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# Escaping the commoditization trap by going downstream

## How does a manufacturer manage its capabilities to create wealth from solutions?

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**Julkaisun nimike**

Hyödykkeistymisloukkua pakoon palveluiden avulla: Kuinka teknologiayritys johtaa kyvykkyyksiään luodakseen arvoa asiakaskohtaisista ratkaisuista?


**Tiivistelmä**

Teknologiayritykset tarjoavat aikaisempaa enemmän palveluita asiakkailleen. Syinä tähän ovat taloudellinen epävarmuus, globalisaatio sekä valmistus- ja tuoteliiketoiminnan hyödykkeistyminen. Palveluiden avulla teknologiayritykset ovat pyrkineet saavuttamaan tasaisemman tulovirran, joka auttaa suhdannevaihteluiden yli. Teknologiayritykset ovat siten alkaneet muistuttaa palveluyrityksiä palveluiden muodostaessa merkittävän osan niiden kokonaisliikevaihdosta ja -tuloksesta. Tätä strategista siirtymää kuvataan palvelullistumisilmiöksi, jonka on nähty tuottavan erilaisia strategisia, taloudellisia ja markkinoinnillisia hyötyjä.

Väitöskirja rakentuu resurssiperustaisen strategianäkemyksen ja palvelullistamiskirjallisuuden perustalle vastaten seuraavaan tutkimuskysymykseen: Miten teknologiayritys johtaa resursseja ja kyvykkyyksiään luodakseen arvoa asiakaskohtaisista palveluista ja ratkaisuista? Väitöskirja pyrkii vastaamaan tähän tutkimuskysymykseen neljän toisiinsa kytkeytyneen tutkimusartikkelin avulla. Väitöskirjan tutkimustapana on laadullinen vertaileva monitapaustutkimus. Sen kohteena ovat olleet palvelu- ja ratkaisuliiketoiminnan avulla kansainvälisesti menestyneet suomalaiset teknologiayritykset. Väitöskirja pyrkii lisäämään ymmärrystä resurssien johtamisen käytännöistä palvelullistamisen kontekstissa.

Tutkimuksen tulosten mukaan menestyneet palvelullistuneet teknologiayritykset kehittävät järjestelmällisesti kyvykkyyksiä, jotka mahdollistavat tiiviimmän yhteistyön heidän asiakkaidensa kanssa. Se on tapahtunut esimerkiksi kehittämällä konsultatiivista myyntikyvykkyyttä tai operoimalla asennettua laitekantaa älykkäämmin. Toiseksi, tutkimuksen tulokset osoittavat, että menestyneet yritykset hyödyntävät aktiivisesti olemassa olevia kyvykkyyksiä uusilla toimialoilla ja tuote-palveluyhdistelmissä. Se on tapahtunut esimerkiksi laajentamalla palveluporftolion kehittämiseen liittyviä kyvykkyyksiä nykyisten asiakkaiden kanssa.

Kolmanneksi, menestyneet valmistavat teknologiayritykset luopuivat järjestelmällisesti ydinliiketoimintaan kuulumattomista tai valmistustoimintaan liittyvistä kyvykkyyksistä keskittyäkseen uuden strategian mukaisten kyvykkyyksien kehittämiseen.

Tutkimuksen mukaan siirtymä tuotteista palveluihin ei tapahdu hetkessä, eikä se ole toimiva strategia kaikille valmistaville yrityksille. Tutkimusten tulosten valossa tämä strateginen siirtymä vaatii aikaa, näkemystä ja sitoutumista teknologiayrityksen ylimmältä johdolta sisäisten ja ulkoisten voimavarojen kehittämiseen ja uudelleensuuntaamiseen.



**Asiasanat**

Palvelullistuminen, ratkaisuliiketoiminta, dynaaminen kyvykkyys, strategiset kyvykkyydet

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Escaping the commoditization trap by going downstream: How does a manufacturer manage its capabilities to create wealth from solutions?

**Abstract**
Economic turmoil, globalization, and increased price pressure in product businesses, have prompted leading manufacturers to provide services/solutions to their customers to avoid the commoditization trap and generate more stable income. Manufacturers have thus started to resemble service companies as services account for a considerable share of their total revenues and profits. This strategic transition has been termed servitization and has been said to generate various strategic, financial, and marketing advantages for those exploiting successful service strategies.

This dissertation builds on the intersection of the resource-based perspective and servitization literature to answer the following research question: How does a manufacturer manage its capabilities to create wealth from customer solutions? To address this question, four empirical research articles have been formulated to advance knowledge of resource management practices in servitization. By using a qualitative comparative multiple case study method, this dissertation scrutinizes those internationally operating Finnish manufacturers that have outperformed their rivals by establishing service strategies and capabilities. This dissertation attempts to advance both theoretical and managerial understanding of the resource management practices in servitization

The results of the study indicate that highly performing manufacturers systematically build new capabilities required to manage better their customer relationships (e.g., consultative selling, or fleet management capabilities). Second, the results indicate that the solution providers leverage their extant capabilities to enter new industries and product-service markets (e.g., nurturing capabilities to expand their service portfolio with existing customers). Third, solution providers released their non-core and upstream resources to focus on developing downstream resources.

This research highlights that entering the solution business may not be a viable strategy for every manufacturer. The strategic transitioning from goods to services does not happen overnight but requires managerial time, vision, attention, and commitment to develop and redirect internal and external resources.

**Keywords**
Servitization, solution business, dynamic capabilities, strategic capabilities

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I am grateful to my parents, Paula and Markku. I believe that my mother's prior work as a director has led me to my current path because her work initially got me interested in management issues in my teens. I want to thank my father for the encouragement to do sport and exercise. Paula and Markku, you have always been supportive and interested in my studies and work-life. Most of all, I am grateful that I have always had the opportunity to adopt my own viewpoint on a subject. I want to thank my big brother, Miika, for good conversations, but also for taking me out of the office to do some leisure activities such as mountain biking.

