negotiate the external organization of solution provision. In addition, the firm had to meet the criteria of the scoping of the overall study: at least half of revenue should come from IPR-related sources.

As the term "representative case" is often used haphazardly or incorrectly when reporting qualitative research (cf. Siggelkow, 2007), we will discuss in more detail why we argue that the selected firm is actually representative of the more general phenomenon of service provision in product firms.

First of all, the selected case firm has both products and knowledge-intensive services in its offering. The firm offers not only training and user support services, but also different types of consulting services related to its software products. As required by our scoping, revenue from product-related sources account for more than 50% of the case firm's total revenue, yet the services also represent a significant share of the overall revenue. Hence, these consulting services are not economically insignificant for the firm's business.

Secondly, the firm has long-term relationships with its direct customers; moreover, there are differences in the intensity of these relationships, as some earlier customers were left on their own devices due to an earlier business approach that emphasized product sales. By contrast, more recent customers are looked after to much wider extent due to change in the firm's outlook on services and its offering. Hence, the case firm has seen a wide range of different customer relationships, and has seen an evolution towards more closer relationships as suggested by the literature on solutions. As indicated by the CEO of the case firm, the firm had previously acted more as a product seller rather than solution provider, which has reflected in the relationships between the firm and these customers:

> [Our firm] has these customers to whom we are purely a technological vendor (CEO)

Third, the case firm has been struggling to find a suitable internal structure for its business, indicated by multiple changes in its relatively small organization over the years. As the firm serves its customers both directly and through its partners, the organization of service personnel has also changed during the years. The firm has thus experimented with different kind of organizational structures, and is aware of the issues about the division into solution/product units and the potential friction between service and product business.

Fourth, as indicated above, the case firm uses service partners to provide most of the required knowledge-intensive services internationally. These partners often own their customers, and hence serve to distance the focal firm from its customers. The case firm therefore has to consider the interorganizational structure of solution provision, and all the potential challenges this entails.

Fifth, in addition to the obvious technological capabilities, the case firm has had to develop significant competences in the solutions supported by its products. The service personnel are highly educated, and have amassed significant experience in the implementation and process consulting skills from doing customer implementations. Furthermore, the firm has also developed expert knowledge about several customer industries. The firm thus has various types of capabilities to deliver its product and its services, yet has had some difficulties in selecting a specific functional and customer domain to focus on.

Sixth, while the case study did not directly explore the issue of organizational culture or "service orientation" of the case firm, several of the above changes in the case firm's organization and customer relationships indicate that the firm has undergone a change in its outlook on services. This could also be inferred directly from informant comments such as:

Informant	Position	Firm Exp (Years)	Date	Duration (Minutes)
1	VP, channel sales	8	4.11.2008	86
2	VP, product mgmt	8	4.11.2008	89
3	CEO	2.5	14.11.2008	52
4	VP, direct sales	7	14.11.2008	54
5	Consultant, channel	2.5	14.11.2008	63
6	KAM, direct sales	1.5	14.11.2008	49
7	VP, marketing	9	14.11.2008	56
8	KAM, channel sales	5.5	17.11.2008	47
9	Consultant, direct	3	17.11.2008	59
10	Consultant, channel	4	18.11.2008	59
11	KAM, channel sales	3.5	18.11.2008	53
P1	Partner CEO, UK		28.11.2008	75
P2	Partner CEO, Russia		11.12.2008	57
C1	Customer, Finland		22.4.2009	28

Key: CEO = Chief Executive Officer; VP = Vice President; KAM = Key Account Manager

Table 5.1: Interviewees in in-depth case study

> We've been a software vendor for so many years that changing our own processes and attitudes is perhaps the first tripping stone (VP, Channel Sales)

> If this organization should be [changed] to a more of a consulting service provider, [...] then in my opinion it's going to be a quite big organizational change (Consultant, Channel Sales)

5.1.3 Data collection

In addition to the case firm itself, we sought to cover the interorganizational aspects of service provision in our case study. In other words, we included several organizations that interacted with the focal firm in our analysis in order to capture the complexity of the phenomenon of service provision, and interviewed informants from the firm's service partners and customers. This approach should allow triangulation by comparing the internal and external views of solution provision (Jick, 1979). Within the focal firm, we attempted to cover multiple points of view by interviewing employees on three levels of organization: top management team members, sales managers, and consultants. This approach should allow us to capture the phenomenon at multiple levels of detail: from strategic management of firm to the face-to-face interaction with customers in service provision. A full list of interviewees is shown in Table 5.1.

Informants were selected based on their organizational position, expertise area and availability. Informant selection was conducted in collaboration with key informant in the case firm, which ensured access to all informants deemed interesting for the current study. In addition, informant selection was done in several phases; in other words, previous interviewees could name

members of the organization who they felt could be informative about the research topic. As indicated by Starbuck and Mezias (1996), it is preferable to use a group of informants with differing experience with the firm, as this experience may cause biases in the data. This was also a factor when choosing informants.

Different topical areas were emphasized depending on the informant's area of expertise and position in the organization. For example, interview with the CEO of the focal firm concentrated on the strategic management of the focal firm, while interviews with the direct sales consultants concentrated on the face-to-face interaction with customers and the execution of individual projects.

Qualitative data were collected using semi-structured interviews (Merton and Kendall, 1946). This type of interview uses a predefined interview guide to collect data on selected topics. However, the informants are not limited to specific answering options, and the topics of the conversation are open ended. Therefore, the interviews were open-ended in nature and the allowed the researcher to pursue emerging issues with probing questions if these were deemed interesting for the research.

The initial interview guide was developed based on the literature review of the solution provision literature. More specifically, the initial guide included questions concerning the offering of the focal firm, customer relationships, internal organization, external organization, capabilities and organizational culture. In addition, we also questioned the informants on issues related to strategy, performance and potential contingent factors, such as its competitive environment. However, a comprehensive list of these contingent factors was not available at the onset as this was not indicated by the literature.

As indicated by the inductive nature of the in-depth case study (Strauss and Corbin, 1990; Dubois and Gadde, 2002), the interview guide and further interviews were redirected based on the previously collected data. In other words, whenever fruitful ideas and insights emerged during interviews, these were incorporated in further interviews through an updated interview guide. The wording and ordering of many questions were also altered due to insights and feedback from previous interviews. This modification of the interview guide was also partly facilitated by the overlapping of data collection and data analysis as suggested by Eisenhardt (1989a). However, ultimately the modifications made to the guide were not significant.

Results from the analysis of previously collected interview data influenced subsequent data collection. The final interview guide is included in Appendix C. To account for the different perspectives taken on the phenomenon by service partners and customers of the focal firm, we also developed a separate interview guide for these informants. The final versions of these guides are also included in Appendix C.

In addition to actual subject matter, firm experience, total industry experience, formal training, sex and position of informants were also inquired during interviews. However, these factors turned out to have very little, if any, bearing on the actual data collected, as suggested by the a priori objective nature of the study. Therefore these factors are largely ignored in further analysis.

In total, the duration of the 14 interviews was 827 minutes, or average of 59 minutes. The interviews were digitally recorded and transcripted to text by a professional transcription service. In total, the interviews amounted to a 132 pages of transcripted text.

In addition to data from interviews themselves, research notes were taken during and after each interview. These notes included observations on the behavior of the interviewee, insights occurring to the interviewer during the interviewer, and observations related to the interview situation itself. These notes were taken on paper during the interview and written down electronically, in nearly all cases within 24 hours of the interview to ensure reliable recollection of the interview and emerged insights. During the writing of these notes in digital form, the interview and the whole case were reflected upon to come up with insights concerning the case, resulting in a *gestalt* about the case that also influenced further data collection and data analysis.

5.1.4 Data analysis

The data used for analysis consisted of the transcripted text from the interviews of informants from both the focal firm and its partners and customers. The purpose of textual data analysis, from the perspective of realist epistemology, is to identify key constructs used by informants and the hypothesized relationships between these constructs (cf. Lacity and Janson, 1994; Bacharach, 1989; Johnson et al., 2006). In other words, we first try to develop an ontology of the service provision phenomenon in our empirical context, and then to derive a causal structure between identified constructs.

Coding

To analyze the textual data, we first employed a coding methodology in content analysis in the form of Strauss and Corbin (1990). As indicated by the choice of wording "content analysis" (Lacity and Janson, 1994), we analyzed the data using the realist epistemology assumption: the differences in informants' view were due to variance in their information about the state of reality rather than fundamental differences in the interpretation of the reality. In other words, no deeper meanings were searched for in data analysis, and informants' accounts were taken at face value. The NVIVO software package for qualitative data analysis was used to facilitate data analysis (Welsh, 2002).

Text was first coded paragraph-by-paragraph on the face value level for all constructs and relationships between constructs identified by informants (Char-

maz, 2006). In other words, we simply recorded all concepts and hypothesized relationships mentioned by the informants, without making any interpretations about these accounts. The purpose of this first phase was to record what is happening in the data on the phenomenological level.

We started the coding process without any structure, as dictated by our exploratory approach to case study. This implied that the coding itself was inductive, and was based solely on the concepts emerging from the qualitative data. Whenever new concepts or relationships were mentioned in the evidence from interviews, they were added to the coding structure, and a short description of the construct was also added to the new code. For example, the following passage[1] in transcribed text:

> The significance of services is really, it's a part of [the case firm's][2] offering in a more standardized form in the future. And its purpose is to enable [our firm] to remain... and to bring get identify clearly higher customer value producing solutions for us. (CEO)

was coded with the following codes:

- Service – impact on value
- Service – standardization
- Solution – definition

In addition, all transcribed textual data were related with the interviewee personal data, such as organizational position, tenure at the firm, and overall experience from software industry. On the other hand, if the identified construct already had a code that corresponded to it to a large degree, this already existing code was used instead of creating a new one. This process eventually produced a tentative codebook of face-value concepts and relationships between these concepts, as well as their detailed descriptions.

Within-case analysis

Once all interview text was coded using the method described above, the resulting coding structure was subjected to further analysis. Similar to the *axial coding* phase suggested by Strauss and Corbin (1990), similarities and differences between constructs were analyzed using the coding structure. In practice, this meant comparing the textual evidence linked to two codes. If these two codes did not differ much, they were combined. Simultaneously, the coding structure was also systematized. More specifically, it was given a tree-like structure.

[1] Most of the interviews were conducted in Finnish; This text here is a translation of the original text. Detailed data was obfuscated for confidentiality reasons.

[2] Throughout this thesis, we will use square brackets ([ ]) to denote text that was implied by the informant but not explicated in the quoted passage. This was necessary, for example, when the concept discussed was explicitly mentioned by the interviewer but was not repeated by the informant. Another use for the notation is [...], which means that text from raw data, such as filler words, or unnecessary repetitions or descriptions, has been omitted during editing and translation process.

Another purpose of this axial coding phase was to raise level of abstraction and to connect the emerging model with existing literature. Ultimately, the purpose was to arrive at theoretical conclusions about the studied phenomenon of service provision. In practice, this was achieved through *constant comparison* (Glaser and Strauss, 1967), by continuously performing the axial coding and comparing it with theoretical literature, in a process reminding the "systematic combining" analysis strategy suggested by Dubois and Gadde (2002). In other words, prior data analysis informed search for relevant theoretical grounding in extant literature, and this literature then affected subsequent axial coding activity by suggesting a way to interpret the face-value data.

For example, all nodes referring to the core product (e.g. Product – maturity; Product – pricing) were coded at the same root node *Product*. Furthermore, the detailed nodes were analyzed to come up with a categorization. This categorization was recorded under the Product root node and includes headings such as Flexibility, Focus and Reliability.

Performing this analysis on all initial nodes identified in open coding, we arrived at the codebook found in Appendix D. This codebook shows all the root nodes derived from the content analysis of the interviews, along with the detailed description of the constructs. Furthermore, we also identified hypothesized relationships between constructs, further discussed in the Results section.

5.2 Case description

We begin our exposition by providing a brief description of the case firm and its business, as well as its challenges related to service provision. The purpose of this description is to provide rich contextual background data about the case. The case firm is a middle-sized Finnish enterprise software firm that has been in operation for nearly 20 years. The firm's total sales in 2008 were in the range of 5-10 million euros, and it employed about 60 employees. For the purposes of confidentiality, exact data about the case firm are purposefully obfuscated. The firm develops and delivers software solutions to both private firms and public sector organizations, and operates globally through a network of business partners, who provide the required services locally. In Finland, the firm operates through direct sales and delivers customers services by itself.

The case firm has followed a fairly typical development path for a Finnish enterprise software firm; it was started as consulting firm, providing consultancy and custom software development services for large enterprise customers. Gradually, the case firm made the strategic decision to move towards being a software product vendor, including additional products in in its port-

folio. In this form, the case firm conducted business with mostly hit-and-run tactics. It sold its products to any customer willing to buy them, but leaving the customers mostly to their own devices after the initial sales. No systematic support was given to the customers, nor was the relationship with these customers developed to any significant degree.

Yet, the case firm's offering was never fully standardized. Even though the software products themselves were quite self-contained and productized, the actual solutions the firm offered were left somewhat vague. This was at least partly due to the lack of choosing a clear focus for the solution, as well as not choosing one particular customer segment to target with the solutions. The case firm thus had clearly-cut, technologically standardized products but lacked a clear vision for the whole offering.

> Our own product technology is [...] in its own segment [...] quite mature. You can tell that from the convergence of comparable products, they are beginning to have the same functionality. (VP, Product Development)

Despite these challenges, the firm also aggressively pushed for internationalization during the same period of time. It founded several offices outside Finland, including the US, manned with expatriated employees. In other markets, the firm started recruiting reseller/service partners for its products. Quite quickly the firm realized that the international markets for its products were highly competitive, and given the lack of credibility due to foreignness, low brand recognition and small size, the firm failed to make any progress in most of the foreign markets. With the personnel and other costs compounding in the international offices, the firm shut down nearly all of these offices, and started to concentrate on the management of its evolving global partner network.

Currently, the case firm conducts business virtually globally through its extensive partner network. It has divested some parts of its business, including the initially most important product, and concentrated on two main products and business around them. Yet, until recently, the firm has still concentrated on the product part of its business, and has not found a solution to the focusing of its offering.

> Well, [in the beginning] we were more of a consulting firm [...] that has taken risks and started to productize its offering, and we've got incredibly far in productization. But when we got those products together [...] we got stuck [in the idea] of pure product business, which looks better on paper. (VP, Direct Sales)

Furthermore, until last few years, the case firm has also neglected the importance of consultancy and other services to its business. This neglect may be partly due to the emphasis on partners as a distribution channel, where the case firm is restricted to the product vendor role and its own services do not play a major part. However, in the domestic Finnish market, the firm does

operate in a way similar to its international partners. Recently the firm has begun to recognize the potential benefits of service provision:

> Currently there is no emphasis being put on services. Services are done on an ad hoc basis. If there's a need for service, then we'll try to organize it, and we'll try to do it. But there is no service structure, there's no real service offering. (Manager, Channel Sales)

> Perhaps we've been too ignorant of [services] in the Finnish market as well — we could have leveraged [services] to our benefit. [...] In my opinion, we should have increased [services] earlier [...] We've lost a lot of revenue by trying to become a pure software [product] firm and believing in exponential growth. When you're only a software developer you distance yourself from the customer and that makes software development more difficult [...] when you don't get to see real customer environments. (VP, Marketing)

The case firm has an international competitor who puts stronger emphasis on providing consulting services to its customers. Furthermore, this competitor has enjoyed a better financial performance than the case firm in the last few years. While many other factors differed between these two firms, such as the home market and available resources, the differences in service provision suggests that service offering may have an impact on firm performance. At least informants of the case firm have attributed this performance difference partly to differences in service provision:

> We believe that a major part of the [performance] difference is due to [differences in] services. And we also believe that [...] they have much deeper relationships with their customers exactly because of their service sales. (VP, Channel Sales)

Currently, the case firm provides various types of consultancy and technical services to both its direct customers, as well as the customers of its partners. These services fit the typology of services described in the solution literature (cf. Frambach et al., 1997; Mathieu, 2001a; Davies, 2004; Neu and Brown, 2005) quite well. In other words, the firm provides presales services (such as pure business consulting services) *before* the actual product sales deal, various implementation services (such as installation and configuration), and operational services (such as user support and main user outsourcing services). The case firm's service offering, as categorized using the typology present in the solution provision literature, can be found in Table 5.2.

Recently, the emphasis in the case firm's service offering has moved towards services that support the customers. This development has been partly due to customers' shifting demands, but also a conscious move towards stronger relationships with customers. The firm puts an emphasis on services that help the customer to actually use the offering, as well as formulate its problem and implement the required organizational changes. Traditionally, the case firm's service offering has been oriented more towards technical services, such as installation and integration services.

Service type	Solution life cycle phase: Pre-sales	Implementation	Operations
Customer targeted	Auditing Methodology consulting	Training Change management Organizational consulting	User support Admin user outsourcing Business process outsourcing
Product targeted	Proof-of-concept demos	Integration Product configuration Installation	Product upgrades Product maintenance

Table 5.2: Service offering of the case firm (cf. Frambach et al. (1997); Mathieu (2001b))

> We used to have services related mainly to the initial implementation; installation and training. (VP, Channel Sales)

> Our professional services [...] have comprised only about 10% of our revenue, have been quite exclusively [...] training and then installing the software, but not really any systematical service offering (CEO)

Yet, most of the case firm's services have remained largely unstandardized, and thus their provision greatly depends on the competences of individual consultants. Furthermore, the attempts to standardize the non-technological part of the solutions have been affected by the generality and complexity of the product technology; as the technology can be applied to nearly all customer and industry contexts, there has been no clear focus on what customer knowledge to enhance and standardize to serve customers more effectively.

Another challenge of the focal firm with regards service standardization is that it operates through partners. As these partners conduct business in various geographical markets of various degrees of maturity and saturation, building and deploying a centrally developed solution template seems unlikely, if not impossible. As knowledge-intensive services are in most cases the main source of revenue for these partners, standardizing services in this way might be directly detrimental to the business of partners. In addition, as the partners are in most cases more knowledgeable about their specific market and solution than the case firm, it would make little sense to force them to use a simplistic solution templates developed far from the customer interface. This dilemma was acknowledge by the firm's management:

> [Replicating a service concept] has been very difficult. Because it's been in so small scale, and the language question has also formed a very high barrier [...] Our partners typically have their own ways of doing things and sometimes offering a "best practice", at least if it's one-way only, can even be detrimental to the relationship with partners. (VP, Marketing)

> Those [partners] with several years' experience of using our software in a way have their fixed ways of doing things, which they change according to their business needs (VP, Channel Sales)

The above description of the case firm's history and current business paints

a picture of a product firm that only recently has embraced the service part of its business. For long, the firm has neglected the impact of services on its business and pursued a products-only strategy. Yet, as lately acknowledged by the case firm, these consulting and other services have clearly an important bearing on the firm's success.

The case description thus already raises several questions regarding the role of service provision in SME firms. In particular, based on the face-value reading of the case firm's history, we are posed with the following dilemmas:

- Why did the case firm find the provision of knowledge-intensive services necessary and beneficial even though it had relatively standardized products in a moderately mature market?
- Why did differences in service provision seem to have an impact on differences in performance between the case firm and its competitor?

To analyze these issues in more depth, we will next present the results from the detailed analysis of the case firm and its business.

5.3 Results

As can be seen from the above case description, the case firm has only recently come to realize the value of services to its traditionally product-centric business. However, as our purpose in this in-depth case study was to venture beyond the face-value description of the case to explore the question why services were important to the case firm, we proceeded to analyze the case in more detail.

5.3.1 Alternative theoretical explanations of service provision

First, we ventured to identify a theoretical perspective to provide a better understanding and explanation the case firm's experiences regarding the provision of knowledge-intensive services. This is required to introduce more structure and coherence to the emerging explanatory framework, and to tie the results more tightly to existing discourses in management research. The choice of the theoretical grounding should also help us derive plausible explanations for all the observed facets of the phenomenon.

During data analysis where we used constant comparison (Glaser and Strauss, 1967) to match empirical evidence and existing theory, we considered three distinct theoretical perspectives to explain the role of services in product firms: *the transaction cost economics* (Williamson, 1979; 1981), *the resource-based view of the firm* (Wernerfelt, 1984; Dierickx and Cool, 1989; Barney, 1991; Peteraf, 1993), and *the knowledge-based view of the firm* (Kogut and Zander, 1992; Nonaka, 1994; Grant, 1996b; Spender and Grant, 1996). In the following,

we discuss the applicability of these theoretical perspectives to our in-depth case.

Transaction cost economics

The transaction cost economics view of the firm (TCE) suggests that the boundaries between firms are dictated by the analysis of transaction costs (Williamson, 1981; 1991). TCE is concerned with the management of these transactions in a way that minimizes their costs to the focal firm. In other words, TCE suggests that costs related to transaction between firms affect when a particular activity is performed inside the focal firm and when it is more efficient to outsource that activity. Transaction costs depend on three factors: frequency of transaction, uncertainty related to the transaction, and asset specificity (Williamson, 1979; Masten et al., 1991).

Essentially, the case of buying an industrial good offering comes down to a make-or-buy decision made by the customer organization. The transaction costs perspective suggests that the customer organization must decide whether it will develop its own solution to the organizational problem ("make") or whether it will buy the solution in the marketplace ("buy"). Applied to our case, TCE suggests that customers are seeking to solve an organizational problem with an solution, which can be either bought from the product vendor or developed internally. An existence of a market for these solutions indicates that customers find it more economical to acquire the required solution from an external vendor.

Observing the sources of transaction cost, we first note that the frequency of transactions when buying solutions is low, implying high costs. Moreover, the outcomes of the transaction are uncertain, as the customer typically cannot infer the value of the solution prior to making purchase decision. The asset specificity of the transaction is also relatively high (cf. Masten et al., 1991), as there is often need for face-to-face interaction between the vendor and the customer (site and temporal specificity), very specific knowledge is required to implement and use the solution (human asset specificity), and often some custom developed components are used in the solution (dedicated assets).

In summary, the transaction costs related to the solution are likely to be high. This would imply that the customer organizations seek to develop solution internally. Of course, we need to also consider the costs involved in creating the solution in-house (Williamson, 1979). These are obviously quite high, and few customer organizations in practice will develop the solution internally. From the view point of the solution vendor, the most obvious way to make the purchase of the solution more probable is to lower transaction costs. Services can argued to help to achieve this goal, as they can lower need for human resources on the side of the customer through providing necessary knowledge from the vendor. However, increasing knowledge-intensive services can actually increase asset specificity since they increase the inter-

action between the vendor and the customer, leading to higher site and temporal specificity. TCE thus provides a contradictory explanation of service provision in product firms. Moreover, TCE does not provide a very good explanation for the learning effects of services, which were considered very important by the case firm.

Resource-based view of the firm

The resource-based view of the firm (RBV) conceptualizes the firm as a bundle of resources, and suggests that differences in the performance of firms are due to differences in the resources they possess (Penrose, 1959). More precisely, RBV posits that a firm has competitive advantage if it possesses resources that are valuable, rare, inimitable and non-transferable (Barney, 1991). The possession of such resources enables the firm to gain extranormal profits in the form of rents from the resources (Peteraf, 1993).

From the perspective of RBV, the solution of the case firm represents a resource that customer organizations use to improve their performance. Obviously, given the standardized nature of the solution, it can merely give comparative parity rather than competitive advantage, unless it is significantly customized to customer specific requirements. Such customization require additional resources in the form of technical expertise. As customer organizations rarely possess such advanced technical competencies to modify the solution, nor do the form a competitive advantage for customers, these resources are then acquired externally — from the product vendor.

From the view point of the case firm, its expert service personnel forms a resource that is both valuable and rare, and may thus constitute a source of competitive advantage. By contrast, expertise solely related to the technical aspects of the solution are less likely to be valuable, since they are more easily imitated or matched by other firms. In other words, the expertise related to the solution provides competitive advantage only if it is unique enough.

Yet, customers also provide valuable resources to complete the offering. Their expertise is required to ensure the value of the solution. From the case firm's point of view, these resources, while being potentially valuable, are hard to require, and easily overlap the customers' expertise. Hence, it would appear that it would make little sense for the case firm to possess such resources. However, this conclusion appears to be incorrect: the case firm does possess resources that are substitutes to customers' own expertise. Therefore, the RBV fails to fully explain all aspects of the case.

Knowledge-based view of the firm

The knowledge-based view of the firm (KBV) conceptualizes organizations as entities that develop, transmit and absorb knowledge (Kogut and Zander, 1992; Grant, 1996b). Organizational knowledge can be conceptualized as the configuration of the firm's resources that enable the firm to perform required activities (Nelson and Winter, 1982; Galunic and Rodan, 1998). In other words,

the firm's knowledge allows (and limits) it to (re)arrange its resources in particular way. An increase in the knowledge of the firm allows it to arrange its resources in a new, potentially valuable way.

Of course, knowledge can also be considered as one specific kind of resource a firm possesses. Indeed, many authors have emphasized the value of knowledge as the rare and difficult-to-imitate resource behind the competitive advantage of firms (Winter, 1987; King and Zeithaml, 2001; McEvily and Chakravarthy, 2002). As such, the knowledge-based view of the firm could be interpreted as a special case of the RBV.

Yet, knowledge as a resource or a configuration of resources differs significantly from many other resources. First of all, unlike most other resources, all knowledge cannot be perfectly explicated — much of the knowledge of a firm remains tacit in nature (Nonaka, 1994). Secondly, knowledge is typically conceptualized to originate in individuals, and hence the firm cannot always directly control all possible knowledge in its use. Knowledge, in its intangible and tacit form, is not easily bounded by organizational boundaries (cf. Santos and Eisenhardt, 2005). The firm thus does not have a full control of knowledge, unlike over other types of resources. This is demonstrated, for example, by the the open innovation phenomenon which is based on this insight that knowledge outside the contractual boundaries of a firm may contribute to the firm's competitive advantage (von Hippel and von Krogh, 2003; Chesbrough et al., 2003).

Applying KBV to our case we conceptualize that, ultimately, the interaction between the case firm and its partners and customers is seen as a process of interorganizational knowledge transfer (cf. van Wijk et al., 2008). Correspondingly, the case firm possesses multiple types of knowledge, some of which may be codified (in the form of software, for example) to solve problems in the customers' problem domain (Nickerson and Zenger, 2004). The offering of the case firm is accordingly seen as a bundle of knowledge that is transferred to the customer organization. From the strategic perspective, the case firm seeks to diffuse its offering in the customer market as effectively as possible (cf. Rogers, 1962). With each customer, it needs to successfully transfer all required knowledge to the customer organization. On the other hand, it needs to learn new knowledge from its partners and customers, and to systematize this knowledge in the form of new solutions and products.

Potential problems with the KBV have been reported; in particular, it has been argued that proponents of knowledge-based view often totally reject the contractual nature of firms suggested by the TCE (Foss, 1996). More specifically, knowledge-based explanations of the firm typically avoid reference to incentives, property rights, and opportunism/moral hazard. Yet, these factors typically determine the boundaries of the firm — in short, KBV thus often fails to provide sufficient rationale for the existence of firms (Foss, 1996).

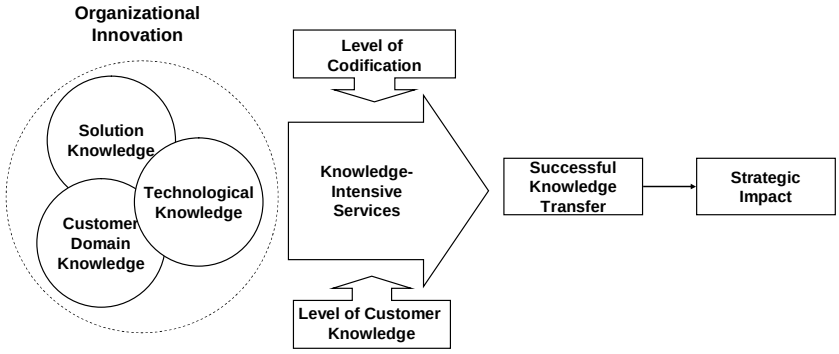


Figure 5.1: Emerging theoretical framework of transfer of organizational innovations

5.3.2 The knowledge-based explanation of service provision

Based on the above analysis of different theoretical explanations for service provision, we argue that role of service provision in the case firm may be best understood and explained through the perspective of knowledge-based view of the firm (Grant, 1996b; Kogut and Zander, 1992; Nonaka, 1994; Spender, 1996), as this theoretical perspective fits the empirical evidence from the case quite well, and seems to provide a coherent explanation for the observed phenomena. Adopting this theoretical perspective, we analyzed the case further. Based on this analysis, we developed an integrative framework for understanding service provision. This emergent framework is shown in Figure 1.

Obviously, the knowledge-based view of the firm is greatly affected by the exact definition of "knowledge" — the concept is inherently multifaceted and complex (Nonaka, 1994). The exact definition of "knowledge " obviously depends on the chosen epistemological position adopted in research. In short, two different types of positions have been typically adopted in the knowledge management literature (Tsoukas and Vladimirou, 2001; Hislop, 2005): *the objectivist position*, which assumes that knowledge is something that that resides in individuals and can be expressed in more or less explicit and codified form, and *the practice-based position*, which assumes that knowledge is created in social interaction between humans, and cannot be detached from this interaction. These two complementary types of epistemological positions can also be understood through the concepts of "knowledge" (static, possessed type of knowledge) and "knowing" (knowledge embedded in actions and practice) (Cook and Brown, 1999). The two types of knowledge concepts can be related to positivist and constructivist epistemologies, respectively (cf. Hislop, 2005).

Given that we have selected to follow a realist epistemology in this study, we opt to use the objectivist position on knowledge. In other words, we will conceptualize knowledge as something that its possessed by individuals and

organizations that helps them to make use of other resources to meet organizational goals, and which can be explicated and codified (at least to some degree).

In summary, our findings indicate that three types of knowledge need to be combined by the software firm to successfully develop and deliver its offering (cf. Figure 5.1): *technological knowledge, knowledge of the customers' problem domain, and solution knowledge* (cf. Kogut and Zander, 1992; Wikström and Normann, 1994). Furthermore, this offering constitutes an *organizational innovation* (Kimberly and Evanisko, 1981; Damanpour and Evan, 1984; Damanpour, 1991; Leonard-Barton, 1988a). Organizational (or administrative) innovations involve changes in organizational structure and administrative processes. They are indirectly related to the basic work activities of an organization and are more directly related to its management (cf. Damanpour and Evan, 1984; Kimberly and Evanisko, 1981).

To successfully implement and use these innovations, customer organizations need to possess sufficient knowledge about the innovation. Some of this knowledge is often tacit in nature and thus embedded in individuals, and resists codification attempts (Szulanski, 1996; Ancori et al., 2000b). Knowledge-intensive services serve to facilitate this required interorganizational knowledge transfer. However, the type of knowledge transfer, and hence services needed depends on two factors: *the level of knowledge codification* (Cowan and Foray, 1997; Cowan et al., 2000), and *the level of customer knowledge* about the offering (Cohen and Levinthal, 1990). If suited to these contingent factors, knowledge-intensive services positively affect the success of knowledge transfer. Consequently, this successful knowledge transfer has positive effect on the performance of the focal firm.

In the following, we discuss the elements of this framework in more detail, provide empirical evidence from the case study, and explicitly discuss the connections to extant literature, strengthening the theoretical grounding of the framework.

5.3.3 Software solution as an organizational innovation

We conceptualize the enterprise software offering as an organizational innovation. An organizational innovation can be considered an architectural innovation that constitutes changes in the processes and organization of an organization (cf. Henderson and Clark, 1990). As indicated by Damanpour (1991), "the adoption of innovation is generally intended to contribute to the performance or effectiveness of the adopting organization." An innovation is defined as the adoption of an internally generated or purchased device, system, policy, program, process, product, or service that is new to the adopting organization (Daft, 1982; Damanpour and Evan, 1984).

Another possibility to conceptualize these solutions is to see them as administrative innovations (Kimberly and Evanisko, 1981; Damanpour, 1987). As indicated by Rogers (1962), any technology has a "hardware" and "software" part (cf. Geroski, 2000). The "hardware" refers to the explicit knowledge about the technology, while "software" refers to the less structured, mostly tacit knowledge related to the proper use of the technology.

However, for the overall solution to be successfully transferred into a customer organization, both the soft and hard dimensions of knowledge related to the innovation need to be addressed by the solution vendor. In other words, we consider the organizational benefits created for customer organizations to be central to the innovation in solution provision. Software is the programmable, intangible part of information technology; also codified, explicit knowledge (Messerschmitt and Szyperski, 2003). The codified part of the innovation, the software product, is an important and necessary but not sufficient part of the innovation. Some parts of the knowledge related to the innovation remain uncodified and tacit. The key issue here is to understand that the technological innovation, embodied in the core product, is only a part of the entire solution:

> There isn't much in the way of [a solution] in those [industries]. The downside is that they don't realize what [our solution] is all about. So there's a lot more time [spent] trying to explain the concept behind it. Whereas [in some other industries] people understand [the solution] far more [...] When you enter some of these verticals [...] you're trying to, as much as sell the product, to actually *sell the concept* (Manager, Channel Sales; emphasis added)

Furthermore, as suggested by earlier research on technology adoption, most technological or organizational innovations require changes to the structure and competences, and in some cases even to the organizational culture of the adopting organization (Damanpour, 1987; Kimberly and Evanisko, 1981). In addition, the innovation typically needs to be modified during its implementation to suit the capabilities of the customer organization (Lewis and Seibold, 1993; Meyer and Goes, 1988; Leonard-Barton, 1988a). In particular, information technology often is associated with changes in the organization (Orlikowski and Robey, 1991; Orlikowski, 1992). Lastly, the innovation adoption process may require the mutual, two-sided adaptation of the innovation and the adopting organization (Leonard-Barton, 1988a).

This was also noted by the case firm; the informants had noted that unless the case firm was significantly involved in the implementation of the overall solution, the results might not be satisfactory for customers. As indicated by informants, a limited participation of the case firm in the implementation of its solutions leads to difficulties since some of the required knowledge is not transferred:

> This is a challenge [...] because we're not involved in the [problem definition] phase, we're just there to implement the solution (VP, Direct Sales)

> Some [customers] are smart and understand to buy help [from us]; some don't see their own dead end, or don't see the benefit in using a consultant (VP, Products and Technology)

In other words, unless the customer recognizes the lack of knowledge about the solution and act accordingly, the solution may fail to yield benefits. This approach is also supported by the service-dominant logic (Vargo and Lusch, 2004; 2008b), that posits that the overall service (cf. solution here) is what is valuable to the customer. This perspective also argues that the customer is always a co-creator of value by using its own skills and competences to complement the service provider's offering (Vargo and Lusch, 2008b; Penttinen and Palmer, 2007).

5.3.4 Software solution as combination of three types of knowledge

As indicated by recent research on industry evolution (Jacobides, 2005; Malerba, 2006), the integration and disintegration of industries do not necessarily depend on purely technological factors. For example, Jacobides (2005) demonstrates that vertical disintegration took place in the mortgage markets without an introduction of a technological innovation. This suggests that innovations in other knowledge domains may also lead to industry disintegration.

For our study, this implies that purely technological analysis of the case firm's business and service provision is not likely to yield satisfactory results. In fact, our analysis of the case indicates that three types of knowledge need to be successfully combined in the organizational innovation to provide value for the customer organizations, and consequently for the software firm. These three types of knowledge are *technological knowledge, domain knowledge, and solution knowledge*. As aptly put by one informant,

> Software by itself won't solve those customer problems; you need to have a *really smart* user to be able to pull through the change process at the customer organization. (VP, Marketing; emphasis added)

This indicates that transferring the technological knowledge is not enough; even though the customer may be able to operate the product technically, the solution yields suboptimal benefit unless combined with sufficient knowledge about the actual customer problem being solved and the correct organizational solution applied to the problem (and faciliated by the technology).

As indicated by one informant, the case firm would like to offer a comprehensive solution rather than just technological products. This suggests that the case firm has recognized the problems entailed in providing only technology instead of a comprehensive customer solution.

> In new [customer] cases it would be good to be able to package the message that we're delivering more than the software product (VP, Marketing)

Technological knowledge

Technological knowledge refers to the technology used to implement the core product of the offering, as well as the related platform technologies that need to be mastered for the successful technical implementation of the product. In the software firm — customer organization dyad, technological knowledge is usually greater in the software firm than in the customer organization. This implies that the software firm is typically responsible for the technical details of the solution implementation, as the technological knowledge is "obvious" for the customer and more readily outsourced from the product firm.

> [Product configuration] has continuously increased the requirements for technical competences for our consultants. [...] these implementations have become quite technical, since [customers] demand integrability and customizability (VP, Channel Sales)

Customer domain knowledge

Domain knowledge refers to knowledge regarding the customer's problem domain (Marengo et al., 2000; Nickerson and Zenger, 2004). In other words, this is the knowledge customers use to formulate managerial problem and to formulate solutions to these problems, and effectively to conduct their business (von Hippel, 1994). In most cases, this refers to the industry of the customer, or to the specific function within the customer organizations that is affected by the organizational innovation. Since this type of knowledge is strongly related to the customer's context, it is usually harder to transfer (Szulanski, 1996; 2000).

In the software firm — customer organization dyad, domain knowledge is naturally greater in the customer organization than in the software firm. Despite this natural division, customers often require this type of domain knowledge in relation to the solution, and demand it from the solution provider or some external consultant. Furthermore, without adequate customer knowledge, the implementation of the solution may not be efficient, as suggested by a consultant:

> Knowledge on customer's domain is important, so that we can [implement] right things in the first place (Consultant, Channel Sales)

However, the case firm's assessment of the level of its own customer domain knowledge is low. This is likely to be due to the reliance on partners to provide such knowledge and related services, and the case firm's history as a product-minded firm. An informant commented on this lack of domain knowledge in the following way:

> We don't have a deep understanding of any industry [...] on which we could build a vertical [solution] (VP, Direct Sales)

It should also be noted that knowledge related to one customer domain does not automatically translate into understanding about other domains; this knowl-

edge needs to be built for each customer market the product firm operates in. Even though the firm may have good technological and solution knowledge, the lack of customer domain knowledge may prohibit successful implementation and business in new customer domains:

> A clear minority of [customer] programs have been of the kind where our consultants have even understood for what kind of business purpose the system is intended and why they wanted a particularly specified system (CEO)

Solution knowledge

Solution knowledge means the knowledge related to the non-technological aspects of the provided organizational innovation. This may refer to specific managerial techniques, such as total quality management (TQM), or to various other methodological fashions within the management (Abrahamson and Fairchild, 1999). This type of knowledge is usually greater within the software firm, but may also be evenly distributed between the customer organization and the software firm, depending on the maturity of the market and the solution. Solution knowledge was recognized by the informants as being distinct from domain knowledge:

> It think [our solutions] are more methodology-based [...] rather than industry-focused, especially since it's [...] difficult to be more focused in Finland[3] (Service Manager, Direct Sales)

Furthermore, in contrast to customer domain knowledge, the case firm saw itself as an expert in the solution knowledge. Clearly, the case firm had a better knowledge of the solution methodologies than its customers on average.

> Many organizations have regarded us as the best consultant firm in Finland [...] in managing modeling activity (VP, Direct Sales)

Solution knowledge is used to improve the performance of the customer organization. However, without adequate domain knowledge, this solution might not be successfully adapted to the specific industry and firm context. Furthermore, without appropriate technological knowledge, some aspects of the innovation may not be feasible or may not be implemented as effectively. As expressed by informants, simple technological competence is not enough to implement solutions successfully: sufficient solution-specific knowledge is required for this:

> Perhaps technically [customers] are able to use [our product], but methodologically their insight is typically not good enough to build anything sensible. (Consultant, Direct Sales)

> A lot of the time [...] even those clients that do look proactively at the system, don't necessarily have the expertise [to solve their own problems with our offering] (CEO, Partner)

[3] This is due to the small size of the Finnish market for software systems for a narrow niche.

As in the case of domain knowledge, customers often also expect the product firm to provide required solution knowledge. The expectation is that the case firm can provide the necessary knowledge to implement the solution in the customer organization. As this knowledge is always easy to express in explicit or codified form, the product firm is likely to need the close interaction enabled by knowledge-intensive services.

In summary, the above findings indicate the importance of balancing the three types of knowledge in the development and implementation of the organizational innovation. Without the complete combination of knowledge from either customer organization or the product vendor, the innovation will not ultimately be successfully implemented, and hence will not improve the performance of the customer organization. This, of course, also implies that the innovation will not create value for the customer organization, and subsequently for the product firm in the form of sales revenue. Hence, it is in the case firm's interest to ensure that the technology will be put into productive use at customer organizations.

5.3.5 Role of services in interorganizational knowledge transfer

Since we have conceptualized the enterprise software offering as an organizational innovation, the sales and implementation of the offering to customers corresponds to interorganizational knowledge transfer (cf. Ko et al., 2005). Knowledge transfer refers to the process of communicating knowledge, in both tacit and codified form, from one organization to another (Simonin, 1999a; Argote and Ingram, 2000; Carlile, 2004; Cummings and Teng, 2003). Interorganizational (or interfirm) knowledge transfer takes place between two firms, separated by a governance boundary (Dhanaraj et al., 2004; Grant, 1997; Knudsen, 2007; Mowery et al., 1996).

In our case firm, such knowledge transfer was mostly manifested in the form of providing the customers with necessary information to implement and use the offering. In particular, it was seen that the case firm needed to provide services to ensure the availability of all three types of knowledge; a lack in even one of these knowledge types would lead to difficulties during solution implementation, and later in solution use. As suggested by a partner of the case firm, customers typically expect the product firm to provide this necessary knowledge:

> 70 percent of the time when we go in, we're probably, one way or another building [a solution] for [customers]. Whereas, in theory, they could be capable of doing that themselves. [...] it's a time resource decision for them, [...] they don't want to spend lots of time being trained, and then maybe spending twice as long as would to build it for them, because we've done it before. (CEO, Partner)

On the other hand, services facilitate learning from customer cases through close hands-on interaction with different customer organizations and envi-

ronments. Knowledge is often (re)created during implementation (Nonaka, 1994; Leonard-Barton, 1988b), and thus the interaction with customers has potential for new knowledge creation. This effect also accumulates knowledge through learning-by-doing, as expressed by one informant:

> On the average, we do [this business] more [than our partners] so perhaps we accumulate a bit more competence and experience (VP, Product Development)

The success of knowledge transfer is subject to many contingent factors (terby-smith$_{i}$nter - organizational$_{2}$008-; vanWijket al., 2008). For example, knowledge is always "sticky" to some extent. The stickiness of knowledge stems from the fact that individuals cannot often express everything they know verbally (Polanyi, 1966; Nonaka, 1994). In other words, they cannot directly communicate all knowledge they possess. Furthermore, as new knowledge is developed through the processes of socialization and creation, knowledge is necessarily adapted to fit local circumstances. These mechanisms imply that knowledge is always local in nature and that its meaning depends on the specific context (von Hippel, 1998; Szulanski, 1996; 2000).

The stickiness of knowledge creates friction in the knowledge transfer process. Services facilitate the successful "translation" of knowledge from one organization to another across organizational boundaries (D'Adderio, 2001; Bettencourt and Brown, 2003; Carlile, 2004; Yanow, 2004; Mucher, 2006). Moreover, the success of knowledge transfer also depends on the absorptive capacity of the recipient organization (Easterby-Smith, Lyles and Tsang, 2008). Absorptive capacity refers to the capability of the recipient organization to identify, learn and absorb new knowledge (Cohen and Levinthal, 1990; Zahra and George, 2002).

The case firm has noted this local nature of knowledge, and the need to translate knowledge across the case firm – customer boundary, including more difficult tacit knowledge. Commenting on the potential of learning from customers, a consultant in the case firm raised the issue of the importance about transferring tacit knowledge about the customers:

> Developing [a solution] requires insights from the real world and requires [...] a critical mass of these *"weak experiences"* at the customer interface which are repeated in many customers before you can see potential opportunities for solutions (Consultant, Direct Sales; Emphasis added)

Of course, another organizational boundary exists between the case firm and its service partners. While the partners are likely to be closer to the case firm than customer organizations in terms of knowledge base, there is likely to exist a need to "translate" knowledge between the case firm and its partners.

> In my opinion [service concepts] could be transferred to [partners] in the sense that we create a kind of generic template that is then profiled by the partners themselves [...] they could modify it to suite their style (Consultant, Channel Sales)

Yet, the cognitive gap between the case firm and its partners may be crossed through a combination of learning-by-doing and interaction with partners; if and when the case firm provides services itself, these experiences help it to communicate and understand its partners:

> It's good for partners that we do services, since that's exactly what the partners do locally [...] then partners don't have to complain about basic things [...] when we run into the same basic issues in our daily business (VP, Marketing)

Again, knowledge transfer is a two-way street; both parties can potentially learn from each other during solution's implementation (Nonaka, 1994). Nevertheless, given the complexity of most enterprise software solutions, a solution vendor is likely to have difficulties in replicating the solution due to the partly tacit nature of the solution knowledge (cf. Kogut and Zander, 1992; Winter and Szulanski, 2001).

Moreover, much of the domain-specific knowledge is actually possessed by the partners of the case firm. As these partner firms provide services and directly interact with customers, they are likely to accumulate significant knowledge on particular customer domains. In fact, many of the partners had expertise on specific types of customers, whom they now served with the case firm's solutions. Thus, given this asymmetry between the domain knowledge between the case firm and its partners, it is unlikely that the case firm can provide a holistic solution that will suit the needs of all its service partners:

> Of course, it would be good [...] if we had [ready solution templates] to meet demand – it's a challenge we should be able to tackle [...] However, I would reckon that developing grand solutions, based on my experience, would be in no way a guarantee for gaining financial returns [...] I doubt that we would get sufficient returns for our investments (Consultant, Channel sales)

> Even though we would be able to repeat the success [of a solution] abroad, I would say that it is very challenging that we could push [a solution] to the consultant and salesmen [at our partners]. It's not enough that one salesman and one consultant understand what they're doing [...] the whole [partner] organization should eventually "get it" (Consultant, Direct sales)

Furthermore, the knowledge transfer is related to diffusion of the organizational innovation in a population of customer organizations (Rogers, 1962; O'Neill et al., 1998; Rajagopal, 2002). In addition to the diffusion of the innovation, the solution is in essence reinvented each time it is adapted to each particular customer environment (cf. Leonard-Barton, 1988a; Lewis and Seibold, 1993), resulting in enhanced knowledge about the innovation and its applicability. Hence, new knowledge is also actively (re)created during the implementation of the existing technologies and solutions in the collaboration between the solution vendor and its customers (cf. Nonaka, 1994). These opportunities for new knowledge creation were also recognized by the case firm, as indicated by the following quotes:

> [By collaboration in implementation] we learn more about the customers, about their potential problems [...] And perhaps we are then able to identify industry or function specific service packages that we could offer (CEO)

> Initial competence should able partners to create first customer relationships, but then the substantial competence comes from them having the first customer and the first implementation, where they go through all these competence levels; it's also a learning process for the partner (Consultant, Channel sales)

5.3.6 Impact of solution codification on service provision

As indicated by literature on interorganizational knowledge transfer, the characteristics of the transferred knowledge have an impact on the success of the knowledge transfer (Easterby-Smith, Lyles and Tsang, 2008; van Wijk et al., 2008). One of the key characteristics of knowledge to be transferred is the ambiguity of the transferred knowledge (Szulanski and Jensen, 2004; Simonin, 1999a). Ambiguity refers to the fact that it is often unclear what actually constitutes the knowledge to be transferred; this uncertainty arises due to the tacitness of significant part of important knowledge, as well as about the structure of the knowledge (Simonin, 1999a).

Codification is the process through which initially tacit knowledge becomes explicated and expressed in a form that is more easily transferred (Ancori et al., 2000a; Cohendet and Steinmueller, 2000; Cowan et al., 2000). This codification of the knowledge also serves to decrease the ambiguity of the transferred knowledge, and in general to make the knowledge transfer easier (Simonin, 1999a; Easterby-Smith, Lyles and Tsang, 2008).

At the beginning of the evolution of a market for a new software solution, the core product obviously is still far from fully codified. Firstly, the technology required to build the solution may still be in nascent phase and needs further product development to simplify the design. This is the mechanism, for example, behind the emergence of dominant designs (Anderson and Tushman, 1990; Murmann and Frenken, 2006). Secondly, and more importantly, the knowledge regarding the actual firm performance problem and its solution may still be largely tacit. In other words, the focal firm (as well as potential customer organizations) do not have a clear idea of what needs to be solved, and how exactly the identified problems should be solved (Nickerson and Zenger, 2004). During the evolution of the market, the knowledge on these other aspects of the solution is also likely to become more structured and codified.

In the case firm, the technology had remained quite stable for a long time, and the products of the firm were already relatively old. This not only indicated that the technology was quite mature, but also that the market for such products had existed for a long time. This was suggested by several informants:

> We have terribly mature products at the moment (VP, Channel Sales)

> Our own products in their own [customer] segment are in their current form quite mature. You can tell this from the convergence of competing products, they all have about the same features now (VP, Products and Technology)

This process of codification is not unidimensional; it may be that the technological part of the solution is codified and standardized first, or that the non-technological aspects become standardized first. Therefore, the process of codification is not necessarily linear or simple. We must thus account for different types of knowledge when analyzing the process of codification. Furthermore, it is also likely that in the case of some solutions the non-technological aspects of the solution may always remain uncodified and hence largely tacit, due to the complexity and ambiguity of the underlying firm performance problem. For example, human resources management is always likely to remain situational and dependent on human interpretations. In such situations, no level of effort is enough to codify the knowledge. This implies that even though the technology behind the solution is standardized, the implementation of a solution will always require face-to-face professional services. Hence, while the technological aspects of the solution may be widely standardized, this does not imply, even in a mature solution, that the non-technological parts would be codified as well. This potential asymmetry between the codification of different types of knowledge was acknowledged by the case firm:

> It's hard to develop a foolproof implementation manual, which would include everything [...] but let's say that for software management we have adequate material, but where we could always improve are the [...] industry-specific examples (Service Manager, Channel Sales)

Furthermore, the existence of different types of standards or ready methodological concepts helps the diffusion of the innovations, as customers are already knowledgeable about these concepts. This, of course, can be related to the idea of *management fashion* (Abrahamson and Fairchild, 1999; Scarbrough and Swan, 2001; David and Strang, 2006). In other words, some of these organizational innovations may be methodological fads that spread throughout the potential customer population. Nevertheless, the existence of such fads may help the developer of organizational innovations by providing a readily codified model for customers, and by lending credibility to the vendor of such solutions. These effects were also experienced by the case firm, where they had facilitated the sales of the solution:

> You're talking about emerging economies. And these guys, really, they're interested in the old fashioned [solution]. They're interested in the old [methodology] even though it's dying out in some countries. These guys are really interested in that. It's *in fashion.* (Manager, Channel Sales; emphasis added)

5.3.7 Impact of customer knowledge on service provision

In addition to the characteristics of the transferred knowledge, the organizational characteristics of the recipient organization have an impact on the success of knowledge transfer (van Wijk et al., 2008; Easterby-Smith, Lyles and Tsang, 2008). These characteristics are usually analyzed using the construct of *absorptive capacity* (Cohen and Levinthal, 1990; Zahra and George, 2002), which refers to the ability to recognize, assimilate and apply new external knowledge.