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# Contents

## Figures



## Tables

# Abbreviations

| | |
|---|---|
| B2B | Business-to-business marketing |
| CAPEX | Capital expenditure (benefit continues over a long period) |
| DC | Dynamic capabilities |
| DIMECC | Digital, Internet, Materials & Engineering Co-Creation Group |
| ERBV | Extended resource-based view |
| IB | Installed-base of products |
| IoT | Internet of Things |
| IMP | Industrial Marketing and Purchasing Group |
| KBV | Knowledge-based view |
| MNE | Multinational enterprise |
| M&A | Mergers and acquisitions |
| OPEX | Operating expense (ongoing cost of running a business) |
| PSS | Product-service systems |
| RBV | Resource-based view |
| RSI | Relationship-specific investment |
| R&D | Research and development |
| SCA | Sustainable competitive advantage |
| SIC | Standard Industrial Classification |
| SME | Small and medium sized enterprise |
| TCO | Total cost of ownership |
| Tekes | The Finnish Funding Agency for Innovation |

## Articles

This dissertation consists of four enclosed research articles:

[1] Huikkola, T. & Kohtamäki, M. (2017). Solution provider's strategic capabilities. *Journal of Business and Industrial Marketing* 32(5): 752-770.[1]

[2] Huikkola, T., Kohtamäki, M. & Rabetino, R. (2016). Resource Realignment in Servitization. *Research-Technology Management* 59(4): 30-39.[2]

[3] Huikkola, T. (2016). How manufacturer's organizational routines are transformed to facilitate a transition from goods to services? The paper was presented and published as a conference proceeding at the *Industrial Marketing and Purchasing Conference* 2016, Poznań, Poland.

[4] Huikkola, T., Ylimäki, J. & Kohtamäki, M. (2013). Joint learning in R&D collaborations and the facilitating relational practices. *Industrial Marketing Management* 42(7): 1167-1180.[3]

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# 1 INTRODUCTION

## 1.1 Background to the study

*"Everybody is in service"* stated Theodore Levitt in 1972 and elaborated that there are no such things as service industries because there are only industries where the service components are greater or less than those of other industries. Even traditional manufacturing companies are in the service business, they just offer fewer service components than pure service firms. However, even though products and services have recently become intertwined, services as such have been estimated to account for 60–80 percent of the world's advanced economies' gross domestic product (GDP) today. For instance, the relative share of services has grown rapidly in Finland since the 1950s and miscellaneous services represented 70.7% of Finland's GDP by 2014 (Statistics Finland, 2016). The importance of advanced services such as knowledge-intensive and ICT-services have been particularly highlighted recently (Cook, Bhamra & Lemon, 2006; Heineke & Davis, 2007; Kohtamäki & Partanen, 2016; Watanabe, 2005). The *we are a service economy* phrase has been used particularly in developed countries to describe the phenomenon whereby the dominance of the service sector has increased and the economic importance of traditional manufacturing sectors and agriculture has diminished respectively.

In addition to the macroeconomic perspective, the importance of services has also been stressed at the micro-level. The *we consider ourselves a service company* utterance has been heard from traditional manufacturers' representatives to illustrate the phenomenon that products contain service components and services account for a remarkable share of the company's total turnover. Specifically, western manufacturers have focused on servitizing their businesses to escape the commoditization trap, to acquire greater revenues and profits, and to reduce their dependence on business cyclicity, which is often considered more of an issue in product and manufacturing businesses than in service businesses (Jacob & Ulaga, 2008). Moving toward more value-added services has been a successful strategy for several traditional global manufacturers such as GE, Ericsson, KONE, Nokia, Rolls-Royce, and SKF because they have all been able to profit from services by delivering various life-cycle solutions to their customers during the product life-cycle (Rabetino et al., 2015). Previous studies have found that total customer expenditure can range from 10 to thirty times pure product costs (Davies, 2004; Wise & Baumgartner, 1999), hereby making the after-sales market an interesting business opportunity

for manufacturers (Cohen, Agrawal & Agrawal, 2006). Manufacturers have thus attempted to generate numerous strategic, economic, and marketing benefits (Gebauer & Fleisch, 2007; Mathieu, 2001) in their industries through sensing and seizing business opportunities in their customers' value chains (Davies, 2004; Wise & Baumgartner, 1999). However, prior studies have indicated that despite promising business opportunities laying downstream, most manufacturers fail to profit from providing services and solutions to their customers (Reinartz & Ulaga, 2008; Ulaga & Reinartz, 2011). Extant literature has found that manufacturers typically fail at scaling and pricing solutions and assessing the service markets (Shankar, Berry & Dotzel, 2009).

One explanation for this failure is that the organizational capabilities required to develop, sell, and deliver solutions differ remarkably from those capabilities required in a traditional product/manufacturing business (Oliva & Kallenberg, 2003; Reinartz & Ulaga, 2008; Storbacka, 2011). For instance, selling life-cycle services differs considerably from traditional product sales as the party responsible for sourcing solutions from the customer side may not be interested in product features or small process improvements (Reinartz & Ulaga, 2008). Instead, the purchaser may be interested in how well the solution enables the customer to increase revenues or profits during the product life-cycle, or how the supplier could support the customer in reducing fixed costs. As one CEO of the studied company stated: *"Customers are not interested in product features, customers buy outcomes*." Such manufacturer *capability gaps* can be narrowed through creating and developing new capabilities that support downstream transition (Fischer et al., 2010; Gebauer, 2011; Kindström, Kowalkowski & Sandberg, 2013). In addition, this transition may require shedding resources and/or organizational unlearning from the old organizational practices and routines (Danneels, 2011; Eisenhardt & Martin, 2000; Tsang & Zahra, 2008). Developing these types of new capabilities is particularly important in the era of intense global competition, the accelerated speed of change, and economic turmoil (Eisenhard & Sull, 2001; Teece, Pisano & Shuen, 1997). These external factors strongly affect product manufacturers as the monolithic organization structures are disappearing (Doz & Kosonen, 2007), manufacturers' value chains are changing (Porter & Heppelmann, 2015), business models are transformed (Kindström, 2010; Storbacka et al., 2013), vertical disintegration increases (Jacobides, 2005), and manufacturers are presumed to become more like software companies, as their products become smarter and more connected to other systems (Kowalkowski et al., 2017; Porter & Heppelmann, 2014; 2015). Hence, both exogeneous (external) and endogenous (internal) factors are forcing manufacturers to change. To respond to these challenges, manufacturers are increasingly considering how they should manage and alter their organizational