As noted in this literature, absorptive capacity is dependent on some level of overlap between the existing knowledge base of the recipient organization and the knowledge to be transferred. In practice, this means that unless the customer has some idea about the solution to be transferred, the transfer of new knowledge will be hindered. As the technological part of the solution is often standardized, the non-technological knowledge related to the solution will usually play a more crucial role. Unless the customer organization can "grasp" what the solution is about, the chances of successfully transferring it to the customer organization are likely to be reduced. This fact was illustrated by case firm informants:

> There isn't much in the way of [a solution] in those [industries]. The downside is that they don't realize what [the solution] is all about. So there's a lot more time [spent] trying to explain the concept behind it. Whereas [in some other industries] people understand [the solution] far more. (Manager, Channel Sales)

In other words, the level of customer knowledge about the solution affects whether the customers recognize that there in fact is an organizational problem that needs to be solved with the solution, and to what extent the customers understand the potential benefits from using the solution. This, in turn, affects type and the extent of knowledge the product firm needs to provide to the customer before, during, and after solution implementation, and, depending on the type of knowledge, what kind of services are required to facilitate this knowledge transfer.

The level of customer organizations' knowledge is likely to increase during the life cycle of the solution. This takes place as these organizations learn, firstly, from the product firm, and secondly, from each other, in particular from other organizations that have successfully implemented the solution. Moreover, other third-party sources of knowledge, such as universities and independent consultants may also affect the level of customer knowledge. All in all, this level of customer knowledge has an impact on the knowledge transfer activities required from the software vendor, and subsequently the knowledge-intensive services required from the vendor. This implies that the optimal service offering is likely to change during the evolution of the market and the technology.

As suggested by the empirical evidence from informants, the case firm had recognized this evolution in their customer markets. This was indicated by the following quotes, which show that the case firm's customers have become more sophisticated, implying an increased understanding of the solution and its benefits:

> Luckily, the market is starting to be so mature [...] that customer by default understand that we're talking about completely different things [when comparing our product and substitutes] (VP, Direct Sales)

> I think that customers are now willing to buy more services [than before] (VP, Marketing)

5.3.8 Strategic impact of interorganizational knowledge transfer

Interorganizational knowledge transfer and the success in the transfer of organizational innovations are not without strategic implications. Quite contrary, the evidence from our case firm indicated that managing the knowledge transfer to customer organizations is in fact one of the key strategic considerations of a product firm. This view is also supported by extant literature, which indicates that there is a positive relationship between interorganizational knowledge transfer and firm performance (Dhanaraj et al., 2004; Williams, 2007; van Wijk et al., 2008).

The case firm has also seen the importance of managing knowledge transfer with customer organizations. In particular, this has happened through negative learning, as indicated by the following quote:

> We have lost a lot of revenue by thinking that we could become a pure software firm and that we could grow exponentially. (VP, Marketing)

Moreover, the fact that the case firm's competitor, who relies more on service provision, has achieved higher performance, suggests that the knowledge transfer facilitated by knowledge-intensive services might have strategic implications.

As an extension to prior research on interorganizational knowledge transfer, our study has identified several detailed processes through which performance of the focal firm may be improved. First of all, the interorganizational knowledge transfer facilitated by service provision has an impact on the learning of the focal firm (Darr et al., 1995; Yli-Renko et al., 2001). In other words, the service employees act as boundary spanners and allow the diffusion of knowledge about the customer and solution domains to the focal organization. This has potentially a positive impact on further provision of services due to more precise knowledge about what needs to be accomplished. Moreover, the success of further interorganizational knowledge transfer may be improved by narrowing down the gap between customers' knowledge and

the focal firm's knowledge (cf. Cohen and Levinthal, 1990; Zahra and George, 2002; Knudsen, 2007).

This logic also applies for the case firm's service partners; as they are also in a position that requires them to provide necessary domain and solution knowledge to customers, the success in this knowledge transfer has implications for their performance as well. The partners must also be able and wise enough to provide sufficient services for their customers. As indicated by an informant, the partners often rely on learning from their customers:

> Initial competences should able [new] partners to create first customer relationships, but the substantial competence comes from them having the first customer, and the first implementation, where they go through all these competence levels, and it's also a learning process for the partner. (Consultant, Channel Sales)

Second, as argued above, service provision is likely to have a positive impact on the success of customer's organizational adaptation of the organizational innovation (Leonard-Barton, 1988a; Salomon and Martin, 2008). In strategic sense, this translates to successful diffusion of the innovation within a population of customers (Cool et al., 1997; Abrahamson and Rosenkopf, 1997; O'Neill et al., 1998; Robertson et al., 2007). Performing knowledge transfer successfully thus allows the focal firm to ensure both the diffusion of the innovation, resulting in faster revenue growth, and the value creation from the organizational innovation, which is likely to have a positive impact on the continued of the innovation's use.

The case firm has only recently acknowledge this importance of managing its installed base, which is usually more important in manufacturing industries (cf. Wise and Baumgartner, 1999; Oliva and Kallenberg, 2003). However, as indicated by the following quote, the case firm is starting to understand the importance of services for ensuring the satisfaction of existing customers:

> We should first [...] increase service offering with customers so that we help them make the software more widely and better used, to get more benefits out of the software. (CEO)

Third, successful knowledge transfer also facilitates the innovation activities of the focal firm (Gilbert and Cordey-Hayes, 1996; Knudsen, 2007; Tsai, 2001), in particular by allowing the transfer of tacit knowledge (Howells, 1996; Cavusgil et al., 2003). By combining customer domain knowledge with its own technological knowledge, the focal firm is likely to improve the performance of its new product development activities — in fact, this complementary knowledge may be necessary to benefit from the technological innovation (Teece, 1986).

This effect is also facilitated by the creation of completely new knowledge at the firm boundary through close collaboration with customers (Nonaka, 1994; D'Adderio, 2001; Carlile, 2004). In general, research on knowledge trans-

fer suggests that there is a positive relationship between knowledge transfer and innovativeness (Tsai, 2001; Powell et al., 1996), indicating that interaction through service provision may help the focal firm to come up with new ideas for further product and service development.

This potential for innovating new products and solutions was also recognized by the case firm. They have begun to see the benefit in collaborating with and learning from customers to identify potential for new solutions:

> Then we learn more about the customers, about their potential problems [...] And perhaps we are then able to identify industry or function specific service packages that we could offer. (CEO)

In particular, the case firm had recently recognized that isolating itself from customers in terms of knowledge transfer is bad for both product development and customer relationships. As indicated by one informant:

> When you're a pure software developer, you will distance yourself from customers and that makes developing your product more difficult. It also makes new product development an innovation harder when you don't get to see real customer environments (VP, Marketing)

In summary, our findings suggest that services that successfully facilitate interorganizational knowledge transfer about knowledge relevant to the overall solution subsequently have a positive impact on the performance of the focal firm.

5.4 Discussion and conclusions

The general conclusion of this in-depth case study is that the role of services in product firms may be effectively explained by the knowledge-based view of the firm. Adopting this theoretical perspective, we have explained the role of knowledge-intensive services in product firms to relate to the need to transfer knowledge between the product firm and customer organizations. These services enable the transfer of richer data than simple sales of products or licensed technology, and in particular the transfer of tacit knowledge about the overall solution.

Instead of seeing the product firm's solution as simply technology, we have conceptualized the solution as consisting of three types of knowledge: technological knowledge, domain knowledge, and solution knowledge. Furthermore, we have also argued that the solution can be seen as an organizational innovation that seeks to improve the performance of a customer organization. In order to gain benefits from the solution, all three types of knowledge need to be successfully applied in the customer environment. While the customer may provide some of this required knowledge (such as knowledge related to its own domain) internally, some types of knowledge need to be provided by the product firm.

What this implies, and what was seen in our empirical evidence about the case firm, was that the product firm must provide knowledge-intensive services to transfer this knowledge. As some types of knowledge cannot be easily, or at all, expressed in explicit, codified form, there is a need for closer interaction between the product firm and its customers to ensure successful knowledge transfer. The knowledge-intensive services provided by the firm facilitate this knowledge transfer.

The fact that knowledge-intensive services facilitate knowledge transfer is obviously tautological. However, what is not obvious is that why do we need these services if the product itself is standardized? The answer lies in the multidimensional concept of knowledge: even though some parts of knowledge related to the solution may be standardized and codified, in particular technological knowledge, other parts may still remain largely tacit. In this case, the product firm will need to provide appropriate services to ensure successful transfer of necessary knowledge to customer organizations.

We also identified two factors that affect the level and type of services required: the level of knowledge codification and the level of customer knowledge. If the knowledge related to the solution is largely codified, there is less need for knowledge-intensive services, since the knowledge can be transferred in a impersonal form without face-to-face interaction. This is what typically happens during the evolution of a market, when the solutions becomes more precisely defined and easier for customers to understand. The knowledge possessed by customers affects the need for knowledge-intensive services similarly; more precisely, if the customers are more knowledgeable about the solution, there is less need for services. Again, as customers learn about the solution, the required amount of services is likely to change. Both these factors indicate that the need for knowledge-intensive services will evolve over time as the solution, markets and competitive environment change.

We have also hypothesized that the success in knowledge transfer activities yields competitive advantage for the enterprise software firm, resulting in superior firm performance. Given the dependence of required services on solution and market evolution, the product firm will need to adapt change its service offering over time to maintain similar strategic impact.

5.4.1 Limitations

The common argument about the limitations of qualitative research, and about grounded theory, is the lack of external validity. In other words, given the limited empirical scope of the study, we can only make modest arguments about the applicability of the results in other contexts. Yet, external validity is not the ultimate goal of grounded theory research (Glaser and Strauss, 1967; Yin, 2003; Dyer and Wilkins, 1991). Rather, we have tried to emphasize construct validity and internal validity by grounding our results in emerging data, and

by visiting the extant literature to provide a fuller theoretical grounding for the identified results.

We have only used one case to study the phenomenon of service provisoin. On one hand, this obviously limits generalizability of the results, and casts some doubts about the internal validity of the findings, given that we were unable to compare our insights between different case firms. On the other hand, concentrating on only one organization allowed us to explore the issue of service provision in more detail, and from multiple points of view (e.g. multiple levels of organization, and partner and customer perspectives), which potentially facilitates theory building better than "shallow data" from multiple firms (cf. Dyer and Wilkins, 1991).

The use of software industry as the empirical context for the study has both benefits and downsides. First of all, the software industry as a knowledge-intensive industry is likely to display the importance of knowledge-intensive services studied in this paper. Moreover, the ICT industry has been indicated as one of the industries that prominently uses solutions (Brown, 2000; Davies et al., 2007). These factors suggest that the chosen empirical context was appropriate given the goals of the study.

However, on the downside, the results of the study might have risen due to the particular empirical context of the study. In particular, the discovered theoretical framework, based on the knowledge-based view of the firm, is likely to be partly due to the context. Yet, this was to be expected given the chosen methodology of exploratory case study, which grounds the emerging theory to empirical findings (Glaser and Strauss, 1967). Nevertheless, the chosen empirical context is likely to limit the generalizability of the results.

In summary, our choice of software industry as the context for the study is likely to have contributed to the identification of the knowledge-based view of the firm as a theoretical explanation for service provision in manufacturing firms. However, we believe that this initial theoretical framing can still be fruitful for further research in other industries as well. Also, given that the research on service provision has thus far been largely devoid of any significant theory development, our results do in any case provide some initial insights into understanding and explaining the phenomenon of service provision and its consequences in product firms in theoretical terms. Of course, the empirical evidence provided to support these claims was still limited, but the developed theoretical model lends itself to further development and empirical testing.

6 Multiple Case Study: The Impact of Service Provision and Service Capability on SME Performance

The previous study sought to identify a theoretical explanation for the use of knowledge-intensive services in product firms. Through exploratory case study in Chapter 5, we identified the knowledge-based view of the firm (Kogut and Zander, 1992; Grant, 1996b) as a potential theoretical framework for understanding the phenomenon. From this theoretical perspective, the role of knowledge-intensive services is to facilitate interorganizational knowledge transfer between the focal firm and its customers. As argued at in the study, success in this knowledge transfer is likely to have an impact on the performance of the products firm.

The in-depth case study provided one potential explanation for *why* knowledge-intensive service provision might be needed in product firms. The main purpose of this current empirical study is to identify *what* exactly is the impact of service provision, given its role in required knowledge transfer. Our goal is thus to provide tentative indications of *how* service provision affects the growth and profitability of the focal firm, as well as what contingent internal and external factors affect these effects. Stated explicitly, the research questions addressed in this multiple case study are

> What is the impact of service provision and service capability on the revenue growth and profitability of product-based SME firms?

and

> How do organizational and environmental contingencies affect this relationship between service provision and firm performance?

To address these research questions, we will first briefly review extant literature on integrated solutions and service provision in product firms, as well as literature on interorganizational knowledge transfer. The purpose of this review is to provide a grounding for the constructs used in this empirical study (cf. Eisenhardt, 1989a). However, as the purpose of this study is largely in-

ductive, we will not build an explicit theoretical framework nor explicate hypotheses at prior to conducting the empirical study.

Next, we will conduct a multiple case study of nine Finnish SME firms in the software industry. This study is mainly based on Eisenhardt's (1989a) case study research process, and on the qualitative data analysis methods described by Miles and Huberman (1994). Based on this multiple case study using both qualitative and quantitative data, we will develop a general understanding of the patterns present in the data, and discuss the theoretical explanations found for these patterns. Ultimately, the study will express its results in the form of hypotheses.

6.1 Prior literature

As indicated in the literature review in Chapter 2, there is only limited evidence on the impact of service provision on the performance of a product firm (e.g., Homburg et al., 2002; Gebauer, 2008; Fang et al., 2008). In particular, there is both positive (Canton, 1988; Ketelhöhn, 1992) and mixed (Foote et al., 2001; Miller et al., 2002; Neu and Brown, 2005; Brax, 2005) evidence of the impact of service provision on product firm performance. Fang et al. (2008) also found that the relationship between service provision and firm performance may also be nonlinear and contingent on other factors. This has also been suggested by Cusumano (2008), who posits that there may several "sweet spots" in the relationship between the extent of service provision and firm performance. In summary, there are still gaps in the knowledge of how exactly provision of knowledge-intensive services affects the performance of a product firm.

Our purpose is to identify patterns in data that relate service provision to firm performance, and to provide theoretical explanations for these patterns. We also suggest that these relationships may be contingent on various organizational and environmental factors. We model these potential contingencies as *fit-as-moderation* (Venkatraman, 1989a). We first analyze our empirical evidence to identify direct relationships between explaining variables (i.e., service provision and service capability), and outcome variables (i.e. revenue growth and profitability). Second, we look for moderating factors that potentially affect these relationships. These moderators include internal organizational factors (e.g. firm capabilities, offering type, product complexity), as well as external, environmental factors (e.g., competitive environment, partner use).

We have included service capability as both an explaining construct and a moderating factor, as the impact of service provision is likely to be affected by the firm's service capability. This is due to the potential efficiency improvements enabled by higher level of competence in service operations manage-

ment (cf. Roth and Jackson, 1995; Soteriou and Zenios, 1999; Singh, 2000), as well as higher service quality resulting from better grasp of service marketing (cf. Parasuraman et al., 1985; Zeithaml, 2000; Babakus et al., 2003). The direct effect of service capability, on the other hand, tests whether service capability has an effect on the performance of a solution SME irrespective of the extent of their service provision activities.

The potential moderating factors of service provision — firm performance relationships partly arise from the preceding in-depth case study. In other words, these constructs were identified through an inductive study that based its conclusions on empirical evidence and emergent constructs. The constructs used in this multiple case study are also informed by extant research and theory. By basing the study on the theoretical perspective of the knowledge-based view of the firm (e.g. Kogut and Zander, 1992; Grant, 1996b; Spender, 1996) and interorganizational knowledge transfer (e.g. Grant and Gregory, 1997; Mowery et al., 1996; Simonin, 1999b), we identified factors that potentially affect the performance of product SMEs based on the literature.

Service capability

First of all, as mentioned above, service capability is a potential moderating factor between service provision and firm performance. By service capability, we mean the organization's capability to, firstly, deliver its services in a reliable and efficient way, and second, to be effectively able to scale up its service operations organization.

When compared to the integrative frameworks of interorganizational knowledge transfer put forth by Easterby-Smith, Lyles and Tsang (2008) and van Wijk et al. (2008), we identify that higher service capability positively affects interorganizational knowledge transfer through to two mechanisms. First, higher service capability implies that the services of the focal firm (i.e. the transferred knowledge) standardized to a higher degree, making the provision of services easier and more effective. Second, service capability also affects positively the knowledge transfer capability of the firm, as it improves the focal firm's ability to effectively replicate its service organization, and to transfer these services in other firms.

The impact of service capability on firm performance is likely to be due to three kinds of effects. First, a firm with higher service capability or service management capability is likely to provide higher service quality to its customers. This is likely to have a positive impact on customer relationships and maintaining customers, both of which tend lead to enhanced firm profitability (Youngdahl and Kellogg, 1997; Homburg and Garbe, 1999; Zeithaml, 2000; Sureshchandar et al., 2002).

Second, higher service capability is likely to enable the solution provider to use its existing service resources more efficiently, again leading to higher

profitability of service activities (Soteriou and Zenios, 1999). This is likely to have a positive impact on the overall profitability of the firm.

Third, higher service capability is also likely to enable the solution provider to effectively and efficiently expand the scale of its service activities. In other words, the solution provider is able to efficiently *replicate* its service business (Nooteboom et al., 1992; Winter and Szulanski, 2001; Martin and Salomon, 2003a). In addition, this also means overcoming the resistance of service employees to share and codify their knowledge (Ancori et al., 2000a; Steinmueller, 2000; Morris, 2001). In summary, service capability is thus likely to enable the productl firm with higher service capability to grow faster, and do this more profitably.

Competitive environment

The characteristics of the competitive environment may also be a moderating factor between service provision and firm performance. By competitive environment, we mean the state of external competition from similar firms and the general development status of this customer market.

As indicated by prior literature, the life cycle phase of the industry is likely to have an impact on the optimal service offering of the solution SME (Grant and Gregory, 1997). Furthermore, in very dynamic environments, the ability to effectively and flexibly integrate knowledge is likely to lead to positive outcomes (Kogut and Zander, 1992; Grant, 1996a; Nickerson and Zenger, 2004). Lastly, the changes in the environment may need to be matched by evolving capabilities of the focal firm (Van den Bosch et al., 1999). In summary, we need to assess the characteristics of the competitive environment as one moderating factor in this case study.

Offering type

By offering type, we mean the actual contents and characteristics of the case firms' offering, including all products and services, as well as the intended customer segment of this offering. The offerings of the case firms, and firms in general, differ greatly in terms of their technological, functional and complexity as perceived by the users of the offering. Hence, different types of services and service capability may be needed to successfully deliver different offerings.

The complexity of the offering is likely to be related with the ambiguity of the offering (Simonin, 1999a). This ambiguity is likely to be negatively correlated with the ease of replicating and implementing such offering (Simonin, 1999a; Laroche et al., 2003; Sorenson et al., 2006; Dibiaggio, 2007), possibly prompting the use of services or other measures to overcome these difficulties. On the other hand, offering complexity may also be positively related to firm performance through making imitation more difficult (Autio et al., 2000; Rivkin, 2001). In summary, prior literature suggests that we need to account for the offering type as a potential moderating factor.

Internationalization
The internationalization of the product SME is also likely to affect the impact of knowledge-intensive service provision on firm performance. Internationalization refers to the growth of the focal firm's business outside the national boundaries of its initial home market. This process is likely to expose the focal firm to issues of cultural and juridical differences, which also potentially have a significant impact on service provision (Samiee, 1999; Grönroos, 1999; Coviello and McAuley, 1999; Javalgi et al., 2003).

Of course, these additional barriers for knowledge transfer are likely to affect the performance of the solution provider. In particular, the transfer of valuable tacit knowledge will become more difficult due to increased cognitive and cultural distance between the focal firm and the other organization (Eriksson et al., 1997; Simonin, 1999b; Jensen and Szulanski, 2004). The appropriate management of the firm's relationships with other firms will thus become more important (Yli-Renko et al., 2002; Dhanaraj et al., 2004; Lindsay et al., 2003). Overall, the firm may need to improve its service capability to overcome these challenges of internationalization (Kogut and Zander, 1993; Martin and Salomon, 2003a). In conclusion, the internationalization degree of the focal firm is likely to have an impact on the optimal service provision and service capability required for firm performance.

Partner use
Related to its internationalization process, the solution provider may also need to consider the use of service partners to provide required services. Whether internationally or domestically, the transfer of necessary knowledge is likely to be more difficult across organizational boundaries than within one organization. As indicated by prior research, the transfer of tacit knowledge to partner firms is particularly difficult (Darr et al., 1995; Zander and Kogut, 1995; Mowery et al., 1996; Subramaniam and Venkatraman, 2001; Muthusamy and White, 2005). Furthermore, the interaction between multiple parties potentially enables new knowledge creation opportunities but, on the other hand, may require different organizational arrangements (Larsson et al., 1998; Mowery et al., 1998; Chen, 2004; Dyer and Hatch, 2006; Becerra et al., 2008).

Capabilities
Of course, the capabilities of the solution provider affect what kind of services the firm can and should offer. These capabilities are distinct from the service capability, and refer in particular to the three types of knowledge identified in the in-depth case study: technological knowledge, solution knowledge and customer knowledge. As indicated by extant research, these capabilities are likely to have an impact on the success of knowledge transfer, and subsequently on the performance of the solution provider.

For example, the knowledge and capabilities of the provider are likely to evolve with its product offering (Kogut and Zander, 1992; Helfat and Raubi-

tschek, 2000; Easterby-Smith and Prieto, 2007). Furthermore, there is an interaction between the dynamic and operational capabilities of the firm (Cepeda and Vera, 2007)

Above, we have provided tentative theoretical grounding for the potential moderating factors of our study. However, as suggested by Eisenhardt (1989a), we start out the study with only preliminary definitions of these concepts. We do not yet fix the theoretical framework for the study, nor did we have clearly defined constructs for potential moderating factors. As indicated by the inductive nature of this case study, the precise constructs and theoretical framework will emerge as part of the study's findings.

6.2 Methodology

Given the lack of extensive research on the strategic impact of service provision, and the relatively early stage of the research field in terms of theoretical development, a hypothetico-deductive research design was deemed incompatible with goals and research questions of the current study (cf. Parkhe, 1993). Therefore, we instead decided to use a qualitative research strategy that allows theoretical findings to emerge inductively from rich empirical data.

The general research process employed in this multiple case study is similar to the process suggested by Eisenhardt (1989a). This research process aims at building new theory based on comparison of multiple case firms. A detailed description of this methodology can be found in Table 6.1.

As indicated in the introduction, we have made recourse to the extant research on service provision in manufacturing industries to provide more firm conceptual grounding for this study. However, as this literature does not provide a solid theoretical grounding, we will remain agnostic about the specific theoretical framework applied in the study (cf. Eisenhardt, 1989a). Yet, we will not ignore the results of the preceding in-depth case study; more specifically, we will acknowledge the importance of knowledge-based of view in understanding the importance of services in our empirical context.

6.2.1 Multiple case study

As in the previous in-depth case study in Chapter 5, the case study research strategy studies contemporary phenomena in their naturally occurring environment (Yin, 2003). In contrast to the in-depth case study which concentrated on one firm and its business network, the multiple case study observes and analyzes multiple cases and their differences. The method thus allows to use comparative logic to infer from the differences between firms and the impact of these differences.

As indicated by both Eisenhardt (1989a) and Yin (2003), a multiple case study is preferred over a study of a single case. A multiple case study allows

Step	Activity	Rationale
Getting started	Definition of research question	Focuses effort
	Possibly a priori constructs	Provides better grounding for construct measures
	Neither theory nor hypotheses	Retains theoretical flexibility
Selecting cases	Specified population	Constraints extraneous variation and sharpens external validity
	Theoretical sampling	Focuses effort on theoretically useful cases – i.e. those that replicate or extend theory by filling conceptual categories
Crafting instruments and protocols	Multiple data collection methods	Strengthens grounding of theory by triangulation of evidence
	Qualitative and quantitative data combined	Synergistic view of emergence
	Multiple investigators	Fosters divergent perspectives and strengthens grounding
Entering the field	Overlap data collection and analysis, including field notes	Speeds analyses and reveals helpful adjustments to data collection
	Flexible and opportunistic data collection methods	Allows investigators to take advantage of emergent themes and unique case features
Analyzing data	Within-case analysis	Gains familiarity with data and preliminary data generation
	Cross-case pattern search using divergent techniques	Forces investigators to look beyond initial impressions and see evidence through multiple lenses
Shaping hypotheses	Iterative tabulation of evidence for each construct	Sharpens construct definition, validity and measurability
	Replication logic across cases	Confirms, extends and sharpens theory
	Search evidence for "why" behind relationships	Builds internal validity
Enfolding literature	Comparison with conflicting literature	Builds internal validity, raises theoretical level, and sharpens construct definitions
	Comparison with similar literature	Sharpens generalizability, improves construct definition, and raises theoretical level
Reaching closure	Theoretical saturation when possible	Ends process when marginal improvements becomes small

Table 6.1: Research process for multiple case study. From Eisenhardt (1989a).

the researcher to compare inferences across cases, which improves the internal validity of a study. Furthermore, using multiple cases also enhances the external validity of the study by showing that conclusions are not merely based on idiosyncratic evidence from a single case study (Eisenhardt, 1989a; Voss et al., 2002). Yet, increasing the number of cases inevitably leads to increasing amount of data. Since a research usually has limited resources at hand, this leads to decrease the "depth" and richness of each study, which downplays the strengths of case study methodology (Dyer and Wilkins, 1991).

While there is no general guideline as to the required number of cases to be included, Eisenhardt (1989a) suggests selecting 4–10 firms for the analysis. This range of number of cases is also supported by McCutcheon and Meredith (1993) and Meredith (1998), who advice using two to eight cases for theory-developing case study research. However, since the purpose of case studies not to be externally valid in the sense quantitative methods (Flyvbjerg, 2006; Yin, 2003), the choice of number of case firms ultimately depends on the requirements of theory development, and not on requirements of external validity (cf. Siggelkow, 2007). In other words, cases should be included on the basis of their contribution of providing contrasting evidence for the emerging theory, rather than for supporting the generalizability of the results.

6.2.2 Case selection

As indicated by Eisenhardt (1989a) and Pratt (2009), it is advisable to explicitly define the population from which the cases are selected from. In this research, the cases for this multiple case study were selected on the basic criteria used to scope the entire study. In other words, the selected firms needed to be Finnish software firms who developed and delivered their own software products to organizational customers, and for whom at least 50% of their revenue came directly from sources related to their IPR (license sales or maintenance fees). In addition, as knowledge-intensive services were the key issue analyzed in this study, care was made to select only firms which had professional services such as consulting and training in their services in contrast to pure software-related services such as custom software development or installation. This condition was quantified as demanding relevant firms having at least 10% of their revenue coming from professional services.

Case selection was based on the data from the Finnish software industry survey (Rönkkö et al., 2008). We used purposive sampling to select the case firms. In other words, the firms were selected based on the measures that were deemed to be important for the purpose of developing theory of solution provision through comparison between different firms. The important measures were identified based on the previous in-depth case study. In addition to the antecedent measures, the case firms were also varied in their performance measures.

We consciously varied the known population of eligible firms, and chose potential firms by ensuring that the overall sample of case firms had enough variance in terms of both explaining, control, moderating, and control factors. Choice of these factors was based on the extant literature and results of the in-depth case study. Naturally, these preselection criteria were subject to the limitations of the data available in the used database. Finally, we had chosen a list of potential firms as stratified by firm size, firm age, revenue shares of services, revenue growth, and profitability.

Next, these potential firms were first contacted by e-mail, and then contacted by phone within one week from sending an initial e-mail. The purpose and demands of the study were explained to the firms, as well as the potential benefits to participating firms (feedback on the firm's strategy and business model, and benchmarking). Wherever possible, direct and indirect personal contacts were used to make faciliate the contacting of firms.

In most cases, the contacted software firms agreed to participate in the study. However, two selected firms refused to participate in the study. In the case of refusal, we chose additional firms with similar characteristics to that refusing to participate and contacted these firms. Furthermore, at the conclusion of the first seven case firms, it was deemed that younger firms were underrepresented, given the emerging importance of the product/market life cycle phase on the strategic impact of service provision. Therefore, two start-up firms were contacted at a later phase in the research and included as last two cases (Cases Kappa and Lambda).

Finally, we had a set of nine case firms for this study, including Case Alpha which was the context of the in-depth case study (cf. Leonard-Barton, 1990). These firms agreed to participate in the study in various degrees, ranging from one informant within the firm's top management team (Case Kappa) to fourteen informants both inside and outside the case firm (Case Alpha). In addition, all participant firms agreed to share their financial and all other relevant numerical information with the author, whenever these data were not available from public sources. Together, the case firms had total revenues of over 120 million euros in 2008, accounting for approximately 3.9% of the revenue of the entire Finnish software industry (cf. Rönkkö et al., 2009).

For reasons of confidentiality, the case firms are not explicitly named in this study. Instead, we use the Greek letters to denote these cases. In addition, for the same reasons exact numerical measures of the case firm's size, personnel and so on are not presented. Instead, we use revenue and personnel size classes to describe the case firms. The descriptive data of the case firms are presented in Table 6.2.

6.2.3 Qualitative data collection

Multiple informants for each case were used for most of the case firms. Using multiple informants allows for informant triangulation, and reduces the dependence on CEOs as sole informants for firm-wide data (Kumar et al., 1993; Sharfman, 1998). These measures should improve the construct validity of the data. Moreover, using multiple informants allows us to combine the expertise of many individuals, which potentially provides more accurate and comprehensive data about the case than using only the CEO as the sole informant (Golden, 1992; Kumar et al., 1993; Sharfman, 1998).

Case	Revenue class (MEur)	Age	Professional services (%)	Revenue Growth (%)	Profitability (%)	Informants
Alpha	5--10	17	11	2.3	0.9	14
Beta	5--10	10	40	60.3	-24.6	6
Delta	1 - -5	22	45	-29.4	-7.1	5
Epsilon	<1	19	25	4.6	13.5	4
Gamma	>10	42	18	8.5	15.4	3
Kappa	<1	4	30	463.4	16.5	1
Lambda	1 - -5	5	20	144.0	0.0	3
Theta	>10	23	32	22.2	10.5	3
Zeta	1 - -5	18	20	-1.0	9.1	4

Age: Time from founding year
Professional services: Revenue share percentage of professional services

Table 6.2: Case firm descriptive characteristics in 2007

Informants from each case firm were selected based on three criteria: 1) their organizational position, 2) their expertise on the topic relevant to the study, and 3) their availability for interview within reasonable time. In addition, some consideration was also given to choosing informants with different length of experience in the firm and industry (Starbuck and Mezias, 1996). Access to informants was usually granted through a key informant, who in most cases was the CEO of the case firm. This ensured we had access to all informants who were in positions to provide the best possible accounts about the topics of the research. A full list of informants is documented in Appendix F.

The interviews were held were held during the period of from March 2009 to November 2009, except for Case Alpha, for which interviews were held in November and December 2008. This timing of the interviews ensured a fairly homogeneous general environment for the case firms, at least in terms of macroeconomic situation.

As indicated by Golden (1992), Kumar et al. (1993), and Huber and Power (1985), measures can be taken to ensure the efficient collection of data using informant interviews. In this study, this was facilitated by conducting the interviews at case firm premises at a time convenient for the informants. The informants were also given a short written introduction about the topic and purpose of the interviews. In addition, the informants received the used interview guide beforehand, allowing them to orient themselves to the topic matters of the interview, and prepare answers, if they so desired.

Data from informants were collected using semi-structured interviews. The interview guide was developed based on the initial one used in the in-depth case study, which was further modified to incorporate the theoretical insights from that study. In short, the interview guide asked the informants to indicate which customers the firm served, what did the firm's offering consist of, briefly define the product and nature of the firm's technology, competition and market situation, the strategy of the firm, service offering, the use of ser-

vice and reseller partners, as well as the knowledge and capabilities of the firm. Moreover, the informants were also asked how they assessed the potential impact of service provision and service capability on firm performance.

In addition, in the course of the multiple case study the interview guide was updated with regards to the wording and order of questions based on informant feedback and insights emerging during the interviews. Yet, the changes made to the interview guide were relatively minor, and no changes were made to the topical areas included in interviews. In other words, the actual themes of the interview remained constant throughout the study. The final version of the interview guide can be found in Appendix E.

The interviews were not restricted to the ordering of the questions in the interview guide. In other words, fluidity of the conversation was deemed more important than sticking to a preset order of questions. Moreover, as described above, the ordering and wording of the questions used was tweaked during the study, indicating that the meaning of the ordering was jeopardized anyway. However, great care was taken to cover all topical critical areas during each interview. In addition, we also pursued emerging themes which seemed important through additional probing questions (cf. Merton and Kendall, 1946; Charmaz, 2006).

In addition to actual subject matter, firm experience, total industry experience, formal training, sex and position of informants were inquired during interviews. However, these factors had very little, if any, bearing on the actual data collected, as suggested by the a priori objective nature of the study. Therefore these factors are largely omitted from further analysis.

In addition to the interview data, research notes were also taken on paper during and after the interviews. These notes related to the general impression of the informant, insights and themes emerging during the interview, and methodology related issues, such as comments on the fluidity of the overall interview, and the understandability and ordering of individual items.

6.2.4 Quantitative data collection

Quantitative data was collected on the case firms to provide external measures for several constructs in the case study. Table 6.3 shows most important quantitative measures acquired. For most these figures, data were collected for the time period 2003–2008, except for Case Kappa and Case Lambda, which were founded in 2005 and 2004, respectively. The available quantitative data on the case firms thus constituted a longitudinal panel data set. However, some measures were only available for the years 2007 and 2008.

Most of the numerical data were available from the Finnish software industry survey (Rönkkö et al., 2009). However, for some parts concerning revenue and assets data were obtained from Finnish authorities based on the firm's official income statements. In addition, financial reports from publicly listed

Construct	Description	Time Range
Age	Age of the firm, calculated from the founding year of the firm	2003–2008
Revenue	Total sales of the firm	2003–2008
Profit	Earnings of the firm before interests and taxes	2003–2008
Personnel	Number of personnel as reported by the firm at the end of the period	2003–2008
Revenue shares	How the revenue is divided among IPR-related revenue, maintenance revenue, professional services and software development services	2003–2008
International revenue	The percent of revenue from countries outside Finland	2003–2008
Partner revenue	The percent of revenue generated by partners of the firm	2003–2008
Competitive environment	Firm's assessment of its competitive environment	2008
Financing structure	Dummy variables for firm's financing structure: indication of use of venture capital and private investor's money	2007–2008
Growth orientation	Firm's assessment of its attitude towards growth and internationalization	2007–2008
Service standardization	Firm's assessment of the level of standardization of its services	2008

Table 6.3: Quantitative measures used in multiple case study

case firms were inspected, providing a third source of data. For the privately owned, non-public firms, these data were made available by request. Inaccuracies and errors in these quantitative data were checked and corrected by case firms during feedback sessions.

The final list of identified constructs and their data sources are listed in Table 6.4. As suggested by the table, most of the outcomes, explanatory and control factors used in the study were available in quantitative form, mostly from the external survey database. Furthermore, most of these measures could be triangulated with qualitative data collected from informants. By contrast, most of the moderating variables were mainly inferred from qualitative data. This is not really a weakness of data but actually important because of the inductive nature of the study; as we are trying to analyze the moderating effects of organizational and environmental contingencies, a qualitative approach is likely to yield more detailed and rich results than strictly quantitative approach. Yet, for some variables, such as internationalization or revenue from partners, quantitative survey data were also available.

6.2.5 Data analysis

The data analysis of interview data followed the three-step process described in Table 6.5. The process consisted of three distinctive phases: *coding, within-case analysis, and cross-case analysis* (cf. Eisenhardt, 1989a). In the coding phase, we coded the informant data elicited with interviews to introduce more

Construct	Case firm sources			External sources
	Interviews	Archival	Quantitative	Survey
Explaining factors				
Service offering	X	X		
Service revenue			X	X
Service standardization	X		X	X
Moderating factors				
Competitive environment	X			X
Offering type	X	X		
Product complexity	X			
Customer segment	X			
Capabilities	X			
Partner use	X		X	X
Internationalization	X		X	X
Control factors				
Growth orientation	X			X
Firm size			X	X
Financing	X		X	X
Firm age		X	X	X
Outcomes				
Revenue growth			X	X
Profitability			X	X
Internal assessment	X			

Table 6.4: Constructs and data sources of multiple case study

structure to the data. In within-case analysis, we compared the accounts of different informants within each case and inferred value for constructs for each case. In cross-case analysis, we looked for similarities and differences across the case firms. In short, we searched for patterns between different constructs in the data through comparative analysis of the cases.

Coding

In the first step of the data analysis process, coding, each interview was coded according to the practices found in grounded theory approaches (Strauss and Corbin, 1990). In other words, each paragraph of interview data was analyzed for constructs and relationships mentioned by the informant (Charmaz, 2006).

The coding methodology used for the multiple case study was similar to the one used in the first step of in-depth case study. In other words, each paragraph of transcribed text was coded with as many codes from a coding structure as seen fit. However, this time we used a predefined coding structure based on the preselected constructs from in-depth case study and literature review instead of a fully emergent structure. Yet, we allowed the coding structure to evolve based on the empirical evidence. For example, we had no clear structure for delineating competitive environment prior to starting the coding of textual data. The detailed coding structure of this and some other constructs emerged during the coding phase.

Phase	Description	Data used
Coding	Use a priori defined coding scheme for constructs and relationships with updates due to data; establish rules for coding	Interview data
Within-case analysis	Based on coding, compare informants' answers and deduce value for each construct and relationship; establish rules for inference; compare with external measures; record quotes for process transparency	Coded interview data; archival data; quantitative measures
Cross-case analysis	Compare construct values between cases and account for possible discrepancies; tabulate key constructs; compare results with results for construct relationships	Case values for constructs; quantitative measures

Table 6.5: Data analysis phases in multiple case study.

Within-case analysis

The coding of textual data for individual informants was followed by a within-case analysis, as suggested by Eisenhardt (1989a) and Miles and Huberman (1994). During this phase, the informants' accounts from each case firm were compared to each other to infer a value of each variable of the case. For example, the intensity of competition for a case firm was inferred from the comparison of answers of all informants.

In addition to actual inferred values of constructs, we also inferred the relative confidence level of the value for each construct from the informants' answers. While this confidence level is by no means objective nor does it bear any statistical meaning, it nevertheless provides some tentative information about the overall validity of the inferred construct value. The scheme used for assigning confidence levels is described in Table 6.6.

In short, a three-star confidence level means that *all* informants within one case firm provided essentially same information about a construct. However, since not all constructs were discussed with all informants of a case, these three-star confidence levels were quite rare. A two-star confidence level meant that at least half of the informants gave concurring evidence on a constructs, with no informant giving evidence that would contradict the inference. A one-star confidence level means that at least one (but less or exactly half) informant provided positive evidence on a construct. In case Lambda, with only one informant this meant that the sole informant provided the evidence. A question mark as confidence level indicates that informants of a case gave contradictory (e.g., both positive and negative) evidence on the value of a construct. Wherever possible, external evidence was used in these cases to provide further evidence on the value of the construct.

During the within-case analysis, all quantitative external measures were incorporated in the analysis. The values of constructs inferred from informants' accounts were compared to the externally acquired measures for these con-

Confidence level	Description
* * *	All informants gave concurrent accounts
**	Majority (at least half) of informants gave concurrent accounts
*	At least one informant gave concurrent account
?	Informants gave contradictory evidence

Table 6.6: Rules for indicating the quality of within-case inference

structs. This method enabled data triangulation and ensured that values of most constructs were indeed based on reality.

In addition, indicative quotations from the informants were collected at this point. Following Eisenhardt (1989a), this approach provides a clear chain of evidence from the data to the inferences made based on that data, and allows readers to make their own inferences. The quotations were selected to provide a compelling way to describe the situation of the case firm in the own words of the informants. As most interviews were conducted in Finnish, the quotes were also translated at this point. These translated quotes were later presented to the informants to ensure the translation agreed with what they had intended. Furthermore, the quotes were also polished at this point: unnecessary words were omitted, and redundant filler words were deleted. We did, however, indicate in the quotes when these omissions were made.

Initial results based on the within-case analysis were presented to each case firm shortly after the completion of interviews and within-case analysis. This presentation ensured that the quotations from informants were translated and understood correctly, and that the inferences made from within-case analysis were concurrent with the informant's knowledge. Seeking this feedback from case firms enhances the internal validity of the case study (Eisenhardt, 1989a).

Cross-case analysis of direct relationships

The final phase of qualitative data analysis — cross-case analysis — consisted of comparing evidence from all cases. In particular, we looked for similarities in the data across cases, and differences between the cases, and patterns these differences form. The purpose of this analysis is to identify relationships between different factors in the data.

The data, consisting of both qualitative and quantitative data, were analyzed using the *tabular displays* advocated by Miles and Huberman (1994) and Eisenhardt (1989a). In practice, these displays are condensed displays of data, and either show the values of constructs for cases, or display the positioning of cases based on two constructs (Miles and Huberman, 1994). The purpose of these displays is to facilitate the analytical comparison of cases with each other and the identification of underlying patterns. Wherever reasonable, we also added direct evidence from the within-case analysis in the form of informant quotes that justify the values of factors for each case.

The cross-case analysis of the multiple case study data was broadened longitudinally by considering separately two three-year periods, the years 2003–2005 (Period 1) and 2006–2008 (Period 2). For the first period, we had full data from five firms; and for the latter from all nine case firms. In total, we thus had fourteen firm–period cases for cross-case analysis.

The averaged three year period values for outcomes and service provision factors were used for three reasons. First, the three-year averages of performance measures provide a more robust and reliable indicator of firm performance than year-to-year measures (Richard et al., 2009). This should improve the construct validity of our analysis. Second, taking averages allows us to somewhat compensate for missing data. In other words, through taking averages we could cope with some missing annual data to proceed with further analyses. Finally, this averaging provided a further degree of protection for preserving case firm anonymity.

The cross-case analysis of direct relationships between explaining factors and outcomes followed a relatively systematic process. First, a tabular display was constructed with the specific explaining and outcome variables of interest, together with all relevant moderating and control variables. Next, we inspected this display for patterns in the data in two ways. First, we inspected whether the cases with better performance had differing value in terms of explaining variables. Second, we inspected whether the cases with larger value of explaining variable had better performance than those with lower value. This two-way inspection procedure provides a bit more reliable results about the relationships between variables than mere one-way inspection. There were combinations of variables for which there were no clear pattern in data, those with pattern in one of the inspection methods, and those for which both methods produced a concurring result. The strength of the pattern was recorded in analysis notes.

Finally, since we had longitudinal data for five firms, we also inspected whether there was differences in variable patterns across time. This was done by comparing the pattern of variable values in Period 1 (2003–2005) to that of Period 2 (2006–2008). Again, the results varied. Some patterns were stable over time, while others failed to produce a concurring pattern in both periods. However, since we did not have full data for all nine firms (of which two were actually founded after Period 1), the results of this analysis are not as reliable as those of the two-way pattern matching described above. Furthermore, the lack of direct qualitative data for Period 1 also reduces the reliability of this analysis. In any case, whenever patterns were found to hold over time, this was recorded in analysis notes.

Cross-case analysis of moderated relationships

Cross-case analysis of moderating relationships proved a bit more challenging to infer directly from tabular displays showing the cases in linear man-

ner. Furthermore, most applications of case study methods only consider direct, linear relationships between constructs (cf., Eisenhardt, 1989b; Ozcan and Eisenhardt, 2009). Thus, in order to facilitate the inference of moderating effects, we devised and followed the following process: first, we divided the firm-year cases into two groups based on the potentially moderating factor. The division point was chosen based on the average value of the moderating factor. Most distributions of these variables were quite symmetrical so this should not introduce significant bias into the analysis.

Secondly, we further divided the two groups of firm-year cases based on both main explaining factor and outcomes. The division points were chosen based on the mean values of these factors after ignoring "outlier" values. Outliers were observations that were clearly outside the range of values exhibited by other cases. For example, the high revenue growth rates of case Kappa and Lambda were assigned as outliers. This resulted in maximum of four groups of firm-year cases for both low and high values of the moderating factor.

Third, we calculated the average values for both explaining and outcomes factors grouped in the last step, again ignoring obvious "outlier" values. This procedure provided us a rough numerical estimate of the sign and magnitude of possible relationship between the explaining and outcome factor. Of course, the calculation of these averages is marred by the low number of cases in each division, as well as the potential impact of skewed distributions of variables.

Fourth, we placed the firm-year cases in a 2 x 2 matrix (or 3 x 2 matrix, in the case of service capability) based on the values of the explaining and outcome factors in comparison to the calculated averages of the group of cases relating to one value of a moderating factor. In other words, these average division points were different for the group of firms related to the high and low values of the moderating factor. This positioning of the cases was thus made in relation to the other cases within the particular value of the moderating factor. This positioning of the cases in relation to each other provided us with a rough (graphical) pattern of the relationship between the explaining and outcome factors.

Fifth, we resolved the role of "outliers" and borderline cases for the emerging pattern of moderation. "Outliers" refer to cases which differ significantly from other cases in terms of one or more variables. While they are useful for elaborating and testing emerging theory, accepting them at face value could have lead to false conclusions about the patterns in data. In practice, this usually referred to the younger case firms (Cases Beta, Kappa and Lambda) whose revenue growth and profitability figures are more extreme than those of the more mature firms. The values of the outcome factors for these cases can be readily explained by their age, small size and high willingness to grow, shown in Table 6.11.

Sometimes, a case was placed in a particular cell in the explaining factor

– outcome matrix even though they would more naturally reside in an adjacent cell as judged by other factors affecting performance. These cases are called borderline cases. Whenever this happened, we analyzed other factors relating to the case and replaced the case accordingly. Another way to resolve these *borderline* cases was to check whether using a median instead of mean values for explaining and outcome factor threshold values would change the positioning of borderline cases. All changes made to borderline cases were noted in the detailed analysis of moderating relationships.

Finally, we compared the case firms' informants perceptions of the hypothesized relationships. While these perceptions do not provide objective evidence for the emerging patterns in data, they do suggest the viability of the identified patterns. We will discuss these perceptions in relation with these moderation analyses.

6.2.6 Feedback from informants

Accuracy of the informant's descriptions and inferences based on these accounts were tested on two separate occasions by holding feedback sessions with case firms. The first feedback meeting typically took place within six to eight weeks after the last interview within that case firm. During this first meeting, preliminary results from the research were presented to the case firm informants. In addition, the case firm was benchmarked against other case firms, and also against relevant industry characteristics derived from the industry survey (Rönkkö et al., 2009). This initial feedback session provided relatively quick feedback from the case firm informants about the accuracy of the conclusions drawn from the within-case analysis between informants, and allowed to ensure the external validity of the conclusions made.

The second feedback sessions were held in February and March 2010. In this session, the full results from the cross-case analyses, and the findings of the research were presented to case firms. In addition, the full range of data used from a single firm was presented in order to allow the informants to correct potential errors in data and conclusions drawn from the data. Furthermore, potentially relevant data that was not included in the original interview guide were elicited at this point. This included items related to the complexity of the case firm's solution. Questions on potentially missing quantitative data were also collected at this point.

6.3 Results of within-case analysis

We begin the analysis of the multiple case study data by performing within-case analysis. During this phase, we try to establish the key constructs for the emerging theoretical findings, and to infer the values of these constructs for

each case firm studied. In other words, we compared data within each case and do not yet compare data across different case firms. This was done by analyzing the interviews of case firm informants, and combining these results with externally available financial and other data.

6.3.1 Explaining factors

Service offering

We first assessed the tentative explaining factors of the study through both qualitative and quantitative evidence. First, we sought to identify the extent and variety of each case firm's service provision activities. Table 6.7 shows the service offering of the case firms. The contents of the table were inferred from the informant's answers, and validated in feedback sessions with the case firms. All in all, the findings were compatible with the generic integrated solutions literature — the typology of pre-sales services, product development services, implementation services, and maintenance services seem to fit well the context of enterprise software firms (cf., Davies, 2004; Sawhney, 2006). In addition, the product-oriented/customer-oriented service dichotomy was found useful in analyzing the service offerings of the firms (Mathieu, 2001a).

Regarding the actual economical importance of knowledge-intensive services, we also used the data on the revenue shares of the case firms. Table 6.8 displays the average revenue shares of the case firms over the time periods of 2003–2005 and 2006–2008. Averaging over several years provides a more robust view of the firm's service provision, since there may be significant idiosyncratic differences between different years, depending, for example, on the realization of important customer deals or macroeconomic situation.

Table 6.8 also shows that not only are there significant differences between the case firms regarding their service provision, but also that the relative importance of different services has evolved during the two time periods. In general, the trend seems to be towards more services, with the share of both maintenance services and professional services rising between the periods, and the simultaneous decrease in revenue from pure license sales. This is also apparent of the evolution of revenue shares of various sources over the period 2003–2008, shown in Figure 6.1.

The diagram shows that, on the average, the share of IPR related revenue has been slowly decreasing over the observed period. Furthermore, since most of the case firms use a pricing model consisting of license sales and maintenance fees that are fixed to license prices, maintenance fee revenue typically follows license sales and, more importantly, as a firm's product proliferates in the marketplace, the firm's existing customer base gradually grows. It is thus not surprising that the share of maintenance fee revenue from all IPR revenue has increased in the case firms.