capabilities and routines to rethink their strategy work and address future business opportunities and requirements residing in downstream activities.

To address to the concerns of product commoditization, price erosion, global competition, and differentiation through products, this dissertation attempts to disentangle how manufacturers manage, develop, and alter their organizational capabilities and routines to create wealth from providing customer solutions.

## 1.2 Research objectives

The main objective of this dissertation is to advance knowledge of resource management in servitized manufacturing companies. This dissertation has four specific objectives. First, it aims to investigate what resource combinations enable manufacturers to create wealth from the solutions business. Thereafter, the first article identifies those strategic capabilities that allow a manufacturer to outperform its rivals in the market, thus creating economic rents for the company from the provision of solutions. Second, this dissertation attempts to answer the question of how manufacturers can alter and realign their resources to support servitization (Article 2). Accordingly, the second article studies the nature of dynamic capabilities, particularly resource reconfiguration practices in servitization. Third, this study seeks to increase understanding of how manufacturers change organizational routines to boost the performance of their solution businesses (Article 3). Finally, the fourth article reviews how a manufacturer and its customer jointly develop solutions and facilitate their mutual learning in deep, complex, and dyadic B2B relationships, in the context of the provision of R&D services.

## 1.3 Research questions and gap

The research question is prompted by the burgeoning discourse on servitization, manufacturers' strategic renewal, and the capabilities required to manage corporate change through resource reconfiguration. The overall aim of this dissertation is to answer the following research question:

***RQ:*** *How does a manufacturer manage its capabilities to create wealth from customer solutions?*

The sub-questions guide the dissertation's focus toward specific research gaps related to a manufacturer's capability development activities. Four sub-questions are formulated to address this main research question:

***SQ1**. What determines the solution provider's strategic capabilities? (Article 1)*

***SQ2.** How manufacturer realigns its resource base when becoming a solution provider? (Article 2)*

***SQ3.** How manufacturer's organizational routines evolve when becoming a solution provider? (Article 3)*

***SQ4.** How do manufacturers and their customers facilitate joint learning in dyadic business relationships?(Article 4)*

To address the dissertation's overall objective, the framework presented below describes the key fields of the dissertation (see Figure 1).

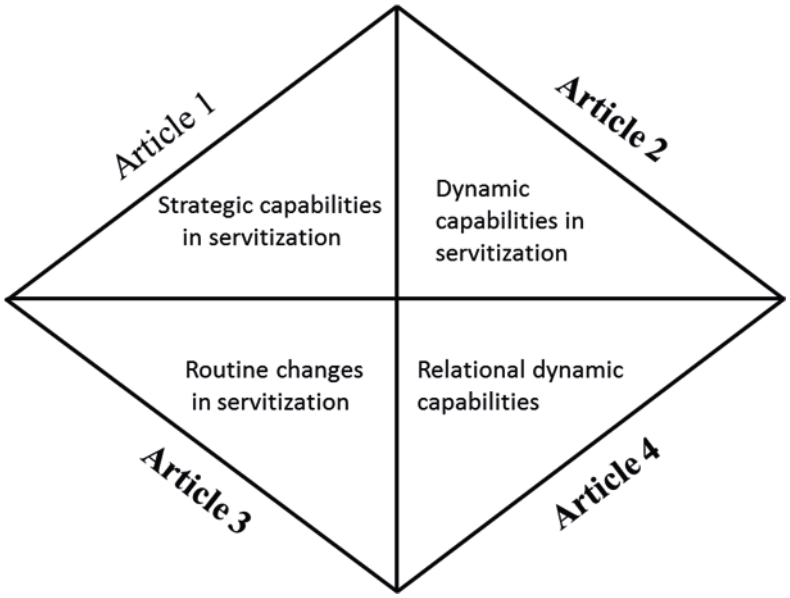


**Figure 1.** The dissertation's framework

Strategic capabilities, that is, those capabilities that enable a manufacturer to create wealth from solutions, are defined in Article 1, whereas the remainder of the articles contribute to the discussion of a firm's dynamic capabilities, that is, how organizational capabilities and routines evolve and are revamped. The articles building on the dynamic capability perspective are marked in **boldface** in Figure 1. Article 4 contributes specifically to the discussion of relational dynamic capabilities. The dissertation is built on the grounds of the resource-based view of the firm. The study looks beyond the firm's directly-owned resources to suggest that effectively managing a firm's external interests, such as supplier resources, can be a major source of competitive advantage. Hence, the

study contributes to the *relational view* of strategy or the *extended resource-based view* (ERBV). Overall, the dissertation contributes at the intersection of the resource-based perspective and servitization literature.