Service category	Service	Kappa	Lambda	Beta	Alpha	Delta	Epsilon	Zeta	Theta	Gamma
Pre-sales	Proof-of-concepts	X	X	X	X			?	?	X
	Demos	X	X	X	X	X	X	?	X	X
	Process consulting	X	X	X	X			(X)	X	X
	Solution planning	X	X	X	X	X	X	X	X	X
	Auditing	X		X		(X)				
SW development	Software customization	(X)	(X)			X	(X)	X		
	New software development							(X)		X
Implementation	Installation	X	X	X	X	X	X	X	X	X
	Configuration	X	X	X	X	X	X	X	X	?
	Integration	X	X	X	X	X	X	(X)	X	
	Migration	X	X	X						X
	Testing	X		X						
	Data conversion	X								X
	Workshops	X	X	X	X	X	X	X	X	
	Project management	X	X	X	?	X	X	X	X	X
	Process consulting	(X)	X	X	X	(X)	X	?	X	X
	Training	X	X	X	X	X	X	X	X	(X)
Operations	Product maintenance	X	X	X	X	X	X	X	X	X
	Upgrades	X	X	X	X	X	X	X	X	X
	Admin user service	X	(X)	?	X		X	(X)	X	X
	User support	X	X	X	X	X	X	X	X	X
	Upgrade service package			X				X		
	Process consulting		X					(X)	X	X

X = service offered by case firm; (X) = service offered to some extent; ? = contradictory evidence

Table 6.7: Service offerings of the case firms

	Deviations from mean revenue shares							
	2003–2005				2006–2008			
Case	**IPR**	**Maint**	**Prof**	**Devel**	**IPR**	**Maint**	**Prof**	**Devel**
Lambda	§	§	§	§	0.19	-0.17	-0.08	0.06
Epsilon	0.13	-0.01	-0.05	-0.06	0.15	-0.07	-0.03	-0.05
Kappa	§	§	§	§	0.12	-0.17	0.08	-0.03
Alpha	0.03	0.14	-0.12	-0.06	0.04	0.17	-0.12	-0.08
Beta	0.10	-0.02	-0.03	-0.04	0.01	-0.02	0.07	-0.07
Zeta	-0.10	-0.11	-0.13	0.34	-0.05	-0.05	-0.01	0.10
Theta	-0.11	0.02	0.15	-0.06	-0.14	0.08	0.12	-0.08
Delta	-0.04	-0.06	0.14	-0.02	-0.15	-0.07	0.11	0.11
Gamma	#	#	#	#	-0.23	0.26	-0.09	0.06
Mean	*0.50*	*0.19*	*0.25*	*0.06*	*0.45*	*0.22*	*0.25*	*0.08*

§ = Not applicable to these cases; # = no data available; IPR = direct IPR-related revenue; Maint = maintenance services; Prof = professional services; Devel = development services

Table 6.8: Deviations from mean revenue shares of case firms

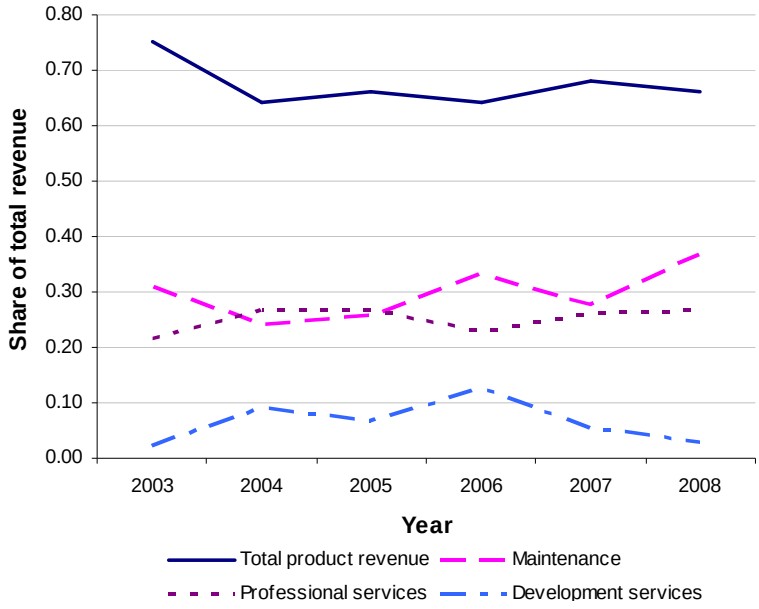


Figure 6.1: Trends of revenue shares

By contrast, the revenue shares of both professional and development services have remained relatively stable over the period 2003–2008. If anything, professional service revenue has slightly increased in importance. This stability in service revenue indicates, firstly, that the case firms have provided these services constantly throughout the observed period. This implies that services have been an important part of the case firm's business. Second, the stability of service revenue in comparison to firm performance figures suggests that the average service shares, per se, do not fully explain differences in firm performance. We must thus consider additional contingent factors to

account for the variance in individual firm performance.

Case firms Kappa and Lambda were founded in 2005 and 2004, respectively, so they are not present in the first time period. The relative difference between these firms' service offering and the others can be explained by the fact that they are selling their software mainly with the Software-as-a-Service model, which is usually based on time-bound fees rather than one-time license sales. However, in other ways they were essentially similar to the other case firms.

Service capability

Service capability refers to to aspects of service management capability: the internal aspect, which covers service operations and competence management, and the external aspect, which covers service marketing and quality management. However, for the sake of cross-case analysis here we treated service capability as an unidimensional construct. The assessment of the case firms' service capability was based on the interviews with informants. We looked for concepts such as "productized services" or "standardized procedures" mentioned by interviewees, or lack thereof. Table 6.9 shows these assessments together with representative quotes from informants.

As can be seen from the table, the case firms had various degrees of service capability, ranging from low (Case Alpha) to high (Case Gamma). Naturally, there were differences in capability between firms marked as having "medium" level of service capability. Of these firms, Case Beta and Case Theta seemed to display the next highest level of competence in service management, reflected in their placement higher in Table 6.9. The positive evidence for service capability for these firms was less clear than for those with high service capability, evidenced, for example, by the informants' reluctance to assess their firm's service capability as "good". Yet, in comparison to other medium level firms, these case firms appeared to have a sligthly better grasp of service capability and an intention to improve it.

6.3.2 Control factors

As indicated in Methodology section, we also collected data on several factors that potentially have an indirect, independent impact on the outcome variables. These factors include firm size, firm age, growth orientation, and financing structure. Table 6.10 shows the values of these factors for the case firms. In the following, we discuss these control factors in more detail.

Firm size

We used total revenue and total number of personnel as measures of firm size. Firm size has been shown to have a significant impact on the revenue growth of a firm (Evans, 1987a; Hall, 1987), also in the service context (Brush and Chaganti, 1999), as well as knowledge transfer (Stuart, 2000). Therefore,

Case	Service Capability	Quotes
Gamma	High***	We've been around for so long that our services are now quite productized. [...] Implementation projects, its phases, training services, consulting services are productized better and better; but of course we need to have flexibility towards customers (SVP)
Kappa	High*	[Our pre-sales services] are very productized. [...] [The implementation phase] is also highly productized, it is in fact quite close to the assessment project, only that we don't do the comparison with current state (Development Director)
Theta	Med***	Yes, we have [invested in service management] [...] we have moved from installations to implementations (SVP, sales) I think [implementation services] are reasonably standardized; this [customer's process] is quite clear, so it is standardizable (SVP, Strategy)
Beta	Med***	We have now productized 60% [of services]. [...] We have already sold them for a year, but now they have become productized (VP, Sales) Now that we've packaged our solutions [...] and sell our new concept and new packaged model, they [customer implementations] don't vary that much (VP, Services)
Zeta	Med***	In private sector [the implementation] is quite standardized, but there's more variety in products there, and each product has its own [requirements] [...] But usually these basic things [...] specification, implementation and then training [...] are repeated (CEO) Service productization has been our policy for many many years, [...] so there isn't anything new in it (Sales Director)
Delta	Med***	We have actually laid down a framework for what is the whole offering — what the customer gets when it orders the product. [...] it always contains these installations, workshops, trainings. (Sales manager) Of course we try [to standardize implementation services], like having certain workshops (VP, Innovation)
Epsilon	Med***	In general all implementations [...] have certain procedures and discussions [...] and are quite well-honed (Project manager) We have named the phases [of the implementation package], how much time they take and in which order everything takes place. It's been written down in a quite detailed way. (Sales Manager)
Lambda	Med***	That has been our challenge [...] we haven't productized [our services] well enough. Basic training packages are well standardized, because we've had to deliver them to all [customers] But then next level of deeper [services], we've done a lot of productization for them this year (CEO) We've got clearly lot to do [in service standardization]. [...] on the other hand it's a great opportunity now to get them productized. Then they would also support all products and services (Business Development Director)
Alpha	Low** (?)	Currently there is no emphasis being put on services. Services are done on an ad hoc basis. If there's a need for service, then we'll try to organize it, and we'll try to do it. But there is no service structure, there's no real service offering. (KAM, Channel Sales) In comparison to average Finnish consulting firm we have considerably more standardized [services] since they are so close to the product, and they always consist of certain things. We do have lots of [...] workshops, trainings [...] done with ready concepts. (VP, Marketing)

Table 6.9: Service capability of the case firms

Case	Firm Size		Firm Age	GO	Financing
	Revenue	Employees			
Alpha	5 - 10	51 - 100	18	Med*	Public
Beta	5 - 10	51 - 100	11	High**	Business angels
Delta	1 - 5	10 - 50	23	Med*	
Epsilon	<1	<10	20	Low*(?)	
Gamma	11 - 50	101 - 500	43	Low*	Subsidiary†
Kappa	<1	10 - 50	4	High*	
Lambda	1 - 5	10 - 50	5	High*	
Theta	>50	>500	24	Med*	Public
Zeta	1 - 5	10 - 50	19	Low*	Subsidiary§

† Business unit of a publicly listed firm; § Wholly owned subsidiary of a publicly listed firm; Revenue = Total revenue class in million euros; Firm Age = Age in years; GO = growth orientation

Table 6.10: Control factor values for case firms in 2008

we deemed that including this as a control factor in the analysis was justified based on extant research. Total revenue of the case firms was available from the Finnish software industry survey database, and was confirmed by asking case firms for financial reports showing this information. The survey database data were also compared to revenue data available from third party (governmental office) sources.

Firm age

As with firm size, firm age has also been related to revenue growth (Evans, 1987a; Brush and Chaganti, 1999) and knowledge transfer (Stuart, 2000). We measured case firm age as the time in years from the founding of the firm. These data were available from the Finnish software industry database, and were checked against data reported by the case firms on their web sites. In addition, most interviewees provided evidence of the firm's age. Data in the software industry database were also checked against available data from third party sources.

Growth orientation

The growth orientation of a firm refers to the willingness of the case firms' management to take risks and prioritize revenue growth over profitability. The construct has been linked to a higher revenue growth rate and lower profitability (e.g., Covin and Slevin, 1990; Covin and Covin, 1990). We inferred the growth orientation of case firms using two methods. First, we asked informants to elaborate whether their firm valued growth over profitability. Second, wherever available, we used quantitative measures form the Finnish software industry survey. These data were measured using a seven-item scale of five-point Likert scales. This scale is reported in Appendix G.

Financing structure

The financing structure of the case firms may have an impact on the performance of the firms, since more financing is likely to provide the firms with

more resources which can be used for faster growth. Hence, we wanted to control performance on the financing structure.

Data on the financing structure of the firms was available from the Finnish software industry survey database. This database dichotomously indicates whether or not a firm has private venture capital, public venture capital, business angel investments, and whether the firm is owned by its employees. In addition, the issue was also queried in most case interviews. Moreover, several of the case firms included were publicly listed, and hence their financing structure was transparent and publicly available.

6.3.3 Outcomes

Next, we analyzed the outcome variables regarding the performance of the case firms. This analysis was based on the collected quantitative data, as well as subjective internal assessment of the firms regarding their desired performance. To assess firm performance, we compared the revenue growth and profitability of the case firms to the median values within the case firm group, as well as the median values from the larger identified group of firms for which the data were available. Median values were used since these performance measures (especially revenue growth) were skewed, in which case the median provides a more accurate description than the mean about what is the performance of the average firm.

We used these relative values for performance for two reasons. Firstly, and more importantly, using relative rather than absolute values for performance variables allows us to control potential effects that affect the software industry as a whole. As the firms are reasonably similar, they are likely to face similar macroeconomic and other truly external environmental factors. Hence, taking these relative performance values allows us to concentrate on the differences *between* the case firms and their impact on relative performance rather than between this group of firms and other kinds of firms. Secondly, using relative values for performance measures allows us to obfuscate the performance variables to some degree. This was deemed necessary in order to protect the confidentiality of the data.

Table 6.11 shows the financial performance of the case firms relative to the median of the case firms, as well as the internal subjective assessment of the firm's performance. This subjective measure of firm performance was collected for triangulation purposes, and provides an indirect assessment of the firm's performance internal financial targets and their attainment (cf. Richard et al., 2009). The table also includes an assessment of the firm's growth orientation; in other words, whether the firms were trying to increase their revenues as quickly as possibly, and potentially risking profitability, or did they try to maximize profits.

	Deviation from median performance					
	2003–2005		2006–2008			Internal
Case	Growth	Profitability	Growth	Profitability	GO	Assessment
Lambda	§	§	14.32	-0.17	High*	High***
Kappa	§	§	7.39	-0.06	High*	Med*
Beta	0.40	0.10	0.85	-0.28	High**	Low*
Theta	0.12	0.00	0.35	0.04	Med*	Med*
Gamma	-0.42	-0.25	0.00	0.06	Low*	Med*
Alpha	-0.15	0.03	-0.01	0.00	Med*	Med**
Delta	0.36	0.00	-0.02	-0.05	Med**	High*
Zeta	0.00	0.06	-0.10	0.02	Low*	Med**
Epsilon	-0.78	-0.02	-0.30	0.03	Low?	Med*
Median	*0.51*	*0.09*	*0.10*	*0.07*		

§= Not applicable to these cases; GO = growth orientation; Internal = internal performance assessment

Table 6.11: Relative performance, growth orientation and internal performance assessment of the case firms

The table shows that the case firms had significant differences in their performance both in terms of growth and profitability. This is important, given that there were also significant differences among the case firms with regards their characteristics in terms of hypothetically explaining variables. Given our objective of finding empirical relationships between explaining factors and outcomes, this variance in both explaining and outcome variables is a desired feature: This variance helps us to differentiate between firms and to deduce whether the possession or lack of certain characteristic is associated with high performance.

From the table on firm performance, we may already infer that, as expected, firm's growth orientation (e.g., the willingness to grow) seems to be positively related to revenue growth, as the three highest growth achieved by the case firms are from firms with a High growth orientation, and, by contrast, the two firms with lowest relative growth rate have a Low growth orientation. Moreover, as expected, the tendency to favor growth was mirrored in lower relative profitability for most firms with high growth orientation. In other words, firms with high relative growth tend to have negative profitability, and vice versa.

We may also conclude from Table 6.11 that the relationships between control variables — firm size and firm age — are related with performance outcomes as expected: firm size is negatively correlated with revenue growth and positively correlated with profitability. Similarly, firm age is negatively correlated with growth and positively with profitability. In other words, the older and larger case firms tend to grow slower but have better profitability.

6.3.4 Moderators – Capabilities

The first type of moderating factors considered are the internal capabilities of the case firms. Given the focus on knowledge-based view of the firm, these were modeled using a three-dimensional typology of domain knowledge, solution knowledge and technological knowledge, as identified in the in-depth case study in Chapter 5. As can be seen from Table 6.12, there were no major differences between firms between their knowledge for service provision[1]. In the following, we will discuss the three types of knowledge separately.

Domain knowledge
Domain knowledge refers to the customer's problem domain, and is usually industry-specific. All case firms had adequate knowledge about their respective solution knowledge, as well as their customer's domain. The firms had acquired such knowledge through interaction with (lead) customers (Case Beta, Case Delta), recruitment of new employees with experience from the customer domain, potentially from customers (Case Lambda, Case Gamma), and through expertise acquired before founding the firm (Case Kappa, Case Epsilon). In summary, it would thus seem that possessing such knowledge is a prerequisite for successful business in enterprise software business.

Furthermore, the evidence suggested that the youngest case firms (Cases Kappa and Lambda) were more conscious about the necessity of having customer domain knowledge. They had proceeded proactively to acquire such knowledge, either by recruiting employees with experience from the customer domain or by having prior expert knowledge about the domain through prior experience. By contrast, the older case firms had usually been very reactive about acquiring customer domain knowledge, and this had usually happened through interaction with early customers. Their emphasis had clearly been in the technological knowledge domain.

Nevertheless, all firms considered that having intricate knowledge about the solution and customer domain as an important competitive factor:

> If we talk about [one specific customer industry], which is one of our largest customer segments [...] each industry have [...] their own terminology and specific quirks. [...] It takes some time to learn these things before we can use what we have already done (VP, Regional Sales; Case Theta)

> In our [main customer segment] we have a reputation that we know the market. [...] in the other segments we have too little competence that we could exactly argument why our product would be the best for [customers] (VP, Innovation; Case Delta)

Solution knowledge
Solution knowledge refers to the actual organizational innovation supported by the case firms' product. This innovation could be based on a specific stan-

[1] Even though the values of several constructs were implied by informants, no direct quotes were available for all constructs. This is indicated by having the construct value in parenthesis in Tables 6.12, 6.13 and 6.14.

Case	Domain Knowledge Value	Quotes	Solution knowledge Value	Quotes	Technological knowledge Value	Quotes
Alpha	Low*	If we have done that [focus on some industry] we haven't had very in-depth knowledge of any vertical industry we could build on (VP, Direct Sales)	High**	"Many organizations have regarded us as the best consultant firm in Finland [...] in managing modeling activity (VP, Direct Sales)	Med	It [product configuration] has continuously increased the requirements for technical competences for our consultants. [...] implementations have become quite technical, [the customers] demand integrability and customizability (VP, Channel Sales)
Beta	Med*	I think that we would need more [knowledge] on the business domain [...] previously we have recruited so technical people (Director, Services)	High	In the Nordic countries, no-one else has this kind organization that is concentrated on this and expertise [...] we've got a lot of projects done (CEO)	(Med)	
Delta	High**	Yes [...] we do [have knowledge] to direct the discussion [...] to find out [...] what they [customers] seek from the system (Consultant)	Med**	Yes [we can discuss and advice on best practice models with customers] (Sales Manager)	Med*	Of course, we have technical expertise from courses and other sources (Consultant)
Epsilon	Med*	Yes, of course [...] I can handle the terminology, and the key performance indicators and stuff like that are easily learned (Project manager)	Med**	When we founded this company our guiding thought was that customers see us as management experts and that the software in itself is only secondary [...] firstmost, we sell ourselves to customer in a way that [...] we might be able them in developing their own processes. (CEO)	Med*	If customers do [...] operating system modifications or changes in the content [...] they might ask for help [...] and get the thing done much easier. (Development manager)

Table 6.12: The knowledge capabilities of the case firms

Case	Domain Knowledge Value	Quotes	Solution knowledge Value	Quotes	Technological knowledge Value	Quotes
Theta	Med**	[Industry-specific knowledge] does affect to some extent, we have indeed [...] industry and business sectors where our systems have sold well, so of course our competence has improved (SVP, Strategy)	Med**	Consultants who deliver solutions [...] need to be familiar with these processes and financial management (SVP, Strategy)	Med**	Now we are at a point where [...] the person who goes to customer not only does the technical implementation but also the functional implementation with customer (SVP, Regional Sales)
Zeta	High**	They [account managers] have about 20 years' experience on public sector (CEO)	High***	The typical customer/buyer knows considerably less than we do (Director, Sales); We try to [use] this expertise in our [specialty area] for new customers (CEO)	Med***	I would say [solution implementation] requires more than junior level knowledge of this [technological platform] (Director, Business Area)
Gamma	High***	Since we have a focused strategy, we need to have competence in customer's business. We need to be experts in these industries (SVP);	High*	Some [customers] have said that the appreciate extremely much that we have integrated all solution know-how of the industry and IT competence, and see that as a strength of the vendor (VP)	Med**	I believe it [managing customizations] is our [...] distinctive capability. [...] We do these development projects in a very disciplined way and make them truly maintainable (SVP)
Kappa	Med*	In my opinion [there are no great differences between industries] (Development director)	High	Our [local] competitive advantage has been based on our great expertise on these processes [...] you can talk with us and inspect processes and get intelligent answers to questions (Development Director)	Med*	I actually programmed this [small] piece of software that [...] simulates [things for a customer]. And it became a hit at the customer. (Development Director)
Lambda	Med**	You need expertise related to the industry domain, so that you can produce the information, analyze and validate the end result (CEO); In the long run [...] the emphasis will turn more into that industry specific knowledge (Director, Business Development)	High***	Then, of course, we have [...] this team who does this trend side [...] without them, there wouldn't be these products (Director, Sales)	High***	There's quite a bit of this technical stuff, which requires IT competences [...] it's pretty critical that we can manage that (Director, Sales)

Table 6.12: Continued

dardized methodology, such as Total Quality Management, or a new management methodology developed by the focal firm. The solutions provided by the case firms ranged from simple distributed financial control systems to consumer business prediction solutions based on sophisticated algorithms and in-depth knowledge of some customer domains. The case firms have acknowledged the importance of solution knowledge as a source of competitive advantage; as indicated by one informant:

> Our [local] competitive advantage has been based on our great expertise on these processes. (Development Director; Case Kappa)

In comparison to knowledge about customer domain, the case firms unsurprisingly tended to be more knowledgeable than their customers about their respective solution. However, this was not as clear as in the case of technological knowledge. There was some variation in how solution knowledge was divided between the solution vendor and customer between the case firms. Furthermore, there was indication that customers of a solution have gradually become more knowledgeable about the solution:

> The typical customer/buyer knows considerably less than we do (Director, Sales; Case Zeta)

> Luckily, the maturity of the market is starting to be on the level, especially of [our other main solution] that also customers understand [...] that [our solution] is completely different [from a substitute solution]. (VP, Direct Sales; Case Alpha)

> Our biggest competitor is an in-house solution, which is due to the newness of this thing so that customers don't yet really understand what can be achieved [with our solution]. (CEO; Case Lambda)

In other words, the customers' knowledge about the solution seemed to rise as the market matures. In a mature market, the gap in solution knowledge between the solution provider and customer organizations diminishes.

Technological knowledge

By technological knowledge, we mean knowledge related to the core product of the case firms. Naturally, the exact type of knowledge varies across cases, so in this sense the cases cannot be compared. Moreover, it is quite expectable that the firms are experts in their own technology, given their status as product firms. Nevertheless, as seen from Table 6.12, there were very little differences between the technological expertise of the case firms. However, none of the case firms actually emphasized the role of technological knowledge – there was little mention of this knowledge constituting a competitive advantage for the firms. Only in one case was this explicitly mentioned:

> Having your own product has its benefits [...] if we can link consulting to our own product, the daily price for consulting is higher [...] than for some mainstream things (CEO, Case Zeta)

In other cases, technological knowledge was seen as a necessary skill to successfully implement the product; however, evidence from the other types of knowledge suggest that in no case was it a *sufficient* prerequisite for successful solution implementation. In other words, the evidence from cross-case analysis suggests that both domain and solution knowledge are required for implementations:

> I would say that the combination [of competences] [is our competitive advantage], since we have the IT firm background. We can implement anything, put them into processes and in a format understood by customers using IT methodology (Director, Business Development; Case Lambda)

In summary, comparison of the cases revealed that there were no major differences between the case firms in terms of their knowledge about technology, or the solution offered to customers. In fact, both these types knowledge were on a surprisingly high level – including the two younger case firms. While the more mature firms had largely learned the domain and customer knowledge gradually through providing services and recruiting employees with suitable education, the younger firms seem to acknowledge the importance of such knowledge by recruiting such employees immediately after the firm's founding, or by having the firm founded by experts in the solution knowledge.

All in all, the relative homogeneity of the case firms' competences regarding knowledge on customers and their solution methodology suggested that they did not explain much of the variance in the firms' performance. Therefore, the technological, solution and domain knowledge were deemed to constitute a "must-have" or "hygiene" factor, i.e. a factor that is necessary but not sufficient for success, and thus consequently left out of the rest of the cross-case comparative analysis.

6.3.5 Moderators – Offering and customer segment

In addition to capabilities of the case firms, the characteristics of the offering and the customer segment may also affect the impact of service provision in product firms. As suggested by research on interorganizational knowledge transfer, the characteristics of the knowledge — the solution here — have an impact on the success of the knowledge transfer (Szulanski, 1996; Simonin, 1999a; Dyer and Hatch, 2006). In general, the ambiguity or the lack of codification of the transferred knowledge has a negative impact on knowledge transfer success, potentially requiring compensatory actions using knowledge-intensive services to overcome this challenge (cf. Simonin, 1999a).

Offering characteristics

We assessed the characteristics of the case firms' offerings through several questions probing into the ease of implementation, size of deals, importance to customers, and so on. Using this data, we inferred the overall complexity of the solution. Based on case data, we landed on three types of criteria. First, we judged whether the solution was a process solution or a point solution. A process solution is used by many employees of a customer organization simultaneously and automates certain processes of the organization. By contrast, a point solution is mainly used by individual employees of the customer organization, with little interaction between different users. There is also very little, if any, process automation in point solutions.

Second, we inferred whether the case firm's solution was developed to support the customer organizations' core business processes or administrative support processes. This difference has implications for the relative importance of the solution in customers' eyes, and is also indicative of the overall complexity of the solution. Typically, a closer a vendor gets to the core business processes of a customer, the more complex the solution gets and the more important it is to the customer.

Last, we also assessed the overall complexity of the solution using three factors as indicators: the length of the sales cycle, project size in terms of overall deal size (including both software and knowledge-intensive services), and the generality of the product. All these factors were queried from informants inferred from the informants' answers. Length of the sales cycle indicates how important the solution is to the customer, how much the customer will invest in the solution, and how "complex" or "difficult" the customer will cognitively perceive the solution to be. The project size again indicates the importance of the solution to customers, as well as the overall magnitude of the implementation project. Generality of the product refers to the flexibility and degree of standardization of the solution. A more generic solution is usually more difficult and to costly to implement.

Based on these three factors, we also calculated an aggregate index for the solution complexity for each case firm. Each factor was evaluated on a three-item scale (high, med, low) based on interviewees' accounts, moderated by data available from the case firms' web site and subjective inference based on overall perception of the case. These values were then quantified (high = 2, med = 1, low = 0) and added together to form an index for the solution complexity, which has a range from 0 (least complex) to 6 (most complex). All the values of individual factors and the overall complexity index value, together with representative quotes from selected informants, are shown in Table 6.13.

Case	Offering		Complexity						Index
	Type	Process	Sales Cycle (+)		Project Size (+)		Product Generality (+)		
Alpha	Process	Support	Long	Sales cycle varies widely [...] let's say from few months up to a year (Account Manager, Direct sales)	Med	Our average sales size is [...] 30 000 to 40 000 [euros] (CEO)	High	Every customer [...] always want[s] to do something that's that little bit different. Our problem is we can support all those little differences that we do. (KAM, Channel Sales)	5
Beta	Process	Support	Long	Our sales process takes quite long time, in quite many [cases] that are in closing stages discussions were initially started a [...] year and a half ago (Director, Services)	(Med)		High	[Our product] is a kind of development environment upon which models are built, and building those models yourself [...] even though they would be ready [...] is not easy (Director, Sales)	5
Gamma	Process	Core	Long	We have such ongoing prospects that we have been there every spring and fall [...] and to discuss whether it would be a good time (VP)	High	[These are] extensive systems whose implementation has been quite challenging (VP)	Med	If we think about our offering to the public sector the fact is that it has been very standardized in Finland (CEO)	5
Lambda	Point?	Core	Long	The longer sales [times] are related to [our core product], there we have to develop customer's understanding quite a bit. (Director, Sales)	(High)		Med	We change the process [...] by introducing a new way to do it. And we bring the tool, we automate or half automate it [...] that's how we change the process (CEO)	5
Theta	Process	Support	Med	For [solutions], we talk about six to nine visits and about half a year, nine months sales cycle, that's already pretty intensive (SVP, Regional Sales)	Med	If our implementation takes 25 to 60 days [...] then we talk about a consulting project worth 30 000 [euros] or 70 000, and for small systems it's around 25 000. [...] For a big system with lots of users, it's around hundreds of thousands (SVP, Regional Sales)	High	Of course we have the dilemma that our product has so broad functionality; [...] we can implement the process in so many different ways (SVP, Regional Sales)	4

Table 6.13: Characteristics of the case firms' offerings

Case	Offering		Complexity					Index
	Type	Process	Sales Cycle (+)		Project Size (+)		Product Generality (+)	
Kappa	Point?	Core	Long	The fastest [sales] cycle has been [...] three months, and the slowest ones have matured the thought for some couple of years (Development Director)	High	It [project size] varies quite directly depending on customer organization size. But [projects] with five figures are pretty rare [...] typically it's six figures (Development Director)	(Low)	4
Epsilon	Process	Support	Med	[The sale cycle] varies greatly but very few cases are realized under half a year (Sales manager)	Med	New customer sale invoicing [...] brings quite a bit sum, about 10 000 [euros] immediately, but then there's no significant invoicing for many months (CEO)	Med	We have a flexible solution [...] that is implemented with us and which completely [...] matches [customers'] needs (Sales Manager)	3
Zeta	Process	Support?	Med	It's more accurate to talk about months than weeks, perhaps I'd say two three months [...] is optimal but sometimes it goes up to four (Director, Business Area)	Low	The investments are smaller in [our solutions] compared to some ERP systems [...] In ERP systems we talk about millions, in our systems it's about tens of thousands (Director, Business Area)	Med	We have basic product solutions that work according to ready concepts. They are pretty comprehensively parametrized [...] if a customer wants it to work in a specific way then we just need to select one check box (Director, Sales)	2
Delta	Process	Support?	Med	On the average, [sales cycle length] is a few months, perhaps four months. In some cases, [...] it's only week or two, for example [...] and in the other extreme its year, year and a half (VP, Sales)	Low	In [our main segment] we talk about thousands of euros, perhaps the ceiling being 10 000 euros. So it's from 1 500 euros upwards (Sales Manager)	Med	Products that are intended for our [main customer segment], [...] we don't really do customizations for them, but all option lists can be edited to suit customer [...] even though everybody has the same data (Sales Manager)	2

Table 6.13: Continued

Customer segment

In addition to offering characteristics, we asked informants to describe their main customer segment. This factors was deemed independent of the offering characteristics, as it is possible to offer different type of solutions to the same customer segment. As noted by McDougall et al. (1994), the breadth of the solution has an impact on new venture growth. The characteristics of the customer segment were queried using the concepts *customer organization size, industry, and number of potential customers*.[2]

Table 6.14 shows the inferred values of these three factors for the case firms. These values are based on the interview data. All three factors were assessed on a three-point scale (Low, Medium, High). As can be noted from the table, there is a clear negative correlation between the first two factors, the industry focus and customer size focus, and the third factor, number of potential customers. In other words, high industry and customer size focus tends to be related with low number of potential customers. Of course, this is to be expected, as tighter customer focus excludes more potential customers, leading to lower number of potential customers.

In this sense, the case firms vary from those with a tightest focus in terms of target customer industry and customer size (Case Kappa, Case Lambda) to those with very little focus (Case Alpha, Case Epsilon). We calculated a customer focus index based on these inferred values of factors by assigning numerical values for the inferred values (Low = -1, Medium = 0, High = 1) and summing these three values, accounting for the negative correlation of potential number of customers by subtracting it from the two first factors. Potentially, the cases thus vary from -3 to 3 on this index. In practice, the minimum value (-2) was assigned to Case Alpha and Case Epsilon. The maximum actual value (2) was assigned to Case Kappa and Case Lambda.

6.3.6 Moderators – Competitive Environment

The state of the firm's competitive environment and markets can have an impact on the necessity of knowledge transfer (Tushman and Anderson, 1986; Grant and Gregory, 1997). Therefore, we included an assessment of the case firms' competitive environment as a moderating factor in the analysis. As indicated in research design and the questionnaires used for interviews, we used multiple different concepts to probe the firm's competitive environment. More specifically, we used the informants' assessment of market growth, price competition in the customer market, the overall intensity of competition in the market, the maturity of product technology in the market, and the dispersion of market (in terms of number of firms and uncertainty of competition).

[2]The number of potential customers refers mainly to such customers in the Finnish market.

Case	Index	Industry Focus (+)		Customer Size Focus (+)		Number of Customers (-)	
Alpha	-2	Low	Our customers are [...] in terms of industry everything possible from a sausage factory to ministry of defense, and everything in between. (VP, Channel Sales)	Med	Our target has always been in the largest companies but in practice it has slipped [...] into middle-sized companies (VP, Channel Sales)	High	[The number of potential customers] is limited to thousands [...] of course, the public and private sectors are there [...] but potential firms, hundreds or thousands, at least not more (KAM, Direct Sales)
Epsilon	-2	Low	[Our offering] is industry independent. [...] but it's easiest to argument to a customer who manufactures and sells. They have more of the problems that can be solved with [our product]. (Project Manager)	Med	I would see that optimal customers for our [main product] [...] would have about 20-100 million in revenue (Sales Manager)	(High)	
Beta	-1	Low	No [we don't have any specific industry focus], our segmenting is quite wide (VP, Sales)	Med	Today I would say those middle-sized firms are our so-called golden point [...] we leave the biggest firms out and also in a way from the smaller side (Sales Director)	(Med)	
Theta	-1	Low	In principle, all businesses can be our customers [...] we don't segment or exclude some segments. (SVP, Strategy)	Med	Our focus in Finland is in top 700 companies [...] so we're typically a solution provider for large organizations (SVP, Regional Sales)	(Med)	
Zeta	-1	Med	Our main body of customers is about 200 communities and community organizations [...] we also have few significant customers from government offices in the public sector [...] and then we have [private] firms (CEO)	Low	It varies from few persons up to multinational firms [...], almost anything really (Director, Business Area)	(Med)	

Table 6.14: Customer segment characteristics of case firms

Case	Index		Industry Focus (+)		Customer Size Focus (+)		Number of Customers (-)
Delta	1	Med	Our main customer body are [in main focus segment], the other main sector are [public sector organizations], and then even smaller group [...] are all [professional firms]. (Sales Manager)	High	From one extreme to another. [...] we're talking about one man offices up to offices with tens of users. [...] we can't really talk about hundreds; the offices aren't that big (Sales Manager)	Med	We are starting to have about 150 offices [as customers], while there are about 700 or 800 offices in Finland. (CEO)
Gamma	1	Med	There is both homogeneity and differences [between our customer segments] [...] Similarities stem largely from [similar purpose for systems]. Non-homogeneity, on the other hand, is caused by us having both public and private sector actors as our customers (SVP)	Med	Our customers range from private [infrastructure firms] to nation-level companies, so the scale is quite broad [...] typically, our customers [...] are large and middle-sized actors in their respective industries [...] we don't target very small professional organizations (SVP)	(Low)	
Kappa	2	Med	[Our offering] is not really industry specific; what similar to our customers is that they deal with an approximately continuous activity, [...] with broad variety of products (Development Director)	High	We have had the rule of thumb [a customer] should have at least 30 millions of revenue before it makes sense to start selling to them (Kappa 1)	Low	We have about ten customers with our system in operational use (Development Director)
Lambda	2	High	Our customers are central retailing chains, and then industrial firms who deliver things to these retailers (CEO)	(Med)		(Low)	

Table 6.14: Continued

Year	Case	Market Growth (+)	Competition Intensity (-)	Customer Knowledge (+)	Market Maturity (-)	Tech Maturity (-)	Competition Dispersion (+)	Index
2005	Alpha	0	+	-	0			-0.50
	Zeta	0	0		+	+		-0.50
	Epsilon							-0.25
	Delta							0.17
	Beta							0.40
	Theta							0.40
2008	Alpha	-	+	0	+			-0.75
	Gamma	-	0		+	+		-0.75
	Zeta	-	0		+	+		-0.67
	Epsilon		+	0	0	+	0	-0.40
	Beta	0	+	0	0	+		-0.40
	Delta	0	-	0	0	0	0	0.17
	Theta	0	-		0	0		0.25
	Lambda	+	-	-	-	0	+	0.50
	Kappa	+	-		-	0		0.75

Table 6.15: Assessment of competitive environment benevolence

We used the following logic to quantify the factors affecting towards a beneficial environment. Each factor present in case data would be coded with either +1, 0, or -1, depending on the results of within-case analysis of this factor. Table 6.15 lists these factors and their hypothetical relation with beneficial competitive environment. As seen from this table, intensity of competition, market maturity, and technological maturity are related with negative competitive environment, while market growth, customer knowledge, and competitive dispersion are related to a positive competitive environment.

Since the cases had different number of these factors in within-case analysis, depending on the informants' answers, we normalized these figures by dividing the sum of the effects by the number of factors included. This would result in a aggregate index of the benevolence of the firm's competitive environment ranging from -1 (a very difficult competitive environment) to +1 (a very benevolent competitive environment).

Table 6.15 shows the values of competitive environment for all period-firm cases. Obviously, as we had direct data only on the current period 2006–2008, we lacked reliable evidence on the competitive environment for the earlier period. In some cases, informant reflected on the change in the environment. In these cases, we could infer the value of the factor for the period 2003–2005 from interview data. For all other factors, we made the assumption that the competitive environment would not become more benevolent in the later period than it was in the earlier period. In other words, we assumed that the competitive environment factors would remain at the level they were in later period.

In general, the assessment of the case firms' competitive environments was compatible with the quantitative measures used for these firms. Therefore, in subsequent analysis we used the calculated values of competitive environ-

ment benevolence for each period-firm case.

6.3.7 Moderators – Internationalization

The degree of international diversification or *internationalization* of the focal firm has potentially important effect on the relationship between the knowledge-intensive service offering and the focal firm's performance, since the firm needs to build local capacity to deliver required services. By definition, the provision of knowledge-intensive services is local in nature due to the requirement of face-to-face interaction and transfer of tacit knowledge (Howells, 1996; Carlile, 2004; Ko et al., 2005). Yet, the replication of the focal firm's service business beyond national borders is often wrought with difficulties (Darr et al., 1995; Lindsay et al., 2003; Martin and Salomon, 2003b; Dhanaraj et al., 2004; Bell et al., 2004; Kotabe et al., 2007), stemming from the difficulty of replicating the required knowledge abroad (Winter and Szulanski, 2001; Jensen and Szulanski, 2004). Furthermore, these challenges are exacerbated by the lack of service management competences in product firms (Nambisan, 2001; Bowen and Ford, 2002). In any case, we will analyze the role of internationalization as a moderator of the relationship between service provision and performance.

Internationalization
Internationalization or international diversification of the case firms was measured as the ratio of revenue from countries outside Finland to their total revenue. This measure was available from the Finnish software industry survey database, and figures were confirmed by the case firms during feedback sessions. While the ratio gives only a rough measure of the total international diversification of a firm (cf., Palepu, 1985; Hoskisson et al., 1993), this was deemed detailed enough, given the qualitative approach of the multiple case study.

Nevertheless, internationalization complicates the delivery of required knowledge-intensive services related to the main product of the case firms. Notwithstanding cultural, legislative or language issues, merely the requirement for local delivery of services requires the focal firm to build some kind of service delivery capacity in each country where it starts to conduct its business. Service human resources can only be shared between different geographical areas to a limited extent, given the geographical, cost and time constraints. Therefore, the focal firm will need to set up service operations for knowledge-intensive services in the form of its own subsidiary or by finding a suitable service partner willing and able to deliver the required services. Regardless of internationalization model, the focal firm will need to replicate its service operations in other countries.

As can be seen from Table 6.16, there were significant differences in the share of international revenue between the case firms. In particular, there

Case	Average International Revenue 2003–2005	2006–2008	Average Partner Revenue 2003–2005	2006–2008
Alpha	0.63	0.67	0.39	0.65
Theta	0.46	0.49	0.16	0.12
Gamma	0.35	0.38	N/D	N/D
Beta	0	0.16	0	0.02
Epsilon	0.05	0.07	0	0
Delta	0.02	0.05	0	0
Zeta	0	0	0	0
Kappa	N/A	0	N/A	0
Lambda	N/A	0	N/A	0
Mean	*0.19*	*0.09*	*0.20*	*0.09*

N/D = No data; N/A = Not applicable

Table 6.16: Internationalization and partner use of case firms

were mature firms which had internationalized (Case Theta, Case Alpha) and firms which had stayed within Finland (Case Epsilon, Case Zeta). In addition, despite its relatively young age, Case Beta had already gained an foothold on international markets. Furthermore, there were very large differences between firms, with many firms having no international presence at all, some firms having a significant portion of their revenue coming from abroad (Case Theta, Case Gamma), and finally Case Alpha, which receives approximately two thirds of its revenues from international markets.

Use of Service Partners

Like internationalization, the use of partners to deliver the necessary knowledge-intensive services poses a challenge for product firms. As with internationalization, the focal firm needs to somehow transfer necessary knowledge to another firm in order to build service capacity (Darr et al., 1995; Dhanaraj et al., 2004; Becerra et al., 2008). However, unlike in the case of internationalization through direct investment, using partners requires transferring knowledge beyond the organizational boundary of the focal firm. As such, partner use may complicate the challenge of service organization replication even further. In theoretical terms, partner use is again equivalent with the replication of services related to the software product (Winter and Szulanski, 2001).

Internationalization does not imply the use of partners. Indeed, as can be seen from Table 6.16, some of the case firms chose to internationalize using direct strategies (Case Gamma, Case Beta), some using mainly partner-based strategy (Case Alpha), and some using mixed strategies (Case Theta). However, none of the firms without international revenue have employed service partners within Finland (to a significant degree). Therefore, the internationalization and partners use decisions can be seen as largely independent, yet it seems that the decision to use partners is typically prompted by interna-

tionalization. We will thus analyze the impact of these two factors separately to acknowledge the potential lack of correlation between them.

6.4 Results of cross-case analysis

The purpose of cross-case analysis is to identify theoretically interesting and justified statements based on patterns found in the multiple case data through comparing case firms with each other (cf. Eisenhardt, 1989a; Miles and Huberman, 1994). This analysis is based on the findings from within-case analysis, during which we established the values for each meaningful construct in the study. These values are now used to compare cases with each other. While this is mostly done at the level of the derived values of the constructs, we occasionally revisit the more detailed evidence available from case informant to provide further support for the claims based on the identified patterns.

6.4.1 Similarities across case firms

We start our comparative cross-case analysis by identifying and explicating similarities between case firms. The purpose of this exercise is to simplify subsequent analysis by excluding factors which do not show significant differences across cases. These factors may be excluded since they do not provide any additional information that can be used in explaining the differences in the performance of the case firms.

We first note that there are only small differences between the case firms in terms of their knowledge capabilities. As seen from Table 6.12, all firms have actually surprisingly good knowledge of all three identified knowledge areas — technological knowledge, customer domain knowledge, and solution knowledge. The similarity of the case firms in this respect implies that these knowledge capabilities cannot explain the differences in firm performance.

This similarity of the case firm in terms of their knowledge was somewhat surprising, as software firms often start out with only technological expertise, and typically learn specific knowledge of their customer segment through service provision (cf. Yli-Renko et al., 2001). Thus, we should have seen start-up firms without significant customer domain knowledge. Yet, this may be due to the selected firms; both the start-up firms (Cases Kappa and Lambda) had grown exceptionally fast, and had quite enlightened management. In particular, both these firms have already acquired significant knowledge on the customer industry, either through founder background (Kappa) or by recruiting customer domain experts early on (Lambda). It is conceivable that less enlightened firms would have had less knowledge on customer domain, ans subsequently potentially had worse firm performance.

If anything, low knowledge on the customer domain seemed to be associated with a lack of customer segment focus. If a firm has no clear cus-

tomer segment, there are less opportunities for learning-by-doing and accumulating significant knowledge on specific customer organization problems. Hence, the small differences in knowledge capabilities of the case firms can be accounted for through analyzing the impact of customer focus as moderator on service provision – performance relationship. In conclusion, knowledge capability factors do not seem to provide much useful comparative information on the case firms, and we will thus omit them from further analysis.

Another similarity across all the case firms was the relatively high level of software productization. In other words, all firms had striven to make their products as standardized and packaged as possible. In theoretical terms, this meant that the technological knowledge related to the products of the firm was relatively well explicated and codified. This product standardization is unrelated to the complexity of the overall offering. Of course, there were major differences in the complexity of the functionality of the case firms' products, but technologically all were relatively stable and mature. This similarity in the level of product technology codification implies that the degree of product standardization does not effectively directly explain the differences in performance between the case firms. We will therefore exclude this factor from subsequent analysis.

After identifying similarities across the case firms, we next turn to *differences* between case firms. In the following sections, we seek to identify patterns across cases that link service provision to firm performance, possibly moderated by the various organizational and environmental factors. Our goal is to identify theoretically justifiable explanatory relationships in the data — in other words, to discover patterns in the empirical evidence and to provide a theoretical explanation for these findings. We proceed in this by comparative analysis of case data, organized by the explaining factors (service offering, service capability) and outcomes (revenue growth, profitability).

Analyses were carried out for all possible combinations of explanatory, outcome and moderating factors. However, for the purposes of conciseness and clarity, we only present the results of the most interesting and strongest patterns identified in the data. In other words, we have omitted the reporting of analyses that did not provide strong enough evidence to warrant further inspection. This include most of the possible combination of explaining factor, outcome and moderator configurations. This choice of concentrating on the most interesting is in line with the suggestions given in extant literature on case study methodology (Siggelkow, 2007; Pratt, 2009) and, of course, is required given the large number of factors considered in the analysis.

6.4.2 Impact of service offering on revenue growth

We first inspected the impact of control variables on revenue growth. By this we wished to understand the variations in performance likely due to known

Case	Period	Firm Age	Firm Size	GO	Financing	Relative Growth	
Lambda	2	1.1	11.7	High		14.32	High
Kappa	2	1.1	11.2	High		7.39	growth
Beta	2	2.4	15.2	High	Business angel	0.85	Above
Beta	1	2.1	14.0	High	Business angel	0.40	average
Delta	1	3.0	13.5	High		0.36	
Theta	2	3.2	17.9	Med	Public	0.35	
Theta	1	3.0	17.1	Med	Public	0.12	
Gamma	2	3.8	16.3	Low	Subsidiary*	0.00	Average
Zeta	1	2.8	15.0	Low	Subsidiary	0.00	or below
Alpha	2	2.9	15.7	Med	Public	-0.01	average
Delta	2	3.1	14.1	Med		-0.02	
Zeta	2	2.9	15.2	Med	Subsidiary	-0.10	
Alpha	1	2.7	15.4	High	Public	-0.15	
Epsilon	2	3.0	12.8	Low		-0.30	
Epsilon	1	2.8	12.9	Low		-0.78	

Period 1 = 2003–2005; Period 2 = 2006–2008; GO = Growth Orientation

Table 6.17: The impact of control variables on three-year relative revenue growth

common factors reported in extant literature. Table 6.17 shows the values of these factors for fifteen case-period pairs, as ordered by relative growth rate. From this table we may infer several effects anticipated on the basis of extant research.

First of all, firms that have a higher rate of revenue growth (the upper half of Table 6.17) tend to be younger and have a higher growth orientation. This is as anticipated based on prior findings of firm growth (Evans, 1987a; Hall, 1987; Covin et al., 1990). Furthermore, these faster-growing firms tend to have external private financing. Publicly listed firms cannot usually take as much risk in creating growth since they need to continuously produce profits for their owners. By contrast, firm size, measured by total revenues, does not seem to have a clear pattern towards affecting revenue growth, as slow and fast growing firms include both small and large firms.

In summary, it seems that the control variables do predict the relative growth rates of the case firms to some degree. Yet, there are effects which warrant further analysis. First of all, firm size does not appear to be correlated with revenue growth. There thus seems to be additional factors that affect growth that need to be accounted for. Second, some case firms seem to be performing at a level lower than expected. For example, Case Alpha is a relatively young firm, and has high growth aspirations, as indicated by its high growth orientation. Yet, despite the potential resources available hinted by its status as a publicly listed firm, it is located in the group of lower-growing firms in both periods. Hence, we need to analyze the impact of further factors on growth to fully explain the differences in revenue growth.

We will thus next analyze the impact of moderators on revenue growth. This

includes inspecting the impact of competitive environment, offering and customer segment characteristics, and internationalization on revenue growth. These factors are listed in Table 6.17, and ordered in a descending order by relative revenue growth.

Several conclusions can be drawn from Table 6.17. First of all, unsurprisingly, a benevolent competitive environment seems to be positively correlated with revenue growth. This was to be expected, since it is easier for firms to grow in an environment with few competitors and less intense competition (Covin and Slevin, 1989; Covin and Covin, 1990; Dess et al., 1997). Of course, another explanation for this correlation is that fast-growing firms perceive their environment to be benevolent and thus support faster growth. Yet, there appears to be a negative correlation between the age of the firm and the benevolent competitive environment index. Since firm age is an objective measure, independent of manager cognition, we conclude that a benevolent competitive environment may thus have a positive impact on growth.

Secondly, and somewhat surprisingly, the case firms with higher relative revenue growth seem to have more complex solutions than those case firms with lower growth. One would have expected that increasing complexity would have been related with lower growth, since the complexity of the product may make required knowledge transfer more difficult (Szulanski, 1996; Simonin, 1999a; Dyer and Hatch, 2006). This conclusion still holds if we exclude the youngest case firms with the fastest relative growth rates (Case Kappa, Case Lambda). Therefore, there has to be some additional factor that explains why these firms, despite the complexity of their solutions, are still able to grow faster than firms with less complex solutions.

Third, it appears that, on the average, firms with a more focused customer segment tend to have a higher growth rate than those firms with less clear customer focus. This, of course, is not surprising, given that lack of clear customer segment focus indicates that the firm will be unlikely to develop extensive knowledge of specific customers' business. Dispersion in customer segment means that knowledge does not accumulate, and it is hard and unprofitable to codify this knowledge due to small scale of replicability (Sundbo, 2002). Moreover, not having a clear customer focus hinders the codification of knowledge about the solution in general (Larsson and Bowen, 1989; Bowen and Jones, 1986). However, this is not likely to be a sufficient reason for relatively poor growth, as the firms may still develop a very codified knowledge of the methodological knowledge behind the solution, which potentially has a positive impact of revenue growth. Therefore we must not overemphasize the significance of customer segmentation vagueness. This is evident from the fact that some case firms with high relative revenue growth (Case Beta, Case Theta) have a relatively low customer focus.

Fourth, there appears to be no clear relation between the internationalization and relative revenue growth. There seems to be a very small negative

Case	Period	Relative Service Prof	Relative Service Devel	Service Capability	Firm Age	GO	Relative Growth
Lambda	2	-0.11	0.13	Med	1.1	High	14.32
Kappa	2	0.06	-0.05	High	1.1	High	7.39
Beta	2	0.05	-0.08	Med	2.4	High	0.85
Beta	1	0.00	-0.05	Low	2.1	High	0.40
Delta	1	0.17	-0.03	Low	3.0	High	0.36
Theta	2	0.09	-0.10	Med	3.2	Med	0.35
Theta	1	0.18	-0.07	Low	3.0	Med	0.12
Zeta	1	-0.10	0.33	Med	2.8	Low	0.00
Gamma	2	-0.12	0.05	High	3.8	Low	0.00
Alpha	2	-0.14	-0.10	Low	2.9	Med	-0.01
Delta	2	0.09	0.09	Med	3.1	Med	-0.02
Zeta	2	-0.03	0.08	Med	2.9	Med	-0.10
Alpha	1	-0.09	-0.07	Low	2.7	High	-0.15
Epsilon	2	-0.05	-0.07	Med	3.0	Low	-0.30
Epsilon	1	-0.02	-0.07	Med	2.8	Low	-0.78

Table 6.18: The direct impact of explaining factors on relative revenue growth

correlation between international revenue and revenue growth. This may be partly explained by the difficulty of international explanation due to more arduous knowledge replication required for expanding business outside Finland. Yet, as mentioned, this pattern is not clear.

Moreover, there is also no clear relation between partner revenue and revenue growth. If anything, there seems to be a slight negative impact of partner use on growth. This effect is mainly due to Case Alpha, which extensively uses service partners but has only achieved low growth. Hence, we may infer that using partners to conduct (international) business does not automatically result in superior revenue growth. Again, other factors must be used to explain the impact of internationalization on revenue growth.

Next we may analyze the impact of service offering and service capability on the relative revenue growth of the firms over a three-year period. Table 6.18 shows the values of the explaining factors (service offering and service capability), revenue growth, and the most important control variables identified above.

The impact of service provision

As can be seen from Table 6.18, the high growth rates of Case Kappa and Case Lambda may readily be explained by their young age, combined with high growth orientation of their management. The explanation behind the relatively higher growth of the next group of firms is more complicated. Comparing the relative values of professional and development service revenue shares, we may infer that, on the average, higher relative professional service share contributes to higher growth rate. This can be seen by comparing the values of professional service revenue shares of above-average growth rates cases to those of below-average growth rates. The five firm-period cases that

make the above average revenue growth group have all their relative professional services revenue share above the average (0), while those below the average performance have a lower than average professional service revenue share. This pattern is also inferred if we instead inspect the performance of above-normal professional services providing firms to those who offer them less than average.

By contrast, there seems to be an opposite relationship between development service revenue and revenue growth. More specifically, a high relative development services provision revenue share tends to be related to lower-than-average revenue growth rate. This result holds even if we control for growth orientation; in other words, on average, excluding Case Kappa and Case Lambda, for firms with high and med GO, those with highest relative professional services share have higher growth rates. Only for low GO is this effect inconsistent.

The impact of professional and development service provision have different theoretical explanations. The positive relationship between professional services and revenue growth is explained by the knowledge transfer and organizational learning the provision of these services enables. In more detail, there are two mutually reinforcing explanations for the impact of professional services.

First of all, the provision of professional services enables the product firm to impact how the overall solution is implemented and actually used in the customer organization (Ko et al., 2005). This can be a crucial step in the offering actually creating value for the customer. Professional services help in transferring the necessary knowledge to the customer organization (Carlile, 2004), and allow the focal firm to help the customer in adopting the solution to local circumstances (Leonard-Barton, 1988a). In particular, this helps the focal firm to make the customer organization understand the solution and to benefit from it, which should make sales faster and ensure customer satisfaction, and continuation of the system's use.

> If we don't have services [in implementations] then there's a risk that the customer won't find a reasonable usage for the software [...] and after three or four years they conclude that "what's this cost" [the maintenance fee] and terminate the maintenance contract. (Consultant, Direct Sales; Case Alpha)

> Customer has to be very committed [to pilot use of the system], and the customer needs to be competent enough; if the customer cannot use the system or doesn't reserve the time it's a lost deal (VP; Case Gamma)

These factors lead to easier initial sales, and after this sales to higher customer loyalty, and ultimately to improved revenue growth through customer retention and success in new customer sales (Andreassen and Lindestad, 1998; Lam et al., 2004).

Second, the adaptation process and the collaborative problem solving it requires allows both parties to learn new knowledge (Leonard-Barton, 1988a;

Nonaka, 1994; Bessant and Rush, 1995). This broadens the focal firm's knowledge on the customer domain and the solution, and potentially creates opportunities for service and product innovation (Howells, 1996; Cavusgil et al., 2003; Knudsen, 2007). In other words, the focal firm can learn new things that it can leverage in future customer relationships and implementations.

Obviously, this new knowledge helps the product firm to create new products and to provide valuable services to other customers (den Hertog, 2000; Gebauer, Krempl, Fleisch and Friedli, 2008). Furthermore, it also helps in subsequent implementations of the solution since the firm knows its customers and its solution a bit better than previously (Winter and Szulanski, 2001). All these factors contribute to the higher growth of the product firm. This effect was also indicated by informants:

> There are a huge number of indirect benefits [for providing implementation services] [...] starting with the fact that if you're continually in contact with the customer [...] so you have a hands-on feeling of what they need (Director, Business Area; Case Zeta)

By contrast, the provision of development services does not serve the knowledge transfer function between the focal firm and customer organizations. Since development services mainly include the use and transfer of technological knowledge, there are fewer opportunities for mutual learning. In addition, while development services are often linked to the implementation of the system through customization, they usually are linked to technical rather than organizational issues related to the solution. The relative difference in technological knowledge between the focal firm and its customers usually matters less than gap in solution knowledge due to the often highly codified nature of technological knowledge. The customer needs not know the technological details as long as the solution works as it wishes. While development services provision does entail some level of solution and customer domain knowledge transfer, the extent of this knowledge is very limited in comparison to that facilitated by professional services. In summary, development services do not facilitate significant extent of knowledge transfer.

The negative impact of development services on revenue growth therefore needs to be explained in another way. First, we note here that the same technical human resources are typically used for both the focal firm's own product development and the provision of development services, as these activities require similar competences. Since these resources are usually limited, resources used for development services are taken from product development efforts. Obviously, this emphasis on development services is likely to have a negative impact on the product development performance of the focal firm, particularly if these services are provided in great length. Ultimately, this will have a negative impact on revenue growth due to the lack of product competitiveness or lack of new products to sell (Banbury and Mitchell, 1995; Chaney

et al., 1991).

Second, the balancing between development services and product development may also affect the product firm's focus. If the service business becomes overly important financially, it may become difficult for the management to retain focus on intended customer market. Obviously, this is likely to have a negative impact on the sales effort of the focal firm, and ultimately on sales growth. This argument also indicates that development services provision should be negatively related to revenue growth.

While development services provision may have a slight positive impact on new product innovation, this products-through-customization practice is usually not commonplace until the core product is mature enough. Furthermore, development services typically entail creating customized software for one customer. The standardization of such complex products is often difficult without significant additional investments in product development. As indicated by one informant:

> [Unique software] is both good and bad. [It's] good in the sense [...] that it brings us easily quite a bit more work, including the future. On the other hand, it also makes life more difficult for both of us. (Director, Business Area; Case Zeta)

Formally, we may thus hypothesize

> ***Proposition 1a.*** *Professional service provision is positively related to revenue growth.*

> ***Proposition 1b.*** *Development service provision is negatively related to revenue growth.*

Next, we will assess the impact of the moderating factors on the relationship between the main explaining factors and performance outcomes. Table 6.19 shows the values of the explaining factors, as well as the moderator values inferred from analysis above.

Moderating effect of competitive environment

As suggested by the in-depth case study and extant literature on knowledge transfer, the life cycle phase of the market for the organizational innovation was deemed to have an impact on the choice of service offering of the product vendor. The maturity of the market is, in general, related to the competitive hostility of the market, measured by the number of competitors (Lambkin and Day, 1989), level of price competition, and standardization of technology and products (Tushman and Anderson, 1986; Anderson and Tushman, 1990). We explored this the potential moderating impact of competitive environment using data from multiple case study, collected and analyzed as described in the methodology section. We employed the methodology for probing moderating relationships described in the methodology section for assessing the moderating impact of competitive environment characteristics.

Case	Period	Relative Prof	Service Devel	Service Capability	ServCap^2	CompEnv	Offering Complexity	Customer Focus	IntRev	Partner	Relative Growth
Lambda	2	-0.11	0.13	0	0	0.50	5	2	0	0	14.32
Kappa	2	0.06	-0.05	1	1	0.75	4	2	0	0	7.39
Beta	2	0.05	-0.08	0	0	-0.40	5	-1	0.16	0.02	0.85
Beta	1	0.00	-0.05	-1	1	0.40	5	-1	0	0	0.40
Delta	1	0.17	-0.03	-1	1	0.17	2	1	0.02	0	0.36
Theta	2	0.09	-0.10	0	0	0.25	4	-1	0.49	0.12	0.35
Theta	1	0.18	-0.07	-1	1	0.40	4	-1	0.46	0.16	0.12
Zeta	1	-0.10	0.33	1	0	-0.67	5	-1	0.38	0	0.00
Gamma	2	-0.12	0.05	0	1	-0.50	2	-1	0	0	0.00
Alpha	2	-0.14	-0.10	-1	1	-0.75	5	-2	0.67	0.65	-0.01
Delta	2	0.09	0.09	0	0	0.17	2	1	0.05	0	-0.02
Zeta	2	-0.03	0.08	0	0	-0.67	2	-1	0	0	-0.10
Alpha	1	-0.09	-0.07	-1	1	-0.50	5	-2	0.63	0.39	-0.15
Epsilon	2	-0.05	-0.07	0	0	-0.40	3	-2	0.07	0	-0.30
Epsilon	1	-0.02	-0.07	0	0	-0.25	3	-2	0.05	0	-0.78

Table 6.19: Interaction analysis of explaining factors, moderating factors and revenue growth

Revenue Growth	Professional services Low	High
High		
Above average	Gamma2 Alpha2 Zeta1	(Beta2)
Below average	Alpha1	Zeta2 Epsilon2 Epsilon1
Ave prof	-0.11	0.00
Ave growth	-0.04	-0.08

(a) Hostile environment

	Professional services Low	High
	Lambda	←(Kappa)
	Beta1	Delta1 Theta2
		(Theta1)↑ Delta2
	-0.03	0.13
	0.40	0.20

(b) Benevolent environment

Table 6.20: Probing the impact of competitive environment and professional services interaction on revenue growth

Based on data in Table 6.19, we inferred the threshold value of 0 for the competitive environment hostility. In other words, we split the firm-period cases into two groups based on the competitive environment benevolence index; those cases with negative index were deemed to have a hostile competitive environment, while those with positive index were deemed to have a benevolent competitive environment. Based on these data, we constructed the relative professional service provision/relative revenue growth displays for both these groups. Table 6.20 shows the patterns of data inferred from the multiple case study.

Inspecting the table we note, first of all, that the firm-period case Beta2 could also be placed to the benevolent competitive environment table due to interpretations made in text analysis. It would be placed to the right hand above average growth cell. Second, the firm-period case Theta1 is a borderline case between below and above average performance; it could thus also be placed in the right hand above average cell. Third, case Kappa is a borderline case between high and low professional services; it could also be placed in the left hand high performance cell.

The results of Table 6.20 are somewhat unclear in the case of a benevolent competitive environment. However, the pattern of data clearly shows that in the case of a hostile competitive environment, a higher share of professional services tends to lead to lower revenue growth. This is in contradiction to the general finding of positive growth impact of professional services provision indicated by **Proposition 1a**. Therefore, we may thus infer from this evidence that competitive environment does moderate the relationship between professional services and revenue growth since without this moderation we should expected to see the same positive relationship between professional services and revenue growth.

While we cannot infer much from the benevolent environment table, the above argumentation indicates that competitive environment benevolence

has a negative moderating impact on the relationship between professional services and revenue growth. We make this inference since, as described above, high relative professional services tend to be related with lower than average growth in the case of hostile competitive environment. In the benevolent environment, we should see a positive relationship. Moving case Beta2 to the benevolent environment table would change the pattern to nearly neutral. Moreover, given the general positive relationship between professional services and revenue growth we argue that there is correspondingly a positive relationship between these services and growth in the case of benevolent competitive environment, but due to other factors this effect is not seen in Table 6.20.

The explanation of this effect is related to the process of market maturation, which, as we have seen, is related to competitive environment hostility. As the market matures, knowledge related to the market typically becomes more codified, forming dominant designs (Tushman and Anderson, 1986; Anderson and Tushman, 1990; Murmann and Frenken, 2006). While literature has mainly discussed the process of codification in terms of product technology knowledge, it is perfectly conceivable that customer domain, and particulary solution knowledge may also become more codified (Cohendet and Steinmueller, 2000; Cowan et al., 2000). The subsequent impact of this codification process is that there is less need to transfer tacit knowledge between the product firm and its customers. Consequently, there is thus also less need for face-to-face professional services (cf. Easterby-Smith, Lyles and Tsang, 2008; van Wijk et al., 2008). Therefore, to attain similar growth, there is now less need for the product firm to provide professional services.

Compare the experiences of a fairly immature (Case Beta) and more mature (Case Epsilon) cases:

> [The early phase of market] shows in that we go with concept first [...] we have to explain the basic things to customers awfully lot (VP, Sales; Case Beta)

> Yes, [customers' competences] have changed; [Customers] have made great progress and it's pretty clear to them how they want to do things. (Development Manager, Case Epsilon)

As indicated by these quotes, the competences of customers seem to evolve over time; in particular, it appears that customers become more knowledgeable about the solution, and hence require different services.

On the other hand, the market maturation also means that customers are likely to become more knowledgeable about the solution, thus reducing the relative difference in knowledge between the focal firm and its customers. Obviously, this also reduces the need for professional services, since the customers are able to perform required activities themselves and are less reliant on the focal firm's knowledge (Brusoni et al., 2001; Mucher, 2006). Again, less professional services are needed to attain the same rate of revenue growth.

Revenue Growth	Development services Low	High
High		
Above average	(Beta2) Alpha2	Zeta1 Gamma2
Below average	Epsilon2 Epsilon1 Alpha1	(Zeta2)↑
Ave devel	-0.08	0.15
Ave growth	-0.08	-0.03

(a) Hostile environment

Development services Low	High
	Kappa Lambda
Delta1 Beta1 Theta2	
Theta1	Delta2
-0.10	0.13
0.31	-0.02

(b) Benevolent environment

Table 6.21: Probing the impact of competitive environment and development services interaction on revenue growth

In summary, these arguments and the discovered data pattern indicate that competitive environment benevolence, negatively related to market maturity, should have a negative moderating impact on the relationship between professional services provision and revenue growth. Put differently, professional services should matter less in a mature market with more competition.

Repeating the above analysis on the moderation effect of competitive environment hostility on development service provision, we find patterns of data as shown in Table 6.21.

Again, the firm-period case Beta2 could be moved to the benevolent competitive environment table in the left hand above average performance cell. Moreover, the case Zeta2 is a borderline case between below and above average revenue growth, and could thus be moved to the right hand above average performance cell in the hostile environment table. Implementing these changes would actually improve the coherence of the below conclusions.

As can be inferred from Table 6.21, the hostility of the competitive environment seems to have a moderating effect on the relationship between development services and revenue growth. This can be inferred from the change of the relationship between development service provision and revenue growth: in hostile environment, development services tend to have a positive impact on revenue growth, whereas in the case of a benevolent competitive environment, the relationships tends to be negative. Further, the overall impact of development service provision on revenue growth was deemed to be negative in previous analysis. The pattern of data shown in the hostile environment of Table 6.21 clearly shows that this pattern is reversed, indicating that competitive environment hostility indeed negatively moderates the relationship between development services provision and revenue growth.

Theoretically the inferred pattern can be explained through market maturation: again, as the competitive environment becomes more hostile (i.e., the market matures), the knowledge related to the solution becomes increasingly

codified (Anderson and Tushman, 1990; Balconi, 2002), and the knowledge overlap between the focal firm and its customers is likely to increase, as both parties gradually learn from each other through collaboration (Mowery et al., 1998). While these factors do not directly affect development services provision and its impact on growth, the indicate that also the products of the focal firm become more codified and mature. This implies that there is less need for product development as the product is more or less completed (Anderson and Tushman, 1990; Utterback and Suarez, 1993). Given that the level of development resources is fixed, the resources may now be used on the provision of development services. These services can now potentially provide direct sales, and on longer term allow the focal firm to maintain its products competitiveness by developing new technology paid by customers.

As indicated by an informant of the most mature case, in a mature market the emphasis in service provision seems to slightly move towards development services. It seems that as the market matures, development services become more commonplace:

> A significant part of our business is also project business [...] for us the basic starting point is that if someone pays [development] it should result in products (VP; Case Gamma)

Compare this with the viewpoint of a recently started firm (Case Kappa), which basically indicates that development services are not something the firm does unless absolutely necessary:

> We might do some development if it's extremely important to a customer [...] we think how to make it more generic and make it so that the customer pays half the costs and gets it immediately. But it becomes a part of the overall offering (Development Director; Case Kappa)

In other words, the returns to product development are greater when the competitive environment is benevolent (i.e. the market is immature). As the market matures, these returns diminish and at some point it may be more productive to use the technological resources on the provision of development services. In summary, competitive environment benevolence thus tends to positively moderate the relationship between development services provision and revenue growth.

We may express the above two findings formally as

> ***Proposition 2a.*** *Competitive environment benevolence has a positive impact on the relationship between professional service provision and revenue growth: the more benevolent (hostile) the environment is, the larger the positive (negative) impact of professional service provision.*

> ***Proposition 2b.*** *Competitive environment benevolence has a negative impact on the relationship between development service provision and revenue growth: the more benevolent (hostile) the environment is, the larger the negative (positive) impact of development service provision.*

Revenue Growth	Professional services Low	High
High		
Above average	(Zeta2)→ Zeta1	Delta1 Delta2
Below average	Epsilon1 Epsilon2	
Ave prof	-0.05	0.13
Ave growth	-0.29	0.17

(a) Simple offering

	Professional services Low	High
High	Lambda	Kappa
Above average	(Beta1)→	Theta2 Beta2
Below average	Gamma2 Alpha1 Alpha2	(Theta1)↑
Ave prof	-0.09	0.11
Ave growth	0.06	0.44

(b) Complex offering

Table 6.22: Probing the impact of offering complexity and professional services interaction on revenue growth

Moderating effect of offering characteristics

We have analyzed the characteristics of the case firms' offerings in terms of two distinct factors: the complexity of the firms' offerings, and the narrowness of the firms' customer segmentation. The complexity refers to how many individual parts the offering is composed of, how many interdependencies exist between these parts, and how difficult the organizational problems solved by the solution are. Customer segment focus describes how tightly the case firm has defined its target customer characteristics; that is, to how different customers the firm sells its offering. The values of these factors are based on case informants' accounts, using an inference process described in detail in the methodology section.

The patterns of data on the moderating effect of offering complexity as inferred from the multiple case study are shown in Table 6.22. Using data from Table 6.19, we used the threshold value of 3 for offering complexity. In other words, those firm-period cases whose offering complexity index was 3 or smaller were deemed to have a simple offering, and by contrast those cases with offering complexity index of 4 or 5 were deemed to have a complex offering. Subsequently, we again created professional services — revenue growth displays based on case firm values for these factors for both levels of offering complexity.

We first note the existence of a few borderline cases in the tables. First of all, the firm-period case Zeta2 has nearly high relative professional services provision. It could thus be moved to the right hand above average performance cell in the simple offering table. Secondly, the case Beta1 has also nearly high relative level of professional services, and could also be placed in the right hand above average performance cell in complex offering group. The Theta1 case is also a borderline between below and above average performance. It could thus be placed in the right hand above average cell.

While the patterns of evidence in Table 6.22 are not too clear, they tend to confirm the results from the general analysis of the impact of professional services: the more professional services a firm offers, the better its revenue growth. In addition, it seems that offering complexity amplifies the relationship between professional service provision and revenue growth. In other words, the positive impact of professional services provision seems to be stronger in the case of complex offerings. This was anticipated based on the data presented in Table 6.19.

While in the case of a simple offering the professional services – revenue growth relationship is positive, there is also some contrary evidence (cases Zeta1, Zeta2). In the case of a complex offering, the relationship seems to be stronger, as after the modification of borderline cases (Beta1, Theta1) there is no contrary evidence left. In other words, we may interpret these patterns as implying that sufficient professional services are required if the overall solution is complex, i.e. the relationship between professional services provision and revenue growth is stronger. By contrast, in the case of simple offerings, the relationship, while still in effect, is weaker.

As indicated by the following informant quotes, the role of professional services is to compensate for the complexity of the the firms' offering. This complexity is indicated, for example, by the size of the implementation projects, as well as the process nature of the solution.

> [Implementation services] are vital [...] to get the system into proper and efficient use, especially in the case of more complex and difficult [product]; if training and efficient use teaching doesn't sink in, then [implementation is] bound to fail (SVP, Strategy, Case Theta)

> There's a clear indication, as some of our solutions are process products, that if you don't train and implement these solutions, you might be left with nothing in your hand (VP, Services, Case Beta)

Theoretically, the complexity of an offering is related to the overall complexity of knowledge. This complexity of knowledge is again related to the ambiguity of knowledge, which has been shown to have a negative impact on knowledge transfer success (Simonin, 1999a; Szulanski et al., 2004; Sorenson et al., 2006). To overcome this complication in knowledge transfer, the product firm must compensate for this with appropriate level of professional services that facilitate tacit knowledge transfer. In other words, more professional services are needed to attain the same rate of revenue growth. By contrast, there is no such need for professional services in the case of simple offerings. Overall, in this case the knowledge related offering is less tacit and thus easier to transfer to customer organizations. Formally, we may thus formulate this finding as:

> ***Proposition 3.*** *Offering complexity has a positive impact on the relationship between professional service provision and revenue growth:*

Revenue Growth	Professional services Low	High
High		
Above average	(Beta1)→	Theta1 Theta2 Beta2
Below average	Epsilon1 Epsilon2 Alpha1 Zeta1 Alpha2	←(Zeta2)
Ave prof	-0.08	0.08
Ave growth	-0.14	0.30

(a) Low customer focus

	Professional services Low	High
	Lambda	Kappa
		Delta1
	Gamma	Delta2
	-0.10	0.13
	0.00	0.17

(b) High customer focus

Table 6.23: Probing the impact of customer segment focus and professional services interaction on revenue growth

the more complex the firm's offering is, the larger the positive impact professional services provision has on revenue growth.

The patterns of data on the moderating effect of customer segmentation focus as inferred from the multiple case study are shown in Table 6.23. Based on the data from Table 6.19, we used the threshold value of 0 as a threshold value for splitting the firm-period cases into low and high customer focus cases. More precisely, those cases with a negative customer focus index value were assigned to the low customer focus group, and those with a positive customer focus index value constituted the high customer focus group.

Again, we have two firm-period cases that constitute borderline cases. First of all, Beta1 is close to the threshold between low and high relative professional services revenue share and could thus be mover to the right hand above average performance cell. Secondly, the case Zeta2 is also nearly a low professional services case and thus could be placed as well in the left hand below average growth cell. Both these changes to the interpretation of data would further strengthen the pattern of positive professional service – revenue growth relationship.

As suggested by findings from the general tabulation of moderating factors in Table 6.19, there was no clear pattern between customer segmentation focus and revenue growth. The identified patterns above tends to confirm this conclusion, as customer focus seems to have no clear pattern of moderation on relationship between professional services provision and revenue growth.

However, as in the case of offering complexity, customer segment focus appears to have a "polarizing", or amplifying, effect on the relationship between professional services provision and revenue growth. Yet, contrary to the effect of complexity, the effect is reversed here, as the relationship is clearer in the case of low customer focus: higher professional services tends to lead to

higher revenue growth. By contrast, in the case of high customer focus the relationship is not as clear; excluding the Lambda and Kappa cases, we may infer that while the relationship is still positive, there is also contradictory evidence (case Delta2). Obviously, the strength of these conclusions is undermined by the fact that there are much less cases in the high customer focus table, making the exact pattern of data less clear.

The found pattern of moderating effect can be explained by understanding the impact of customer focus. As argued above, a higher customer focus means that the focal firm targets a relatively narrow customer segment with its solution. This narrow targeting is typically associated with a need to cater the needs of the customer in more depth, which corresponds to a focus (Porter, 1980) or customer intimacy strategy (Treacy and Wiersema, 1993). To successfully deliver this increased value to customers, the focal firm needs to possess more knowledge about the customer domain and its own solution. A significant overlap in the knowledge bases of the focal firm and its customer organizations is thus likely to exist.

Given the relative narrowness of the knowledge gap between the focal firm and its customers, there is also a reduced need for professional services. The need is reduced since common knowledge base increases the relative absorptive capacity of both parties (Cohen and Levinthal, 1990; Zahra and George, 2002). This increased absorptive capacity has the effect of improving the chances of knowledge transfer success (Tsai, 2001; Chen, 2004; Easterby-Smith, Lyles and Tsang, 2008). Hence, the focal firm needs not to provide as much professional services to ensure knowledge transfer success, and the relationship between professional services and revenue growth is weakened, as suggested by the identified pattern in data.

Compare this to the case where the customer segmentation focus of the product firm is broader. In this case, the overlap in the knowledge base of the focal firm and its customers is likely to become smaller, implying a negative impact on absorptive capacity. This has subsequently a negative impact on knowledge transfer, and thus the product firm has to increase the provision of professional services to compensate for this effect to ensure the transfer of necessary knowledge to customer organization. These arguments suggest that we should see a much clearer pattern in the relationship between professional services and revenue growth in the case of low customer focus, as we have observed in the data.

In summary, we may thus conclude that if the firm's offering does not have a clear and narrow customer segment, the choice of professional service provision matters more and has a stronger impact on revenue growth. By contrast, professional services matter less if the offering has a well-defined and narrow customer segment. Stated formally,

Proposition 4. *Customer segmentation focus has a negative impact*

Revenue Growth	Professional services Low	High
High	Lambda	Kappa
Above average	(Beta1)→ Zeta1	Delta1 Delta2
Below average	Zeta2 Epsilon2 Epsilon1	
Ave prof	-0.05	0.13
Ave growth	-0.16	0.17

(a) Low internationalization

	Professional services Low	High
		Theta2 Beta2
	Gamma Alpha1 Alpha2	(Theta1)↑
	-0.11	0.11
	-0.06	0.44

(b) High internationalization

Table 6.24: Probing the impact of internationalization and professional services interaction on revenue growth

on the relationship between professional service provision and revenue growth: the better (worse) the customer segment focus is, the smaller (larger) impact professional services provision has on revenue growth.

Moderating effect of internationalization

The moderating effect of internationalization was investigated in terms of two independent factors: *the degree of internationalization*, measured by the share of revenue coming outside Finland, and *the degree of reseller and service partner use*, measured by the share of revenue generated by these partners. The values of these factors were gathered from the industry survey database and the financial statements of the case firms, and are shown in Table 6.19. In the following, we proceed to analyze the potential moderating impact of these factors on the relationship between service provision and revenue growth.

First, we analyze the relationship between professional services and revenue growth as moderated by the degree of internationalization. We divided the firm-period cases into two groups based on the degree of internationalization, with the threshold value of 0.10. In other words, those cases with more than 10% of their revenue coming from abroad were considered "high internationalization" cases, and those with less than 10% revenue from abroad were considered "low internationalization" cases. The patterns of data inferred from the multiple case study are shown in Table 6.24.

Inspecting the table, we first notice the appearance of two borderline cases. Firstly, the firm-period case Beta1 has nearly high enough relative professional services share to be moved to the right hand above average cell in the low internationalization table. Secondly, case Theta1 is near the threshold of below and above average revenue growth and could thus be placed in the right hand above average performance cell. Both these changes would make the pattern between professional services and revenue growth stronger and

thus indicate that internationalization has only an amplifying impact on the professional services – revenue growth relationship.

Based on the above patterns in data, we may infer to some degree that internationalization has a strengthening impact on the relationship between professional service provision and revenue growth. This inference is based on the fact that the service provision – revenue growth relationship is much clearer in the case of high internationalization. If we move Case Theta1 to the high performance quadrant, no contradictory evidence is left in the high internationalization group. This is also indicated by the comparative performance impact of low versus high professional services provision in the different cases of internationalization: the impact is much stronger in the case of high internationalization.

Theoretically, the observed pattern may be explained by considering the impact of internationalization on knowledge transfer. Obviously, the process of internationalization entails crossing national boundaries and replicating one's business in another country. To do this, the focal firm has to overcome national, language, legislation, and cultural barriers (Barkema et al., 1996; Jensen and Szulanski, 2004). in two ways: first, it has to be able to create the necessary sales and services organization in the country. Secondly, the product firm has to be successful in the knowledge transfer to customer organizations.

The general effect of these difficulties is that they make knowledge transfer between the focal firm and its customer organizations more difficult than between the firm and its domestic customers as the cultural distance increases (Easterby-Smith, Lyles and Tsang, 2008). Hence, to overcome this negative impact on knowledge transfer due to internationalization, the focal firm needs to provide more professional services. These services help the firm to overcome the barriers due to face-to-face nature of these services (Rosenkopf and Nerkar, 2001; Bettencourt and Brown, 2003). By contrast, a firm operating in only its home market has much lower barrier to cross to its customers. Hence, here the relationship between professional services provision and revenue growth should be less obvious, as seen in the data.

Thus, in summary, if a firm has a high degree of internationalization, the choice of low or high professional services provision matters more than in the case of low internationalization. By contrast, the relationship is less clear and weaker in the case of low internationalization. In summary, the more internationalized business SME has, the stronger is the relationship between professional services provision and revenue growth.

Next, we performed the similar analysis on the relationship between development services and revenue growth when moderated by internationalization of the cases. The patterns found in the multiple case study data can be seen in Table 6.25.

Revenue Growth	Development services Low	High
High	Kappa	Lambda
Above average	Delta1 Beta1	Zeta1 Delta2
Below average	Epsilon1 Epsilon2	(Zeta2)↑
Ave devel	-0.07	0.17
Ave growth	-0.08	-0.04

(a) Low internationalization

	Development services Low	High
	Theta2 Beta2	
	(Theta1)↑ Alpha2 Alpha1	Gamma
	-0.09	0.06
	0.23	0.00

(b) High internationalization

Table 6.25: Probing the impact of internationalization and development services interaction on revenue growth

We first note that the firm-period case Zeta2 is a borderline case as it almost has above average revenue growth rate. It could thus be moved to the right hand above average growth cell in the low internationalization table. Moreover, the performance of case Theta1 is over the median relative revenue growth rate and thus it could be moved to the left hand above average growth cell. These changes would strengthen the pattern of a negative relationship between development service provision and revenue growth identified in the below analysis.

As we remember from earlier analysis, development service provision has in general a negative impact on the revenue growth of SMEs (Proposition 2). Thus we should see a negative relationship between development services and revenue growth regardless of degree of internationalization. However, as seen from Table 6.25, this pattern is in fact less clear and nearly reversed in the case of low internationalization. In other words, for low internationalization, adding development services can actually have a *positive* impact on revenue growth. By contrast, in the case of high internationalization, the negative relationship is quite clear and definitely yields much stronger effect than the low internationalization case. While these patterns are by no means very clear, we may nevertheless hypothesize that internationalization has a negative impact on the development services – revenue growth relationship.

Theoretically, the perceived pattern in data can be explained by understanding the nature of development services. These services require technological knowledge, which is typically relatively highly codified, rather than transfer of intricate customer domain or solution knowledge. Furthermore, as development services are provided using similar resources as the focal firm's product development efforts, these services are often delivered from the headquarters of the product firm. Both these factors tend to limit the face-to-face exposure with customers that is a key factor towards successful knowledge transfer (Nonaka, 1994). In short, development services fail to provide much in the

way of knowledge transfer to customers, or the product firm's learning from customers. Hence, as observed from the data, there should be a clear negative pattern between development services provision and revenue growth.

By contrast, in the case of a product firm that only serves its domestic market, the transfer of knowledge is easier due to lower cultural and cognitive barriers, and the use of development services is easier. We should thus see a less clear pattern between development services and revenue growth.

Based on the above analysis of the moderating relationships of internationalization, we may formally formulate the following propositions:

> ***Proposition 5a.*** *The degree of internationalization has a positive impact on the relationship between professional service provision and revenue growth: the higher the degree of internationalization, the larger positive impact professional services provision has on revenue growth.*

> ***Proposition 5b.*** *The degree of internationalization has a negative impact on the relationship between development service provision and revenue growth: the higher (lower) the degree of internationalization, the larger negative (positive) impact development services provision has on revenue growth.*

The second potential moderating factor between service provision and revenue growth related to internationalization was the use of reseller and service partners. While the use of partners is one typical pattern of internationalization, they can in principle also be employed in the domestic market. However, as shown by the data in Table 6.19, internationalization and partner use are not clearly correlated, justifying their separate analysis. As seen from the data in the Table, we choose the threshold value of 5% of revenue from partners to divide the cases in to partner-using and non-partner cases. The 2% revenue from partners for Case Beta2 was deemed to be too small to warrant its inclusion in the partner-using groups.

First, we analyze the impact of partner use on the relationship between professional services provision and revenue growth. The evidence from the multiple case study is presented in Table 6.26.

The relative placement of two cases could be changed as these are close to the threshold values. First of all, firm-period case Gamma is nearly an above average performing firm, and could thus be moved to the left hand above average cell in the no partners table. Case Zeta1 is also nearly an above average growth firm and could also be moved to the same cell. These changes are significant for the inferences made from the evidence in the following.

Observing the patterns in Table 6.26, we may infer, even though the effect is far from being clear, that partner use appears to have a polarizing effect on the relationship between professional services provision and revenue growth. In other words, it appears that the impact of professional services on revenue growth is stronger in the case of high use of partners. From the patterns of

Revenue Growth	Professional services Low	High
High	Lambda	Kappa
Above average	Beta2	Delta1 Beta2
Below average	(Gamma)↑ (Zeta1)↑ Zeta2 Epsilon1 Epsilon2	Delta2
Ave prof	-0.06	0.08
Ave growth	-0.10	0.08

(a) No partners

	Professional services Low	High
		Theta1 Theta2
	Alpha1 Alpha2	
	-0.12	0.13
	-0.08	0.23

(b) Partners used

Table 6.26: Probing the impact of partner use and professional services interaction on revenue growth

cases we see that the relationship is clear in the case of partner-using case, while for cases without partners the relationship is not nearly as evident. Furthermore, comparing the relative strengths of the relationship between non-partner and partner-using cases, we see that the relationship is stronger in the case of partner-using cases. In summary, using partners thus puts an emphasis on the choice of professional services provision, as differences in this share are likely to make a larger difference on the growth of the firm.

The theoretical explanation of this observed pattern is related to the difficulty of knowledge transfer between the focal firm and its international customers. As mentioned above, internationalization requires the focal firm to overcome various cultural and geographical barriers. By using independent local reseller and service partners instead of its own subsidiaries, the focal firm may reduce the impact of these barriers, since these local partners are likely to be more knowledgeable about the culture and business norms of the specific geographical market (Hitt et al., 2000). Furthermore, they are likely to have some level of pre-existing social capital in the form of personal and formal networks (Nahapiet and Ghoshal, 1998; Ellis, 2000; Yli-Renko et al., 2002; Inkpen and Tsang, 2005). In short, local partners performing as intermediaries can increase the chances of success for knowledge transfer between the focal firm and its international customers. This, in turn, is likely to have a positive impact on the revenue growth of the firm. Moreover, the use of partners can potentially allow the focal firm to replicate its business more rapidly despite the challenges in transferring the necessary knowledge to its new partners (Makino and Delios, 1996; Hitt et al., 2000).

The professional services revenue of the focal firm typically comes from its own service provision activities. However, these services enable the product firm to learn from its customers. Thus, in comparison to a firm with partners and low professional services, the firm with high professional services

Revenue Growth	Development services Low	Development services High
High	Kappa	Lambda
Above average	Delta1 Beta2 Beta1	
Below average	Epsilon2 Epsilon1	(Zeta1)↑ (Gamma)↑ Zeta2 Delta2
Ave devel	-0.07	0.14
Ave growth	0.10	-0.03

(a) No partners

Development services Cases
Theta1 Theta2
Alpha1 Alpha2
-0.09
0.07

(b) Partners used

Table 6.27: Probing the impact of partner use and development services interaction on revenue growth

can learn new valuable knowledge *and* leverage this knowledge through its partner network (Dyer and Nobeoka, 2000; Bell and Zaheer, 2007). If the firm does not perform the services itself, it can become distanced from its customers can lose the opportunity for acquiring new knowledge:

> Product firms have a tendency to become distanced from the customers' reality. [...] and since we've been depending on our partners through our sales channel for [knowledge on] customer's real situation: how they use our software, what benefits they get from it. We've been too unknowledgeable about it. (CEO; Case Alpha)

In summary, despite using service partners, the product firm can still benefit from the provision of professional services. If the firm can learn from these face-to-face services, it can effectively leverage the accumulated knowledge through its partner network (Dyer and Nobeoka, 2000; Brusoni and Prencipe, 2001; Ernst and Kim, 2002; Hansen, 2002; Bell and Zaheer, 2007). In short, partner use appears to positively moderate the relationship between professional services provision and revenue growth.

Next, we repeat the above analysis for the relationship between development service provision and revenue growth as moderated by reseller and service partner use. The patterns found in the multiple case study can be found in Table 6.27.

Again, the tables contain borderline cases. The firm-period cases Gamma and Zeta1 have nearly high revenue growth and could therefore be moved to the right hand above average revenue growth cell. This change is significant for making the inferences indicated below.

First of all, we note that there are no differences in the relative extent of development service provision between cases with partner use. Therefore, we cannot infer anything meaningful from that data, except for the average development service shares and revenue growth rates shown in Table 6.27.

By contrast, the cases with no partners have variance in both development services provision and revenue growth. The pattern of data in the no partners table, while not overly clear, suggests that there is a negative relationship between development services and revenue growth. However, the replacement of the two borderline cases would effectively make this conclusion false.

As in the case of internationalization, development service provision per se has a negative impact on revenue growth; on average, cases with lower development service revenue share tend to have lower growth rates. However, in contrast to the moderating effect of internationalization, it actually appears that use of partners does not reverse the basic pattern of development services provision impact on revenue growth in the case of firms with no service partners.

Yet, on theoretical grounds, we argue that the provision of development services would be beneficial for the focal firm if it has service partners. Providing development services enables the focal product firm to develop new codified products, which may then be sold to customers internationally through its partner network. So, unlike in the case of having no partners, the focal firm may more effectively leverage the economies of scale than when it operates internationally directly with its customers. In effect, the firms having partners are likely to provide development services only in the domestic market, while partners abroad provide only professional services based on codified products[3].

Of course, given the lack of tangible evidence about the impact of development services in firms with partners, the conclusions about the moderation effect are admittedly weak. Nevertheless, we may now express the above conclusions in the form of formal propositions:

> ***Proposition 6a.*** *The degree of partner use has a positive impact on the relationship between professional service provision and revenue growth: the higher the degree of partner use, the larger positive impact professional services provision has on revenue growth.*

> ***Proposition 6b.*** *The degree of partner use has a positive impact on the relationship between development service provision and revenue growth: the higher (lower) the degree of partner use, the larger positive (negative) impact development services provision has on revenue growth.*

6.4.3 Impact of service offering on profitability

In addition to revenue growth, our study also considered the firm profitability as an alternative measure of firm performance. Even though profitability

[3] We note that the share of development service revenue share only measures development services provided by the case firms.

Case	Period	Relative Service Prof	Relative Service Devel	Service Capability	Firm Age	GO	Relative Profitability	
Beta	1	0.00	-0.05	Low	2.1	High	0.10	Above
Zeta	1	-0.10	0.33	Med	2.8	Low	0.06	average
Gamma	2	-0.12	0.05	High	3.8	Low	0.06	
Theta	2	0.09	-0.10	Med	3.2	Med	0.04	
Alpha	1	-0.09	-0.07	Low	2.7	High	0.03	
Epsilon	2	-0.05	-0.07	Med	3.0	Low	0.03	
Zeta	2	-0.03	0.08	Med	2.9	Med	0.02	
Delta	1	0.17	-0.03	Low	3.0	High	0.00	Below
Alpha	2	-0.14	-0.10	Low	2.9	Med	0.00	average
Theta	1	0.18	-0.07	Low	3.0	Med	0.00	
Epsilon	1	-0.02	-0.07	Med	2.8	Low	-0.02	
Delta	2	0.09	0.09	Med	3.1	Med	-0.05	
Kappa	2	0.06	-0.05	High	1.1	High	-0.06	
Lambda	2	-0.11	0.13	Med	1.1	High	-0.17	Low
Beta	2	0.05	-0.08	Med	2.4	High	-0.28	

Table 6.28: The direct impact of explaining factors on relative profitability

is often not the primary or critical performance measure for start-ups, ultimately firms need to become and remain profitable if they are to survive in the long run. The consideration of profitability as a performance measure was also based on the notion that the case firms had different financial goals: while others were trying to achieve rapid revenue growth, others were contend with the revenue level they had and instead concentrated on being profitable. For most cases, the chosen strategic financial goal was in the middle ground between these two extremes.

Considering the impact of service provision also on profitability is important from the viewpoint of identifying, justifying and elaborating more general theory for understanding the role of services in manufacturing industries, as it forces us to consider how product firms can use services to create profitable business in the long run. In addition, it provides a clearer link to extant research on solution-based business in manufacturing industries, where profitability is often the more important measure of performance than revenue growth.

As shown in Table 6.28, there is much less variation in the profitability of the case firm-periods than in the revenue growth of the firms. While the differences are less striking than as in the case of revenue growth, firm-period cases Lambda and Beta2 stand out as outliers with low profitability. It is important to note that these are cases which had a very high growth rate. Due to less variation in the outcome variable, the patterns observed in this data are likely to be less noticeable than those observed for revenue growth. Despite this, several notions can be inferred directly from the basic data shown in Table 6.28.

First of all, we note that firm age tends to be positively correlated with profitability; firms who are older seem to have higher profitability than more re-

cently started firms. Of course, this effect is not surprising since these new firms often look for stronger growth at the expense of short-term profitability (Steffens et al., 2006). Furthermore, as firms mature their processes are likely to become more refined through creation of routines, helping the organization to become more efficient (March, 1991; Crossan et al., 1999). This also potentially improves firm profitability in the short run.

The preferences of the managers of young firms are also reflected in the growth orientation (GO) of the case firms; those firms with higher GO tend to have a lower profitability than those with proclivity for growth (Covin and Covin, 1990; Covin and Slevin, 1990). This is simply due to the set strategic goals of the firm and emphasis on growth mentioned above. However, this effect is not monotonic, since some firms with high GO also have a high relative profitability, and some firms with low GO for some reason still have low profitability. Other factors must therefore be included in the analysis to explain the differences in the profitability of the case firms.

Secondly, there appears to be a negative relationship between professional services provision and profitability — the average relative share of professional services is slightly lower (-0.04) in firms with above average profitability than in those with below average profitability (0.04). However, as expected above, this effect is not very strong. By contrast, higher development services provision seems to lead to slightly higher profitability, as firms with above average profitability have higher development services share (0.02) than those with below average profitability (-0.02). This effect is even more subtle. Both findings are maintained and become more prominent if we exclude the cases Lambda and Beta2 as extreme cases — they have significantly low profitability due to their emphasis on revenue growth.

In summary, the analysis of the impact of explaining factors on profitability seems to mirror the findings of the impact on revenue growth: whereas in the case of revenue growth, professional and development service provision have positive and negative impact, respectively, here these effects are reversed. More specifically, professional service provision seems to have a negative impact on profitability, while for development services the effect is now positive. Of course, this was to be expected as revenue growth and profitability are often argued to be opposite, contradictory performance goals for firms (Steffens et al., 2006). Therefore, it is not surprising to see the direction of the effects reversed.

Theoretically, these inferred patterns may be explained as follows. On one hand, while professional services provision enhances knowledge transfer between the focal firm and its customers, it also requires human resources with increasingly intricate knowledge about the customer domain and the product firm's solution. The amount of expertise required to deliver the solutions thus grows, making replication of service operations increasingly costly. On the other hand, professional services improve the focal firm's opportunities

to learn from customers, potentially serving to increase this knowledge over time. Hence, the impact of professional services on profitability is not obviously clear.

Therefore, we must resort to analysis of the profitability between products and services to explain the impact of service provision on profitability. As argued in the in-depth case study, software products are essentially codified technological knowledge, combined with knowledge about customer domain and the solution methodology (cf. Leonard-Barton, 1988a). As codified information products, software is essentially free to reproduce (Shapiro and Varian, 1999). Therefore, as long as the value of the professional services is not great, the product business by itself would be typically more profitable than the pure professional services business. Hence, the less there are professional services in the offering, the better profitability the solution firm should enjoy.

By contrast, we observed a slight positive relationship between development service provision and firm profitability in Table 6.28. In other words, higher relative development service revenue share tends to be associated with higher firm profitability. Theoretically, this observed pattern may be explained by remembering that development services can feed into firm's own product development efforts. In effect, the firm can subsidize its own product development by having customers pay for development that would have taken place anyway. Thus, higher development service revenue shares imply that, at least in principle, the product firms can earn more from the same product development resources. This should have a positive impact on the profitability of the product firm. Formally, we may thus hypothesize:

> ***Proposition 7a.*** *Professional service provision has a negative impact on firm profitability.*

> ***Proposition 7b.*** *Development service provision has a positive impact on firm profitability.*

Next, we consider the impact of contingency factors on the relationships between explaining factors and profitability. For this purpose, we first tabulate the values of these factors for each case when ordered by firm profitability. This data is shown in Table 6.29.

Inspecting Table 6.29 for evident patterns between moderating factors and profitability, we notice that there are no strong relationships between the moderating factors and profitability. However, some of the factors appear to correlate with firm profitability to some degree.

First, we note that there is a negative relationship between the state of the competitive environment and firm profitability. That is, on the average, a hostile competitive environment tends to be associated with high relative profitability, and a benevolent competitive environment with low relative profitability. However, this effect is again partly due to the life-cycle phase of the

Case	Period	Relative Prof	Service Devel	Service Capability	ServCap2	CompEnv	Offering Complexity	Customer Focus	IntRev	Partner	Relative Profitability
Beta	1	-0.02	-0.07	-1	1	0.40	5	-1	0	0	0.10
Zeta	1	-0.12	0.31	0	0	-0.50	2	-1	0	0	0.06
Gamma	2	-0.10	0.06	1	1	-0.67	5	1	0.38	0	0.06
Theta	2	0.11	-0.09	0	0	0.25	4	-1	0.49	0.12	0.04
Alpha	1	-0.11	-0.09	-1	1	-0.50	5	-2	0.63	0.39	0.03
Epsilon	2	-0.03	-0.06	0	0	-0.40	3	-2	0.07	0	0.03
Zeta	2	-0.01	0.09	0	0	-0.67	2	-1	0	0	0.02
Delta	1	0.15	-0.06	-1	1	0.17	2	1	0.02	0	0.00
Alpha	2	-0.13	-0.09	-1	1	-0.75	5	-2	0.67	0.65	0.00
Theta	1	0.16	-0.09	-1	1	0.40	4	-1	0.46	0.16	0.00
Epsilon	1	-0.04	-0.09	0	0	-0.25	3	-2	0.05	0	-0.02
Delta	2	0.11	0.10	0	0	0.17	2	1	0.05	0	-0.05
Kappa	2	0.07	-0.04	1	1	0.75	4	2	0	0	-0.06
Lambda	2	-0.09	0.14	0	0	0.50	5	2	0	0	-0.17
Beta	2	0.06	-0.07	0	0	-0.40	5	-1	0.16	0.02	-0.28

Table 6.29: Interaction analysis of explaining factors, moderating factors and profitability

firms. Young firms tend to face less hostile competitive environment, yet simultaneously they target rapid growth and thus forgo short-term profitability. Hence, there may be no independent relationship between competitive environment hostility and profitability. However, comparing case by case, there are differences between profitabilities of case firms with similar environmental hostilities, so firm age does not exhaustively explain these differences.

Secondly, there seems to be a negative relationship between the customer segment focus and relative profitability of the case firms. This can be explained by two reasons: first, a tighter customer focus typically indicates that a firm is willing to take risks with its business, since it willingly refuses to sell to all possible customers. Therefore, a high customer segment focus is likely to lead to lower profitability (but potentially higher growth) in comparison to firms with less clear customer segment. Secondly, high customer focus is often associated with firms in start-up phase that, as we have seen, also take larger risks and target revenue growth instead of profitability. Together, these two factors are likely to explain the noted pattern.

In terms of other moderating factors, there does not seem to be any clear patterns of effect on profitability. There does not seem to be any direct relationship between offering complexity, international revenue share, or partner revenue share. Therefore, we omit the analysis of these moderating factors on the service provision – firm profitability relationship.

Moderating effect of competitive environment

Given that we have inferred that most moderating factors are unlikely to have an impact on the relationship between service provision and firm profitability, we proceed to test the moderation effects of competitive environment benevolence. As noted above, this factor is likely to be positively associated with customer segment focus. Therefore, we will skip the separate testing of the customer segment focus moderation effect.

We explore the potential moderating effect the hostility of the competitive environment has on the relationship between service provision and profitability of the case firms. As in the case of revenue growth, competitive environment hostility was inferred from the data collected in the multiple case study, using a process described in the methodology section. Based on this data, we analyzed the moderated relationship between service provision and profitability, documented in Table 6.30.

First, we note the presence of at least one borderline case. The firm-period case Alpha2 has nearly low profitability, and could thus be moved to the left hand below average profitability cell in the hostile environment table. This change would decrease the strength of the following conclusions drawn from the patterns in data, but would not invalidate the findings.