## 1.4 Dissertation scope, position, and contribution

Establishing the reasons behind the firm's (sustainable) competitive advantage has been a core issue for strategy scholars during strategic management's relatively brief history as an academic subject. It has been stated that successes and failures can be explained in several ways because the managers, owners, employees, researchers, media, and other stakeholders have somewhat biased perspectives on the potential sources of a firm's competitive advantage. For instance, Laamanen, Lamberg, and Vaara (2016) found 625 narrative attributions to explain Finnish telecom giant Nokia's rise and fall. These attributions included both firm-endogenous (e.g., capabilities, strategic leadership, organizational design) and firm-exogenous (e.g., business environment, public policy) factors. Paradoxically, the same factors that were used to explain Nokia's tremendous success in the 1990s, were also often presented to explain Nokia's later downfall (particularly between the years 2008–2013). Hence, scholars studying the firm's competitive advantage should be aware of respondents' cognitive biases, as well as their political agendas when interpreting the data and explaining causalities.

Managers have typically emphasized internal factors such as their firm's capabilities, management team competencies, or decision-making abilities when explaining their firm's sources of success. However, when looking for reasons for their firm's failures managers tend to stress environmental factors such as economic turmoil or harmful political decisions (Laamanen, Lamberg & Vaara, 2016). This is understandable because of human nature, but researchers should understand these potential biases when analyzing and interpreting the data. Particularly in qualitative studies, these cognitive biases should be identified, controlled, and managed. Qualitative study scholars (e.g., Beverland & Lindgreen, 2010; Eisenhardt, 1989b; Huberman & Miles, 1994) have suggested that researchers can avoid misinterpreting data for instance by applying an appropriate case selection process alongside data triangulation and auditing techniques.

The dissertation contributes to the discussion of servitization through the theoretical lenses of the resource-based view and the dynamic capability perspective. The dissertation advances understanding of the sources of

competitive advantage of the industrial solution providers by studying the resource combinations and strategic business processes of the leading manufacturers. Second, the dissertation builds a conceptual model of the dynamic capability of certain firms. This model contributes specifically to the dynamic capability perspective by studying how successful solution providers alter their resources to become service-led companies. Third, the dissertation contributes to the discussion of organizational routines in the context of organizational renewal. The third article investigates how manufacturers revamp their ostensive, and performative routines to become customer-focused solution providers. Finally, the dissertation contributes to the relational view of strategy by investigating how solution providers and their customers jointly develop solutions and increase their mutual learning in business relationships marked by high information asymmetry between the parties.

## 1.5 Dissertation structure

This dissertation is divided into two parts. The first part of the dissertation consists of the introduction, theoretical background, methodology, article summaries, and the discussion and conclusions chapters. The purpose of the first part is to present the background to the study, introduce the main concepts, and position the articles. Figure 2 presents the structure of the first part of the dissertation.

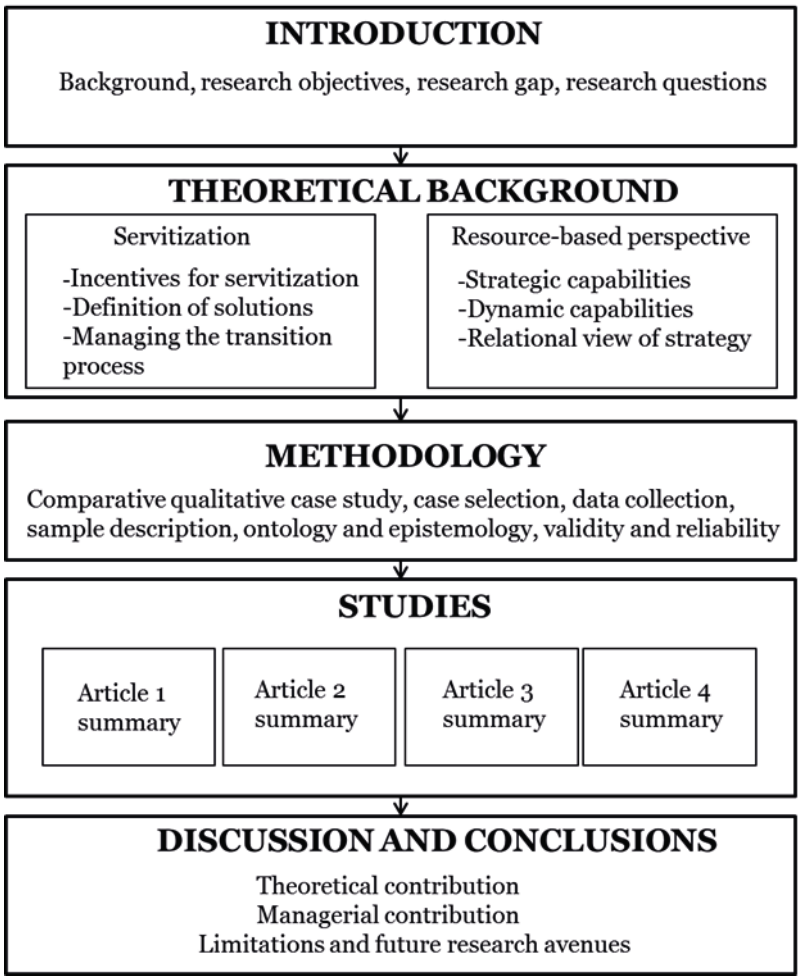


**Figure 2.** Structure of the dissertation (part 1)

The second part consists of four articles. Article 1 is co-authored by Huikkola and Kohtamäki. Article 2 is co-authored by Huikkola, Kohtamäki, and Rabetino. Article 3 is sole authored by Huikkola. Article 4 is co-authored by Huikkola, Ylimäki, and Kohtamäki. Huikkola is the leading author in all of the articles and has had the main responsibility for designing, writing, and formulating the articles, collecting, and analyzing the data, and managing the review processes. Table 1 summarizes the articles' detailed research questions, theoretical grounds, research methods, research contexts, case selection processes, and samples.

**Table 1.** Article summaries

| | Article 1 | Article 2 | Article 3 | Article 4 |
|---|---|---|---|---|
| **Research question** | What determines the solution provider's strategic capabilities? | How manufacturer realigns its resources when becoming a solution provider? | How manufacturer's organizational routines change and evolve when becoming a solution provider? | How do manufacturers and their customers facilitate joint learning in (dyadic) business relationships? |
| **Theoretical background** | [Extended] resource-based perspective | Dynamic capability perspective | Dynamic capability perspective | Dynamic capability perspective<br>Relational view |
| **Research method** | Qualitative comparative case study | Qualitative comparative case study | Qualitative comparative case study | Qualitative comparative case study |
| **Research context** | Servitization | Servitization | Servitization | Dyadic R&D collaborations (complex services) |
| **Unit of analysis** | Focal company | Focal company | Focal company | Business relationship |
| **Case selection** | Cases were selected for further analysis based on the results of a generalizable quantitative dataset collected | Cases were selected based on the results of a generalizable quantitative dataset collected | Purposive sampling (deviant case sampling) | Cases selected based on results derived from the cluster analysis of quantitative dataset |
| **Sample** | 9 servitized manufacturers | 9 servitized manufacturers | 5 global manufacturers | 7 dyadic relationships |
| **Key data sources** | 35 semi-structured interviews<br>+ extensive secondary data | 35 semi-structured interviews + extensive secondary data | 19 executive interviews + extensive secondary data | 26 interviews + secondary data |

# 2 THEORETICAL BACKGROUND

## 2.1 Service business development in manufacturing companies

The public discussion has been almost unanimous in emphasizing the benefits of services and solutions to manufacturers (Neu & Brown, 2005; Oliva & Kallenberg, 2003; Ulaga & Reinartz, 2011). Depending on the viewpoint, services and the solution business have been described either as lifesavers or goldmines for western manufacturers in the era of product commoditization, price erosion, and global competition (Cohen, Agrawal & Agrawal, 2006; Luoto, Brax & Kohtamäki, 2016; Oliva & Kallenberg, 2003). Scholars have described how manufacturers can achieve economic, strategic and marketing advantages through providing services (Gebauer & Fleisch, 2007). It has been stated that compared to pure products, services have potentially higher margins (Cohen, Agrawal & Agrawal, 2006; Kowalkowski, Gebauer & Oliva, 2017), guarantee more stable sources of revenues (Brax, 2005; Mathe & Shapiro, 1993), require fewer assets (Davies, 2004), and increase customer loyalty throughout the product life-cycle (Palmatier, Scheer & Steenkamp, 2007). While these appealing statements may be reality for some manufacturers, the extant studies have found that only a minority (20–25%) of manufacturers are able to profit from providing services/solutions to their customers (Reinartz & Ulaga, 2008; Ulaga & Reinartz, 2011). It has been acknowledged that manufacturers typically fail to price and scale the solutions, or assess the service markets appropriately (Shankar, Berry & Dotzel, 2009). Manufacturers may also be trapped with their histories of operating as providers of products and thus, they fail to create and develop the new types of capabilities and mindset required to operate downstream (Cook, Bhamra & Lemon, 2006; Luoto, Brax & Kohtamäki, 2016; Rothenberg, 2007). Servitization may also change the manufacturer's competitive landscape, and the manufacturer may need to start to compete with its existing customers, or with completely different players. As they go downstream, their positions in the industries' value systems change (Salonen & Jaakkola, 2015; Wise & Baumgartner, 1999). This may mean that a manufacturer needs to rethink and develop an understanding of what the customer's customer does and values.

The term *servitization* was coined by Vandermerwe and Rada in 1988 to describe the phenomenon of bundling products, services, software, and expertise into sold and productized packages. The study highlighted that the distribution of work between suppliers and customers will be different in the future and that a firm's

top management team responsible for strategy creation and execution needs to be aware of the business opportunities in services. Their original idea was that services are not just added to the offerings but that firms should understand that products, services, software, and expertise must be amalgamated in an intelligent way. Understanding this would enable firms to achieve strategic benefits compared to their rivals. Vandermerwe and Rada (1988) used multiple types of examples from different industries (from banking and consumer markets to investment goods) to support their arguments and illustrate the servitization phenomenon in general.

The term *service infusion* differs notably from servitization as it assumes that services are added to the offerings incrementally. Accordingly, it takes a viewpoint that products and services are to some extent separate and services are added individually to the offerings. While the term *servitization* is reminiscent of the logic of LEGO pieces, in that they can be integrated in almost any way, the service infusion resembles domino tiles that must be placed down in a row. Brax (2005) was the first to use the term service infusion, but the term did not become popular until the 2010s, particularly after the contributions of Kowalkowski, Witell, and Gustafsson (2013) and others. Service infusion has been applied particularly in studies investigating the phenomenon of the growth of services in manufacturing companies.

Some scholars (e.g., Fang, Palmatier & Steenkamp, 2008; Josephson et al., 2016) have discussed *service transition*. This term is typically used to describe the evolution of the service business in the manufacturing sector. Authors applying this term typically examine how the relative share of services in total revenues is evolving. The empirical quantitative studies (Eggert et al., 2014; Fang, Palmatier & Steenkamp, 2008; Kohtamäki, Partanen, Parida & Wincent, 2013; Raddats & Burton, 2011) have investigated the performance effects of services and found that manufacturers need a critical mass of services to profit from them through scale advantages and learning benefits. The empirical studies have also found mixed performance effects of services for manufacturing companies. For instance, early studies on servitization (e.g., Davies, 2004; Rothenberg, 2007) identified positive effects of adding services while the more recent studies (e.g., Neely, 2008) found negative effects at some levels. Fang et al., (2008) and Kohtamäki et al., (2013), on the other hand, suggest services are associated with non-linear performance effects, indicating that adding services may not be profitable initially or when the share of services becomes too dominant. Overall, according to the prior empirical studies, the relationship between provided services and performance in the manufacturing context is not clear or without gaps. In practice, listed manufacturing companies in particular have started to

report the extent to which services contribute to their total revenues. Some of the manufacturers have even reported their service and product business profits separately. Unfortunately, managers can be tempted to prioritize the performance outcomes of their own units, even if that comes at the cost of the suboptimization of cashflows of the other units in the firm. In many listed manufacturing companies today, executive compensation is heavily based on service business development, making service business growth the key incentive for the top management team. Furthermore, currently, sales of spare parts account for most (60–80%) of the listed Finnish manufacturers' service business revenues, thus making the service offerings' sales skewed and unevenly distributed. The term service transition is in line with the service infusion as it implies services do not completely replace the product sales but are instead complementary.