Profitability	Professional services Low	High
Above average	Gamma Alpha1 Zeta1 (Alpha2)↓	Zeta2 Epsilon2
Below average		Beta2 Epsilon1
Ave prof	-0.11	-0.01
Ave profit	0.04	-0.06

(a) Hostile environment

	Professional services Low	High
	Beta1	Theta1 Delta1 Theta2
	Kappa Lambda	Delta2
	-0.01	0.13
	-0.04	0.00

(b) Benevolent environment

Table 6.30: Probing the impact of competitive environment and professional services interaction on firm profitability

As can be seen from Table 6.30, there is a clear moderation effect in place: for cases in benevolent competitive environment, higher professional services provision tends to be associated with higher profitability. Conversely, higher professional services tend to lead to lower profitability in the case of hostile environment. This latter pattern is somewhat weakened if we move case Alpha2 to the lower half of the table. We have not discriminated between below average and low average profitability firms in Table 6.30. Making this distinction would not changes the conclusions inferred from the table; in fact, it would even somewhat strengthen the observed pattern.

We have earlier hypothesized that professional services provision is in general negatively related to firm profitability (**Proposition 7a**). There is clearly a reversal in this pattern in the case of benevolent competitive environment. In summary, this means that competitive environment moderates positively the relationship between professional services provision and firm profitability, as hostile competitive environment is related with a pattern similar to the overall effect.

Theoretically, this positive moderation effect is explained by the impact competitive environment benevolence has on knowledge codification. As the market matures (and thus competitive environment becomes increasingly hostile), the knowledge related to the focal firm's solution tends to become increasingly codified (cf. Anderson and Tushman, 1990). This implies that the knowledge transfer between the focal firm and its customers becomes easier, and there is less need for professional services. This demand is also reduced by the narrowing gap between the focal firm's and customers' knowledge bases.

While knowledge transfer in itself does not necessarily affect firm profitability, the fact that less professional services are needed can have an impact on profitability. In a mature market the competitive environment is hostile and typically characterized by fierce price competition (Anderson and Zeithaml,

Profitability	Development services Low	High
Above average	Epsilon2 Alpha1 Alpha2	Zeta1 Zeta2 Gamma
Below average	Beta2 Epsilon1	
Ave devel	-0.08	0.15
Ave profit	-0.05	0.05

(a) Hostile environment

	Development services Low	High
	Theta2 Beta1 (Theta1)↓ (Delta1)↓	
	Kappa	Lambda Delta2
	-0.07	0.12
	0.01	-0.11

(b) Benevolent environment

Table 6.31: Probing the impact of competitive environment and development services interaction on firm profitability

1984). In other words, the focal firm's product business is likely to become less profitable. This, when combined with less need for professional services that could, in principle, be more profitable than the product business, leads to overall lower firm profitability in a hostile environment.

Next, we repeat the above analysis for development services provision. As usual, we begin by constructing displays based on the same thresholds as above for competitive environment hostility. These displays are seen in Table 6.31.

We note from the tables that there are two cases which could be interpreted as borderline cases. Cases Theta1 and Delta1 are both near to the threshold between below and above average profitability, and could thus be moved to the left hand below average profitability cell in the benevolent competitive environment table. This change would somewhat lessen the strength of the inferences made from the data below. However, making these modifications would not seriously threaten the overall validity of the conclusions drawn from the evidence.

Here we again see relatively convincing evidence of moderating impact of competitive environment benevolence. Whereas higher development services provision tends to be associated with lower profitability in the case of benevolent competitive environment, the opposite holds for hostile environment: higher development services are related to higher profitability. While the evidence is not totally without contradictions, the lack of case evidence for high development services — high profitability in benevolent environment and high development services — low profitability in hostile environment

Based on the above observations, and remembering that in general development services should have a positive impact on profitability (**Proposition 7b**), we argue that competitive environment benevolence has a negative moderating effect on the relationship between development services provision

and firm profitability.

Unlike for professional services, market maturation and ensuing knowledge codification and reduction in the knowledge gap are actually good for development services provision. As customers become increasingly knowledgeable about the solution, the find it easier to buy technical development services from the focal firm since they know what they will be buying. At some point in the evolution of the market these development services may become even more profitable than the product of the focal firm (Wise and Baumgartner, 1999; Oliva and Kallenberg, 2003; Sawhney, 2006). Hence, for a firm in a hostile competitive environment (i.e., mature market) an increase in the provision of development services can actually improve the profitability of the firm. Another way in which development services provision may improve profitability is that in a mature market there is no longer a need to aggressively develop the core products. By contrast, the focal firm may gain new products for sale through development services, which are paid by the customers. In effect, this will reduce the relative cost of R&D resources, which obviously has a positive impact on firm profitability.

As indicated again by evidence from the oldest case firm (Case Gamma), a mature market with a large installed customers base seems to provide more opportunities for product development collaboration with customers, hence improving the profitability of development services:

> Our credo is that we try to build [customized software] into add-on [products] and make our process support palette more complete [...] So we do this with a couple of customers, then it becomes a license and we can sell them. (SVP; Case Gamma)

Based on the above analysis, we may now formally hypothesize:

> ***Proposition 8a.*** *The benevolence of the competitive environment has a positive impact on the relationship between professional service provision and profitability: the more benevolent (hostile) the environment is, the larger the positive (negative) impact professional service provision has on firm profitability.*

> ***Proposition 8b.*** *The benevolence of the competitive environment has a negative impact on the relationship between development service provision and profitability: the more benevolent (hostile) the environment is, the larger the negative (positive) impact development service provision has on firm profitability.*

6.4.4 Impact of service capability on revenue growth

After analyzing the impact of service provision on firm performance, and the impact of various moderating factors, we now turn to the analysis of firm's service capability as an explanatory factor of the firm performance. Service capability refers to the firms' ability to deliver its services effectively to meet

customer expectations and to produce them efficiently with existing resources. This analysis is based on the obvious assumption that, in addition to what and how much services a firm provides, *how well* the firm manages its service operations also has an impact on performance. We start with the analysis of service capability's direct and moderated impact on revenue growth.

Unlike the impact of service provision, Table 6.18 does not show a clear pattern between service capability of the case firms and their revenue growth. If anything, there seems to be a slight negative relationship between service capability and revenue growth. This can be seen by inspecting the service capabilities of case firms with above average growth rates: they are either Low or Medium, whereas firms with below average growth tend to have at least Medium service capability.

First, we will analyze what direct impact, if any, the service capability of the case firms has on the revenue growth of these firms. As seen from Table 6.18, if we exclude the start-up cases as obvious growth outliers (Kappa and Lambda), we see that in fact it appears that the service capability of the case firms tends to be slightly negatively related with revenue growth — case with above average revenue growth rate have, on the average, slightly lower service capability than those firms whose growth rate is lower. However, from the outlier cases it seems that at least moderate service capability is necessary for fast revenue growth. Overall, the pattern does thus seem slightly ambiguous.

Based on theoretical considerations, we would anticipate service capability to have a positive impact on revenue growth: higher service capability should allow product firms to replicate their business more effectively, leading to higher revenue growth rate (Winter and Szulanski, 2001; Jensen and Szulanski, 2007). This effect seems to be present in the outlier cases. Evidence thus suggests that service capability is a necessary condition for fast growth. There is also informant evidence in support of this view:

> Without [service] productization it's pretty hard to do that growth, because it becomes a snowball that grows and grows and at some point explodes [...] because it gets out of your control (VP, Services; Case Beta)

> Ultimately our team is small, but we've been able to finetune it to be very efficient; we do things very quickly. [...] so services don't slow down our sales, we're able to deliver what we've promised (Director, Business development; Case Kappa)

Yet, for more mature firms the effect does seem to be less clear. It appears that this effect is not apparent; it would seem that, if the product firm does not need to expand its service organization as quickly, it does not need particularly high service capability. In fact, higher service capability could in these cases even be counterproductive, as efforts spend on improving service capability would be taken from the actual expansion of operations. Moreover, high service capability could also indicate that the product firm is concentrating on providing high service quality to its current customers at the expense

Revenue Growth	Service capability Low	Medium	High
High		Lambda	Kappa
Above average	Delta1 Beta1	Zeta1 (Delta2)↓	
Below average		Epsilon2 Epsilon1 Zeta2	
Average growth	0.38	-0.24	N/A

(a) Low internationalization

	Service capability Low	Medium	High
		Beta2 Theta2	
	(Theta1)↑ Alpha1 Alpha2		Gamma
	-0.02	0.60	N/A

(b) High internationalization

Table 6.32: Probing the impact of internationalization and service capability interaction on revenue growth

of new customer sales, which ultimately is required for substantial revenue growth.

Thus, based on the evidence from the multiple case study and the above theoretical argumentation, we may thus propose that

> ***Proposition 9.*** *Service capability has a negative impact on revenue growth.*

We note that this proposition mainly applies to firms with slower growth rates. As discussed above, high service capability is likely to be a necessary factor for attaining fast growth.

Moderating effect of internationalization

As in the case of service provision impact on performance, the degree of internationalization was expected to have an impact on the relationship between service capability and revenue growth. Internationalization was conceptualized with two independent constructs: degree of internationalization, and the degree of reseller/service partner use. The degree of internationalization was measured using the share of revenue coming from abroad as a proxy. Correspondingly, partner use was measured using the share of revenue generated by reseller and service partners.

First, we inspected the impact of internationalization on the relationship between service capability and revenue growth. Again, we used the threshold value of 10% to delineate between low and high internationalization. The pattern of data as inferred from multiple case data evidence is shown in Table 6.32.

There were two borderline cases in the data. First, the firm-period case Theta1 could be interpreted as having above average growth and thus placed in the left hand above average performance cell. This modification would not strictly constitute contradictory evidence for the drawn conclusions, but

would somewhat decrease the validity of the conclusions. The other borderline case is Delta2, which is a borderline case between above and below average performance. Therefore it could thus be moved to the right hand below average growth cell in low internationalization table. This change would in fact have a strengthening effect on the conclusions of the analysis.

As can be seen from Table 6.32, it seems that the degree of internationalization does moderate the relationship between service capability and revenue growth. As stated earlier, service capability in general has a slight negative impact on revenue growth. However, as seen from the table, when excluding the start-up cases (Kappa and Lambda) and case Gamma, that this relationship is reversed for high degree of internationalization. In other words, for case firms with high degree of internationalization, higher service capability tends to lead to higher revenue growth.

The explanation for this pattern depends on the effects of service capability. As higher service capability improves the product firm's ability to manage its service operations, it also improves the chances for successful replication of the business (Winter and Szulanski, 2001; Jensen and Szulanski, 2007). Obviously, successful replication is required for the growth of the business, especially beyond currently available human resources. This is usually the case for firms moving into new international markets (Martin and Salomon, 2003a). Furthermore, internationalization increases the difficulty of replication due to national, language and cultural barriers (Barkema et al., 1996; Jensen and Szulanski, 2004). The following quote hints at the difficulty of transferring knowledge to international partners *without* proper standardization:

> There's still a long way to go to actually get the cooperation to work so that the know-how in Finland can be transferred to [international partners] (CEO; Case Lambda)

Internationalization also makes knowledge transfer to customers of the focal firm more difficult due to differences in culture and potentially also knowledge bases due to different maturity of the markets. These cultural effects related to internationalization were experienced by multiple case firms, as suggested by the following evidence:

> The Nordic countries are quite progressive [in one solution area], so if we compare that, for example, to America, we're years ahead. On the other hand, the Americans are years ahead of Europe [in another solution area]. (SVP, Strategy; Case Theta)

> One reason for doing [service standardization] is that we [...] can deliver these designs to our partners abroad, so that they can sell them and then produce the service themselves. If we standardize the services and define what services customers need it enables our growth (Sales Director; Case Beta)

Service capability affects this aspect of internationalization as well. If the product firm has high service capability, it is able to codify its knowledge and

Revenue Growth	Service capability Low	Medium	High
High		Lambda	Kappa
Above average	Delta1 Beta1	Beta2	
Below average		Zeta1 Epsilon1 Epsilon2 Zeta2 Delta2	Gamma
Average growth	0.38	-0.06	0

(a) Low partner use

Service capability Low	Medium	High
Theta1	Theta2	
Alpha1 Alpha2		
-0.02	0.35	N/A

(b) High partner use

Table 6.33: Probing the impact of partner use and service capability interaction on revenue growth

related services effectively, which has a positive impact on knowledge transfer success due to reduction in knowledge ambiguity (Simonin, 1999a; Szulanski and Jensen, 2004). Both these mechanism highlight the importance of service capability for internationalized firms, as there is a clear positive relationship between service capability and revenue growth in the case of high internationalization.

Next, we explore the impact of partner use on service capability – revenue growth relationship. Again, we used the threshold value of 10% to delineate between cases with no partner use and high partner use. Based on the multiple case data, we find the patterns of data found in Table 6.33.

As in the case of degree of internationalization, we see again the relationship between service capability and revenue growth reversed between the cases of low and high partner use. More specifically, the expected pattern of negative correlation between service capability and revenue growth is reversed in the case of high partner use. With some contradictory evidence (start-up cases Kappa and Lambda), the use of service partners appears to moderate the relationship between service capability and revenue growth.

The explanation of this effect is similar to the explanation of the moderating effect of internationalization. The effective use of partners for revenue growth requires the focal firm to replicate its business in these local partners (Zander and Kogut, 1995; Winter and Szulanski, 2001; Jensen and Szulanski, 2007). Again, this is more difficult due to the necessity to transfer knowledge across organizational boundaries (Lyles and Salk, 1996; Carlile, 2004; Jensen and Szulanski, 2004). Service capability has a positive effect on the focal firm's capability to replicate its business and thus serves to compensate for the difficulties created by the use of partners.

The informant evidence supports these patterns in in both negative (low service capability) and positive (high service capability) cases. While the be-

low quotes refer mainly to service productization, also other aspects of service capability are likely to have similar effects.

> One reason for doing [service productization] is that we [...] are able to bring [these services] to partners abroad, so that they can sell and deliver the services themselves (Sales Director, Case Beta)

> We should better be able to do ready templates related to our product in a marketing sense [...] from a marketing point of view these packages would be beneficial [...] to partners (VP, Marketing, Case Alpha)

Based on the above analysis and empirical evidence we may hypothesize:

> ***Proposition 10a.*** *The degree of internationalization has a positive impact on the relationship between service capability and revenue growth: the higher (lower) the degree of internationalization, the larger the positive (negative) impact service capability has on revenue growth.*

> ***Proposition 10b.*** *The degree of partner use has a positive impact on the relationship between service capability and revenue growth: the higher (lower) the degree of partner use, the larger the positive (negative) impact service capability has on revenue growth.*

6.4.5 Impact of service capability on profitability

In addition to its impact on revenue growth, we have also theorized that service capability may also have an impact on firm profitability. In essence, the analysis of the impact of service capability on profitability was carried out in the same way as for revenue growth. First, we inspected whether service capability has a direct impact on profitability. Again, we used data in Table 6.28 to check for potential patterns in data.

Based on the multiple case study data, we may conclude that service capability tends to have a negative impact on firm profitability. This is judged by comparing the average profitability of firms with low, medium and high service capability. Combining medium and high service capability cases, we see that their average relative profitability is lower (-0.04) than that of firms with low service capability (0.03). This conclusion holds even if we exclude the outlier cases (Beta2, Lambda) whose profitability is noticeably low in comparison to the other cases.

Furthermore, it would seem that there is a curvilinear relationship between service capability and profitability. More specifically, it appears that firms with low *and* high service capability have, on the average, higher profitability than those with medium service capability. However, given the multitude of hypotheses considered in this study, we excluded the analysis of curvilinear relationships between explaining and outcome factors.

The observed negative relationship between service capability and firm profitability is somewhat contrary to our expectations. As higher service capability allows the product firm to produce its services more efficiently, it should

have a clear positive impact on profitability. Therefore, we will assess the impact of other factors in order to isolate the impact of service capability on firm profitability. This further analysis was also prompted by strong informant evidence, which suggested that firms see a positive relationship between service capability and profitability:

> [If you have] a productized service then you know how much of your own effort is required, you know your own costs, so you can set a price at which you can make a profit. (VP, Services; Case Beta)

> In a way we get the same [revenue] for less work, or we can sell more, so [service standardization] definitely has an impact on [profitability]. (VP; Case Gamma)

> We have increased our revenue from consulting [...] for the last three years, even though we haven't increased our head count. Our consulting productivity has been increased through service productization. (SVP, Regional sales; Case Theta)

As indicated earlier in this chapter, the growth orientation of firms has a negative impact on the profitability of the case firms. In other words, firms with high growth aspirations tend to care less about the short term profitability of the firms. We thus first assess how growth orientation affects the relationship between service capability and firm profitability. To do this, we first tried to exclude cases with high growth orientation from the analysis. This provided a clear result: instead of a weakly negative relationship, we instead see a clear *positive* relationship between service capability and profitability. Correspondingly, for the high growth orientation firms we see a clear negative relationship. We may thus conclude that growth orientation has a great impact on firm profitability and completely shadows the impact of service capability on profitability. Had we controlled firm performance for growth orientation, we would have been likely to directly see a positive relationship.

We next conducted the same analysis on firm age, also an important explanatory factor of firm profitability. This analysis produced nearly identical results: for young firms (cf., high growth orientation) service capability appeared to have a negative impact on firm profitability, but for more mature firms the impact was positive. Based on these observations, we suggest that the impact of service capability is overshadowed by other factors. Based on the above argumentation, we thus formally hypothesize:

> ***Proposition 11.*** *Service capability has a positive impact on firm profitability.*

Next, we explore the impact of contingency factors on the relationship between service capability and profitability. While there were numerous potential factors included in the analysis, we concentrated on the moderating effects of internationalization and partner use, discussed in the following.

Profitability	Service capability		
	Low	Medium	High
Above average	Beta1 Delta1	Epsilon2 Zeta1 Zeta2	
Below average		Lambda* Epsilon1 Delta2	Kappa
Average profit	0.05	-0.02	-0.06

(a) Low internationalization

	Service capability		
	Low	Medium	High
Above average	Alpha1 Alpha2 Theta1	Theta2	Gamma
Below average		Beta2*	
Average profit	0.01	-0.12	0.06

(b) High internationalization

Table 6.34: Probing the impact of internationalization and service capability interaction on firm profitability

Moderating effect of internationalization

Next, we analyze the potential impact of internationalization on the relationship between service capability and firm profitability. As above, internationalization is conceptualized using two constructs: the degree of internationalization and the use of reseller/service partners.

We first analyze the impact of the degree of internationalization on the service capability — profitability relationship. Based on multiple case study data, we first construct a tabular display of the relationship, shown in Table 6.34. Based on the patterns of data found the table, we may infer that there appears to be some level of moderating effect between internationalization and the service capability — profitability relationship. More specifically, it appears that for case firms with high internationalization that, with the exception of case Beta2, there is now a positive relationship between service capability and profitability. In other words, the general negative impact of service capability on profitability seems to be reversed here, and in fact higher service capability now seems to correlate with higher profitability.

Excluding case Beta2 would have lead to higher average profitability in the case of high degree of internationalization, and subsequently cases Alpha1 and Theta1 would have been placed in the lower left quadrant. This would have been even more in line with the general conclusion drawn above of the positive moderating impact of internationalization. Case firms have identified the importance of service capability to their internationalization:

> Service standardization is something we think about a lot [...] how we should actually do it [...] because I believe that it contains the keys to either our success or our failure. (VP, Channel sales; Case Alpha)

As in the case of analyzing the impact of service capability on revenue growth, when moderated by internationalization, the explanation of the identified patterns relies on the ability of service capability to enhance knowledge transfer through knowledge codification, as well as the use of efficient methods for

Profitability	Service capability		
	Low	Medium	High
Above average	Beta1 Delta1	Epsilon2 Epsilon1 Zeta1 Zeta2	Gamma
Below average		Lambda* Beta2* Delta2	Kappa
Average profit	0.05	-0.06	0.00

(a) Low partner use

	Service capability		
	Low	Medium	High
Above average	(Alpha1)↓	Theta2	
Below average	Alpha2 Theta1		
Average profit	0.01	0.04	N/A

(b) High partner use

Table 6.35: Probing the impact of partner use and service capability interaction on firm profitability

transferring the knowledge across geographical markets. Higher service capability thus implies that the product firm is able to transfer required knowledge to its international markets in an efficient way. This in turn translates into higher profitability of the overall business, as costs related to this knowledge transfer are lowered.

Secondly, we inspect the impact of reseller/service partner use on the relationship between service capability and firm profitability. Based on the data from the multiple case study, we have the tabular display shown in Table 6.34.

We note that there are again borderline cases in the tables. Case Alpha1 is near the threshold between above and below average profitability. Interpreting the case as low profitability would move it to the left hand below average profitability cell in the high partner use table. This change would increase the power of the conclusions drawn from the tabular display. Furthermore, the exclusion of the case Beta2 in low partner use table would increase the average profitability for cases with medium service capability.

The evidence in Table 6.35 again suggests that the degree of reseller/service partner use appears to moderate the service capability – profitability relationship. In general, service capability has a negative impact on profitability (Proposition 12). Yet, as seen from the high partner use part of Table 6.35, there now seems to be a positive relationship between service capability and firm profitability. From this evidence, it thus seems that partner use indeed positively moderates the service capability – profitability relationship.

The positive impact of service capability on the focal firm – partner knowledge transfer was also noted by several informants:

> [Our services] are partly ready [to be transferred to partners]; for some parts we have quite ready package, but if we talk about [specific functionality] we still have a little more to do. (VP, Case Gamma)

> Our channel partners would welcome such templates (Consultant, Channel sales; Case Alpha)

Theoretically, the explanation is similar as in the case of revenue growth analysis. Higher service capability enables the focal firm to transfer necessary knowledge more effectively and efficiently to its partners, which lowers the costs associated with knowledge transfer. This enhancements in knowledge transfer are brought about by the reduction in knowledge ambiguity, as well as knowledge codification. Moreover, the procedures and processes used for knowledge transfer are also improved by higher service capability. Consequently, the enhanced knowledge transfer between the focal firm and its partners will thus result in higher profitability of the business. The above findings may stated formally as follows:

> ***Proposition 12a.*** *The degree of internationalization has a positive impact on the relationship between service capability and profitability: the higher (lower) the degree of internationalization, the larger the positive (negative) impact service capability has on firm profitability.*

> ***Proposition 12b.*** *The degree of partner use has a positive impact on the relationship between service capability and profitability: the higher (lower) the degree of partner use, the larger the positive (negative) impact service capability has on firm profitability.*

6.5 Discussion and conclusions

The purpose of this multiple case study was to study whether provision of knowledge-intensive services has an impact on the performance of a product SME, and whether internal or environmental contingencies affect this relationship. Based on the comparative case study of nine Finnish case firms, we have identified several patterns relating the professional and development services provision, and service capability of the case firms to revenue growth and firm profitability. In addition, our analysis of case data has also established several factors that do moderate the relationship between service provision and firm performance. A full list of the identified relationships, expressed in the form of propositions, can be found in Table 6.36.

More specifically, our first major conclusion from the findings of this study is that basic notion that services do matter: our findings indicate that service provision have an impact on both the revenue growth and firm profitability. We have identified several patterns in our data that clearly link services to firm performance.

Second, we have found that the two types of services, professional and development services tend to have contradictory impact on firm performance. This finding suggests, unlike much of the earlier literature, that services should not be considered a homogeneous construct when analyzing the strategic impact of service provision. Treating services as one homogeneous group

Proposition #	Relationship	Hypothesized Effect
1a	Professional service → Revenue growth	+
1b	Development service → Revenue growth	-
2a	Professional service × Benevolent Environment → Revenue growth	+
2b	Development service × Benevolent Environment → Revenue growth	-
3	Professional service × Offering complexity → Revenue growth	+
4	Professional service × Customer focus → Revenue growth	-
5a	Professional service × Internationalization → Revenue growth	+
5b	Development service × Internationalization → Revenue growth	-
6a	Professional service × Partner use → Revenue growth	+
6b	Development service × Partner use → Revenue growth	+
7a	Professional service → Profitability	-
7b	Development service → Profitability	+
8a	Professional service × Benevolent Environment → Profitability	+
8b	Development service × Benevolent Environment → Profitability	-
9	Service capability → Revenue growth	-
10a	Service capability × Internationalization → Revenue growth	+
10b	Service capability × Partner use → Revenue growth	+
11	Service capability → Profitability	+
12a	Service capability × Internationalization → Profitability	+
12b	Service capability × Partner Use → Profitability	+

Table 6.36: Hypotheses identified in multiple case study

is likely to miss the potentially differing conclusions relating to the impact of different services.

Third, we have identified several contingency factors that moderate the relationship between service provision and firm performance. As suggested by the in-depth case study, offering complexity and market maturity (represented by the benevolence of the competitive environment) have an impact on how service provision activities of the case firm affect their performance. Moreover, the degree of internationalization and the use of service and reseller partners also moderates the relationship between knowledge-intensive services and performance. This provides additional evidence supporting the knowledge-based interpretation of service provision, as the replication of service business is known to be even more difficult internationally (Simonin, 2004; Kotabe et al., 2007), and outside the organizational boundaries of the focal firm (Subramaniam and Venkatraman, 2001; Dhanaraj et al., 2004; Jensen and Szulanski, 2004). Lastly, the overall complexity of the case firms' offerings' seems to require different types of knowledge-intensive services to complement the technological innovation to result in enhanced performance.

Fourth, and finally, our comparative analysis of the case firms revealed that the service capability of the case firms, *per se*, had an impact on the firms' performance, irrespective of the extent of service provision activities. Firms with a high degree of internationalization and use of partners seem to benefit from a better service capability even though they would not provide much services themselves. This, again, is an indication that the knowledge-based interpretation of solution provision is viable, as it highlights the importance of interorganizational knowledge transfer. The chances of success of this transfer are improved by the service capability of the focal firm.

Overall, the results of the multiple case study have supported the initial conclusions made in the in-depth case study. In particular, the various patterns and explanations identified through comparative case analysis support the adoption of knowledge-based view of the firm as a feasible theoretical grounding for understanding the role and impact of service provision in product firms. Furthermore, the findings support the conclusions that offering complexity and life-cycle affect the optimal choice of service provision activities.

Obviously, a case study is subject to multiple inherent weaknesses. As indicated by Yin (2003) and Miles and Huberman (1994), a case study cannot escape the subjectivity injected by the researcher. However, we have tried to adopt measures that minimize the potential negative impact of these weaknesses on the reliability and validity of the study. As suggested by (Pratt, 2009), we have tried to provide as clear as possible description of the actual analytical process through which we arrived at the conclusions of the study. Examples of this transparency include the detailed description of the data analysis process and the inclusion of informant quotes to facilitate the making of independent inferences about the cases. Thus, even though the individuals inferences made by the author about the cases may, of course, still display subjectiveness, the overall research process should be closely replicable. This should improve the replicability and reliability of the study.

Our multiple case study has discovered several patterns in the collected data on the case firms. In general, our findings suggest that service provision and service capability do have a clear impact both the revenue growth and profitability of a product SME. In more detail, our analysis revealed that different types of services have a different impact on growth, and that this impact is dependent on the market maturity.

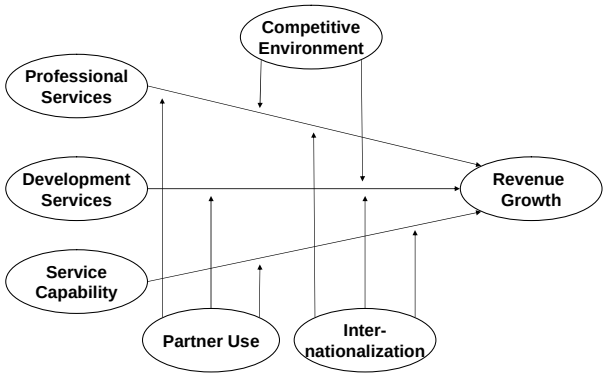
7 Quantitative Analyses

The purpose of this chapter is to test the hypotheses regarding the strategic impact of service provision and service capability in product firms. These hypotheses were developed in the multiple case study using qualitative, inductive methods. Our objective in this study is to provide additional empirical evidence beyond the purposefully selected group of case firms, hereby enhancing the external validity of the overall study. Furthermore, the test of the developed hypotheses also serves as an opportunity to re-evaluate the propositions and to revise them to form a coherent overall theoretical explanation of the identified patterns in data.

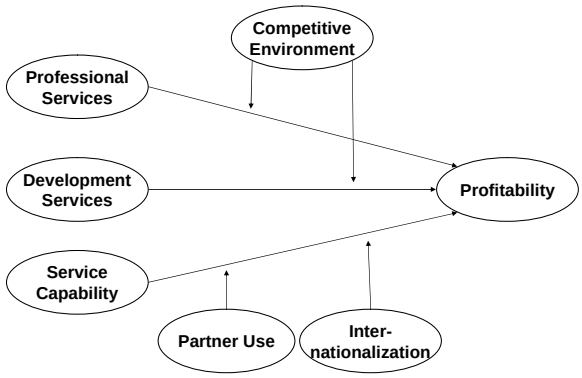
To this end, we use quantitative analysis methods on cross-sectional data available from the Finnish software industry survey (Rönkkö et al., 2009). The data from this database allows us to test the emerging hypotheses on a population of hundreds of firms. However, given our strict focus on product SMEs, we must limit number of eligible observations to some degree.

We will concentrate on the most significant and clearest hypothetical relationships identified during qualitative research. Comprehensive testing of all potential relationships and hypotheses is beyond the scope of this study, given our emphasis on theory identification and elaboration. In addition, quantitative data was not available for all constructs in the study, such as offering complexity. Therefore, we could not test some of the hypothesized relationships at all. In addition, we had to use crude proxy variables to operationalize several of the constructs present in qualitative studies. In summary, all this suggests that the analyses in this chapter should be considered more or less exploratory rather than conclusive.

Given that we have already discussed the theoretical grounding and derivation of the hypotheses tested here in the multiple case study of Chapter 6, we will omit the discussion on theory and hypothesis development. The tested relationships between constructs are shown in Figure 7.1. However, since quantitative study here is partly exploratory and lead to changes in the inferred propositions, we will return to the theoretical explanations in the discussion section of this chapter. The emerging integrative theoretical framework is discussed in its entirety in the Chapter 8.



(a) Impact on revenue growth



(b) Impact on profitability

Figure 7.1: Relationships tested with quantitative analysis

7.1 Methodology

Quantitative analysis in management research is typically used within the *hypothetico-deductive* research approach, which is typically linked with the positivist or realistic epistemological position. In this research approach, quantitative analysis using statistical methods is used to test hypotheses arising from extant theory. Ideally, the hypotheses are laid out before collecting and analyzing data, ensuring that the hypotheses are indeed developed a priori from theoretical considerations and do not arise inductively from the data.

Obviously, our study thus far has followed the tradition of inductive, theory-generating approach to research using qualitative methods (Corbin and Strauss, 1990; Eisenhardt, 1989a; Parkhe, 1993; Yin, 2003). While qualitative studies typically can are based on the collection of rich data that allows extensive theorizing and development of new theory, this type of research cannot usually provide empirical generalizability of the results, i.e. the external validity of such studies is often low in statistical sense (Yin, 2003; Johnson et al., 2006; Gibbert et al., 2008). However, this is a known feature of qualitative research strategies (Flyvbjerg, 2006), and typically these studies instead aim for *theo-*

retical generalization, which means generalizing the theoretical insights from the study to a more general theoretical context (Yin, 2003).

As mentioned in the discussion on the quality of the research design in Chapter 4, we seek to rectify these potential weaknesses regarding the internal and external validity of the qualitative studies employed thus far in this study (cf. Diefenbach, 2008) by complementing them with a quantitative analysis of most of the propositions developed through multiple case study. The purpose of this approach is twofold: first, we seek to improve the generalizability (i.e. external validity) of the results by testing the hypotheses in a larger population of firms than the nine case firms purposefully selected for the case study. Secondly, this analysis should also provide new insights to the hypotheses themselves, by providing complementary evidence which may also be in contradiction with the findings of the case studies. This evidence helps us to refine our theoretical explanation of service provision, and thus contributes to the overall theoretical results of the study.

Given our goal of modeling the impact of service provision on firm performance in terms of fit-as-moderation, multiple regression analysis using direct and interaction terms is the appropriate analytical method (Venkatraman, 1989a). In this view of contingent fit, we wish to explain the variance of the outcome variable (firm performance) in terms of the independent variables (service offering and service capability), possibly moderated by other factors (moderators hypothesized in the multiple case study). The methodology used in this chapter thus follows the standard procedure for analyzing linear relationships between variables through multiple regression analysis (Hair et al., 2006).

First, we will discuss the population of firms included in the survey, how the survey was conducted, and how the sample of firms for analysis was gathered. Second, we will discuss the operationalization of all constructs used in the statistical analysis. Most of the constructs have been introduced and used in prior research; however, for service capability and growth orientation constructs we need to evaluate their reliability and validity for further analysis, as these have an impact on the accuracy of the findings made in regression analysis. This testing will consist of conducting exploratory factor analysis and calculating Cronbach's Alpha (Cronbach and Meehl, 1955). During the discussion of each construct's operationalization, we will also consider the potential existence of outliers and skewness of variable distributions. These obviously also have an impact on the results of the regression analysis.

Third, we will conduct regression analyses using ordinary least squares (OLS) multiple variable regression, by first including control variables and then introducing independent variables and their interaction terms one at a time. In addition to the sign, magnitude and significance of regression coefficients, we will also observe the overall fit of the models, as well as the variance infla-

tion factor (VIF), caused by variable multicollinearity, which potentially reduces the reliability of the coefficient estimates.

Fourth, the direct interpretation of interaction term coefficients is not trivial (Cohen et al., 2003, pp. 261–262). Therefore, we will use the graphical method of interpreting these effects advocated by Preacher et al. (2006). This method consists of plotting the simple slopes of the dependent variable as a function of the independent variable at various levels of the moderating variable. Observing changes in the slope of the relationship allows us to confirm the interpretations made from regression coefficients of interaction terms.

7.2 Population and Sampling

The data for quantitative analysis come from the annual survey of the Finnish software survey (Rönkkö et al., 2009)[1] conducted using a tailored survey design method (Dillman, 2007). The data used in this study was collected in 2009, and comprises the financial data from the year 2008 and the managers' assessment of their firm's business in early 2009, somewhat coinciding with qualitative data collection.

The population of the survey was defined as all Finnish-owned and located firms whose business in some way or other includes the sales of software products or software services. These firms roughly correspond to SIC codes 7371 (custom programming services), 7372 (prepackaged software) and 7373 (system integrators). The initial list of firms was based on the registry data from the Finnish patent office based on predetermined industry codes, data available from firm contact information databases, other stakeholders (such as the Finnish software entrepreneurs' association), and previous years' respondents. In total, 4544 Finnish firms were contacted and asked to participate in the survey. This population consisted mainly of firms whose business is in developing custom software for other organizations or standardized software products.

All eligible firms were contacted through email and mailed questionnaire with a cover letter explaining the purpose of the survey. Multiple reminder email messages were sent for all nonrespondents before closing the survey to ensure as large number of respondents as possible. In the end, a total of 584 firms provided complete responses to the survey, yielding a response rate of 12.9%. However, this figure is somewhat misleading, since the questionnaire was also sent to many firms that were actualy not software firms. Moreover, since many Finnish software firms are very small service firms that are not as likely to provide an answer as larger firms, the response rate was substantially larger (approximately 30%) for firms relevant to this study.

[1] This reference contains a more detailed description of the survey process and methodology used. Here, we provide only a rough overview of the methodology.

The survey data covered both software product and services firms. As the purpose of this study is to analyze the impact of knowledge-intensive services on product firms, we employed two criteria for observations to be included in further analysis. First, informants were asked to indicate the type of their firm based on a predefined categorization, ranging from software product to not software related services (Rönkkö et al., 2009). We chose only those firms who had identified themselves as product firms for further analysis.

Secondly, as indicated previously, we used the threshold of 50% revenue share coming from directly or indirectly product-related sources — more specifically, the sales of licenses or software as a service, plus the revenue from software maintenance contracts. Both items are directly related to the IPR the firm possesses, as maintenance services, which include product upgrades and customer support services, are typically contractually linked to previously sold licenses (i.e., product sales). In other words, included firms receive at least half of their revenue from sales of IPR-related products or services. Setting this threshold ensured that the firms in quantitative analysis were relevant given the scope of the overall study on product firms. In other words, included firms were dominated by product-based business in terms of their revenue composition.

After applying these conditions for included firm in subsequent analysis, a total of 162 observations were left for further analysis. However, inspecting data for obvious errors, missing data and outliers, mainly in the dependent variables, we were left with 116 usable observations for regression analysis. Observations were excluded if either of the dependent variables was clearly outside the typical range[2]. In addition, we also excluded observations that were clearly erroneous when checked against the firm web site and officially available data, and for which we could not find a reliable value in the available databases. Finally, we note that for some variables we had less observations. Hence, for some regression analyses the actual number of usable observation was even lower.

7.3 Construct operationalizations

Table 7.1 shows the characteristic statistics of the variables used in quantitative analysis after excluding outliers and errors in data. In the following, we discuss how the constructs identified during the multiple case study were operationalized for measurement and statistical analysis in more detail. In particular, we describe how the used measures were developed, and how the reliability of the measures were evaluated, were applicable.

[2]For more detailed description of the procedure used to detect outliers, see Section 7.3.1

Variable	Obs	Mean	Median	S.d.	Min	Max	Alpha
Dependent variables							
Revenue Growth	126	0.14	0.10	0.31	-0.52	1.39	
Profitability	124	0.05	0.04	0.12	-0.33	0.31	
Independent variables							
Prof Services	109	0.13	0.10	0.12	0.00	0.50	
Rev Services	109	0.09	0.05	0.11	0.00	0.50	
Service Capability*	67	-0.03	-0.01	0.58	-1.84	1.07	0.79
Moderating variables							
Internationalization	78	-0.31	-0.32	0.45	-1.00	0.68	
Partner Use	134	0.36	0.00	0.48	0.00	1.00	
Control variables							
Firm Size† (t - 1)	134	13.47	13.55	1.50	9.39	18.09	
Firm Age†	134	2.47	2.63	0.62	0.69	3.76	
Growth Orientation	110	0.27	0.37	0.70	-1.17	1.61	0.87
External Finance	104	0.21	-0.30	0.97	-0.30	3.37	

* Also used as a moderating variable; † Logarithmic scale; Alpha = Cronbach's Alpha

Table 7.1: Characteristic statistics of measures used in quantitative analysis

	Variable	1	2	3	4	5	6	7	8	9	10
1	**Revenue Growth**										
2	**Profitability**	-.04									
3	**Prof Service**	.09	.07								
4	**Devel Service**	-.15	.02	-.16							
5	**Service Capability**	.02	.32*	.19	-.12						
6	**Intern'n**	-.12	-.05	-.18	.22	-.36*					
7	**Partner Use**	-.01	-.05	-.20*	.01	-.19	.29				
8	**Firm Size (t-1)**	-.12	.07	.08	-.15	.22	.17	-.04			
9	**Firm Age**	-.28*	.27*	.06	-.17	.07	.12	-.14	.22*		
10	**GO**	.34*	-.19	-.02	-.11	-.17	.28*	.18	-.03	-.21*	
11	**ExtFinance**	.06	-.31*	-.11	-.13	-.13	.21	.09	.16	.13	.20*

Correlations coefficients marked with * are significant at $p < 0.05$ level.

Table 7.2: Correlations between variables

7.3.1 Dependent variables

As we have done throughout this study, we used two measures to operationalize firm performance: *revenue growth* and *firm profitability*. The revenue growth was measured in terms of total sales of the firm, and defined as the ratio of revenue change between the years 2007 and 2008, and revenue in 2007. Firm profitability was measured as the ratio of before-taxes-and-interest profits and revenue in 2008. Both measures of performance are independent of firm size, as both absolute revenue change and profitability are proportional with firm size. We thus need not consider other measures to account for differences in firm size. In addition, given the tight empirical focus on product firms from software industry with over 50% revenue from IPR sources, the performance measures should be relatively homogeneous over the sample. In other words, the firms in the sample are likely to use similar measures of

performance (Richard et al., 2009).

The data for the measurement of performance was provided by firm informants, but was based on firms' own financial statements. Furthermore, we checked these revenue and profit data against data available from public government and private sources whenever this was possible. There were no major differences between the self-reported and official figures. In the few cases that these figures did not converge, we used the data from the official sources. After comparing the performance data with other databases, we were quite confident that these measures were reliable. We thus skipped further reliability analysis on these variables. In fact, these variables as dependent variables need not be reliable to be used in regression analysis (Hair et al., 2006).

Next, we inspected the outcome variables, Revenue Growth and Profitability for outliers and other oddities in the data. We first noted that there were obvious outliers in the data. In the case of revenue growth, these outliers could be accounted for two clear reasons. First, there were some clear errors in data. For example, the error of one degree of magnitude in revenue reflects directly on the growth ratio. Some errors were also present in the data, as well as missing data. Secondly, for some firms the revenue growth figures were significantly higher than for main population. This was relevant especially for young and small firms, for which fast relative growth is easier to achieve (Evans, 1987a;b).

These manual tests for outliers in performance variables were complemented by the automated Grubbs' procedure for identifying outliers implemented in Stata software (Grubbs, 1969). Setting a 95% confidence level, this method produced the ranges of $]-0.8, 1.4[$ and $]-0.4, 0.4[$ for Revenue Growth and Profitability, respectively. The results of the manual inspection of outliers and Grubbs' method produced similar results, improving our confidence in the correctness of these limits as outlier thresholds.

7.3.2 Independent variables

Service provision

For an indication of the extent of a firm's service provision, we used the revenue shares of these services as a proxy. This is reasonable, since if a firm receives revenue from service provision, it truly is considered seriously and not merely as an add-on to product sales. Obviously, this type of measure is dependent on the actual pricing of the services and thus not necessarily reflect the true extent of service provision. However, we argue that these revenue shares do reflect the true economic importance of these services for the firm. If the firm provided services but did not price them significantly, their importance for the business of the firm could be questioned.

To measure the extent and variety in the product firms' service provision actibities, we asked firms to divide their revenue into five sources: direct IPR

revenue, coming from the one-off sales of licenses; maintenance revenue, which covers user support and future upgrades, and is dependent on product sales in previous years; professional services, which includes various consulting, training and project management tasks that are not directly related to the firm's software technology; software development services, which covers technical services including customer software development and other technically-oriented services; and category "other", which covers all other activities not covered by the described categories.

We used the sum of license and maintenance revenue shares (i.e. the total IPR-derived revenue of the firm) to exclude firms against the set threshold of at least 50% IPR revenue. As the maintenance revenue is often directly dependent on license sales, we did not analyze its impact on revenue growth, since the management of the product firm does not have much choice over its provision. Moreover, due to the dependency on previous product sales, the share of maintenance revenue typically follows a similar pattern, starting from zero and rising gradually. Reciprocally, the share of product sales tends to decrease over time. By contrast, the extent of providing professional and development services can be affected to a much greater degree — the management can choose how much of these services it will offer, and in what proportion.

The data on revenue shares of service provision was, obviously, an outcome measure of the product firm's service provision activities. We also had data on the personnel distribution of a limited number of software firms. This data measured how large share of the firm's employees worked with deployment services (i.e. professional services), user support and maintenance services, and sales and marketing. Unfortunately, this data was only available for 89 firms, and did not cover product development services. We did collect data for the total R&D expenditure of the firms, but this data does not differentiate between resources used for own product development versus resources used for providing development services.

Despite these limitations, since our argumentation is based on the assumption that revenue shares of services can be used to describe the firm's resource commitments to such services, we roughly assessed the power of these revenue share proxies by assessing the correlations between the personnel and revenue share variables.

As can be seen from Table 7.3, as expected, there are statistically significant and positive correlations (0.38 and 0.42) between the revenue shares of maintenance and professional services, and the personnel shares in maintenance and consulting services, respectively. By contrast, correlations between other types of services revenue shares and personnel shares are both small and nonsignificant. In particular, the share of development service revenue share is not significantly correlated with neither professional or maintenance service personnel shares, which leads us to suggest that is independent of these

	Variable	1	2	3	4
1	**Revenue share of maintenance**				
2	**Revenue share of prof services**	.05			
3	**Revenue share of devel services**	-.08	-.14		
4	**PersonnelShareMaintenance**	.38*	-.03	.01	
5	**PersonnelShareConsulting**	.13	.42*	.15	.27*

* Significant at $p < 0.05$ level

Table 7.3: Correlations between service personnel shares and service revenue shares (N = 89)

personnel shares. While this evidence is admittedly not statistically conclusive, it nevertheless does suggest that the revenue shares can be used as a crude proxy of the personnel shares (i.e. resources) used in these services.

We also ran a simple regression analysis to provide further evidence to support our arguments regarding the use of revenue share data as proxy for service resource use. Using the personnel shares as dependent variables, revenue shares as independent variables, and firm size and age as control variables, we find that both professional and maintenance service revenue shares explain a significant portion of the variance in personnel shares of these services. The estimates for the relationships are 0.697 and 0.310, respectively, both at $p < 0.001$ significance level. However, much of the variation in personnel shares is likely to be dependent on factors not considered in these regressions, such as organizational efficiency and pricing of services. Yet, based on these analyses, we may tentatively conclude that the revenue shares of services can be used as a crude proxy of the resource allocations made by the firm to the provision of these services.

There were also significant correlations between total revenue share from IPR sales, and professional (r = 0.59) and development services (r = 0.60). At least some level of correlations were expected between these variables due to the linear constraint linking these variables (the revenue shares are summed to unity), and was thus expected to some degree. However, the small correlation (r = -0.13) between these two service provision variables suggested that these two variables were independent, and hence we refrained from creating a composite variable of service provision. As we will later see, this is important since different services are shown to have differing impact on firm performance.

Next, we inspected the revenue share variables for the shape of their distributions, shown in Figure 7.2. The development services revenue share variable was positively skewed. However, since the variable is constrained to the interval $[0, 0.5]$, the usual logarithm-transformation was likely not to work as well. Therefore, we used a square root transformation on this variable. Doing this improved (i.e. decreased) the skewness of the distribution from 1.68 to 0.34. The problem with this transformation is that it introduced multimodal-

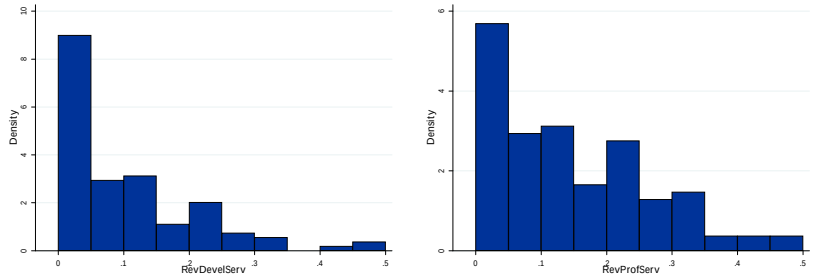


Figure 7.2: Histograms of professional and development service revenue share variables

ity into the distribution, since for many firms the original variable assumed value 0.

For similarity reasons, we also transformed the professional services revenue share variable similarly, even though its skewness was less severe and did thus not prompt such transformation *per se*. We used here the same transformation, square-root, as for development services. This transformation changed the skewness of the distribution to a small degree (from 0.85 to -0.21), while also introducing multimodality into the distribution. In other words, the resulting transformed variable had two peaks in its distribution, again due to many firms having no revenue from professional services at all.

Service capability

Service capability of the product firms was measured using a eight-item scale composed of 5-point Likert scales. As indicated by the conceptualization of the service capability construct in case study chapters, this scale probed both the internal and external aspect of service capability.

The initial items for the scale were developed based on the author's experience and case firm's input, and were reflected with the literature to ensure that the items covered all theoretically expected dimensions of service capability. These initial items were then subjected to review by academics and practitioners (cf. Venkatraman and Grant, 1986). This resulted in the elimination of selected items and revision of the remaining items in terms of ordering and wording. The final scale containing seven items used can be found in Appendix H. These items were originally developed in English; for some firms it was necessary to translate the items into Finnish. These translations and back-translations were done according to the methods suggested by Brislin (1970).

To test the reliability and validity of the scale, we first conducted confirmatory factor analysis using principal factor analysis. This analysis indicated that there was only one factor with eigenvalue over 1. This suggests that all items load on one common factor and that the scale indeed measures only one construct. This was confirmed to some degree by rotating the results of

the factor analysis and retaining only the one factor. This first factor explains a significant share (89.1%) of the total variance in the data. This rotation resulted in the items being loaded to the single factor, with the exceptions of items 2 and 5. These findings suggested that the scale could be used to measure service capability one-dimensionally. However, we also ran a confirmatory factor analysis using MPlus software that tested a model with all items forming reflective indicators of the latent construct Service Capability.

From principal factor analysis we could already see that Item 5 of the service capability scale did not perform well. This was confirmed by confirmatory factor analysis, where Item #5 had the weakest correlation with the latent Service Capability construct (r = -0.110). In addition, this item was not statistically significant. Based on these factors, we therefore eliminated this item from the summated scale for Service Capability. This elimination somewhat improved the fit of the overall model. The summated scale, calculated as the average of the remaining seven items, had Cronbach's alpha of 0.79, which we deemed satisfactory given the exploratory nature of the study and the reliance on a newly developed scale for measuring this construct. We used the seven-item standardized summated scale for further analysis.

7.3.3 Moderating variables

Competitive environment

The competitive environment benevolence construct describes how easy it is for the focal firm to compete in the market. It is linked to the product/market life cycle of the firm (Day, 1981; Miller and Friesen, 1984). Unfortunately, only a crude direct measure for competitive environment was available. This measure asked firms to indicate how they perceived their competitive environment. Therefore, we used several proxy measures to describe the competitive environment of the focal firm.

First, we used the ratio of R&D expenditures to total revenue (RnD) as one indicator of where in the product life cycle the focal firm was. The nature of high-tech markets as cyclical markets with Schumpeterian competition implies that SMEs tend to have only one main product with a clear life cycle. Our case firms and other firms were by scoping product firms in a high-tech industry. Hence, the RnD roughly indicates how mature the firm's product is, and also suggest how (im)mature the overall product market is. More precisely, a high RnD indicates that the firm is using its resources on product development, attempting to standardize the technology and product to improve its replicability. By contrast, a low RnD indicates that the firm's products do not anymore require significant product development efforts, and in this sense are mature.

Secondly, we also used the firm's age as a proxy for the competitive environment. While not a very good proxy for this construct, the firm's age in

a high-tech product market is often correlated with the age of the market, as firms enter market near the start of the market. In other words, a young product firm is likely to compete in a newly formed market, and an older firm is likely to compete in a more mature market.