Wise and Baumgartner (1999) used the term *going downstream* to show that the product costs typically represent only a small proportion of the customer's total cost of equipment ownership (TCO). That is because the customer generates costs for instance when acquiring, financing, using, and disposing of the product. Wise and Baumgartner therefore suggest that manufacturers should focus on serving their customers throughout the product life-cycle, because the value lies in the usage of the equipment, not in the short phase of new equipment sales (Davies, 2004). Service scholars suggest that manufacturers should focus on identifying, quantifying, communicating, and verifying the equipment's life-cycle value and costs to their customers to justify potentially higher product prices (Töytäri & Rajala, 2015). It needs to be specified that *going downstream* is not limited only to after-sales services such as spare parts but the term covers all the equipment-related costs and returns to the customer. Therefore, instead of calculating the traditional repayment period of equipment (the shorter the better), scholars and practitioners suggest that customers should pay more attention to assessing the equipment's return on investment (ROI) during the product lifespan (the higher the better).

Oliva and Kallenberg (2003) use the term *moving from products to services* to emphasize the strategic importance of services to manufacturers. Although the term refers to *strategic transformation* (revolutionary change), the examples applied in their article show that the authors contribute to the term *strategic transition*, which is incremental, and evolutionary in nature. While strategic transformation refers to a firm's complete renewal (e.g., the manufacturer no longer produces goods any longer/ the firm changes its Standard Industrial Classification, SIC), strategic transition accords with strategic extension (e.g., the manufacturer provides services in addition to products). This term implies that

services should not be viewed as add-ons, but manufacturers should consider if their products should in fact be considered the add-ons.

*Servicizing* is a term coined by Rothenberg (2007). This term has been adopted to illustrate a phenomenon that firms can make more profits even if selling less volume of product in the same time. This term has proved useful in the discussion of a firm's social responsibility and particularly, environmental sustainability (Pereira et al., 2016), and it can be applied in both consumer and B2B-markets. The term *dematerialization* has also been used to illustrate the phenomenon of doing more with less.

Léo and Philippe (2001) apply the term *tertiarisation* to describe how services enable manufacturing firms to expand to other sectors through diversification. For instance, IBM has been able to successfully expand into the consultancy and software sectors through services. Apple has been able to leverage its software and service competencies to cover sectors other than computers (e.g., mobile phones and tablets). KONE has also expanded its operations to include maintaining automatic doors, in addition to servicing elevators and escalators. Service business development in manufacturing companies has pushed them to develop new breakthrough service-related technologies such as the IoT. This development may lead some manufacturers to operate in unheard of sectors in the future, to disrupt other markets, or to find their own markets being disrupted by up and coming companies.

*Value migration* refers to the process of value creation evolving through services. This term suggests that manufacturers should evaluate how much profit they could capture throughout the product life-cycle. Martin and Horne (1992) apply the term *service orientation* to describe the same phenomenon. Value migration is reminiscent of the term *going downstream,* as it emphasizes the value captured after the sales of equipment. For instance, it has been estimated that more than 80% of an operator's costs arise from operation, maintenance, and administration (Davies, 2004).

Table 2 presents some widely-adopted terms to describe service business development in product manufacturing companies. The applied terms have their similarities and differences, and also to some extent overlap each other. In this dissertation, the general term *servitization* will be used from now on to describe service business development and services strategic role in product manufacturing companies because the term is established, widely used, and it permits of a viewpoint that products, services, and software are intertwined, albeit in rather complex ways.

**Table 2.** Selected terms adopted to describe service business development in manufacturing companies

| Term | Extract | Source(s) |
|---|---|---|
| Servitization | "Modern corporations are increasingly offering fuller market packages or 'bundles' of customer-focused combinations of goods, services, support, self-service, and knowledge" | Vandermerwe & Rada, 1988: 314 |
| Service infusion | "To test the ground in the service business and avoid substantial risk, manufacturers add services to their total offering one-by-one" | Brax, 2005: 143; Kowalkowski, Witell, & Gustafsson, 2013 |
| Service transition | "A firm initiating a service transition strategy typically begins with a low service ratio and, over time, attains progressively higher levels of service content" | Böhm, Eggert & Thiesbrummel, 2016; Fang et al., 2008: 1 |
| Going downstream | "The combination of stagnant product demand and an expanding installed base has pushed economic value downstream, away from manufacturing and toward providing services required to operate and maintain products" | Wise & Baumgartner, 1999: 134 |
| Moving from products to services | "Transitioning from product manufacturer into service provider constitutes a major managerial challenge. Services require organizational principles, structures and processes new to the manufacturer. Not only are new capabilities, metrics and incentives needed, but also the emphasis of the business model changes from transaction- to relationship-based" | Oliva & Kallenberg, 2003: 161 |
| Servicizing | "By 'servicizing', suppliers may change the focus of their business models from selling products to providing services, thereby turning demand for reduced material use into a strategic opportunity" | Rothenberg, 2007: 83; Pereira et al., 2016 |
| Tertiarisation | "The services which are the most closely linked to the product (after-sales services, technical assistance, transportation, machine setting or maintenance services) are the more commonly provided by exporters" | Léo and Philippe, 2001: 91; Malleret, 2006 |
| Value migration | "By expanding the scope of the product offering to include services, firms can capture life-cycle profits associated with servicing an installed base" | Davies, 2004: 731 |