For lack of better available measure for market maturity, we used the age of a firm as a crude proxy for this construct. As the software industry is known for its Schumpeterian creative destruction, the introduction of a completely new technology (or a new generation of existing technology) is often related to the emergence of a group of new entrants that try to seize the arising opportunity (Anderson and Tushman, 1990; Henderson and Clark, 1990; Christensen and Rosenbloom, 1995). Hence, given the knowledge and technology intensity of the software industry, we argue that the age of a software firm is related to the maturity of the market. This argument is supported to some extent by the significant correlations between the age of the firm and its growth orientation ($r = -0.211, p < 0.020$), and the additional constructs of perceived market growth ($r = -0.207, p < 0.072$), and R&D costs/total revenue ratio ($r = -0.199, p < 0.03$), not otherwise used in this study. Due to the skewness of the distribution we used a logarithm-transformed version of the variable.

Internationalization

As indicated in the qualitative studies, we used two constructs to describe the internationalization process of the case firms. More specifically, we used the share of revenue from abroad, and the share of revenue generated by the case firm's partners. These two measures were used also to operationalize the construct of internationalization in the quantitative analyses as well.

We measured Internationalization by using the ratio of revenue from outside home market (Finland) to total revenue of the focal firm (cf. Bloodgood et al., 1996; McDougall and Oviatt, 1996). While there exist more sophisticated measures of international diversification (cf. Hitt et al., 1997), and more detailed data would have been available, we judged that this simple measure was good enough given our interest in internationalization as only a moderating factor.

Partner Use was measured as the ratio of revenue generated by the focal firm's service and reseller partners to its total revenue. As in the case of internationalization, we could have applied more sophisticated measures for this construct, but in this case only this summary data was available.

We first checked the normality of the distributions of the Internationalization and Partner Use variables, shown in Figure 7.3. As both variables are bounded to the interval $[0, 1]$, it was expected that they would be skewed. Correspondingly, the distributions of both variables were severely positively skewed. In other words, while there were firms with all degrees of internationalization and partner use, most firms had none or very little international revenue or did not use partners. Here again the independent vari-

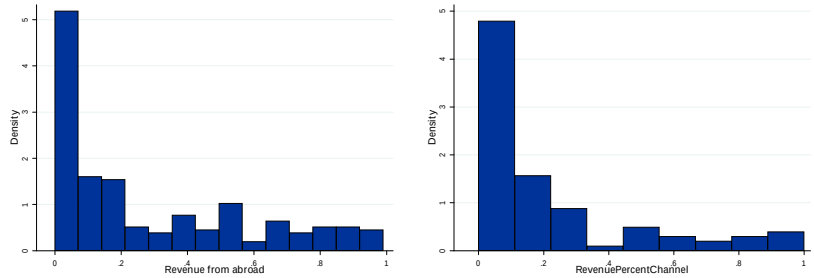


Figure 7.3: Histograms of interationalization and partner use variables

ables are bounded to the interval [0,1]. Hence, to improve the normality of the distributions of these variables, we used a folded powers transformation $P \rightarrow P^q - (1 - P)^q$ with $q = 0.3$ (Atkinson, 1985). This improved skewness of the internationalization variable from 0.77 to 0.15.

The partner use variable was also severely positively skewed. Therefore, we used a similar folded powers transformation for the variable with $q = 0.2$. This improved the skewness of the Partner Use variable from 1.54 to 0.63, but again introduced multimodality into the distribution.

As seen from Table 7.2, there is a statistically significant correlation between internationalization and partner use. However, this correlation not very strong ($r = 0.29$), and thus it should not introduce significant amounts of multicollinearity into subsequent regression analyses. We thus decided to use the variables as mutually independent moderators in our regression analyses.

Service capability

In addition to being an explanatory construct *per se*, service capability was also perceived as an important moderating variable between service offering and firm performance, since by definition it describes how effectively the firm is able to provide its services and replicate its service operations. Therefore, we used service capability also as a moderating variable. We used the summated scale for service capability as a moderating variable as in the case of using the same construct for independent variable.

7.3.4 Control variables

Firm Size and Firm Age

As indicated by many authors in the extant literature on firm growth, the size and age of a firm have an impact on the subsequent growth of a firm (cf. Evans, 1987a;b; Hall, 1987). We used the total revenue of the firm, i.e., the total yearly sales, to measure firm size. This measure is quite well correlated with the number of employees, particularly since we have limited the study to a quite homogeneous group of firms by imposing the threshold of at least

50% IPR-related revenue. Within this relatively homogeneous group of firms, the total revenue and employee measures correlate strongly and significantly ($r = 0.91, p < 0.001$). We thus dropped the number of employees from variables and used the total revenue of firm exclusively to measure firm size.

The total revenue of the firm was available from multiple data sources: firms' self-reported revenue, and public databases (Rönkkö et al., 2009). These different measures correlated significantly enough to lead us to believe that the self-reported figures were reliable enough for further analysis in the case where no other measures were available.

The measurement of firm age was more straightforward; we used the number of years from the firm's founding year until 2008 as a measure for the firm's age. This measure was double-checked from publicly available databases and, in some cases, from the firms' websites.

The distributions of both Firm Size and Age variables were significantly positively skewed (see Table 7.1). To ensure compatibility with the assumptions of OLS regression analysis, we used the log-transformed versions of these variables in further analysis (cf. Hair et al., 2006).

Growth orientation

Firms, especially new ventures, differ in their managers' preferences on how they emphasize revenue growth as opposed to firm profitability. Many young firms choose to be unprofitable in order to grow faster and reap the benefits from this growth later (Covin and Covin, 1990; Porter, 1996). Therefore, we included a control variable for this growth orientation of the firm.

Growth orientation was measured using a scale developed for the annual survey (Rönkkö et al., 2009), shown in Appendix G. This scale includes seven items related to the growth versus profitability preference, attitudes towards taking risks, and willingness to internationalize, all measured using 5-point Likert scales.

Again, we began the assessment of the reliability of this scale by conducting a principal factor analysis in Stata. The results of this factor analysis show that only the first factor has an eigenvalue of over 1. This first factor explains a significant share (85.5%) of the total variance in the data. Moreover, most factors, with the exception of item 7 load mainly on this first factor. This result is again confirmed by rotating the one-factor solution. These results indicate that the scale is one-dimensional and there is convergent validity.

To provide an easily comparable figure of the scale's reliability, we also calculated Cronbach's alpha for the summated scale. The scale demonstrated good reliability in this sense as well ($\alpha = 0.86$). A standardized version of this summated scale was used in further analysis.

Financing

As seen from the multiple case study in Chapter 6, financing has potentially significant impact on the subsequent growth and profitability of the firms

through two mechanisms. First, external financing provides the firm with abundant resources for product and services development, potentially improving their chances of business replicability and hence positively affecting future growth (Becchetti and Trovato, 2002; Gilbert et al., 2006). External financing allows the firm to temporarily withstand losses in order to reap the benefits of faster growth afterwards. Second, the financiers often affect the strategic decisions of the firm through involvement in corporate governance (Hellmann and Puri, 2002). Hence, the firm with external financing may pursue a higher level of growth than a firm without such financing, as these financiers often want to see a return to their investment.

We used three dummy variables to probe firms' financing structure. We asked the firms to indicate whether they had financing from private institutional investors, public institutional investors, or independent individual investors (i.e., "business angels"). Correlations between these all factors were positive and significant (minimum of $r = 0.21$ at $p < 0.05$). Given these positive correlations, we decided to assess the independence of these variables.

The results of a principal factor analysis showed that the variables loaded on a single factor that explained most of the variance in the data. In particular, the institutional investor dummies correlated strongly with each other. We thus decided to generate a summated scale of these three variables that indicates to what extent the firm has received external financing. This summated discrete scale, Finance, had a Cronbach's alpha of 0.64.

The decision to use a summated scale for financing variables was also prompted by the relatively low number of usable observations; using three variables would have potentially decreased the explanatory power of the regression models. Furthermore, as indicated by initial exploratory regression analyses, the impact of these financing variables on performance was also small and nonsignificant, suggesting low explanatory power.

7.4 Impact of Service Offering on Revenue Growth

After discussing the operationalization and regression assumptions testing of used variables, we may now continue with the actual regression analysis of the developed hypotheses. We begin with the analysis of the impact of service provision on revenue growth.

We tested the impact of service offering on one-year revenue growth using ordinary least squares (OLS) regression models. As indicated by the multiple case study, we should see both direct and moderated effects on revenue growth. Therefore, we tested both direct and moderated models of these effects.

First, we formed the baseline model by including our control variables in the regression model. The results of this regression analysis are shown in Ta-

Revenue Growth	Model 1	Model 2	Model 3
Firm Size (t-1)	-0.024 §	-0.024 §	-0.024 §
Firm Age	-0.154 ***	-0.127 **	-0.130 **
GO		0.122 ***	0.118 **
ExtFinance			0.014
Intercept	0.823 **	0.717 **	0.734 **
R^2	0.154 ***	0.243 ***	0.245 ***
ΔR^2		0.089 ***	0.002
Adjusted R^2	0.137 ***	0.221 ***	0.215 ***
F	9.112 ***	10.618***	7.969 ***
N	103	103	103

Table 7.4: Regression analysis of control variables on revenue growth

ble 7.4[3]. The Model 3 in the regression analysis results will form our baseline model for further analysis of the impact of service provision on revenue growth.

The results of the control variables are as expected; the older and larger the firm is, the slower its yearly revenue growth is likely to be. This is seen from the negative correlation coefficients for firm size (β = -0.024, $p < 0.2$) and firm age (β = -0.130, $p < 0.01$). Growth orientation has a positive and significant impact on growth (β = 0.118, $p < 0.01$). The effect of financing (the sum of the Investor dummy variables) is ambiguous and adds very little into the analysis, as indicated by the nonsignificant increase in the explanatory power of the model (ΔR^2 = 0.002). As a whole, the baseline model (Model 3 in Table 7.4) has reasonable explanatory power, as indicated by the R^2 of .245.

7.4.1 Direct impact

Next we will test for the direct impact of service provision variables on revenue growth, using results (Model 3) from last regression analysis as the baseline model, shown as Model 0 in the following analyses.

As anticipated based on the results of the multiple case study, both professional and development services provision should have a direct impact on the revenue growth of product SMEs. To test these hypotheses, we ran a regression analysis using professional and development services revenue shares as explaining variables. The results of this analysis are shown in Table 7.5.

As can be seen from the regression coefficients of Models 1a and 1b in the table, both professional services and development services provision have a weakly significant impact ($p < 0.1$) on revenue growth, β = 0.315 and

[3]Throughout this chapter we will use the following symbols for significance levels: § $p < 0.2$, + $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. We include lower levels of significance (§ and +) due to the partly exploratory nature of the study. Standard errors are omitted from the regression result tables for reasons of brevity.

Revenue Growth	Model 0	Model 1a	Model 2a	Model 1b	Model 2b
Firm Size†§	-0.024 §	-0.030 +	-0.024 §	-0.028 §	-0.029 §
Firm Age†	-0.130 **	-0.130 **	-0.030	-0.139 **	-0.213 **
GO	0.118 **	0.118 **	0.116 **	0.109 **	0.105 **
ExtFinance	0.014	0.017	0.013	0.010	0.013
ProfServ		0.315 *	1.203 *		
ProfServ x Firm Age			-0.356 +		
DevelServ				-0.250 +	-0.912 +
DevelServ x Firm Age					0.272
Intercept	0.734 **	0.718 **	0.388 §	0.869 ***	1.061 ***
R^2	0.245 ***	0.295 ***	0.320 ***	0.273 ***	0.285 ***
ΔR^2		0.050 *	0.025 +	0.028 +	0.012
Adjusted R^2	0.215 ***	0.258 ***	0.277 ***	0.235 ***	0.240 ***
F	7.969 ***	8.040 ***	7.446 ***	7.210 ***	6.318 ***
N	103	102	102	102	102
Mean VIF			7.40		7.21

† Logarithm-transformed variable
§ Value from year 2007; all other variables from year 2008

Table 7.5: Results of direct and competitive environment moderated impact of service provision on revenue growth

β = -.250, respectively[4]. Overall, models 1A and 1B which contain these terms have reasonably high explanatory power (R^2 = 0.295 and R^2 = 0.273, respectively). Furthermore, the addition of both of these independent variables has a significant impact on the explanatory power of the models in comparison to the baseline model with control variables (ΔR^2 = 0.050 and ΔR^2 = 0.028, respectively).

All regression models were tested for heteroskedasticity using the Breusch-Pagan / Cook-Weisberg test using the functionality in Stata software. None of the models showed significant heteroskedasciticity.

In summary, we may conclude that both the coefficients for the service provision variables are at least somewhat statistically significant, and their signs are as expected. In summary, these results provide empirical support for **Propositions 1a and 1b** from the multiple case study.

7.4.2 Moderated impact of services

Next, we tested the impact of various contingency factors on relationship between service provision and revenue growth, as suggested in the multiple case study in Chapter 6. More specifically, we tested if market maturity, internationalization, the use of partners, and service capability have an impact on the relationship between service provision and revenue growth as hypothesized.

[4]These are not standardized coefficients, and hence the effect sizes of different variables are not directly comparable. Moreover, the professional service and development service provision variables have been square root transformed.

Moderating effect of market maturity

As indicated in the construct operationalization section, we used Firm Age variable as a proxy for market maturity, or conversely, the negation of the benevolence of the competitive environment. Adding the interaction term of this variable with service provision variables, we had the results shown as Models 2a and 2b in Table 7.5.

As seen from the table, both professional services and development services provision retain their impact on revenue growth (β = 1.203, p $<$ 0.05 and β = - 0.912, p $<$ 0.1), respectively. This provides further support for the acceptance of **Propositions 1a and 1b** discussed above.

The interaction terms also show impact on revenue growth. The effect is clearer in the case of professional services moderated by market maturity (β = -0.356, p $<$ 0.1). However, for the moderated effect of development services on growth we only have a non-significant effect β = 0.272, p = 0.206. Nevertheless, the sign of both these correlation coefficients are as anticipated by **Propositions 2a and 2b**. In other words, the results suggest that the impact of professional services is weakened as the market matures (and competitive environment becomes more hostile). For development services this effect appears to be reversed: the negative impact of development services provision is dampened as market matures (the interaction coefficient is positive).

We also inspected the mean variation inflation factors (VIFs) for these two interaction models. A high VIF indicates high multicollinearity among the independent variables, and tends to make the regression estimates less reliable, i.e. decreasing the statistical significance of correlation coefficients. The somewhat high VIF in the interaction models (7.40 and 7.21) is due to multicollinearity introduced through the interaction term, but are still below the often-suggested threshold level of 10 (Kutner et al., 2004). Yet, given the relatively high significance of the interaction terms and dependent variables, the high VIFs should not jeopardize the validity of the models.

The interpretation of interaction terms is not straightforward from regression results (Cohen et al., 2003). Therefore, we further examined interpretation of the interaction terms using the graphical methods advocated by Preacher et al. (2006), using their web-based tool for calculating the simple slopes of the interactions terms. The simple slopes show how the relationship between explanatory and outcome variables changes as the value of the moderating variable changes. The graphs were then produced with the R software package[5].

Figure 7.4 display the simple slopes of professional service–maturity interaction and development service–maturity interaction. In both figures, slopes were plotted for values Firm Age = 1, 2.5 and 3.5, corresponding to actual firm

[5]All interaction diagrams were drawn with parameters estimated with nontransformed explaining and moderating variables to ensure the interpretability of the results.

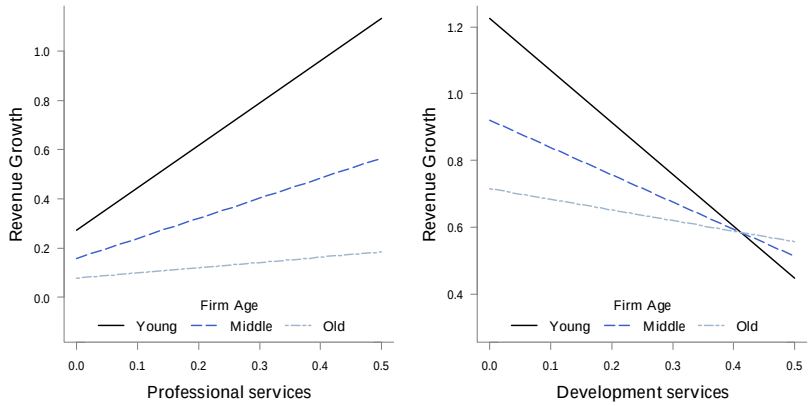


Figure 7.4: Simple slopes of the service provision × Maturity interaction

age of 1, 11 and 32 years. These values were inferred from the distribution of the LnAge variable. As both professional service and development service revenue shares can vary between 0 and 0.5, all graphs were plotted between these two extreme figures.

As can be seen from Figure 7.4, the interpretations of the regression analysis results are confirmed by examination of the simple slopes diagrams: as the market matures (measured with firm age), the impact of professional service provision on revenue growth is weakened. In the case of young firms, the impact of professional services is the strongest, while it is the weakest for old firms competing in a mature market. This indicates that a firm should expect to gain the most from professional services in terms of revenue growth in an early stage of its growth.

As indicated by results of the regression analysis, development services provision has a negative impact on revenue growth — this is also suggested by the downward slopes in Figure 7.4. Market maturity (or competitive environment hostility) has a effect similar but reversed to the case of professional services: the more mature the market is, the weaker is the negative impact of development service provision on revenue growth. In other words, the more mature the market is, the less detrimental development services are for firm growth. In summary, these findings provide moderate empirical support for the **Propositions 2a and 2b** from the multiple case study.

Moderating effect of internationalization

Next, we assess the impact of internationalization on the relationship between service provision and revenue growth. As mentioned above, we have operationalized internationalization using two variables: the degree of internationalization and the share of revenue generated by service and reseller partners. To test **Propositions 5a to 6b** regarding the impact of these moderating variables, we conducted OLS regression analysis of these factors with

Revenue Growth	Model 0	Model 1a	Model 2a	Model 1b	Model 2b
Firm Size	-0.007	-0.014	-0.013	-0.006	0.000
Firm Age	-0.127 **	-0.124 **	-0.127 **	-0.134 **	-0.128 **
GO	0.135 **	0.154 **	0.157 ***	0.150 **	0.153 **
ExtFinance	-0.003	0.002	0.008	-0.001	-0.001
ProfServ		0.293 §	0.549 **		
DevelServ				-0.315 +	-0.212
Intern		-0.026	-0.003	-0.026	-0.022
ProfServ x Intern		-0.219	-0.571 +		
DevelServ x Intern					-0.461 §
Partner			-0.112 §		-0.046
ProfServ x Partner			0.881 **		
DevelServ x Partner					0.377 §
Intercept	0.479 +	0.433 §	0.396 §	0.506 +	0.398
R2	0.244 **	0.356 ***	0.455 ***	0.320 ***	0.341 **
R2 Delta		0.112 *	0.099 **	0.076 +	0.021
Adjusted R2	0.198 **	0.284 ***	0.373 ***	0.243 ***	0.242 **
F	5.247 **	4.904 ***	5.567 ***	4.161 ***	3.446 **
N	70	70	70	70	70
Mean VIF			2.24		1.70

Table 7.6: Results of internationalization moderation on service provision – revenue growth relationship

appropriate interaction terms added to the baseline model. The results of these analyses are shown in Table 7.6.

As seen from the table, both internationalization and partner use tend to significantly moderate the relationship between service provision and revenue growth. However, contrary to expectations, these effects seem to be similar for both types of services. More specifically, the results of the analysis indicate that internationalization has a weakly significant negative moderation effect on the professional services – revenue growth relationship (β = -0.571, $p < 0.1$) and development services – revenue growth relationship (β = -0.461, $p < 0.2$). However, the first coefficient is not positive, as posited by **Proposition 5a**. By contrast, the correlation coefficient of the second interaction term is as expected by **Proposition 5b**. Obviously, this deviation (actually, a contrary result) from hypothesized effect needs to be discussed in more detail. This will take place at the end of this chapter.

Similarly, the analysis results for partner use indicate that there is a positive and significant interaction effect between partner use and professional services ($\beta = 0.881, p < 0.01$). This provides confirming support for **Proposition 6a**. Furthermore, there appears to be also a weak positive interaction effect between partner use and development services, as suggested by **Proposition 6b** ($\beta = 0.377$). As indicated by the relatively low VIFs of Models 2a and 2b, the regression results seem reliable enough. In addition, the overall fit of the models is adequate, with $R^2 = 0.455$ for Model 2a and $R^2 = 0.341$

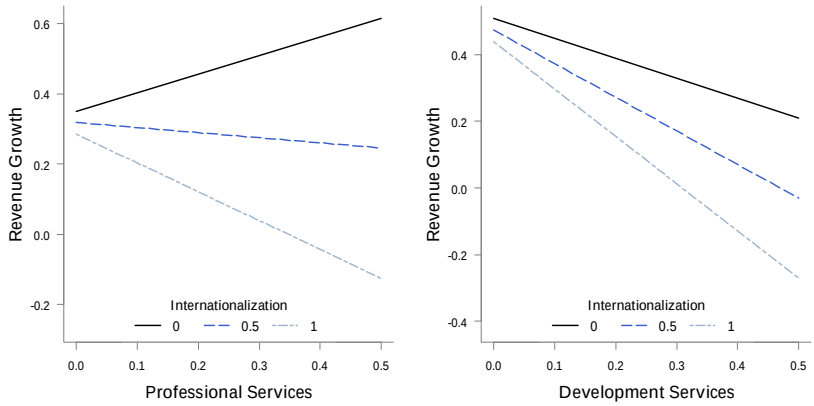


Figure 7.5: Simple slopes of the service provision × Internationalization interaction

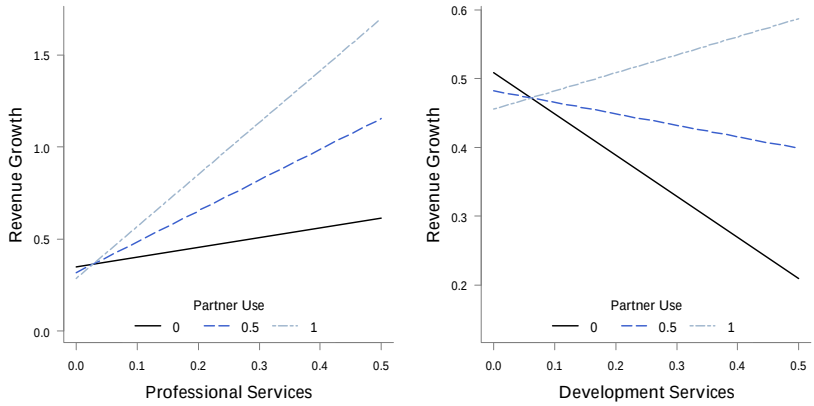


Figure 7.6: Simple slopes of the service provision × Partner use interaction

for Model 2b. This relatively high explanatory power of the models suggests that the addition of interaction terms is appropriate. This is also suggested by the significant and quite large changes in R^2. However, given the relatively small sample size ($N = 70$), the absolute fit of the models is not too high, as indicated by the adjusted values of R^2 (0.373 and 0.242, respectively).

To check the interpretation of the interaction terms, we again use the graphical method of simple slopes to check the moderating effects of internationalization and partner use on revenue growth. These slopes are shown in Figures 7.5 and 7.6.

As can be seen from Figure 7.5, the above interpretation of the interaction terms of internationalization seems correct. In both graphs, a higher degree of internationalization is related to decrease in the impact of services provision. More specifically, the more internationalized the firm is, the more negative is the impact of service provision, regardless of the type of service.

Profitability	Model 1	Model 2	Model 3
Firm Size	0.017 **	0.017 **	0.017 **
Firm Age	0.027 *	0.021 +	0.021 +
GO		-0.026 *	-0.027 *
ExtFinance			0.000
Intercept	-0.235 **	-0.204 **	-0.204 **
R2	0.154 ***	0.185 ***	0.185 ***
		0.031 *	0.000
Adjusted R2	0.139 ***	0.163 ***	0.156 ***
F	10.269 ***	8.468 ***	6.295 ***
N	116	116	116

Table 7.7: Regression analysis of the impact of control variables on firm profitability

The interaction effect of partner use on service provision — revenue growth relationship is shown in Figure 7.6. Contrary to the case of internationalization, here its seems that the positive moderating effect of partner use is confirmed: the more the focal firm uses partners, the more positive is the impact of service provision on revenue growth, regardless of the type of service.

In summary, the results of the regression analysis of the interaction effects of internationalization and partner use has yielded contradictory results. On one hand, the results have provided supporting empirical evidence for **Propositions 5b and 6a**. On the other hand, the analysis has revealed significant contradictory evidence against **Propositions 5a**. More specifically, unlike hypothesized based on the multiple case study, both internationalization and partner use seem to have a similar moderating effect on the relationship between service provision and revenue growth, regardless of the type of service. Obviously, these are significant deviations from the hypothesized effects and needs to be addressed in terms of theoretical and empirical explanations. This will be done in the discussion section of this chapter and the separate discussion chapter of the overall study.

7.5 Impact of Service Offering on Profitability

Similar to the above analysis of service provision activity on revenue growth, we now proceed to test the direct and moderated impact of service provision on firm profitability. We take similar steps in the analysis; first we establish the baseline model by testing the impact of control variables on profitability. The results of this analysis are shown in Table 7.7.

Again, the results of this initial analysis are as expected: firm size has a positive impact on the profitability of the firm ($\beta = 0.017, p < 0.01$) due to economies of scale and market power effects (Katz and Shapiro, 1985; 1992), while firm age has slight positive impact due to maturation of processes and

Profitability	Model 0	Model 1a	Model 2a	Model 1b	Model 2b
Firm Size	0.017 **	0.014 *	0.015 *	0.017 **	0.016 **
Firm Age	0.021 +	0.021 +	0.014	0.020 §	0.028 §
GO	-0.027 *	-0.023 +	-0.023 +	-0.027 *	-0.026 +
ExtFinance	0.000	0.001	0.001	0.000	-0.001
ProfServ		0.093 *	0.046		
ProfServ x Firm Age			0.021		
DevelServ				-0.014	0.068
DevelServ x Firm Age					-0.038
Intercept	-0.204 **	-0.205 **	-0.192 *	-0.202 *	-0.214 **
R2	0.185 ***	0.217 ***	0.218 ***	0.186 ***	0.189 ***
R2 Delta		0.032 *	0.001	0.000	0.003
Adjusted R2	0.156 ***	0.182 ***	0.175 ***	0.149 ***	0.144 ***
F	6.295 ***	6.103 ***	5.073 ***	5.014 ***	4.226 ***
N	116	116	116	116	116
Mean VIF			4.71		4.30

Table 7.8: Regression analysis of the impact of service provision on profitability

the efficiency it creates (β = 0.021, p $<$ 0.1). By contrast, growth orientation of the firm's management team has a significant negative impact on the profitability of the firm (β = -0.027, p $<$ 0.05) due to the tendency to emphasize revenue growth and larger future profits at the cost of current profitability. Similar to analysis of revenue growth, external financing has no significant impact on firm performance. Overall, the baseline model shows acceptable explanatory power with a R^2 of .185. In the following analyses, we use Model 3 in Table 7.7 as our new baseline model.

7.5.1 Direct impact

Next, we tested the direct impact of the service provision variables on firm profitability using OLS regression. The results of this analysis can be seen in Table 7.8. As shown by Models 1a and 1b in the table, service provision appears to have some level of impact on firm profitability. However, the effect of professional services provision is positive (β = 0.093, p $<$ 0.05) instead of negative as expected based on the multiple case study. Therefore, we must re-evaluate **Proposition 7a** that stated that professional services provision should be negatively related to firm profitability. We will discuss this issue at the end of this chapter and further in Chapter 8.

By contrast, the direct impact of development services provision does not appear to be significant (β = -0.014, p = 0.755). Even though the direction of the effect is again not as expected — the multiple case study suggested it should have been positive — the significance of this regression coefficient is so low that we cannot make any conclusions about the acceptance or rejection of **Proposition 7b**.

However, if we inspect the overall fit of the Models 1a and 1b, we see that both have relatively modest R^2 (0.217 and 0.186). Thus the explanatory power of these models is quite low, and consequently we cannot infer too much about these models. This effect is also repeated in the low explanatory power of the moderated regression models below.

7.5.2 Moderated impact of service provision on firm profitability

Moderating effect of competitive environment hostility

Next, we tested the moderating effect of competitive environment benevolence on the service provision — firm profitability relationship. This was done by adding interaction terms into the regression analysis, shown by Models 2a and 2b in Table 7.8. As shown by the regression coefficients in the table, neither professional service (β = 0.021, p = 0.695) nor development services (β = -0.038, p = 0.521) show any significant moderating effects with competitive environment hostility.

In addition, the increase in explanatory power gained by adding these interaction terms is negligible (ΔR^2 = 0.001 and ΔR^2 = 0.003, respectively). This provides further indication that competitive environment benevolence has no significant moderation effect with respect to the impact of service provision on firm profitability. In summary, this means that the empirical evidence for accepting or rejecting **Propositions 8a and 8b** is inconclusive, as the statistical significance of the coefficients is far too low to support any conclusions. The lack of significant support in the moderation effects also implies that further analysis of the interaction terms is unnecessary.

7.6 Impact of Service Capability on Revenue Growth

Last, we analyzed the impact of service capability as an explanatory variable. We had already used this variable as a moderating variable in previous analysis between service offering and firm performance, but we also wanted to see whether this variable had explanatory power *per se*, as suggested by the results of the multiple case study.

7.6.1 Direct impact

We start with the baseline models from previous analyses. However, given that service capability is related how well the product firms can produce their services, we can argue that the impact of service capability is dependent on the extent of service provision. Therefore, we will use a model with control variables and both professional and development service provision variables as the baseline model for testing the impact of service capability. We first

Revenue Growth	Model 0	Model 1	Model 2
Firm Size	0.006	-0.033	-0.032
Firm Age	-0.100 +	-0.106 *	-0.106 *
GO	0.079 +	0.087 *	0.087 *
ExtFinance	-0.019	-0.021	-0.021
ProfServ		0.414 **	0.417 *
DevelServ		-0.222 +	-0.222 +
ServCap			-0.005
Intercept	0.250	0.699 +	0.691 §
R2	0.155 *	0.302 **	0.302 **
R2 Delta		0.147 **	0.000
Adjusted R2	0.097 *	0.227 **	0.213 **
F	2.659 *	4.037 **	3.401 **
N	63	63	63

Table 7.9: Regression analysis of the effect of service capability on revenue growth

inspected the direct impact of service capability on both firm revenue growth and profitability, shown as Model 2 in Table 7.9.

We first note that, despite the lower number of observations with complete data (63 against 102 in Table 7.5), the correlation coefficients of service provision variables are still significant, and their signs are as expected (positive for professional services, negative for development services). This provides additional evidence for our **Propositions 1a and 1b**.

However, as can be seen from Model 2 in Table 7.9, service capability does not have any significant impact on revenue growth, and the estimated coefficient is very small (β = -0.005, p = 0.914). Therefore the results of the direct impact regression analysis are inconclusive; they fail to give either positive or negative reinforcement for **Proposition 9** which stated that service capability should be negatively related to revenue growth.

7.6.2 Moderated impact of service capability

As indicated by the multiple case study, service capability seems to have a positive impact on both firm revenue growth and profitability when a firm is internationalized and if it uses partners to sell and deliver its offering. **Propositions 10a and 10b** state that these factors have a positive moderating effect on the service capability – revenue growth relationship. As above, we controlled the effects by adding both professional and development services provision variables into the regression analysis. We will thus use the Model 1 from Table 7.9 as our baseline model (henceforth Model 0). The results of this analysis are shown in Table 7.10.

As seen from Table 7.10, the coefficients of professional service and development service provision are again as expected and significant in most cases.

Revenue Growth	Model 0	Model 1	Model 2	Model 3
Firm Size	-0.050 §	-0.047	-0.036	-0.049 §
Firm Age	-0.095 +	-0.096 +	-0.070	-0.070 §
GO	0.135 **	0.134 **	0.175 ***	0.161 **
ExtFinance	-0.024	-0.026	-0.013	-0.010
ProfServ	0.682 **	0.699 **	0.674 **	0.987 ***
DevelServ	-0.369 *	-0.372 *	-0.301 +	-0.154
ServCap		-0.021	-0.085 §	0.035
Intern			-0.206 *	-0.217 *
ServCap x Intern			-0.039	-0.128
PartnerUse				0.153 *
ServCap x PartnerUse				0.306 *
Intercept	0.825 §	0.786 §	0.452	0.542
R2	0.416 **	0.418 **	0.501 **	0.586 ***
R2 Delta		0.002	0.081 +	0.085 *
Adjusted R2	0.326 **	0.311 **	0.376 **	0.452 ***
F	4.633 **	3.907 **	4.018 **	4.369 ***
N	46	46	46	46
Mean VIF				2.03

Table 7.10: Regression analysis of the moderating effect of internationalization and partner use on service capacity – revenue growth relationship

However, the results for the moderated impact of service capability are mixed. As seen from Model 3, the regression coefficient of service capability – partner use interaction is positive and significant (β = 0.300, p $<$ 0.05). This thus provides support for **Proposition 10b**. More specifically, it shows that the more a product firm uses service and reseller partners, the more positive impact service capability has on revenue growth.

Unfortunately, the evidence for Hypothesis 10a is inconclusive. The coefficient for service capability — internationalization interaction is negative (β = -0.128, p = 0.271, contrary to what was expected. However, the coefficient is not statistically significant. Therefore, we cannot provide any conclusive evidence for the acceptance or rejection of **Proposition 10a**.

The conclusions above are supported by the relatively good fit of the overall model: Model 3 has R^2 of 0.542, and both the changes in R^2 related to the addition of the interaction terms are significant (0.081 and 0.085). However, as indicated by the adjusted R^2 values (0.452 for the full model), part of the fit is due to large number of fitted parameters in relation to the number of observations. Hence, given the small sample size (N = 46), we must be cautious when interpreting the overall fit of the models.

To inspect the interpretation of the interaction of partner use and service capability in more detail, we use the graphical method of simple slopes. These slopes can be seen in Figure 7.7. As previously, the interpretation of the coefficients is correct; the use of partners significantly moderates the relationship between service capability and revenue growth. More precisely, service capa-

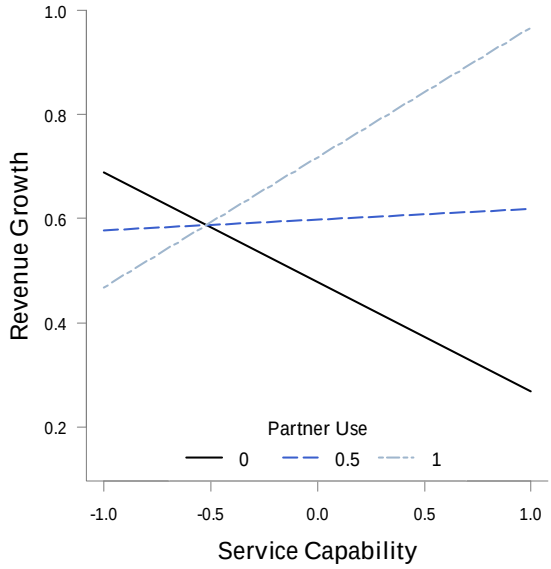


Figure 7.7: Simple slopes interaction diagram for impact of partner use on service capability – revenue growth relationship

bility is positively related to revenue growth when partner use is high, and negatively when partner use is low.

7.7 Impact of Service Capability on Profitability

We proceed to test whether service capability has direct or moderated impact on firm profitability. The analyses are conducted in similar way as the regression analyses above for impact on revenue growth. Like in the case of analysis of service capability on revenue growth, we here also control for the extent of service provision by including professional and development service revenue share variables as control variables in the subsequent regression analyses.

7.7.1 Direct impact of service capability on profitability

We first tested the direct impact of service capability on firm profitability. As suggested by **Proposition 11** from the multiple case study, service capability is expected to have a positive impact on firm profitability. The results of the regression analysis that tests this direct relationship is shown as Model 2 in Table 7.11.

As shown by the regression coefficient in the table, service capability has a small positive but statistically nonsignificant ($\beta = 0.015, p = 0.411$) impact on firm profitability. While the direction of this effect is what was expected, the low significance of the coefficient hinders us from making any strong conclusions about the acceptance or rejection of **Proposition 11**. Yet, as suggested

Profitability	Model 0	Model 1	Model 2
Firm Size	0.031 **	0.026 *	0.025 *
Firm Age	0.033 +	0.030 +	0.032 +
GO	-0.043 **	-0.041 **	-0.040 **
ExtFinance	-0.022 §	-0.022 §	-0.022 §
ProfServ		0.064	0.061
DevelServ		-0.018	-0.016
ServCap			0.015
Intercept	-0.431 **	-0.373 *	-0.363 *
R2	0.310 ***	0.325 ***	0.333 ***
R2 Delta		0.015	0.008
Adjusted R2	0.265 ***	0.256 ***	0.252 ***
F	6.854 ***	4.729 ***	4.130 ***
N	66	66	66
Mean VIF			

Table 7.11: Regression analysis of the impact of service capability on firm profitability

by the firm age moderated Model 3 in Table 7.11, there appears to be a weakly significant positive impact on profitability. However, it remains inconclusive whether service capability has a positive impact on firm profitability or not.

7.7.2 Moderated impact of service capability on profitability

We also tested for the moderating effects of internationalization and partner use on service capability — profitability relationship, as suggested by **Propositions 12a and 12b**. The results of these regression analyses are shown in Table 7.12.

As seen from Model 3 in the Table, the coefficients of Internationalization and Partner Use interaction terms are positive and statistically significant ($\beta = 0.125, p < 0.05$ and $\beta = 0.085, p < 0.05$, respectively). This indicates that both variables have a significant moderating effect on the relationship between service capability and profitability. More specifically, the more Internationalized a firm is or the more it uses service and reseller partners, the more positive is the impact of service capability on profitability. Given that the range of both moderating variables is [-1, 1], and the size of the interaction coefficient in relation to the service capability direct coefficient, we suspect that this moderating effect may reverse the relationship between service capability and profitability. In other words, for sufficiently low values of Internationalization and Partner Use service capability may also have a negative impact on profitability. In summary, these findings provide supporting evidence for both **Propositions 12a and 12b**.

Model 3 in Table 7.12 shows good overall fit ($R^2 = 0.609$). Furthermore, both the additions of moderating variables are associated with a statistical signif-

Profitability	Model 0	Model 1	Model 2	Model 3
Firm Size	0.022 *	0.009	0.006	0.003
Firm Age	0.023	0.017	0.033 +	0.032 +
GO	-0.058 **	-0.053 **	-0.036 +	-0.049 *
ExtFinance	-0.013	-0.012	-0.007	0.002
ProfServ		0.165 *	0.115 §	0.158 *
DevelServ		-0.011	-0.024	0.024
ServCap			0.078 *	0.044 §
Intern			-0.026	-0.025
ServCap x Intern			0.109 +	0.125 *
Partner				0.030 §
ServCap x Partner				0.085 *
Intercept	-0.277 +	-0.136	-0.116	-0.119
R2	0.349 **	0.424 ***	0.525 ***	0.609 ***
R2 Delta		0.075 +	0.101 +	0.084 *
Adjusted R2	0.286 **	0.335 ***	0.406 ***	0.482 ***
F	5.507 **	4.784 ***	4.413 ***	4.811 ***
N	46	46	46	46
Mean VIF				1.80

Table 7.12: Regression analysis of the moderating effect of internationalization and partner use on service capacity – profitability relationship

icant change in the explanatory power (ΔR^2 = 0.101 for Internationalization and ΔR^2 = 0.084 for Partner Use). This suggests that both variables are statistically significant also in terms of their explanatory power. This provides additional evidence in support of the **Propositions 12a and 12b**. However, we must again be careful when evaluating the overall fit of the model, as the number of usable observations is low (N = 46). The adjusted R^2 is only moderate at 0.482. Therefore, we cannot infer too much about the overall explanatory power of the models, and more observations would be needed for more reliable testing of the propositions.

As usual, we also inspected the interpretation of the interaction terms with the simple slopes graphical method. Using the method described by Preacher et al. (2006), we draw the simple slope diagrams for both internationalization and partner use interactions. These diagrams are shown in Figure 7.12.

The diagrams confirm the conclusions drawn from regression analysis results: the moderating impact of Internationalization and Partner Use are similar in effect direction. Furthermore, both moderating effects have the same feature of reversing the relationship between service capability and firm profitability: for high values of both moderating variables, the relationship is positive, and for low values it is negative. In conclusion, this evidence indicates that service capability has a positive impact on the profitability of highly internationalized and partner using firms, while for firms with low degree of internationalization and partner use the impact may also be negative.

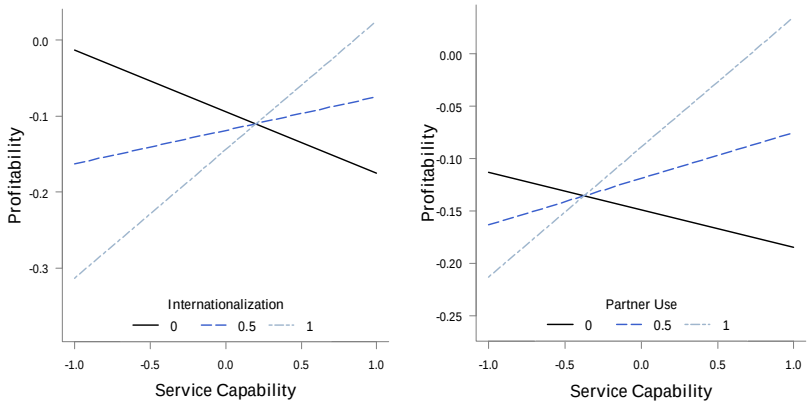


Figure 7.8: Simple slopes diagrams of the service capability interaction with internationalization and partner use

7.8 Discussion and Conclusions

In this chapter, we have tested many of the propositions that emerged from the multiple case study in Chapter 6. In general, we have found a reasonable level of support for the propositions using cross-sectional data from the Finnish software industry. While we did not achieve statistical significance in many of the regression analyses, only limited number of the analyses produced results were in contradiction with case study results. The results thus provide further empirical support for the propositions and significantly improve the external validity of the results of the overall study.

Table 7.13 shows the tested propositions and the results of the regression analyses. The results of this quantitative study fall into three categories: *supporting evidence, contradictory evidence, and inconclusive evidence*. The first group of propositions were supported by the quantitative data in a statistically significant way. By contrast, the statistical tests of a second group of propositions yielded significant yet contradictory evidence against the hypothesized relationships. The tests for the third group of propositions failed to receive significant support in either direction. As seen from the table, ten out of the eighteen tested propositions were at least weakly supported by the data. Moreover, contradictory evidence was found for two of the identified propositions. Six propositions were left without conclusive empirical evidence. We deemed evidence inconclusive if the regression coefficient was statistically significant at level of $p = 0.2$ or worse.

The interpretation of the confirming evidence is straightforward: if the results of the statistical analysis supported the propositions formed in multiple case study, the evidence obviously greatly enhances the external validity of the conclusions. The strongest evidence was found for the impact of service offering on revenue growth and the impact of service capability, when mod-

Proposition #	Relationship	Effect Hypothesized	Effect Observed	Significance
1a	Professional service → Revenue growth	+	+	*
1b	Development service → Revenue growth	-	-	+
2a	Professional service × Benevolent environment → Revenue growth	+	+	+
2b	Development service × Benevolent environment → Revenue growth	-	?	
3,4	(Omitted due to lack of data)			
5a	Professional service × Internationalization → Revenue growth	+	-	+
5b	Development service × Internationalization → Revenue growth	-	-	§
6a	Professional service × Partner use → Revenue growth	+	+	**
6b	Development service × Partner use → Revenue growth	+	+	§
7a	Professional service → Profitability	-	+	*
7b	Development service → Profitability	+	?	
8a	Professional service × Benevolent environment → Profitability	+	?	
8b	Development service × Benevolent environment → Profitability	-	?	
9	Service capability → Revenue growth	-	?	
10a	Service capability × Internationalization → Revenue growth	+	?	
10b	Service capability × Partner use → Revenue growth	+	+	*
11	Service capability → Profitability	+	+	§
12a	Service capability × Internationalization → Profitability	+	+	*
12b	Service capability × Partner use → Profitability	+	+	*

** Significant on $p < 0.01$ level; * = Significant on $p < 0.05$ level; + = Significant on $p < 0.1$ level; § = Significant on $p < 0.2$ level; ? = No conclusive evidence

Table 7.13: Statistical support found for the propositions of the study

erated by the degree of internationalization and partner use, on both revenue growth and firm profitability.

Some results of the quantitative study were inconclusive; in other words, no statistically significant evidence was found either for or against the hypothesized propositions. Obviously, in these cases we can neither confirm or refute the proposition in question. The conclusive testing of these propositions are thus left for further research, and we here simply acknowledge that the external validity of these propositions is limited to that of the multiple case study. This also applies for the two propositions that could not be tested due to lack

of suitable quantitative data.

However, for many of these propositions without inconclusive evidence, the lack of confirming evidence was likely to be partly due to the relatively low number of observations, and potentially issues with the measures used for constructs. This was suggested by many regression analyses being *almost* statistically significant in support of the hypothesized effects. We have briefly discussed these nearly supported propositions in the above analyses whenever necessary. While we have discussed these weakly supported propositions, we have still reported them as being inconclusive. In summary, further empirical research is needed to provide better evidence on these propositions.

The most problematic in terms of interpretation is the statistically significant evidence in contradiction to the hypothesized propositions. This contradictory evidence is obviously problematic, since it indicates that the hypotheses derived inductively in the comparative multiple case study were, at the very least, not valid except for the immediate group of case firms. The failure of these propositions in a larger group of firms suggests that, at least in a more general context, the effects may be reverse to what was expected based on the multiple case study. In the following, we discuss potential measurement reasons for the differences in results between the case study and the statistical analysis in this chapter. The theoretical implications of the results are discussed in Chapter 8.

There were at least three significant differences, in addition to the included firms, in the data used for the multiple case study and the quantitative data used in this chapter. First of all, we used the average values of revenue growth and profitability over a three-year periods to measure firm performance. By contrast, the results of this chapter are based on cross-sectional data from only one year. This might have had an impact on the results, as some firms may have achieved temporary success in 2008 but not in the longer run (the three-year periods in multiple case study). Furthermore, we used performance data from the year 2008 to measure firm performance in the quantitative analyses, whereas the multiple case study used performance data from the period 2003–2008. This different observational periods may have also affected the results.

Secondly, while we did probe for moderation effects of control factors in multiple case study, we did not explicitly assess the impact of these factors on outcomes. In other words, we did not explicitly modify performance values based on the values of control (i.e., non-explanatory) factors. Obviously, case study methodology is not meant to be used in terms of quantitative methodology, and thus the use of control factors can be seen as contradictory. Given the smaller variance of firm profitability, it is not surprising that the results regarding the impact on profitability were in general less reliable.

Finally, the measurement scale used for service capability in the multiple

case study was far more coarse than that used in the quantitative analysis. In the multiple case study, we used a simple and admittedly crude three-level categorization. By contrast, service capability was measured using an eight-item scale in the quantitative analysis. Obviously, the more refined operationalization of the concept might have influenced the results of this study. The same applies for the control variable of growth orientation. In the multiple case study we used a three-level categorization for growth orientation, while the quantitative study used a eight-item scale to measure the same construct, obviously resulting in a more fine-grained assessment of the firms' willingness to grow.

Besides differences in construct measurement, there were also some differences in observations used for the studies. More specifically, not all of the firms of the multiple case study were included in the analysis of this chapter for various reasons, including being a business unit of a firm (Case Gamma) to simply not providing all necessary data. While this should not have an impact on the results of quantitative analysis, the firms in the multiple case study might have had some latent factor in common that could explain the differences between that study and the results of the quantitative analysis presented in this chapter. The detailed analysis of such potential factors is however omitted here and left for further research.

Yet, we may also interpret these contradictory results as a inevitable part of an inductive research process. Through conducting hypothesis testing statistical analysis, we receive feedback on the feasibility of the relationships hypothesized on the basis of the case study. Given the subjectivity and relativity of most qualitative methods (Yin, 2003; Flyvbjerg, 2006) it is not surprising to see these hypotheses being refuted by wider empirical evidence. Statistical testing allows us to, in its part, to test the coherence and feasibility of the propositions. Since our purpose is to discover theory for understanding service provision and its effects in product firms, our ultimate goal is to provide a coherent explanatory theoretical framework. The contradictory quantitative evidence allows us to step back and revise our propositions so that the theoretical coherence is improved, ultimately resulting in a better theoretical explanation. In this sense the contradictions may be seen as a positive outcome of the statistical analysis. We will discuss revision of the propositions and the integrative theoretical framework in the Discussion chapter.

7.8.1 Contributions

The quantitative analyses performed in this chapter do, by themselves, make several contributions to the literature on services in manufacturing industries. First, the results clearly indicate the varying strategic impact of different kinds of knowledge-intensive services. Unlike much of the extant research on service provision, which assumes that services are uniform and homoge-

neous in their effects, these results suggest that instead it is definitely necessary to delineate between different services when analyzing their impact.

Second, the results also suggest that using a firm-level construct of service capability is meaningful and is nomologically valid, as the service capability construct could successfully be used to explain variance in firm performance. While the construct did not perform as well in other respects of validity, these results indicate that service capability of product firms does make a difference in terms of firm performance.

Third, this study has linked service provision to revenue growth in addition to firm profitability. As much of the research on service provision and solutions has only explored the impact of service provision in large multinational firms for whom profitability is the most important performance measure, our analyses here provide complementary evidence of the service offering's impact on firm growth. Our results indicate that services can and do have have an important impact also on the revenue of product SMEs.

7.8.2 Limitations

While the results of the quantitative analysis of service provision's strategic impact showed some significant results, many of the analysis results were statistically nonsignificant. This was mostly due to the limitations in the available data: the number of observations was relatively low, only crude proxies were available for some variables, and for some variables no quantitative data were available. These limitations were clearly reflected in the number of analyses that could be performed and in the relatively low statistical strength of the conclusions for those analyses that could be performed.

Obviously, some of the operationalizations used for the research were relatively crude. First, using firm age as a proxy for competitive environment hostility is admittedly a vast simplification. However, as argued above, given the emergent nature of many software markets, firm age probably does reflect to some degree the evolution of the market. Of course, future tests of the hypotheses in this study should seek to use more sophisticated measures of competitive environment characteristics. These crude proxy variables might have, of course, affected our results.

Second, using revenue shares to measure service provision was also somewhat simplistic way of capturing the software firms' service activities. Extant research has used, for example, the variety of services as one way of measuring service strategies (Homburg et al., 2002; Gebauer, 2008; Gebauer et al., 2010). However, as noted in the multiple case study in Chapter 6, there were relatively little differences in the service portfolio of the case firms. Moreover, we did capture some of this service variety by measuring the revenue shares of two types of services, development and professional services.

We note that the purpose of the quantitative analyses were never to provide conclusive empirical support for all the propositions that emerged from multiple case study. Our goal was rather to improve the external validity of the case study results through testing the propositions on a limited collection of data. Comprehensive testing of the emerged propositions would have required a significantly larger database, and can be argued to remain outside the scope of this study. Therefore, given the number of significant regression results, we may argue that quantitative analysis served its purpose and did provide additional empirical support for the conclusions of the overall study.

Third, we also note we tested our hypotheses using only cross-sectional data. While this type of data has been traditionally used in management research to provide statistical evidence for hypotheses, purely cross-sectional studies are becoming increasingly insufficient for testing sophisticated models and complex hypotheses (Scandura and Williams, 2000; Aguinis et al., 2009).

In particular, reliance on cross-sectional data raises the question of causality: since we cannot infer the direction of the relationships from this kind of data, we can actually only state that constructs are related to each other rather than being truly causally linked. The proper causal testing of the hypotheses would, of course, have required longitudinal data. Yet, longitudinal data were unavailable at the time of this study, and would have complicated the statistical analysis. Given the time and resource limitations of this study, these inclusions would have significantly and likely unnecessarily lengthened the research process. Moreover, since our primary goal in this study is to provide a theoretical explanation of the strategic impact of service provision, such robust tests for causality can be argued to be to be outside the scope of the current study. Such tests form one potential direction for further research.

Fourth, the question of causality is also raised by our data collection procedure: we collected the data in spring 2009, while the performance variables refer to year 2008. Especially due to the global financial recession starting at the end of 2008, the measurement of independent and control variables might have been affected in a way that could have an impact on the results of the analysis. In particular, the growth orientation, service revenue shares and service capability might have been influenced by this effect.

Growth orientation, when measured in 2009, might be actually lower than in 2008 due to general worsening of the financial situation. This implies that the GO values used in our analyses might be lower than the actual values in 2008. As a defensive measure, managers of software firms might also have changed their offering towards more services to generate cash flow more quickly. This would inflate the service revenue shares from the normal state of business for the firm, and somewhat overestimate the importance of services to the firms. Finally, service capability of software firms was also measured in

2009. Since service capability is likely to improve over time, there is a chance that the used measures could have overestimated the actual values in 2008.

The overall impact of the potential errors in data discussed above is hard to assess in detail. In general, they do cast some level of doubt on the validity of the results, and further data collection and longitudinal statistical analysis is required for comprehensive testing of the propositions. However, the variables used to operationalize the constructs were dictated by practical issues, i.e., the availability of data at the time of the analysis. Given the emphasis on qualitative analysis in this study, we suggest that the available data and analysis results provide encouraging tentative support for our propositions.

7.8.3 Conclusions

In general, the results of the quantitative analysis on a cross-sectional data from the Finnish software industry provided further supporting evidence for the propositions developed in the multiple case study. While limited by the number of usable observations and data available to measure constructs, the results from simple regression analysis confirmed many of the conclusions drawn from multiple case study. In several cases, the results were even statistically significant, improving the generalizability of the multiple case study results.

8 Discussion

8.1 Research findings

We begin the discussion of the study's results and their significance by recalling the research questions stated in Chapter 3. We will first discuss the results of the study and how they allow us to answer the research questions.

8.1.1 RQ1. What is the impact of service offering on revenue growth?

Our first research question asked how the variety and breadth of a product firm's service offering affects the revenue growth of the firm. This research question was analyzed in the multiple case study in Chapter 6, as well as through quantitative methods in Chapter 7. As indicated by the results of the in-depth case study, the service offering of the product SME has an impact on revenue growth through facilitating interorganizational knowledge transfer between the focal firm and its customers. As multiple types of knowledge need to be transferred successfully to deliver the overall solution, different services have a different impact on the focal firm's revenue growth.

We have found that professional services provision has a positive impact on the revenue growth of the product firm (**Proposition 1a**). This is based on the effects created by the transfer of tacit knowledge that face-to-face delivered professional services have on the success of knowledge transfer to customer organizations, and also on the enhanced learning of the focal firm from its experiences. By contrast, the provision of development services was shown to have a negative impact of revenue growth (**Proposition 1b**). This is due to the distracting characteristics of these services since they use the same resources as the focal firm's product development efforts.

Above results imply, firstly, that service provision activities of product firms do make a difference: the revenue share of different services, serving as a proxy for the extent of service provision, have a significant impact on revenue growth. Secondly, the results also indicate that different services have different impacts on growth. In other words, what services a product firm offers makes a difference on the revenue growth of these firms.

Our study also probed the potential moderating effects of various factors on the relationship between service provision and revenue growth. First of all, we found that the benevolence of the focal firm's competitive environment, inversely related to the maturity of the market, has a significant impact on the relationship between service provision and revenue growth. We found that competitive environment benevolence positively moderates the relationship between professional services and revenue growth (**Proposition 2a**). In essence, this indicates that professional services matter the most at the beginning of the product firm's life cycle. Conversely, we also found qualitative evidence that the detrimental effect of development services on revenue growth weakens as the market matures. Competitive environment benevolence thus has a negative moderating effect on the relationship between development services and revenue growth (**Proposition 2b**). This implies that the potentially harmful impact of development services provision is at its strongest at the early phase of the firm's life cycle.

Second, the multiple case study also indicated that offering complexity and customer segment focus tend to moderate the relationship between professional service provision and revenue growth positively and negatively, respectively (**Propositions 3 and 4**). Unfortunately, no quantitative data was available for these constructs and therefore they could not be tested statistically. The quantitative testing these propositions is left for future research.

Third, we tested the moderating effect of internationalization on the relationship between service provision and revenue growth. Here, our results were not very clear and were in some respects were contradictory. Based on the multiple case study, we hypothesized that internationalization should positively moderate the relationship between professional services provision and revenue growth (**Proposition 5a**). However, the statistical test of this proposition yielded weakly significant empirical evidence *against* this proposition. In other words, quantitative analysis indicates that the impact of professional service provision on revenue growth is negatively moderated by internationalization.

This result could have been produced by the particular selection of firms included in the multiple case study and the quantitative analysis. As the groups of firms used in the two analyses did not fully overlap, it is conceivable that individual differences might have caused the reversed result. Furthermore, as indicated in Chapter 7, there were major differences between the case study and the quantitative analysis, for example in the operationalization of revenue growth, and also in terms of controlling for additional factors. The performance measure used in multiple case study was limited to the period 2003–2008, while the quantitative study used measured revenue growth as total sales growth from 2008 to 2009. The global financial crisis might have affected the results of the quantitative study. These differences could have

attributed to the difference between the results.

Nevertheless, a plausible alternative theoretical explanation for the observed quantitative result may also be given: as professional services are typically related to transfer of customer domain and solution related knowledge, they are likely to be tacit to a significant degree in comparison to technological knowledge, making knowledge transfer more difficult for professional services (Dhanaraj et al., 2004; Simonin, 1999a). Combined with internationalization, the cultural and cognitive barriers would make successful transfer of solution and customer knowledge even harder (Jensen and Szulanski, 2004). Ultimately, this would mean that the more professional services the focal firm provides, the harder it is to transfer the necessary knowledge to customers, which implies the found negative moderating effect. Obviously, further empirical research is required to provide more conclusive evidence for or against this proposition.

Next, we hypothesized that internationalization should negatively moderate the relationship between development services provision and revenue growth (**Proposition 5b**). We found weak evidence in support of this proposition. Together, this and the previous finding indicate that, in general, the revenue growth of internationalized product firms is made more difficult by the provision of *any* type of knowledge-intensive services.

Fourth, we investigated the potential impact of reseller and service partner use on the relationship between the focal firm service provision and revenue growth. Here, our findings from the quantitative analysis provided statistical support for our propositions. More precisely, as hypothesized, internationalization positively moderates the relationship between professional services provision and revenue growth (**Proposition 6a**). Moreover, the quantitative analysis also provided weak evidence in support of **Proposition 6b**, which stated that partner use should negatively moderate the relationship between development services and revenue growth. Together, these results indicate that the use of partners is generally a good idea for a product firm, since it appears that both internationalization and partner use positively moderate the relationship between the provision of both types of services and revenue growth of these firms. This effect is likely due to the diffusion and leveraging of new knowledge learned from customer through these services.

In summary, we may conclude that service provision does have a significant impact on the revenue growth of a product firm. Furthermore, and importantly, we found that professional and development services have different, opposite effects on revenue growth. Lastly, we also tested the moderating impact of various factors and found that, at least, market maturity, internationalization, and partner use significantly moderate the relationship between service provision and revenue growth.

8.1.2 RQ2. What is the impact of service offering on profitability?

The weakest findings of the study concern the impact of service provision on firm profitability. While we identified propositions through multiple case study that related knowledge-intensive service provision directly to profitability (**Propositions 7a and 7b**), and moderated by market maturity (**Propositions 8a and 8b**), the statistical tests of these propositions using quantitative data yielded mixed evidence.

First of all, we found moderately strong contradictory evidence against **Proposition 7a**, which stated that professional services provision is negatively related to firm profitability. Empirical evidence supported the exactly opposite conclusion that professional services provision is *positively* related to firm profitability. Again, this effect may be at least partly due to differences in operationalizations between the multiple case study and the quantitative analysis. The measures and the period of measurement for profitability were different for these two studies. As with **Proposition 5a**, using performance data from the financially challenging year 2009 potentially has a biasing effect on the results, as it is conceivable that in the tougher competitive situation professional service provision is positively related to profitability, given the difficulty of product sales during this period.

Of course, this observed effect may also be due to the value-adding nature of typical professional services. More specifically, the complex and knowledge-intensive services provided by the focal firm may be more valuable to the customers, allowing the focal firm to invoice more from these services in comparison to more general technological services. This is in line with the argument from many traditional manufacturing industries that the profitability of services is often higher than for the actual products (cf. Potts, 1988; Wise and Baumgartner, 1999; Gebauer et al., 2005), and would imply that the more the product firm offers professional services, the more profitable it should be. However, in the case of software industry the effect might not be as strong, as software products typically enjoy very high profitability (Shapiro and Varian, 1999). Obviously, further empirical research is needed to produce more conclusive evidence on this proposition.

Next, based on the multiple case study, we hypothesized that development services would have a positive impact on firm profitability **Proposition 7b**. However, we could not find statistically significant evidence in support or against this proposition in quantitative analysis. If anything, the evidence seem to be slightly in contradiction with the proposition, but this result was not significant even at $p < 0.2$ level. Therefore, we cannot draw any solid conclusions from the quantitative evidence, and we need to conclude that more research would be needed to provide generalizable support for this proposition.

We also tested the potential moderating impact of competitive environ-

ment benevolence on the relationship between service provision and firm profitability. Competitive environment benevolence is typically inversely related to market maturity, and was suggested to affect service provision impact through the diffusion and codification of knowledge related to the focal firm's offering.

As indicated by the multiple case study, we hypothesized that competitive environment benevolence should negatively moderate the relationship between professional services provision and firm profitability (**Proposition 8a**). However, we found no conclusive evidence in support or against this proposition in the quantitative analysis. By contrast, we hypothesized that benevolence should negatively moderate the relationship between development services and profitability (**Proposition 8b**). Again, we found no conclusive evidence for accepting or refuting this proposition in quantitative analysis.

If he above two propositions regarding the moderating effect of market maturity were in fact true, it would imply, firstly, that the impact of professional services on firm profitability is at its smallest at the beginning of the product firm's life cycle. Secondly, the impact of development services should be at its greatest at the beginning of the market life cycle. These findings suggests that the optimal service offering depends on the evolution of the offering, as well as that of the market and customers. However, the empirical evidence was based mainly on multiple case study, implying noticeably lower external validity for the findings.

In summary, we found somewhat weak evidence for the impact of service provision on firm profitability. In the case of professional services, the quantitative analysis results indicated that service provision is positively related to profitability, while development services have a similar yet weak effect. Overall, the effects are significantly smaller than for revenue growth. We also hypothesized that competitive environment benevolence should moderate the relationship between service provision and firm profitability, but no conclusive evidence was found for these hypotheses in the quantitative analysis.

8.1.3 RQ3. What is the impact of service capability on revenue growth?

In addition to what kind and how much services the product firms offered, we also analyzed the impact of service capability on firm performance. Service capability describes how well the firm can provide its services, and covers both external and internal effectiveness of its service operations. Based on this conceptualization, it is easy to make the assumption that service capability should also be somehow related to product firm performance.

Based on the results of the multiple case study, we expected service capability to have a negative impact on revenue growth (**Proposition 9**). However, as seen in the quantitative analysis of a larger population of software firms in Chapter 7, we found no conclusive or contradictory evidence of this pos-

itive effect. In fact, the service capability had very little, if any, direct impact on revenue growth. This indicates that service capability does not, by itself, help a product firm grow. Yet, as indicated by some evidence in the multiple case study, it would seem that sufficiently high service capability is required to attain high revenue growth rates. This effect would be due to the limiting effect service operations potentially have on product firm growth — a high service capability would allow the firm to effectively replicate its service operations to support the growth of its overall business (Winter and Szulanski, 2001; Jensen and Szulanski, 2007).

Multiple case study led us also to posit that service capability has an important impact on firm growth when moderated by internationalization and partner use (**Propositions 10a and 10b**). In other words, this indicates that whenever a product firm seeks to internationalize or use service partners, and cannot eliminate services altogether, the firm should seek to improve its service capability. Quantitative analysis of these hypothetical relationships indeed found support for these propositions. However, no conclusive evidence was found for **Proposition 10a** that stated that high service capability should have a positive impact on revenue growth in highly internationalized firms.

In the case of **Proposition 10b** that claimed that service capability has a positive impact on revenue growth in firms who use service partners, we found statistically significant evidence in support of the proposition. In other words, we concluded that if a product firm uses service partners to deliver the required services, service capability has significant positive impact on the revenue growth of the focal firm. This effect is due to service capability's positive impact on the success of knowledge transfer between the focal firm and its partners through effective codification of the solution and service processes, and transfer of these practices to the partner firm (Winter and Szulanski, 2001; Szulanski and Jensen, 2004).

In summary, while not directly contributing to revenue growth of service-providing product firms, service capability of the focal firm does have an important impact on growth through enabling the firm to effectively and efficiently use partners and international subsidiaries. Given the inherent limits of growth in Finland as a home market, the transfer to international markets is a necessary yet difficult step in the growth of a Finnish software firm. From this we may conclude that service capability may be one of the key capabilities of a product firm that wishes to expand internationally.

8.1.4 RQ4. What is the impact of service capability on profitability?

Finally, we also studied whether service capability has an impact on the profitability of product firms. The multiple case study indicated that service capability has a positive impact on the profitability of product firms (**Proposition**

11). This conclusion was based on a slightly more complex analysis, but nevertheless the evidence suggested that, when controlling for other factors, such as growth orientation and firm age, service capability did have a small positive impact on firm profitability.

We found weakly significant support for this proposition in quantitative analysis. This finding implies that product firms should increase their service capability in order to attain better profitability. Yet, we might suppose that there are limits to how good a product firm should become in this respect — too high service capability could lead to inflexibility in service operations and unresponsiveness to customer requests. Therefore, it is conceivable that service capability has a curvilinear (quadratic) relationship with firm profitability. However, the evidence in support of this argument is not conclusive and should be subjected to further empirical testing.

We also hypothesized that service capability has a positive impact on firm profitability when moderated by internationalization (**Proposition 12a**) and partner use (**Proposition 12b**). Statistical tests of these proposition indicated that both were supported by empirical evidence. The tests for both propositions were statistically significant and their direction was as expected. More specifically, both internationalization and partner use tended to positively moderate the relationship between service capability and firm profitability. These findings again suggest that service capability can be of great importance to product firms if they seek compete internationally or use service partners.

The conclusive evidence for these propositions highlights the importance of service capability for not only the profitability but also the revenue growth of internationalizing product firms. Service capability allows product firms to grow effectively and efficiently by expanding to new geographical markets and by working with service partners. As argued in the case of service capability's impact on revenue growth, internationalization is often necessary for the growth of SMEs with a small home market. Therefore, the empirical evidence indicates the importance of service capability not only for revenue growth through international expansion but also for maintaining firm profitability. In this sense, service capability appears to be important in every life cycle phase of the service-providing product SMEs.

In summary, we may conclude that while service capability does not seem to have a strong direct impact on firm profitability, its importance increases significantly if the product firm chooses to internationalize or to use service partners. In this case, service capability has a clear positive impact on profitability. This effect is clearly due to the positive impact service capability has on the firm's ability to replicate its service operations to new markets, and to effectively transfer required knowledge to partner firms (cf. Winter and Szulanski, 2001; Jensen and Szulanski, 2007).

8.2 Emerging theoretical framework

Drawing on the results of the multiple case study and taking into account the results of the quantitative analyses, we may now delineate an integrative framework for understanding the relationships between service provision and firm performance. This framework, used to explain the identified patterns in data, is shown in Figure 8.1. The purpose of this framework is to integrate the theoretical findings of this study into one coherent framework, and to discuss how these findings relate to prior research. The framework is based on the propositions which were refined based on the results of the quantitative analysis.

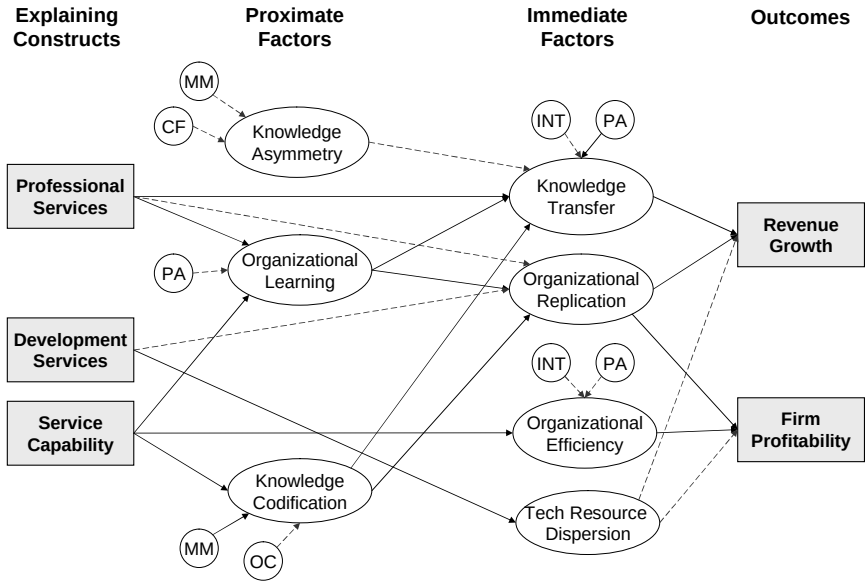
We argue that several immediate and proximate mediating factors effectively explain the mechanisms through which the provision of knowledge-intensive services and service capability affect firm performance. The immediate factors are mechanisms that directly affect the performance of the focal firm, while the proximate factors contribute to performance indirectly through the immediate factors. The framework also contains the explaining constructs (professional service provision, development service provision, and service capability), several moderating factors, and the performance outcomes (revenue growth and firm performance). To make the diagram less cluttered, we have used abbreviations for all moderating factors. Next, we will elaborate this framework in more detail and how it relates to prior research on the impact of ínterfirm knowledge transfer and knowledge management.

8.2.1 Immediate mediating factors

First, we note the immediate mediating factors of the framework: *knowledge transfer, organizational replication, organizational efficiency, and technological resource dispersion.* We argue that these factors are directly related to product firm performance.

Knowledge transfer

Knowledge transfer refers to the rate of success in transferring required knowledge *to* customer organizations for successful use of the solution (cf. Leonard-Barton, 1988a). This success is a necessary requirement for the customer organization to draw value from the solution, and depends on the type of knowledge transferred, properties of both the sender and recipient organizations, environmental factors and the relationship between the organizations (Easterby-Smith, Lyles and Tsang, 2008; van Wijk et al., 2008). Without successful knowledge transfer, the focal firm would have more difficulties in selling and deploying its solution and subsequently attaining desired growth rates. Knowledge transfer is thus positively related to firm growth.



Solid arrow: Positive relationship
Dashed arrow: Negative relationship
Key: MM = Market Maturity; CF = Customer Focus; OC = Offering Complexity; INT = Internationalization; PA = Partner Use

Figure 8.1: Integrative theoretical framework of the performance impact of service provision and service capability

Organizational replication

Organizational replication refers to the mechanisms through which the product firm expands its service organization (Winter and Szulanski, 2001; Jensen and Szulanski, 2007; Szulanski and Jensen, 2008). This is required if the existing service resources cannot provide the required services, which is the case if the focal firm seeks to grow. Replication is thus positively related to revenue growth. By contrast, unsuccessful organizational replication stymies the focal firm's growth as it is unable to expand its service operations quickly enough (Jensen and Szulanski, 2007). In addition, this failure in replication is likely to result in spending significant amounts of the product firm's service resources without much tangible results, lowering the profitability of the overall business. Success in replication is therefore also positively related to firm profitability.

Organizational efficiency

Organizational efficiency refers to the operational efficiency of the service operations of the focal firm (Aranda, 2003; Johnston, 2005; Correa et al., 2007). More specifically, it describes how good the focal firm is in using its existing service resources. This efficiency is not likely to result in significant growth in revenues (although it allows this by enabling more resources to be sold freed

by more effective use). However, organizational efficiency obviously has a positive impact on profitability by allowing the focal firm to deliver more services using less resources (Smith and Reece, 1999; Soteriou and Zenios, 1999).

Technological resource dispersion

Lastly, the technological resource dispersion factor describes how the technological resources of the product firm are allocated. The firm has two options for using these resources: it can either use them to deliver custom product development services to its customers, or it can use the them to develop new products or to improve existing products. The same set of skills is required for both these activities: solid knowledge about the product technologies as well as some knowledge about the customer domain. If the product firm chooses to provide customization development services to a great extent, the technological resources are dispersed, given the dual goals of development service provision and product development. Having less resources to use on R&D is likely to hurt the product firm's product development efforts, which will ultimately result in having less competitive products to sell in the future. Obviously, this will potentially have a negative impact on revenue growth by limiting the potential product sales of the focal firm. Moreover, as products are essentially codified knowledge, they are also easier to sell than development services. Therefore, the dispersion of technological resources resulting from the provision of development services is likely to have a negative impact on the revenue growth of the focal firm, particularly in the long run.

In addition, product business is potentially immensely profitable in software industry due to economies of scale on both demand and supply sides (Shapiro and Varian, 1999; Messerschmitt and Szyperski, 2003). Hence, product sales are likely to be more profitable than the provision of development services. These development services are often based on the sales of relatively straightforward and commonplace technological knowledge and skills, resulting in lower profit margins than expert technical services. In summary, emphasis on using development resources on service provision is likely to have a negative impact also on the profitability of the focal firm.

8.2.2 Proximate mediating factors

We argue that, in addition to the immediate factors explaining solution firm performance there are also proximate factors that serve to explain the relationship between service provision and service capability, and firm performance. These factors are *knowledge asymmetry, knowledge codification, and organizational learning.*

Knowledge asymmetry

Knowledge asymmetry exists when the focal firm and customer organizations possess different types of knowledge or possess same knowledge in different extent. For example, asymmetry exists if the customer organization is does not possess specific solution knowledge used by the focal solution firm. As noted by Grant and Baden-Fuller (2004), this asymmetry is likely to coincide with the boundaries of firms, as firms try to economize on the need to integrate different types of knowledge within one organization.

Knowledge asymmetry also covers the issue of overlapping knowledge bases: sometimes the organizational knowledge bases of two organizations do not perfectly match but are overlapped. In this case, they possess some common knowledge but are not perfectly knowledgeable about the knowledge possessed by the other organization (Balconi, 1993; Mowery et al., 1998; Miller, 2006; Mucher, 2006; Zhang et al., 2007). This type of overlap is often cited as an antecedent to absorptive capacity (Cohen and Levinthal, 1990; Lane and Lubatkin, 1998), which in turn has a positive impact on the success of interorganizational knowledge transfer (Easterby-Smith, Lyles and Tsang, 2008). In summary, knowledge asymmetry (i.e. the lack of a knowledge overlap) has a negative impact on the success of knowledge transfer.

Knowledge codification

Knowledge codification refers to the degree the knowledge possessed by the solution firm has been expressed in an explicit form readily understandable by other organizations (Nonaka, 1994; Cohendet and Steinmueller, 2000). This codification can apply to any of the types of knowledge related to the focal firm's offering. In other words, the technological knowledge may be codified in the form of a product, and the knowledge related to the solution may be codified in terms of manuals and process descriptions. As argued in the literature on knowledge transfer, the more codified (i.e. simplified) knowledge is, the easier it is to transfer to other organizations (Cowan and Foray, 1997; Cowan et al., 2000; Easterby-Smith, Lyles and Tsang, 2008). Knowledge codification thus has a positive impact on the success of knowledge transfer.

In addition, knowledge codification also has a positive impact on the organizational replication of the service business. By making the knowledge and processes of the focal firm more explicit, knowledge codification makes replication efforts easier (Winter and Szulanski, 2001). There is thus a positive relationship between knowledge codification and organizational replication.

Organizational learning

The third proximate mediating factor of the framework, organizational learning, refers to how well the focal firm is able to collectively learn from its experiences (Huber, 1991; Attewell, 1992). This learning enables the focal firm to deepen and broaden its knowledge base. Therefore organizational learning

improves the focal firm's opportunities to successfully transfer knowledge to its customer organizations.

8.2.3 The explaining constructs of the study

The explaining constructs of the study, namely professional and development services provision, and service capability, are related to the proximate and immediate mediating factors in many ways that help to explain the patterns found in multiple case study and partly confirmed by quantitative analysis. In the following, we describe how these explaining factors are related to the other factors in more detail.

Professional services provision
First of all, professional services provision is positively related to the success of knowledge transfer between the focal firm and its customers. This is due to the knowledge transfer facilitating characteristics of these services — the provision of professional services allows the focal firm to transfer both codified and tacit knowledge related to the offering more effectively than without those services (cf. Balconi, 2002; Carlile, 2004; Becerra et al., 2008).

Second, professional services provision is also positively related to organizational learning. By providing face-to-face services, the focal firm can more effectively learn from its customers new knowledge related to its offering. By enabling learning about the customer domain, professional services potentially enable explorative learning and the broadening of the focal firm's knowledge base (March, 1991).

Third, professional services provision is also negatively related to organizational replication. This is due to the complexity impact of such services: since professional services typically require (tacit) expert knowledge to be delivered (Von Nordenflycht, 2010), and apply knowledge different from the core technological knowledge, they increase the demands on the personnel delivering them. In other words, adding professional services tends to make the offering more complex and thus the replication of such business harder (Winter and Szulanski, 2001; Anderson et al., 1997; Kathuria et al., 2008).

Development service provision
By contrast, the provision of development services does not facilitate knowledge transfer to even nearly to the same extent as professional services. These development services are mainly performed within the focal firm, and the face-to-face contacts with the customer organization are much more scarce. Furthermore, development services mainly require technological knowledge and much less solution and customer knowledge, thus supporting only exploitative learning close to the focal firm's current core knowledge (March, 1991). Hence, development services tend to actually maintain or increase knowledge differences between customers and the focal firm rather than to

decrease them. Therefore, the impact of development services provision differs markedly from the impact of professional services.

Similar to professional services, development services also tend to make the business less easily replicable. There is thus a negative relationship between development services provision and organizational replication. The other impact development services provision has is that it changes the balance of product development resources use: instead of using the resources on product development, they are used on the provision of development services. There is thus a positive relationship between development services provision and technological resource dispersion.

Service capability

Service capability, as discussed earlier in this study, refers to how well the product firm delivers its services. It encompasses two dimensions: the external and internal dimensions. The external dimension relates to how well the focal firm delivers its current services to customers with existing resources, and hence is related to service marketing and service quality management. In other words, how *effectively* the firm can offer its services. In practice, this means that the product firm's service offering is codified in a way that is more easily understandable by the customer organizations. There is thus a positive relationship between service capability and knowledge codification.

The other aspect of service capability is how *efficiently* the product firm can offer its services, and deals mainly with internal aspects of service operations. In other words, it also describes how well the firm can utilize its current service resources, and how well it is able to transfer necessary knowledge internally. Obviously, these arguments link the service capability of the product firm to its organizational efficiency. There appears to be a positive relationship between these two constructs. Moreover, service capability is also directly related to organizational replication — by being able to effectively internally transfer knowledge between service resources, the firm is also able to replicate its services in other contexts as well. There is thus a positive relationship between service capability and organizational replication.

As indicated by the literature on service quality, a higher service quality improves customer satisfaction, customer retention, and subsequently firm performance (Cronin et al., 2000; Roth and Jackson, 1995). Hence, service capability as an antecedent of service quality should also be related to firm performance. In addition, this conclusion is also supported by research on service operations (Nayyar, 1992; Roth and Jackson, 1995), which suggests that superior management of service operations positively affects firm performance. In summary, our results on the impact of service capability is in concordance with this prior research.

8.2.4 Moderating factors

Our integrative framework also contains moderating factors that affect the relationships between explaining factors and outcomes. More specifically, the framework includes the moderating constructs of *customer focus, offering complexity, market maturity, internationalization and partner use*. In the following, we discuss in more detail how these factors are related to the mediating factors.

Customer focus
First of all, the customer focus of the product firm is related to knowledge asymmetry. By customer focus, we mean how narrowly the focal firm has defined its customer segment in terms of customer organization industry, size, and other characteristics. Typically, the narrower this segment is, the more specialized the focal firm becomes and hence the more deeper knowledge it must develop to provide value to its customers. If the firm can specialize in such customers, it is likely to develop a more concentrated knowledge base (Grant and Baden-Fuller, 2004) and, due to the narrowness of this knowledge base, more likely to engage in exploitative than explorative learning.

Having narrow customer focus also often requires the focal firm to become intimately acquainted with the customer segment (Yli-Renko et al., 2001). Based on these observations, we argue that the tighter the focal firm's customer focus is, the is the narrower is the knowledge asymmetry between the focal firm and its customers. Conversely, a very loose customer focus should be associated with a wider knowledge asymmetry.

Offering complexity
Offering complexity refers to the vagueness, interconnectedness and number of different components the offering is composed of (Hobday, 1998). Obviously, the complexity of the offering is also related to how hard it is to understand and to manage, as the number of interdependencies and relationships between the components requires more knowledge about how these components work together and as a whole. Typically, complex offerings also combine a large number of different types of knowledge (Hobday, 1998), often in ways that require the mastery of tacit knowledge referring to specific components. In this sense, offering complexity tends to make the offering less easy to transfer successfully to customer organization. Therefore, we argue that there is a negative relationship between offering complexity and knowledge codification.

Market maturity
The third moderating factor, market maturity, refers to two factors regarding uncertainty around the focal firm. On one hand, it describes how mature and stable the knowledge and hence technology used in the products of the focal firm has become during the evolution of the markets in which the firm

competes. On the other hand, it also describes how stable the market itself is — more specifically, are there a lot of new entrants to the market, and in general are there a lot of small firms or only a small number of major players in the market. Typically, a mature market is associated with more stable knowledge and product technology than an immature market (Anderson and Tushman, 1990; Suarez and Utterback, 1995; Murmann and Frenken, 2006). Moreover, a mature market typically is also more stable in terms of competition, with clearly defined competitors and customers (Day, 1981; Lambkin and Day, 1989).

These arguments indicate that, firstly, market maturity should be negatively related to knowledge asymmetry between the focal firm and its customers. As the market matures, knowledge related to the solution becomes more evenly diffused in the customer population, thus reducing the asymmetry. On the other hand, the product firm also learns from its customers, further reducing the asymmetry between the firm and its customers. Secondly, as the market matures, the knowledge related to the solution in the market tends to become more stable and codified (Anderson and Tushman, 1990). There should thus be a positive relationship between market maturity and knowledge codification.

Internationalization

The last two moderating factors, internationalization and the use of service partners, are related to how much the focal firm needs to bridge gaps between different geographical markets and organizational boundaries. As indicated in the literature on knowledge transfer, these gaps tend to make knowledge transfer more difficult (Easterby-Smith, Lyles and Tsang, 2008).

Internationalization refers to the extent the product firm operates outside the national boundaries of its home market, and typically is measured in terms of revenue generated abroad (Bloodgood et al., 1996; McDougall and Oviatt, 1996). Operations in international markets usually require bridging gaps in national and organizational culture, and the need to adapt the firm's offering to local conditions (Calof and Beamish, 1995; Barkema et al., 1996). While services can be provided from within the focal firm, the language and cultural barriers make successful knowledge transfer to customers more difficult (Bhagat et al., 2002; van Wijk et al., 2008). There thus is likely to be a negative relationship between the internationalization of the focal firm and knowledge transfer success.

Furthermore, operating abroad usually requires the focal firm to expand its service organization to those countries it operates in, since the provision of (in particular professional) services requires face-to-face interaction with customers. Yet, as with knowledge transfer to customers, the focal firm needs to be able to successfully recruit and train new personnel who often come from the particular country and hence subject to language and cultural bar-

riers (Jensen and Szulanski, 2004; Kotabe et al., 2007), making the replication of the business more difficult (cf. Jensen and Szulanski, 2004) Therefore, we argue that there is also a negative relationship between internationalization and organizational replication.

Partner use

By partner use, we mean the extent to which the focal firm uses independent firms as agents who resell the product firm's offering and deliver required services related to the offering. Typically, these firms are used particularly outside the home market and therefore partner use is often strongly linked with internationalization. Of course, this need not be the case, as a product firm can operate internationally without partners or domestically using partners. Nevertheless, the use of partners has benefits for the focal firm: as the partner firms are often from the local markets, they face less cultural or language barriers, and are often more trusted than a foreign firm (Szulanski et al., 2004). Therefore, there is likely to exist a positive relationship between partner use and knowledge transfer between the focal firm and its customers.

However, the use of partners has also negative consequences. By eliminating the need for extensive knowledge-intensive service provision, partner use has a negative impact on organizational learning, as the focal firm no longer has as intimate relationships with its customers. This reduces the chances for the transfer of tacit knowledge about the customer's problems, and also limits the potential for explorative learning through exposition to varying customer domains. Furthermore, while eliminating the need for own personnel in a geographical market, the use of partners still entails the search and recruitment of partners to expand to the market. This is often more difficult than simply starting a directly owned subsidiary in the market. Therefore, there is also a negative relationship between partner use and organizational replication.

8.2.5 Relation to the framework in in-depth case study

While the theoretical framework depicted in Figure 8.1 is much more complex and detailed, it is nevertheless related to the tentative framework shown in Figure 5.1 that was identified through inductive methods in Chapter 5. In describing the similarities and differences between these two models, we must remember that the empirical research that lead to these frameworks had different goals: the in-depth case study of Chapter 5 sought to identify a theoretical grounding for explaining the phenomenon of knowledge-intensive service provision in all its aspects, while the integrative framework was based on multiple case study and quantitative analyses that sought to identify patterns in empirical evidence and to provide a theoretical explanation for these patterns.

Our tentative framework of the impact of service provision developed in Chapter 5 used only limited number of constructs, namely three types of

knowledge, knowledge transfer success, knowledge codification, customer knowledge, service provision, and firm performance. Comparing these to Figure 8.1, we see that these constructs are mostly present in the integrative framework, and mainly relate to the upper part of the diagram.

The knowledge transfer construct is nearly the same in both framework; however, in the integrative framework we have differentiated between knowledge transfer (outbound knowledge flows) and organizational learning (inbound knowledge flows). Making these distinctions is important, since they serve different functions in determining firm performance. The outbound knowledge transfer is related to how well the firm can transfer sufficient skills to the customers to ensure the proper use of the overall solution. By contrast, inbound organizational learning enables explorative learning through interaction with customers, which potentially has positive impact on focal firm innovativeness (Rosenkopf and Nerkar, 2001).

The customer knowledge construct in the tentative framework relates mainly to the knowledge asymmetry factor in Figure 8.1. In other words, as already theorized in Chapter 5, as the market matures, customer learn more about the solution, and thus the relative asymmetry in knowledge between the product firm and its customers is reduced. This also reduces the need for knowledge transfer, allowing the same level of knowledge transfer with less knowledge-intensive services.

Knowledge codification is again nearly similar between the two frameworks; it refers to the extent the knowledge included in the product firm's offering can be expressed in explicit, written form (Cowan et al., 2000; Balconi, 2002). Its effect is also identical in both frameworks; it makes the knowledge easier to transfer to customers, and hence reduces the need for service provision.

The main differences between the two frameworks relate to the level of detail related to service provision itself. In the tentative framework, we did not differentiate between different kind of services. By contrast, as the result of subsequent research we decided to concentrate our analysis on two types of knowledge-intensive services: professional services and development services. As can be seen from the integrative framework in Figure 8.1, these two types of services have vastly different impacts on firm performance, and the mechanisms through which these effects work also differ significantly. The integrative framework thus provides a much more detailed explanation of why and how knowledge-intensive service provision is related to firm performance.

In addition, the differentiation between the two types of services also relates to the three types of knowledge hypothesized in the tentative framework: customer domain knowledge, solution knowledge, and technological knowledge. Ultimately, professional services are mainly related to the transfer of customer domain and solution knowledge, while development services are restricted to the transfer of technological knowledge. These differences in

the type of knowledge transferred are reflected in the integrative framework in the different ways the two types of services affect firm performance. The main conclusion made in Chapter 5 remains valid in the integrative framework: to successfully deliver value with its products, the product firm must transfer sufficient amounts of *all* required types of knowledge to the customer. In most cases, the provision of technological, development services is not enough, and the firm must provide professional services to transfer required solution and customer domain knowledge.

In summary, the integrative framework can thus be seen as a more detailed description of the effects hypothesized in the tentative framework based on the in-depth case study. In particular, the final framework provides a more comprehensive explanation of the effects of services provision, including the impact of various organizational and environmental factors.

8.3 Contributions

The current study was motivated by gaps in the literature on the role of services in product firms. In particular, only limited research was found to discuss the *impact* of service provision on the performance of a product firm (Neely, 2008; Fang et al., 2008; Gebauer, 2008; Gebauer et al., 2010). The purpose of this study was to contribute to this stream of literature by developing a theoretical framework for understanding the strategic impact of service provision in the context of product SMEs. Moreover, we also sought to forth propositions relating service provision to the performance of product SMEs, as moderated by organizational and environmental contingency factors.

This research has been mostly inductive in nature. In other words, we have attempted to build theory for understanding the strategic impact of service provision. As such, the study has made contributions to the extant literature; mainly in the literature on service provision in manufacturing industries, but also some modest contributions to literature on interorganizational knowledge transfer. In the following, we discuss these contributions in more detail, and contrast them with the current state of research.

8.3.1 Contributions to the solution literature

Two recent reviews of the literature on solution provision (Cova and Salle, 2007; Jacob and Ulaga, 2008), as well as the literature review in this study (Chapter 2), have indicated that scholarly research on the phenomenon of service provision in product firms is in a early phase. This was implied by the relatively incoherent terminology used by authors, the rudimentary status of theoretical development, and the emphasis on qualitative research methodology in the field (cf. Jacob and Ulaga, 2008). This study has attempted to

contribute to this emerging literature by providing one potential theoretical grounding for understanding and explaining the impact of service provision, as well as analyze the phenomenon in more detail using quantitative methods and direct statistical relationships. In the following, we review the specific contributions of this study to the literature on solution provision.

Entrepreneurial SMEs

With few exceptions (e.g., Ceci and Prencipe, 2008; Gebauer et al., 2010), the extant literature on solution provision is based on firmly established, large and multinational enterprises. The current study has discussed the phenomenon in the context of small, local and entrepreneurial firms. Our study therefore provides complementary evidence of the solution provision from the alternative perspective of a small firm, where revenue growth rather than firm profitability is the most important performance measure.

Our results indicate that services do have a significant impact on firm performance also in the case of SMEs. This implies that the benefits of service provision in product firms are not limited to large multinational firms. Moreover, our results also indicate the potential importance of services and service management for the growth of entrepreneurial product firms even at the very start of their life cycle, rather than only in saturated mature markets, discussed in most contributions to the solution literature (e.g. Wise and Baumgartner, 1999; Oliva and Kallenberg, 2003).

As indicated by research on entrepreneurial firms (Yli-Renko et al., 2001; 2002), the initial customer relationships of a small firm can have great implications for its future growth. These findings are in concord with the findings of this study, which revealed that the provision of professional services at the beginning of the firm's life cycle has a strong positive impact on firm growth. Furthermore, as indicated by Hitt et al. (2001), building strong human capital (i.e., solution or domain knowledge) is necessary for the success of a professional service organization. Our study also suggests that, unlike for larger firms, solution business in SMEs emphasizes learning from customers and the diffusion of the solution in a new market. Furthermore, SMEs are likely to grow *with* the solution model. There is thus less need for drastic organizational change to adapt to service provision, in contrast to larger product firms with set markets and products.

One aspect of entrepreneurial SMEs we have only indirectly touched through the concept of growth orientation is *entrepreneurial orientation*. This central concept in entrepreneurship research relates to "a firm's firm's strategic orientation, capturing specific entrepreneurial aspects of decision making styles, methods, and practices" (Lumpkin and Dess, 1996; Wiklund et al., 2009). As we could see in the multiple case study, and the quantitative analysis of the service provision phenomenon, the orientation of firm's management towards risk-taking and growth had a significant impact on firm performance. While

we did not assess this aspect of firm's orientation, future research on service provision could explore it more deeply. One interesting question is *What is the relation between entreprenurial orientation and service orientation of a product firm, and what is their combined impact on firm performance?*

Service provision in ICT sector

Although the ICT sector has been hailed as one of the forerunners of the solution-driven business (Brown, 2000; Miller et al., 2002), only limited managerial research has actually used the industry as a context for empirical research (cf. Neu and Brown, 2005; 2008; Ceci and Prencipe, 2008). Our study has explored service provision in the software industry context, and thus provides new evidence on service provision and its impact in an alternative empirical context.

Our results indicate that, in general, enterprise software business can be understood in the terms of general solution provision literature, and hence is phenomenologically compatible with extant literature on service provision. We have identified the knowledge-based view of the firm as a potential theoretical perspective for understanding the provision of services in the ICT sector. However, such perspective may not apply as well in more mature industries that produce tangible goods.

Theoretical grounding for the phenomenon

Despite a sharp rise in the volume of research discussing the phenomenon of service provision in manufacturing industries, very few authors have ventured to develop a deeper theoretical understanding of the phenomenon. In particular, the fundamental questions *Why do firms offer both products and services?* and *How much services should a firm offer for optimal firm performance?* are still largely unanswered in the literature (Jacob and Ulaga, 2008). Furthermore, the variety of theoretical approaches adopted in the literature is likely to impede the evolution of the research field towards a coherent common vocabulary and theoretical grounding[1].

Our study has made initial progress towards answering these questions in the general case. We have found that adopting the knowledge-based view of the firm presents one potential and promising theoretical perspective for understanding service provision. This perspective seems to provide a coherent explanation for why product firms would choose to provide services, and why are these services needed. To our knowledge, only the study by Fischer et al. (2010) has used this theoretical perspective of service provision.

From the knowledge-based perspective, services are required to facilitate interorganizational transfer of often imperfectly explicated and codified knowledge. Because the solution offering is based different types of knowledge, all of which are imperfectly codified to some degree, various knowledge-intensive

[1] As noted in the literature review, this is partly due to the different research perspectives into the phenomenon.

services are required to deliver the offering and allow customers benefit from the offering through improving customer organization's knowledge about the solution.

Of course, our results are empirically generalizable, at best, to the software industry. The software industry has unique characteristics in comparison to traditional manufacturing industries due to differences in knowledge intensity and the typical distance in the knowledge bases between software firms and their customers. These differences may lead to very different ways of organizing for service provision and hence the results do not necessarily apply to manufacturing industries. Nevertheless, the current study has taken some initial steps towards the development of a general theoretical explanation of service provision, and can potentially help to understand service provision in other industries as well.

Strategic impact of solution provision

Much of the extant literature on service provision in manufacturing industries is based on the often implicit assumption that adding services to the offering has a positive impact on the performance of the manufacturing firm. A majority of the contributions to the literature have then discussed how manufacturing firms can then best make the transition from a product to a solution-based firm (Brax, 2005; Wise and Baumgartner, 1999; Oliva and Kallenberg, 2003; Penttinen and Palmer, 2007). However, very few papers have actually discussed the underlying assumption: does service provision lead to superior performance, and under what conditions (Gebauer and Putz, 2007; Gebauer, 2008; Antioco et al., 2008; Fang et al., 2008)?

The previous research considering this question (Gebauer and Putz, 2007; Gebauer, 2008; Neu and Brown, 2005; 2008) have been largely limited to configurational approaches (Miller, 1986; Dess et al., 1993) to the strategy–environment fit. Our study has taken one step forward and has attempted to analyze the relationship between service provision and firm performance based on the mediation and moderation types of fit instead of the holistic *gestalt* type of fit (Venkatraman, 1989a), and thus complements existing studies using this perspective (Gebauer, 2007a; Antioco et al., 2008; Fang et al., 2008)

We have found that the service offering of the product firm does indeed have a direct impact on the performance of the firm. In particular, our results indicate that the type and extent of services provided by the product firm have a differential impact on firm performance (cf. Antioco et al., 2008). In addition, our research has identified several environmental and internal factors that affect this relationship. More specifically, we have shown that, in some cases, adding services to the enterprise software firm offering has a positive impact on the performance of the firm. However, the same change in the offering can also have a negative impact, depending on organizational and environmental contingencies. Our study thus suggests that future stud-

ies should more carefully account for *what kind* of services are being provided by product firms.

In summary, this research contributes to the literature on the role of services in the manufacturing industries by proving initial steps toward a more detailed understanding the direct relation between service provision and firm performance. However, as seen in this study, these relationships are complex and depend on a large number of contingencies. Much thus remains to be done in terms of understanding the performance impact of service provision.

8.3.2 Contributions to the knowledge management literature

While this study has mostly been aimed at explaining the phenomenon of service provision, we have also made some moderate contributions to the general management research. More specifically, we have discussed the role of services for interorganizational knowledge transfer and, moreover, the impact of success in this knowledge transfer on firm performance.

Our findings have provided additional empirical evidence for the results presented in the management literature that the intensity of interorganizational collaboration, for example, in the form of services, has a positive impact on the success of interorganizational knowledge transfer (Dyer and Hatch, 2006; Yli-Renko et al., 2001). Furthermore, complementing the extant literature, we have analyzed the impact of different types of services on knowledge transfer, thus providing more detailed view of how interorganizational collaboration in the form of services can facilitate knowledge transfer.

In particular, we have found that not all knowledge-intensive services are alike — different services have a different impact on knowledge transfer, and subsequently on firm performance, depending on the type of underlying knowledge. Furthermore, we have related the optimal service portfolio and its dependence on organizational and environmental contingencies. Findings of our study include that the market life cycle phase, the codifiability of knowledge, and the degree of codification of the core technology have a significant impact on the optimal choice of services to be offered to customers.

The second contribution of the current study to literature on knowledge transfer and management has been to highlight the nature of innovations as combinations of multiple types of knowledge, and in particular the importance of non-technological knowledge. Our study indicates that such knowledge has an important impact on the rate of diffusion of the technological innovation. Non-technological knowledge thus has important implications for not only the diffusion of innovations (Rogers, 1962), but also for the structure of production (cf. Araujo et al., 2003; Araujo and Spring, 2006; Santos and Eisenhardt, 2005).

In fact, recent research on industry evolution (Malerba, 2006) has called for studies examining the importance of non-technological innovation consid-

ered in this study. In addition, the non-technological antecedents of industry disintegration have been considered by Jacobides (2005). Ultimately, such considerations have implications for the research on the theories of the firm and the boundaries of the firm yet were beyond the scope of the current study (cf. Jacobides and Billinger, 2006; Jacobides and Winter, 2005).

8.3.3 Relation to other recent research

The theoretical framework developed in this study closely parallels recent research by Cusumano et al. (2008). Their findings are, in general, in harmony with the findings of this study, and hence lend further evidence of the validity of these findings. However, there are differences between these two research streams to justify the value of the contributions provided by this study.

First, while both the research of Cusumano et al. and this study are theoretically based on the knowledge-based view, our research complements their work by considering the effect of innovation life cycle on service provision. Second, they use a hypothetico-deductive model of research, using a large sample data and statistical models. The current study's choice of inductive approach and use of mainly qualitative research methods again complements the research done by them. In addition, the access to more detailed data about the solution providing firms provides a more detailed description of the phenomenon. Third, their sample is based on data on large, publicly listed firms. This study concentrates on private, small firms and hence provides a complementing view of the solution provision phenomenon.

Fourth, the empirical study of Suarez et al. (2008) concentrates on profitability as the measure of firm performance. This study employs both revenue growth and profitability as performance measures, and therefore provides an extension of their study. As the studied firms are relatively small, the emphasis is likely to be on the impact of services on growth, which again provides complementary evidence on the phenomenon.

Fifth, and finally, the firms relevant to this study are required to internationalize in order to grow beyond a very moderate size. Therefore, the current study explicitly considers the effects of internationalization on firm performance, something not addressed in Cusumano et al.'s research even though it is likely to have an effect on the business of enterprise software firms due to the necessity of delivering services locally and the impact of cultural barriers.

8.4 Managerial implications

As indicated in Introduction, we have adopted the principles of engaged scholarship (Van de Ven, 2007) in this study. This means that that this study has aimed to have practical relevance in addition to providing a theoretical con-

tribution to the academic literature. Therefore, the managerial implications section is of great importance to the current study.

The current study has many potentially important implications for managers of enterprise software firms. The general observation based of our study is that software firms need to carefully consider the role of knowledge-intensive services in relation to their software product. While these services limit the potential growth rate of these firms, in many cases their provision is necessary, and providing these services often offers other beneficial effects on the overall business. In summary, enterprise software firms are advised to carefully consider the situational factors identified in this study as a basis when making decisions about their service offering, as we have demonstrated the significance of such decisions on the performance of firms. In the following, we have briefly discussed some of these factors and their impact on the optimal service offering.

Service offering

This study has demonstrated the potential impact of a product firm's service offering on firm performance. Our results clearly suggest that even though over half of the case firms' revenue may come from product-related sources, even the relatively small differences in knowledge-intensive service provision can have an impact on the firm performance.