### 2.1.1 Definition of solution(s)

The Oxford English Dictionary defines a solution as "*a means of solving a problem or dealing with a difficult situation.*" Solutions (plural) have been described as "*products or services designed to meet a particular need.*" In the servitization literature, the term *solution* has been applied in various ways, and scholars have prefixed the term *solution* with *customer, integrated,* or *total* to highlight the different types of existing solutions (Nordin & Kowalkowski, 2010). Tuli et al. (2007) use the term *customer solution* to emphasize that a solution should meet a customer's particular need. The term *integrated solution* has been used to emphasize that products and services are combined into a productized package sold to the customer. Authors typically use the term integrated solution to describe a phenomenon where a manufacturer designs a solution for the customer based on key parameters set by the customer. For instance, an airport management company may request a supplier design a solution to move 20,000 passengers inside one terminal as fast as possible each day. Suppliers then design a solution to address their customer's specific needs, and such a solution might include a range of products, a service contract, or performance guarantees (Davies, Brady & Hobday, 2006; Windahl & Lakemond, 2010). A *total solution* usually refers to a so-called turnkey solution provided to the customer. This is an attempt to offer customers a one-stop-shopping experience, meaning that a customer can source all the services required from one supplier to reduce its transaction costs. The supplier decides which tasks it will undertake in-house and which it will outsource. For instance, ABB offers total solutions to its customers operating in the oil and gas sectors, which involves taking full responsibility for a plant's functionality. A *total customer solution* in contrast refers to a tailored solution provided to a firm's existing customers. In addition, the terms *customized* (see Kohtamäki & Partanen, 2016) or *tailored solutions* have been applied to underline the importance of the knowledge-related work required to modify solutions on a case-by-case basis.

*Product-service systems* (PSS) are a Scandinavian concept (Baines et al., 2008) and have been used particularly in the manufacturing sector and technical studies to describe the integration of products and services that deliver value in use. For instance, Rolls-Royce's *power-by-the-hour* concept or Michelin's fleet management solution could be illustrations of PSS because the customer pays for the value (flight hours or kilometers driven) and outcomes rather than for pure products or services. On the other hand, these types of examples could be described also as performance-based services, operations, and maintenance (O&M) solutions, or total solutions. Key to the PSS concept is that the supplier is responsible for providing the outcome to the customer. Hence, the supplier takes

the risk (and the possible profits based on the risk-level) of guaranteeing the solution's functionality.

Other authors use the simple term *offerings* to refer to value derived from the product/service usage (Gummesson, 2002; Grönroos, 2008). *Hybrid offerings* (Ulaga & Reinartz, 2011) accords with the integration of products and services into the offerings provided. This term is used to indicate that the value of products and services is greater when bundled than if they were purchased separately. Accordingly, it assumes that one plus one is greater than two. Table 2 presents the most commonly used terms to describe solutions; however, the contents do not form an exhaustive list but cover only the terms that often appear in the servitization literature. In this dissertation, the purest form, *solution,* is preferred but in the research articles specific terms may have been applied for technical reasons. To wrap up, a solution in this dissertation is defined as *a combination of products, services, software, and knowledge provided by the manufacturer that solves customer-specific problems or meets customer-specific needs*.

**Table 3.** Types of solutions

| Term | Extract | Source(s) |
|---|---|---|
| Integrated solutions | "The new model is about systems integration and the provision of services"<br><br>"[integrated solutions] combine products and services into a seamless offering that addresses a pressing customer need | Davies, Brady & Hobday, 2006: 40;<br>Wise & Baumgartner, 1999: 138 |
| Product-service systems (PSS) | "A Product-Service System (PSS) is an integrated combination of products and services that deliver value in use" | Baines et al., 2008: 554 |
| Customer solutions | "A solution is a customized and integrated combination of goods and services for meeting a customer's business needs" | Tuli et al., 2007: 1 |
| Total solutions (also turnkey solutions, plug & play solutions) | "Industrial service providers should offer one-stop-shopping to their clients. This implies a high degree of customization and a "proactive" sensing of hardly explicit client specifications" | Antioco et al., 2008;<br>Matthyssens & Vandenbempt, 1998: 346 |
| Solutions offerings | "There is no unanimous and rigorous definition of solutions, but rather a number of often broad and generic descriptions that could be applied to a wide array of different offerings, if not generically" | Nordin & Kowalkowski, 2010: 441 |
| Total customer solution | "An intimate and deep customer understanding and relationship that allows us to develop value propositions that bond to each individual customer" | Hax & Wilde, 2001: 382 |
| Offerings | "They [offerings] are bought by customers in order to assist them with a service that should create value for them" | Gummesson, 2002;<br>Grönroos, 2008: 301 |
| Hybrid offerings/solutions | "[hybrid offerings are] one or more goods and one or more services, creating more customer benefits than if the good and service were available separately"<br><br>"hybrid solutions are products and services combined into innovative offerings" | Shankar, Berry & Dotzel, 2009: 95;<br>Ulaga & Reinartz, 2011: 5 |

### 2.1.2 Drivers of servitization

The extant literature has suggested a number of reasons why manufacturing companies pursue servitization strategies (Luoto, Brax & Kohtamäki, 2016). Typically, servitization has been assumed to generate greater financial benefits for the company (Wise & Baumgartner, 1999) because of higher profit margins (Cohen, Agrawal & Agrawal, 2006) and a more stable source of income (Gebauer & Friedli, 2005; Mathe & Shapiro, 1993). A service business typically requires fewer assets than the traditional manufacturing business model (Davies, 2004) and thus offers the manufacturer a better return on equity (ROE). In addition to the financial benefits, scholars have identified that servitization offers a manufacturer strategic and marketing advantages in the industrial markets (Gebauer, Fleisch & Friedli, 2005; Neu & Brown, 2005; Rabetino, Kohtamäki & Gebauer, 2016). Manufacturers are able to generate a competitive advantage in the markets through services because product-service components seem to be less sensitive to the customer's usage of a market mechanism (Baines et al., 2008), which further allows the manufacturer to achieve greater profitability (Lele, 1986; Oliva & Kallenberg, 2003; Ulaga & Reinartz, 2011). It has been stated that product-service combinations are more difficult for competitors to duplicate because they cannot be touched, smelled, or easily compared before making a buying decision (Gebauer & Friedli, 2005; Oliva & Kallenberg, 2003). Servitization typically contains a pronounced human factor, thus potentially making the outcome more variable and insecure (Di Mascio, 2010; Neu & Brown, 2005).