In particular, our study shows the importance of knowledge-intensive services for facilitating the sales of firm's product offering. Thus, the role of professional services is particularly important — there is a positive relationship between the provision of these services and revenue growth. These services help the product firm to transfer necessary knowledge about the solution to customer organizations, and reciprocally allow the firm to learn about customers.

By contrast, development, or software customization services have a negative impact on performance. This is due to the potential organizational conflict between these services and product development efforts of the product firm. Resources used on these services are taken from new product development efforts. By contrast, resources used on professional services are complementary rather than substitutes for product development.

Our results suggest that managers of product firms should carefully review their strategies regarding the provision of knowledge-intensive services. These services are often considered as mere add-ons to the main product, leading to neglect regarding their development and management. Yet, our findings indicate that the provision of these services has potentially significant impact on the subsequent firm growth. In particular, managers should carefully consider the balance between professional and product development services, given their opposite effects on revenue growth. It is also important to notice that this optimal balance is dependent on the evolution of the industry; the

results suggest that the emphasis should move from professional services to product development services.

Market maturity

Our study has shown that the maturity of the focal firm's main market has an important and significant impact on the choice of an optimal service offering, and subsequently on the performance of the focal firm. In particular, the provision of professional services in the early phases of the focal firm's market has a clear positive impact on the growth of the firm. By contrast, the provision of product development services has a negative impact in the early phase. Yet, as the market matures these effects are changed; in a mature market, the impact of professional services provision will diminish and can even have a negative impact on growth, while the provision of development services is less detrimental for revenue growth, and can even offset some of the growth lost for slowing product sales.

Internationalization

One clear implication of the results of this study is that, in general, knowledge-intensive service provision combined with internationalization has a negative impact on the growth and profitability of the a product firm. However, if the focal firm operates internationally through service partners, its own service provision activities may allow the focal firm to learn from its direct customers, and potentially thus to understand better the business needs of its partners. Direct interaction with customers may also enable the creation of new knowledge, services and products whose successful distribution to the partner network creates economies of scale.

One significant factor that affected the internationalization of a service-providing product firm was its service capability. Regardless of the chosen internationalization mode of entry, service capability enables the focal firm to successfully replicate its service business abroad. Ultimately, the product-based part of the business can only grow as quickly as the firm can replicate its service business. Hence, possessing the capability to manage service marketing and service operations has a positive impact on the growth and profitability of the product firm.

Product complexity

Obviously, the complexity of the focal firm's core product and the selected customer segment also have an impact on the services required from the software vendor. As increasing product complexity is related with increasing ambiguity and intangibility of the overall solution, the vendor will need to add professional services to overcome this adverse effect on customer purchasing decision. A slight positive impact was identified between professional services and revenue growth, given high complexity of the core product. Yet,

product complexity need not mean technological complexity; it may also refer to the complexity of the solution knowledge, or the customer knowledge related to the solution.

Service capability

As shown in Chapters 6 and 7, standardization of service provision has a significant impact on the performance of the software firm. In terms of organization development, this means making investments in service marketing and service operations management competences. Service marketing skills will help the firm to communicate more effectively about its often intangible offering to potential customers, building trust and lowering the barrier towards selling the core component of the offering, the product.

Even more crucial is the service operations management capability. This will help the firm manage its service personnel effectively in terms of resource usage, competence management and development, and service quality management. As shown by our results, this competence is critical not only for running a profitable business but also for growing the business beyond current resources. The explanation behind this is that ultimately the growth of the overall product-based business is limited by the replication of the service business. Service operations management competence helps the firm to ensure that this replication can be achieved effectively and efficiently. Furthermore, service operations management will also help the firm to co-operate with potential partners through the productization of existing services.

As noted in the multiple case study, several case firms had recruited personnel from pure service business backgrounds to management positions. This leads us to suggest that they have already seen the value of service management competence.

8.5 Limitations

Naturally, no empirical research is without its limitations. In the following, we have tried to cover potential pitfalls of the research design and individual research methods, and assess how these factors are likely to influence the quality of conclusions. We will also what measures have been taken to minimize the impact of these factors.

Qualitative research methods

Even though we have tried to tackle the common critique towards the use of qualitative research methods (cf. Flyvbjerg, 2006; Diefenbach, 2008; Pratt, 2008) by employing a research design that uses mixed methods, and attempts to be transparent about the used research process and methods (Pratt, 2009), this study is still subject to the same criticism.

Of course, as indicated by Lincoln and Guba (1985), Flyvbjerg (2006), and Miles and Huberman (1994), one should not apply directly the criteria of quantitative research for assessing the quality of qualitative research (cf. Johnson et al., 2006). However, case studies are still subject to arguments about the subjectivity of data and the conclusions based on the data (Diefenbach, 2008). In addition, alternative criteria for assessing the quality of qualitative studies have been proposed (Lincoln and Guba, 1985; Miles and Huberman, 1994; Johnson et al., 2006).

Yet, as explained in Chapter 4, our research design has attempted to overcome these potential weaknesses of qualitative research methods. Subscribing to the advice given by Pratt (2009), we have tried to provide as transparent a view as possible of the research process and the progress of data analysis. While this does not remove the subjectivity of some of the inferences made from the data, it at least clarifies the process of data analysis.

We have also tried to balance showing informant accounts, telling about them, and analyzing them (Miles and Huberman, 1994; Pratt, 2009). Furthermore, we have used multiple data sources in addition to informants and interviews to triangulate between different information sources. Finally, we were able to use statistical methods to test some of the hypothetical relationships identified in case studies, which should improve the external validity of our qualitative findings. We believe that these approaches, while they do not totally eliminate the problems of qualitative research, have served to minimize potential biases and inaccuracies in the empirical studies.

Generalizability

The inherent problem of qualitative research is the question of external validity or generalizability to a broader empirical context (Flyvbjerg, 2006; Ragin and Becker, 1992; Yin, 2003). Obviously, the findings cannot be directly generalized to a population in the same manner as in statistical analysis. Of course, as mentioned above, this is not in fact the objective of qualitative research. Instead, qualitative research, and case studies in particular, seek to attain *theoretical generalization* (Yin, 2003); in other words, the key point is the generalizable nature of the emerging theoretical insight.

We have attempted to ensure some level of generalizability by employing methodologies that encompass more than few case studies. Quantitative analysis studies included in this study provide evidence of the phenomenon at the level of Finnish software industry, and also provide limited evidence of the generalizability of the conclusions drawn from qualitative analysis. As indicated by the quantitative part of the study, much of the conclusions from the multiple case study are statistically generalizable to the population of Finnish software product firms.

However, we must also consider the impact of the special characteristics of the software industry on the theoretical generalizability of the results. Un-

fortunately, the software industry is in many ways different from the other industries in which service provision has been studied. More specifically, software industry exemplifies a turbulent, high-velocity industry in which innovations are continuously brought to the market, and competitive environment which is both highly dynamic and uncertain. This is in contrast to many manufacturing industries, which are relatively mature and stable, and where radical changes are not as common.

Furthermore, the relative distance between the knowledge bases of enterprise software firms and their customers is more distance than in manufacturing industries. More specifically, the customer organizations have relatively little knowledge about software technologies, at least of the specific product technologies used by software firms. Correspondingly, software firms do not typically have extensive knowledge of the customer firms' business. In contrast, manufacturing firms often have much more in common with their customers and the knowledge base distance is much smaller. The large distance in software context implies that there are less conflicts of interest, and there are less risks involved in exposing one's knowledge to the other party (Larsson et al., 1998; Dyer and Nobeoka, 2000; Szulanski and Jensen, 2004; Coff et al., 2006). Hence, in the context of software industry the role of knowledge-intensive professional services might have been emphasized due to the higher willingness of parties to collaborate and share knowledge.

Given these characteristics of the software industry, the generalizability of the results may be contested on at least three grounds. First, in more mature manufacturing industries the emphasis seems to be on the leveraging of the installed customer base and providing operations or maintenance related services, rather than on innovating new products or solutions that need to be sold to new customers (cf. Wise and Baumgartner, 1999; Oliva and Kallenberg, 2003). This evidence is concurrent with the findings of this study. While the role of knowledge-intensive services has increased (cf. Davies, 2004), their role is still typically small. Hence, our emphasis on knowledge-intensive services limits the applicability of the findings in traditional manufacturing industries. Yet, given our focus on these knowledge-intensive services, our context was likely to provide rich empirical data for understanding these services even in more traditional manufacturing contexts.

Secondly, even though many of the case firms in this study had some level of existing customer base, most of them were still heavily engaged in new customer sales. Hence, innovation and diffusion of the new solution is likely to be relatively more important for the empirical context of this study than for firms in manufacturing industries.

Third, the specific theoretical lens selected for this study — the knowledge-based view of the firm — may have emerged specifically due to the knowledge-intensive nature of the selected empirical context of software industry. In other words, the selected theoretical lens might not be easily applicable to

industries with more mature and tangible products and technologies, such as most traditional manufacturing industries.

Despite these arguments against the generalizability of the theoretical insights to other types of industries, we believe that the current study has provided some initial steps towards developing theory in a emerging research field with scarce prior theoretical development. Hence, even though the statistical generalizability of the results may be called to question, we argue that our study was justified by the relative lack of prior theorizing on the subject, providing a potential stepping stone for further research into the phenomenon of service provision in manufacturing industries.

Static view

Even though we have covered a reasonable period in time with regards to quantitative measures, in essence the study is still a cross-sectional variance study. A complete exploration of the phenomenon of service provision could have included a longitudinal, process view of the phenomenon (Van de Ven and Poole, 1995; 2005). While this is not necessarily a limitation, but rather a feature of the selected research design, it still limits the kind of conclusions that can be inferred from the research.

For example, while we have accounted for changes in the case firms' profitability and revenue growth, our analysis of why and how this happened is still limited. Furthermore, the reliance on cross-sectional evidence for theory development provides only limited view of how the phenomenon behaves and evolves over time.

Another important limitation of this chosen static perspective is that we have ignored the dynamical perspective on strategy (cf. Porter, 1991). In other words, we have not considered the feasible strategy for the firms to use a suboptimal strategy now to attain better strategic outcomes in the future. Such consideration would have complicated the empirical studies, as well as the analysis of the empirical evidence. Hence, we deemed it necessary to limit ourselves to the analysis of the static view of strategy.

Empirical evidence from only one country

The data used in this study was collected entirely from one country, Finland. While the collected quantitative data was relatively comprehensive in covering the entire Finnish software industry, the generalizability of the results to other countries with different profiles can be questioned. Idiosyncratic characteristics of the Finnish context might have produced some of the findings. Yet, the linking of the empirical results to extant theory provides some indication that the findings are not merely the result of chance; in other words, relating the results to theory provides some level of *theoretical generalization* of the results (Yin, 2003).

On the other hand, limiting the empirical study to one industry of one country helps to control the variance of factors related to industry and country,

such as macroeconomical environment characteristics. Hence, this limitation also helps to isolate the analyses on relevant factors, as we were able to exclude some of these external factors from the analysis.

Theory development

The purpose of this research was not to reach the top layer in the pyramid of Christensen's (2006) model of theoretical development. On this level, the theory is specified as models, or statements of association. This is similar to Dubin's (1978) taxonomy of theory development, where we have reached the level of inferring the presence and directionality of relationships between theoretical constructs. In other words, the resulting theoretical framework is only preliminary and should be subjected to testing for further external validation, and identification of anomalies (Christensen, 2006) and paradoxes (Poole and Van de Ven, 1989) in order to improve the emerging theory. In summary, the developed framework allows further research using the hypothetico-deductive approach using quantitative methods.

Moreover, as our goal in this study was not to develop new theory but rather apply existing theory to a new phenomenon to explain the phenomenon of service provision in product firms, the overall degree of theory development cannot be considered too high. Our study has not made groundbreaking contributions to literature in knowledge management or strategic management, nor was it ever meant to provide such contributions. We have, however, made some limited contributions to literature on knowledge transfer and the impact of knowledge on organizational boundaries.

Omission of operational services

Several case firms indicated that they provided business process outsourcing services in addition to professional and development services. Analyzing the performance impact of the provision of these type of services might have provided additional insights about the impact of service provision in product firms. Furthermore, operational (or industrial) services provided by the product vendor play a major role in the business of manufacturing industries today (cf. Davies, 2004; Brax, 2005).

However, we decided not to pursue the analysis of these services any further. There were several reasons for this decision. First of all, not all firms provided these services, and indeed the significance of these services was not critical even to the firms providing them. Hence there was only limited data to analyze the performance impact of these services. Secondly, analyzing these services in-depth would have further expanded the scope of the study, potentially having a negative impact on the quality of other, more central analyses. Lastly, we argue that the analysis of professional and development services was more fruitful, given the empirical context of software industry in which solutions are based on high technology and are rarely standardized to a significant extent. This standardization of the offering is a necessary antecedent

for potential to provide operational services, and may only occur only after the solution and the knowledge related to the solution have been sufficiently standardized (cf. Anderson and Tushman, 1990). Without sufficient codification, customers cannot yet define what kind of services they need.

Omission of organizational structure and culture
As indicated in the review on the extant literature on solution provision, organizational structure and organizational culture (i.e., "service orientation") are two key factors of service provision in product firms, and have been studied relatively widely (e.g., Miller et al., 2002; Galbraith, 2002; Oliva and Kallenberg, 2003; Homburg et al., 2002). However, we have omitted the analysis of these factors from our study for four reasons.

First, extant research has already covered the role of organizational culture for service provision and subsequent firm performance to a significant degree, including quantitative methods (cf. Homburg et al., 2002; Gebauer et al., 2009). Second, the inclusion of these factors would have further complicated the analysis of the strategic impact of service provision by introducing additional contingent factors in the equation. Third, the study of organizational culture would have been somewhat in contradiction with the selected realist epistemological position adopted in this study. Fourth, the thorough analysis of the case firms' organizational culture would have likely required more extensive fieldwork, including observation using ethnographic methods (cf. Lincoln and Guba, 1985), requiring a longer time for empirical work. Unfortunately, due to resource and time constraints this type of fieldwork would not have been possible.

8.6 Avenues for Further Research

The current study has purposefully been restricted to a limited number of small and medium sized product firms from single country, yet the phenomenon of service provision in product industries extends beyond this empirical setting. In addition, our research provides only initial conclusions about the importance of services in these industries. Moreover, during this study several interesting observations were made that could not be followed due to the scoping and focus of this study. Therefore, the subject is still ripe with opportunities for further research. In the following, we discuss these potential avenues for future research on the topic.

Internationalization
We have consciously downplayed the role of internationalization in our analysis, treating it simply as a moderating factor. Including the process and effects of internationalization in the current study would have broadened the scope of the study needlessly. However, as indicated by the results of the

study, internationalization of product firms is a very complex process upon which the success of many of these firms ultimately lies. Therefore, studying in more detail the internationalization process of entrepreneurial solution firms would make a very important and interesting avenue for further research. At least the following research questions would warrant further research:

- Are there differences in the internationalization of product SMEs between small and large home markets? Does this have an impact on the performance of the firm?
- What is the optimal entry model for a product SME? What contingency factors affect this choice of entry model?
- What is the optimal division of labor between the SME and its international partners? How does the performance of the focal firm depend on the choice of collaboration model?
- How do services affect the internationalization of a product SME?

Business networks

This study has concentrated on performance the focal firm, yet many of the case firms and similar firms conduct business in international networks. While analysis of the business network and its impact on the business of the focal firm were included in detail in the in-depth case study, study of these factors was reduced to quantitative measures in the multiple case study. A closer study of the models of collaboration between the focal firm and its service partners would likely to be an interesting avenue for further research. Explicit questions to be considered include:

- Are there performance differences between different collaboration models between product SMEs and their service partners?
- What kind of business network should the product SME have as a whole for optimal performance?

Other industries

The current study has found that the knowledge-based view of the firm can be used explain the phenomenon of solution provision. However, this argument has been partly based on the characteristics of software as a knowledge-intensive information product. As indicated in limitations section, the differences between software and manufacturing industries are likely to affect the applicability of the findings to other industry contexts. The relevance and validity of this theoretical grounding in other industries with more tangible products was beyond the scope of this study, yet it is of extreme importance for the generalizability of the theoretical findings of the study. The key research questions for further research are thus

- Can the knowledge-based view of the firm explain solution provision in industries other than the software industry?
- Do the findings of this study apply to other industries?

Other countries

As the empirical evidence of the study is limited to Finland, replicating or supplementing the study with data from other countries would further improve the generalizability of the results. Furthermore, internationalization aspects of the phenomenon were consciously downplayed due to research scoping reasons, yet during the research many factors related to internationalization were hinted to have an impact on the performance of the software firms. Specific questions that might be addressed in future research include:

- What is the impact of the home market characteristics on the internationalization and growth of the SME solution firm?
- Do local national factors, such as cultural, institutional and legislational factors affect the conclusions presented in this study?

Process study

As indicated in discussion of the limitations of this study, the current study has only considered the variance-type study of the impact of service provision. While the solution provision literature has discussed the transition from product firm to solution provider to some extent, the process perspective warrants more research. In particular, the internationalization process of solution firms warrants further research. Explicit research questions to be considered include

- What is the transition process from a SME product firm to a solution firm? What are the critical factors in this transition?
- What is the internationalization process of solution SMEs, and how does service provision affect this process and success in it?

Tactical issues

This study has concentrated on the strategic management level of the impact of services on enterprise software firm performance. Yet, during the empirical studies several tactical level issues emerged, mostly related to the marketing of the solutions. While these issues definitively are likely to have an impact on the success of the software firms, they were excluded since their consideration would have needlessly complicated current study, for example in terms of theoretical background, as well as research design. Some of these emerged research questions could be pursued in further research from other theoretical perspectives, including the following:

- What practical methods can be used to standardize the services and solutions of a product firm?

- How do product firms develop and maintain service capability?
- How should service and solution development be arranged within a product firm?
- How can the software firm overcome the perceived riskiness and intangibility of its complex offering?

9 Conclusions

Forces of global competition, shortening product life cycles, and products commoditization are currently prompting many product firms to switch from the sales of standalone products to integrated solutions that are composed of both products and services. Despite growing research interest towards the phenomenon, the research field still lacks clear answers to many fundamental questions, such as *What is the impact of service provision on product-based firm performance?* and *How can we explain the need the role of services for product firms?* In addition to these gaps in the extant knowledge, our study was also motivated by the observation that also many small and medium sized enterprises (SMEs) engage in service provision, also in high-tech industries. This is in contrast to most of the extant literature, that typically studies service provision in mature manufacturing industries and large, multinational corporations.

The purpose of this study was to analyze service provision from a strategic management perspective. In other words, we were interested in the direct and moderated relationships between service provision and product firm performance. Potential moderators included various organizational and environmental factors. More precisely, we sought to find an answer to the detailed research problem:

> What is the impact of knowledge-intensive services provision on SME product firm performance?

Given the lack of theoretical development and the relatively low level of methodological sophistication in the extant research on service provision, we decided to adopt an inductive research design based on both qualitative and quantitative methods. Using literature on service provision in manufacturing industries, we identified three potential factors explaining performance outcomes: the range of services provided, the scale of service provision, and the quality of service provision (i.e. the service capability of the product firm). Furthermore, as our emphasis was on small and medium firms, we considered both the revenue growth and profitability of product firms.

Our first key finding, based on an in-depth case study of one software firm, was that the knowledge-based view of the firm can provide a coherent ex-

planation for the role of service provision in product firms. Based on this grounding, we argued that the product firm must successfully combine three types of knowledge to deliver the solution to its customers: technological knowledge, customer domain knowledge, and solution knowledge. Together with empirical evidence from the case, the theoretical perspective also suggested that factors such as customer knowledge, maturity of technology, and intermediaries are likely to affect knowledge transfer success, and subsequently the performance of the product firm. The role of services, from this perspective, is to facilitate knowledge transfer between the focal firm and customer organizations.

Next, based on a comparative multiple case study of nine Finnish software firms, we sought to identify patterns between service provision and firm performance. Based on this analysis, we ultimately identified several direct and moderated relationships between service provision factors and firm performance in the data, expressed in the form of 20 propositions. Our most important findings were 1) The scale of service provision has an impact on product firm revenue growth and profitability; 2) The direction of this impact depends on the type of services provided — professional services provision was positively related to firm performance, while the impact of development services was mostly negative; 3) The maturity of the market moderates the relationship between service provision and revenue growth, decreasing the positive impact of professional services and negative impact of development services; 4) Service capability has a positive impact on both revenue growth and profitability when moderated by internationalization and partner use.

Finally, we tested 18 of these 20 propositions using cross-sectional data from the Finnish software industry survey. Performing regression analysis with data from 116 software product firms, we found at least weakly significant statistical support for ten of the tested 18 propositions. For six propositions no conclusive evidence was found. However, we also found statistically significant contradictory evidence for two propositions.

Based on this empirical evidence, we revisited and revised the propositions for which contradictory evidence was found. Given these slight modifications to the findings from the multiple case study, we developed a theoretical framework that provides a coherent explanation of the impact of service provision on firm performance. This framework, drawing on the knowledge-based view of the firm, introduced the immediate mediating factors of knowledge transfer success, organizational replication, organizational efficiency and product development focus, and the proximate mediating factors of knowledge asymmetry, knowledge codification, and organizational learning.

Our study has made several contributions to research on service provision in product firms. First of all, this research has identified one coherent theoretical grounding, the knowledge-based view of the firm, for understanding and explaining the impact of service provision. Secondly, we have provided

direct empirical evidence of the strategic impact of service provision on product firm performance. Third, our study has provided evidence of the nature and importance of solution provision in the context of a high-tech industry. Fourth, by considering the importance of services in the context of SME product firms, we have extended the view of integrated solutions provision to smaller, entrepreneurial firms.

The study has also practical implications for software firm managers. First of all, our findings help managers to analyze and optimize their service offering and scale of service provision, given their strategic goals. Our results indicate that service offering has important implications for the performance of these firms, and that the life cycle phase of the market significantly affects what this impact is. Secondly, our study has demonstrated that service capability has an important impact on the performance of product firms. This effect is especially pronounced if the firm conducts business internationally, and who use partners to deliver required knowledge-intensive services. Hence, software product firms need to assess their service management competences, and to invest in service capabilities.

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Appendices

A Literature review search strings

A.1 ISI Web of Science

```
TI= (servi* OR solution* OR complex)
SAME
TI= (manufact* OR product OR products OR basic OR industr* OR business
OR good* OR after OR system* OR life cycle OR system* OR project)
SAME
TI = (orient* OR strateg* OR provi* OR integrat* OR moving OR move
OR transition* OR toward* OR market* OR management OR managing
OR performance OR impact OR deliver* OR exploit* OR organi*
OR success* OR offer* OR innovat*)
NOT
TI = (IT OR ICT OR IS OR differ* OR compari* OR international*
OR multinational* OR global* OR internet OR web OR online
OR new OR information)
```

A.2 Scopus

```
TITLE(servi* OR solution* OR complex)
AND
TITLE(manufact* OR product OR products OR basic OR industr* OR business
OR good* OR after OR system* OR life cycle OR system* OR project)
AND
TITLE(orient* OR strateg* OR provi* OR integrat* OR moving OR
move OR transition* OR toward* OR market* OR management OR managing
OR performance OR impact OR deliver* OR exploit* OR organi*
OR success* OR offer* OR innovat*)
AND NOT
TITLE(it OR ict OR is OR differ* OR compari* OR international*
OR multinational* OR global* OR internet OR web OR online
OR new OR information)
AND
(LIMIT-TO(DOCTYPE, "ar"))AND (LIMIT-TO(SUBJAREA, "BUSI")
OR LIMIT-TO(SUBJAREA, "MULT"))
```

B Selected solution literature references

This appendix provides a more detailed overview of the literature on solutions. The following list is not comprehensive; instead, it lists key references that we deemed to be of significance to the research field, and be of high enough quality. Furthermore, most papers from practitioners journals, such as Harvard Business Review, were excluded from the list since while they provide evidence of the phenomenon and indications of how managers conceptualize the role of services in manufacturing industries, ultimately these papers provide little in the way of theory development.

Table B.1 provides a description of the columns in the actual table of key references.

Field	Abbr.	Description
Key concept		The central concept used by author(s) of the study
Context		The empirical context of the study
Methodology		Brief description of the empirical research methodology employed in the study
Solution elements		
Offering	OFF	The products and services, and whole offering of the solution provider
Customer relationship	CUS	Interaction and relationship development with customers
Internal organization	INT	Arrangement of organizational structures and processes within the solution provider
External organization	EXT	Arrangement of inter-organizational structures and processes between firms
Capabilities	CAP	Competences and skills required to provide solutions
Organizational culture	CUL	Attitudes and beliefs of the solution provider's personnel
Research themes		
Transition	TRA	Transition from product manufacturer to solution provider
Impact	IMP	The impact of solution elements on performance
Innovation	INN	The innovation of new services and solutions

Table B.1: Concepts used in the literature review

Article	Key concept	Context	Methodology	Solution elements						Themes		
				OFF	CUS	INT	EXT	CAP	CUL	TRA	IMP	INN
Bell (1986)	Bundling; differentiation		[Anecdotal evidence]	x	x					x		
Canton (1988)	Service business	US manufacturing	[Anecdotal evidence]	x	x			x		x		
Jackson and Cooper (1988)	Industrial service		[Conceptual article]	x								
Vandermerwe and Rada (1988)	Servitization		Interviews with managers	x				x				
Quinn et al. (1988)	Service-manufacturing interactions	US manufacturing	[Anecdotal evidence]	x						x	x	
Bowen et al. (1989)	Service orientation	-	[Conceptual article]	x	x	x		x	x			
Quinn et al. (1990)	Service-based strategy	US manufacturing	[Anecdotal evidence]	x			x			x	x	
Singh (1990)	Service strategy		Case study of one firm	x	x	x			x	x		
Chase et al. (1992)	Service-based manufacturing	Manufacturing industry	[Anecdotal evidence]	x	x	x	x				x	
Martin and Horne (1992)	Service orientation	US manufacturing	Interviews (80) and group discussions	x	x					x		x
Morris and Davis (1992)	Customer service	US manufacturing	Regression analysis of 90 firms	x		x					x	
Samli et al. (1992)	Service orientation		[Anecdotal evidence]	x		x			x			
Fry et al. (1994)	Service-oriented strategy	US manufacturing	[Anecdotal evidence]			x					x	
Burger and Cann (1995)	Post-purchase strategy		[Anecdotal evidence]		x						x	
Donaldson (1995)	Customer service	UK manufacturing	Survey and factor analysis of 150 firms	x	x				x		x	
Youngdahl (1996)	Service-based manufacturing	Manufacturing	Interviews; MANOVA analysis of 32 firms		x	x					x	
Boyt and Harvey (1997)	Industrial service		[Anecdotal evidence]	x	x					x		x
Cohen and Whang (1997)	Product life-cycle		Mathematical modeling	x							x	
Frambach et al. (1997)	Product service strategy	European health market	Case study; factor and cluster analysis of 217 firms	x	x							x
Matthyssens and Vandenbempt (1998)	Industrial service		Five focus groups	x	x	x		x	x		x	

Table B.2: Key references in the solution literature

Article	Key concept	Context	Methodology	Solution elements						Themes		
				OFF	CUS	INT	EXT	CAP	CUL	TRA	IMP	INN
Wise and Baumgartner (1999)	Going downstream		[Anecdotal evidence]	x	x		x			x		
Homburg and Garbe (1999)	Industrial service	German machinery industry	Regression analysis of 177 firms	x	x						x	
Davies and Brady (2000)	CoPS	Telecommunication	Longitudinal case study of two projects					x				
Gann and Salter (2000)	CoPS	Construction	In-depth interviews of 30		x	x			x			x
Hobday et al. (2000)	CoPS	Project-based organization	Case study of 2 projects		x	x	x					
Shepherd and Ahmed (2000)	Solutions innovation	Computer industry	[Anecdotal evidence]	x	x			x		x		x
Stremersch et al. (2001)	Full service offering	Industrial maintenance	27 grounded theory interviews; quantitative data from 109 managers	x						x		
Léo and Philippe (2001)	Product services	French product exporters	Logistic regression and ANOVA anaysis of 6703 firm-year observations	x			x				x	
Mathieu (2001a)	Product services	European manufacturer	Interviews with 22 informants; content analysis	x	x		x			x		
Mathieu (2001b)	Service strategy		Case studies of 22 firms	x			x		x	x		
Galbraith (2002)	Solution		[Anecdotal evidence]			x			x	x		
Homburg et al. (2002)	Service orientation	Retailing	Regression and SEM analysis of 411 firms	x					x		x	
Miller et al. (2002)	Solution		[Anecdotal evidence]	x	x	x	x	x		x		
Homburg et al. (2003)	Service orientation		Interviews with 10 managers; regerssion analysis of 271 firms	x					x	x	x	
Oliva and Kallenberg (2003)	Installed base	Machine manufacturing	Qualitative field study of 11 firms	x	x	x		x	x	x		
Davies (2004)	Integrated solution	CoPS	Case study of 5 organizations	x				x		x		
Windahl et al. (2004)	Integrated solution	Capital goods industry	Case studies of three firms		x			x		x		x
Brax (2005)	Transition to service	Manufacturing	Case study of one firm	x	x					x		
Neu and Brown (2005)	Business-to-business services	IT firms	Case studies of four firms	x	x	x		x				x
Gebauer et al. (2005)	Service paradox	Manufacturing	[Anecdotal evidence]	x	x	x			x	x		x

Table B.2: (Continued)

Article	Key concept	Context	Methodology	Solution elements						Themes		
				OFF	CUS	INT	EXT	CAP	CUL	TRA	IMP	INN
Davies et al. (2006)	Integrated solution	Capital goods	[Anecdotal evidence]	x		x		x		x		
Windahl and Lakemond (2006)	Integrated solution		Case studies of two solutions	x	x		x					x
Davies et al. (2007)	Integrated solution	Capital goods	Case studies of 5 firms			x	x			x		
Helander and Möller (2007)	System supplier		Case studies of two firms		x			x				
Tuli et al. (2007)	Customer solutions		Interviews and focus groups with 104 supplier and buyer emnployees	x	x						x	
Gebauer (2007a)	Service business	Manufacturing industries	Case studies of 10 firms	x	x				x	x		
Penttinen and Palmer (2007)	Offering completeness	Manufacturing	Case studies of four firms	x	x					x		
Gebauer (2008)	Service strategy	Manufacturing	Factor and cluster analysis of 195 firms	x							x	
Antioco et al. (2008)	Service business orientation	Manufacturing	PLS analysis of 137 firms	x		x			x		x	
Neu and Brown (2008)	Complex business service	IT firm	Case study of one firm	x		x	x	x				x
Ceci and Prencipe (2008)	Integrated solution	IT	Case studies of 10 firms					x		x		
Fang et al. (2008)	Service transition	Manufacturing	Regression analysis of 477 firms	x	x			x	x	x	x	
Helander and Möller (2008b)	Solution provider	System supplier	Case studies of two firms	x	x	x		x		x		
Helander and Möller (2008a)	Solution provider	System supplier	Case studies of two firms	x	x			x		x		
Matthyssens and Vandenbempt (2008)	Value-added strategy	Electro-technical industry	Case studies of 8 firms	x			x			x		
Sheth and Sharma (2008)	Service shift		[Anecdotal evidence]		x	x				x		
Gebauer, Bravo-Sanchez and Fleisch (2008)	Service development	Manufacturing	Case studies of 16 firms			x						x
Gebauer, Krempl, Fleisch and Friedli (2008)	Product-related services	Manufacturing	Case studies of three firms			x			x			x

Table B.2: (Continued)

C In-depth case study interview guides

C.1 Focal firm interview guide

Personal background

- What is your current position?
- What kind of responsibilities do you have?
- What kind of positions have you held previously?
- How long have you worked at the current employer?
- What is your educational background?

Firm background

- How would you assess the level of competition in your business?
- How would you assess the maturity of product technology of your firm? Against competitors?
- How would you assess the life-cycle phase and maturity of your markets?
- Are there any industry or international standards in your offering domain that affect your firm? How?

Strategy

- How would you describe your firm's current strategy?
- Which strategic goal is more important to your firm right now: growth or profitability?
- How do you consider your firm's performance in the last financial year? Against competition?
- What do you think is your firm's main source of competitive advantage?
- What is the strategic importance of services to your firm?
- How do you think services impact the performance of your firm?

Offering details

- What kind of skills does the implementation and use of your products require?
- What kinds of services are included in your offering?
- Why do you offer these services?
- Why do you think you should offer more/less services?
- How standardized are these services?
- Why would you like to standardize these services?
- What is your value proposition to your customer?
- Who buys your offering?

Customer relationships

- What kind of relationships do you currently have with your customers?
- What would you consider a good customer?
- How saturated are the markets for your offering?

Resources and capabilities

- What kind of skills does your business require?
- How would you assess the level of these skills in your firm?
- How are these capabilities divided between your firm, your partners and your customers? Why?
- Do you think your firm possesses capabilities that provide competitive advantage? Why?

Internal organization

- What kind of organization do you have for the development and deployment of your offering?
- How is product development organized in your firm?
- How is service development organized in your firm?
- How is the overall offering development organized in your firm?

External organization

- What kinds of partners does your firm use?
- What would be the ideal partner profile?
- What kind of business models do you partners have?
- What kind of challenges have you had when seeking for new partners?
- What kind of incentive structures do you have for these partners?
- How do partners price their own offerings?

Managerial challenges?

- What kind of managerial challenges do you currently have in your business?
- In terms of operational management?
- In terms of human resources?
- In terms of customer relationships?
- In terms of partner relationships?

Impact of services?

- What kind of impact would the increased importance of services have on your firm? Why?
- In terms of customer relationships?
- In terms of partner relationships?
- In terms of required capabilities and resources?
- In terms of internal organization?

C.2 Partner interview guide

Personal background

- What is your current position?
- What kind of responsibilities do you have?
- What kind of positions have you held previously?
- How long have you worked at the current employer?

- What is your educational background?

Business model and strategy of your firm

- What is the business model of your firm?
- Which strategic goal is more important to your firm right now: growth or profitability?
- What is the size of your firm in terms of employees and revenue?
- What are the revenue sources for your firm?
- Do you have business besides the one based on the case firm's Product?
- In what markets do you compete?
- How would you assess the market maturity?
- Who are your competitors?
- How would you assess the level of competition in your market?
- How would you assess case firm's Product and technology against competitors?
- What would you consider your competitive advantage?

Offering details

- What is your offering to customers?
- What is your value proposition to your customer?
- Who buys your offering?
- What is the average sales cycle?
- What kinds of services are included in your offering?
- Why do you offer these services?
- How standardized are these services?
- What skills are required to deliver a solution based on the Product?

Relationship with the case firm

- How did you initially come to know the case firm?
- How long have you worked with case firm?
- What is your motivation to do business with the case firm?
- Are you planning to grow the business around the Product? How? Why?
- What does the case firm provide you in terms of support?
- Have there been any moments of dissatisfaction?
- How could the case firm improve its support to your business?

Relationship with customers

- What is a good customer?
- Do you look to do one-off sales or build relationships with customers?
- Do you prefer shorter projects with more customers or longer projects with fewer customers?
- What makes a successful customer case?
- What is your customer satisfaction?

Impact of services

- What is the strategic importance of services to your firm?
- How do you think services impact the performance of your firm?
- Would you be interested in using ready service concepts, if offered by the case firm?
- Would you be willing to share service concepts developed by your firm with the case firm?

C.3 Customer interview guide (translated from Finnish)

Acquisition

- When did you purchase the solution?
- For what purpose did you buy the solution?
- What benefits do you seek from using the software?
- How did you choose the Firm as a vendor for the software?
- What factors affected the purchasing decision?
- What other options did you consider instead of the software?

Implementation

- What skills did the software's implementation require in your opinion?
- Has the software been adapted to your needs, or have you changed your processes to match the software?

Use and benefits of software

- In what ways have you used the software?
- Have you received all the benefits you wanted/expected from the software?

Knowledge and capabilities

- What kind of knowledge or capabilities do you have related to the software?
- Has this capability changed during implementation or use of the system?
- Has the Firm listened to your suggestions regarding the future development of the software?
- Has the Firm been able to support the specific characteristics of your organization during implementation and use of the software?

Services

- What services have you received or bought from the Firm?
- Have you bought other kinds of services than those directly related to the software?
- Why have you bought these services?
- How have the services affected the implementation of the software and its success?
- Have the services affected the knowledge or capabilities of your organization?

D In-depth case study codebook

This appendix includes a summary of the codebook related to the in-depth case study. In other words, the following table summarizes the concepts that emerged during the inductive study, as well as the descriptions of these concepts and evidence on the concepts provided by informants.

Code	Description	Quotes
Knowledge		
Technological	Knowledge on the software product and related technologies.	Technically you need to have competent people [at partners] so that they won't be be completely lost (Alpha 5) Implementation services have become quite technical since [customers] demand integrability and flexibility (Alpha 1)
Customer domain	Knowledge of the solution domain/industry (e.g., IT management, performance management) and idiosyncronities related to this domain. Knowledge on how to conduct a specific kind of business or how to carry out certain operations. What is the practical problem customer are dealing with, i.e. IT management?	Quite often when we talk about our partners [...] they have specialized in some industry (Alpha 1) We don't have a deep understanding of any industry [...] on which we could build a vertical [solution] (Alpha 4) It's unrealistic to think that we could grow [...] to become an expert in every field; it's much more probable that we remain [...] a generic provider (Alpha 7) Of course, [not having a clear industry focus] has its challenges in new product development; it would be much easier to develop new products for specific industry (Alpha 7)
Solution	Knowledge on the solution offered by the software firm. I.e., to best practices and processes used to solve the customer problem – the organizational innovation and related methodology (cf. process re-engineering). What is the solution and how should it be implemented in customer environments? Synonyms: "substance knowledge"	We've been involved in big programs, consulting to various degrees, so [...] we have pretty solid idea of how to pull through these kinds of development projects and what our role in that could be (Alpha 6) In the end, in consulting the product's role is extremely small [...] I've developed this comprehension of what kind of things are reasonable to do and what not. (Alpha 9) We have modified our training [services] according to management standards (Alpha 1) Perhaps these [...] management concepts and standards have influenced us the most. (Alpha 1) When you enter some of these verticals [...] you're trying to, as much as sell the product, to actually sell the concept (Alpha 8)
Customer knowledge	What is the customer's knowledge related to the offering, domain, solution or technology	In the beginning when you're innovative and come in the start phase of the curve, then those [customer] who buy are smart in the sense that they have thought about the thing, and they want and are able to drive the change [themselves] (Alpha 3) Customers understand that, related to building competences related to software use, it's expensive to train people and when there's changes in personnel, you have to train more (Alpha 7)
Knowledge transfer	The transfer of knowledge between the focal firm and its customers in either codified or tacit form	[Our partner training program] includes training, but a few days of training will not bring about 110% of competences [...] but it should help the partners to start building their own competence and knowledge (Alpha 10) [We need] more of those services; but not only services, we really need to get our customers to open up and learn to speak our customers' language about their challenges (Alpha 4)

Table D.1: In-depth case study codebook summary

Code	Description	Quotes
Knowledge-intensive services		
Professional services	Services related to the implementation of software products, including auditing, business and process consulting, installation, integration, configuration, and training	My responsibilities include building customer implementations and their maintenance, to some extent [...] training, and product training in bigger cases, where this service side is clearly included (Alpha 9) So far, we haven't really had anything else but these training services and then these implementation services. These implementation services have become quite technical since [...] they demand integrability and customizability (Alpha 1) Well, we have trained them [customers] a little and then we have just installed software and perhaps done a workshop, but there hasn't really been a systematic offering (Alpha 3) We have also done some pure consulting projects, where the software wasn't the main thing (Alpha 6)
Development services	Services related directly to the development of new software products, before, during or after implementation, including existing product customization and customer-paid new product development	Abroad we do more of these high end implementation services: customized scripts, [...] difficult integrations [...] and everything our partners cannot deliver (Alpha 1)
Maintenance services	Services related to the maintenance phase of software solution when the system is in production use at customer, including software maintenance, upgrades, user support	By maintenance services I mean as quick as possible reaction to problematic situations (Alpha 4) We get beaten in things like maintenance, different forms of support and user groups (Alpha 5)
Outsourcing services	Business process outsourcing - outsourcing operational parts of customers' core or support process not directly related to the software product; not related to the implementation of the solution	Some customers have continuous [administrative] service contracts, since they have asked for those. But we have not been able to offer those [kind of contracts]. (Alpha 3)
Organizational innovation	The conceptualization of the software solution as an innovation that requires changes to both technology and organizational configuration	In new cases it would be good to be able to package the attitude that we're delivering more than the software product (Alpha 7) We would like to have products where we would do a [methodology] assessment in the beginning [...] and then help customers to become more mature (Alpha 7)
Impact		
Services on knowledge transfer	Do services have an impact on knowledge transfer between the focal firm and its customers	By investing in these services we're able to improve our knowledge and ideas about with what kind of products you should be in the market in five or ten years' time (Alpha 2) When you're a pure software developer, you will distance yourself from customers and that makes developing your product more difficult. It also makes new product development an innovation harder when you don't get to see real customer environments (Alpha 7) It's good for partners that we do these services since it's exactly what they do locally [...] partners don't have complain anymore about basic things that are wrong with the product since we would meet the same things in day-to-day work (Alpha 7)

Table D.1: (Continued)

Code	Description	Quotes
Impact		
Knowledge transfer on solution implementation	Whether improved knowledge transfer between the focal firm has an impact on solution implementation success	In Finland we lost a lot of good opportunities in building our home market [...] when we believed that our software would sell itself (Alpha 3) This is a challenge [...] because we're not involved in the [problem definition] phase, we're just there to implement the solution (Alpha 4) But in no case do we know even today why we ended up delivering this kind of solution to the customer (Alpha 4)
Knowledge transfer on organizational learning	Impact of services on the delivery of solutions and generation of ideas for new products in the future	If you've done already banks, if you've done telecom companies, then you should just go and reproduce. You just reproduce, you don't need to re-invent the wheel. (Alpha 11) Perhaps the only significant difference [between us and our partners] is that we do [services] more in larger scale, so maybe we accumulate more knowledge and experience [...] perhaps our customers' activities are more erratic (Alpha 2) We've done these software products so long that we've developed certain competences. But of course we've been [...] involved in larger projects, consulting more or less, so our employees have solid insight into how these developed projects can be managed and what our role can be in the process. (Alpha 6) [Partners'] actual practical competence comes from having a first customer and first implementation where they go through all competences [...] it's a learning process for them (Alpha 10)
Customer knowledge on knowledge transfer	How what customer knows affects the knowledge transfer between the focal firm and the customer	When the [solution] becomes more commonplace, then customers become more demanding and want service (Alpha 3) There isn't much in the way of [solution] in those [industries]. The downside is that they don't realize what [solution] is all about. So there's a lot more time [spent] trying to explain the concept behind it. Whereas [in some other industries] people understand [solution] far more. (Alpha 8) You're talking about emerging economies. And these guys, really, they're interested in the old fashioned [solution]. They're interested in the old [methodology] even though it's dying out in some countries. (Alpha 11)
Knowledge codification on knowledge transfer	How the codification of the knowledge related to the offering affects knowledge transfer	It's hard to develop a foolproof implementation manual, which would include everything [...] but let's say that for software management we have adequate material, but where we could always improve is the [...] industry-specific examples (Alpha 10) Our goal has more been to get some control over our own service offering [...] our first goal is to get more systematical approach and replicability to our own offering (Alpha 2) Of course, if we had so good [service] concept that by teaching it to partners they would make more software sales (Alpha 7)

Table D.1: (Continued)

E Multiple case study interview guide

Personal background

- What is your current position and what kind of responsibilities do you have?
- How long have you worked at the current employer and what positions have you held previously?
- What is your educational background?

Customers

- Who are your customers?
- Firm/organization size?
- Specific industries?
- How many existing customers do you have?

Offering

- What is your offering?
- What is the value proposition / benefit from your solution to customers?
- What is the importance of your solution to customers' core/support process?

Product and technology

- What products are included in your offering?
- How can these products be customized?
- How and by what methods are your products integrated to other systems?
- What is the maturity of product technology in your markets?
- How does your firm's products compare to your competitor's products?
- What is the level of technological turbulence?

Service offering

- What pre-sales services do you offer?
- What implementation services do you offer?
- What maintenance phase services do you offer?
- Why do you offer these services/what is the function of these services?
- How standardized are these services? / How have you standardized them?

Competition

- Who are competitors of your firm?
- What is the level of competition in relevant markets?
- In Finland/internationally?
- In terms of market turbulence (variety in customer needs)?

- In terms of competitor hostility (e.g. pricing)?
- In terms of competition concentration?

Market growth

- What is the rate of growth in relevant markets of your firm?
- What is the level of market saturation in relevant markets?
- How many new customers do you get each year?
- What is the balance in sales efforts between new and existing customers?

Knowledge

- What kind of knowledge does your firm have related to your offering?
- How would you assess the knowledge of customers related to your offering?
- Domain/industry-specific?
- Solution-specific management or technical methodology?
- Software technologies?
- How is this displayed?

Partners

- Does your firm have service partners?
- What is the most common business model of your service partners?
- What is a typical partner and what type of knowledge do they have?
- How much of your partners' revenue is generated by business related to your firm's product?
- What is the share of revenue generated by these partners?

Impact on service offering

- Does your existing customer base affect your service offering?
- How does your product offering affect your service offering?
- Does the maturity of product technology affect your service offering?
- Does the level of competition affect your choice of service offering?
- Does internationalization affect your service offering?
- Does market saturation affect your service offering?
- Does the knowledge your firm possesses affect your service offering?
- Does the average knowledge of customers affect your service offering?
- Does your existing partner network affect your service offering?

Strategic impact of services

- Does your service offering have a direct impact on revenue growth?
- Does your service offering affect growth of product sales?
- Does your service offering your profitability?
- How does service standardization affect profitability?
- How does service standardization affect revenue growth?

Strategy

- Has your business strategy significantly changed in the last three years? How?
- What do you think is your firm's main source of competitive advantage?
- On a scale from 0 to 100, what is the priority you give to revenue growth?
- How well has your firm achieved its performance goals in last three years?
- What competitor could be used as a benchmark for your firm?
- What is your most significant strategic challenge as a firm right now?

F Informants in multiple case study

Case	Informant	Position	Date	Duration
Alpha	1	VP, channel sales	4.11.2008	86
	2	VP, product management	4.11.2008	89
	3	CEO	14.11.2008	52
	4	VP, direct sales	14.11.2008	54
	5	Consultant, channel	14.11.2008	63
	6	KAM, direct sales	14.11.2008	49
	7	VP, marketing	14.11.2008	56
	8	KAM, channel sales	17.11.2008	47
	9	Consultant, direct	17.11.2008	59
	10	Consultant, channel	18.11.2008	59
	11	KAM, channel sales	18.11.2008	53
	P1	Partner CEO, UK	28.11.2008	75
	P2	Partner CEO, Russia	11.12.2008	57
	C1	Customer's project manager, Finland	22.4.2009	28
Beta	1	CEO	7.4.2009	64
	2	VP, Sales	7.4.2009	60
	3	Service director	7.4.2009	61
	4	VP, Services	8.4.2009	74
	5	VP, Products	8.4.2009	69
	6	Sales director	15.4.2009	64
Delta	1	VP, Sales & marketing	25.5.2009	47
	2	Sales manager	25.5.2009	42
	3	Consultant	25.5.2009	50
	4	CEO	26.5.2009	62
	5	VP, Innovation (business development)	2.6.2009	51
Epsilon	1	CEO	19.5.2009	95
	2	Development manager	19.5.2009	76
	3	Project manager	20.5.2009	69
	4	Sales manager	20.5.2009	55

Key: CEO = Chief Executive Officer; VP = Vice President; KAM = Key Account Manager

Table F.1: List of informants in multiple case study.

Case	Informant	Position	Date	Duration
Gamma	1	SVP, Unit executive	3.4.2009	89
	2	VP	17.4.2009	84
	3	VP	17.4.2009	54
Kappa	1	Co-Founder, Development Director	28.9.2009	95
Lambda	1	CEO	26.11.2009	79
	2	Sales Director	26.11.2009	49
	3	Business Development Director	26.11.2009	47
Theta	1	SVP, Strategy	30.6.2009	87
	2	SVP, Regional sales	4.8.2009	59
	3	SVP, Regional sales	25.8.2009	74
Zeta	1	CEO	26.5.2009	68
	2	Director, Sales & Marketing	27.5.2009	58
	3	Director, Business Area 1	9.6.2009	75
	4	Director, Business Area 2	9.6.2009	68

Key: CEO = Chief Executive Officer; SVP = Senior Vice President; VP = Vice President; KAM = Key Account Manager

Table F.1: (Continued)

G Growth Orientation Scale

How well do the following statements describe the growth of your firm?
(All items measured on a five-point Likert scale with anchors 1 = Strongly disagree and 5 = Strongly agree)

- Growth is the most important objective of our firm
- At the moment, the size of our firm is ideal, and our firm sees no need for strong growth (R)
- Growing our firm is the most important personal objective for many members of our management team
- The growth of our firm must not take place at the expense of profitability (R)
- Our firm must grow even if it means that we would need to take more risks
- We aim at strong growth in international markets
- Our management team believes that our firm is or will be an important player in international markets

(R) = Reverse coded

H Service Capability Scale

How well do the following describe your firm's consulting and other service offering on average?
(All items measured on a five-point Likert scale with anchors 1 = Strongly disagree and 5 = Strongly agree)

- The human and other resources required by our services are clearly defined
- We have developed software tools to support our service delivery
- We can forecast the usage of human resources required by our services
- We have precisely defined service processes
- The outcomes of our services are strongly dependent on the personnel that deliver them (R)
- We use detailed checklists in our service production
- We have specified in detail what our customers receive from our services
- We can guarantee the success of our services to our customers

(R) = Reverse coded

The importance of services for traditional product-based industries has increased significantly during the last 50 years. Instead of standalone products, many firms now offer integrated solutions that are composed of both products and services, and are often customized to meet unique customer needs. This dissertation studies this phenomenon in the context of small and medium sized product firms in the software industry, and offers new insights into why product firms need to provide knowledge-intensive services, and what is the strategic impact of service provision. The results of this study show that services can benefit product firm performance; however, different services have different impact on firm performance, and these effects depend on various environmental and organizational contingencies. The successful management of service provision is shown to be particularly important for product firms that wish to internationalize or use partners, as service business is difficult to replicate and may hinder the overall growth of the firm.

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