Scholars have also acknowledged that manufacturers' customers have increasingly started to ask for services (Auramo & Ala-Risku, 2005). One factor that has increased the service demand is an increased outsourcing/subcontracting trend (Levery, 1998; Reinartz & Ulaga, 2008). Generally, companies have outsourced 1) their non-core activities to release capital and to focus on developing their core businesses and 2) part of their core activities to add flexibility (Eurostat, 2016). Consequently, vertical disintegration and increased networking and collaboration between firms have facilitated the increased demand for services (Slack, 2005). Moreover, developing deep and intimate customer relationships has facilitated learning between manufacturers and their customers, thus providing new service ideas and boosting new service development (NSD) processes (Kindström, Kowalkowski & Sandberg, 2013; Penttinen & Palmer, 2007; Tuli et al., 2007; Vargo & Lusch, 2008).

While the above-mentioned factors could be called pull factors, some push factors can also be identified that impel manufacturers to consider servitization

strategies. One of the most common is the commoditization of the product business (Oliva & Kallenberg, 2003; Reinartz & Ulaga, 2008). Commoditization causes price erosion because it is more difficult for the firm to differentiate itself in the markets through its products. Increasing the features or the intelligence of the product may be one way to protect a product business; however, product features are typically copied more easily and faster than service components because a product is tangible. Competition in the product business has intensified during the last 10 years because of the accelerated speed of globalization. Specifically, increased competition from the East-Asian economies (e.g., China and India) has driven western manufacturers to sense business opportunities downstream. In addition, increased environmental concerns and the dematerialization trend have pushed value downstream (see Rothenberg, 2007) as the business model based on traditional production logic has been seen as a polluting, unecological, unsustainable, or even unattractive one. Furthermore, the manufacturer's installed base of products can become stagnant in certain markets, and thus new equipment sales do not provide attractive business opportunities (Reinartz & Ulaga, 2008). This pushes the manufacturer to seek business opportunities from other product markets or customers' value chains by leveraging its existing resources (Barney & Clifford, 2010; Danneels, 2011; Léo & Philippe, 2001). Moreover, longer product life-spans have forced manufacturers to serve their customers by offering life-cycle services (Rabetino et al., 2015; Wise & Baumgartner, 1999). Manufacturers have also noticed that the product business does not provide opportunities to develop sufficiently deep relationships with their customers (Baines et al., 2008; Boyt & Harvey, 1997). This is pushing manufacturers to provide services to their customers because services encourage the manufacturer to develop long-lasting and deep customer relationships (Tuli et al., 2007; Vargo & Lusch, 2004). Complex R&D services typically provide opportunities to collaborate closely with customers as the information asymmetry in R&D services is typically high and their development requires resources, time, and relationship-specific investments from the dyads. Based on the extant servitization literature, Table 4 lists the recognized push and pull factors that cause manufacturers to strive to implement servitization strategies.

**Table 4.** Drivers of servitization

| Push factors | Pull factors |
|---|---|
| Product commoditization (Reinartz & Ulaga 2008) | Differentiation through servitization (Gebauer & Fleisch, 2007; Gebauer, Gustafsson & Witell, 2011) |
| Price and profit erosion in product business and fear of being a laggard without services (Cohen, Agrawal & Agrawal, 2006; Wise & Baumgartner, 1999) | Profit opportunities during the product life-cycle (Davies, 2004; Wise & Baumgartner, 1999) |
| Customer insistence (Maxwell & van der Vorst, 2003; Davies, Brady & Hobday, 2007 ) | Increased customer understanding and demand (Auramo & Ala-Risku, 2005; Oliva & Kallenberg, 2003) |
| East-Asian competition and globalization trend (Davies, 2004; Luoto, Brax & Kohtamäki, 2016) | Economic, strategic and marketing benefits (Baines et al., 2008; Gebauer, 2005; Mathieu, 2001) |
| Environmental concerns and dematerialization trend (Maxwell & van der Vorst, 2003; Rothenberg, 2007) | Dematerialization trend (Pereira et al., 2016; Rothenberg, 2007) |
| Saturation of installed base (Reinartz & Ulaga, 2008) | Stability of income (Gebauer & Fleisch, 2007; Mathe & Shapiro, 2003) |
| Superficial customer relationships in product business (Baines et al., 2008) | Less sensitivity to price-based competition (Malleret, 2006) |
| Longer product life-spans (Wise & Baumgartner, 1999) | Developing long-lasting customer relationships (Mathieu, 2001; Penttinen & Palmer, 2007; Tuli et al., 2007; Vandermerwe & Rada, 1988) |
| Growth and profitability requirements and pressures from owners, sponsors and other stakeholders (Fang et al., 2008; Neely, 2008) | Outsourcing trend (Reinartz & Ulaga, 2008; Slack, 2005) |

### 2.1.3 Managing the transition from products to solutions

The early studies on servitization (e.g., Kalliokoski et al., 2003; Neu & Brown, 2005; Oliva & Kallenberg, 2003; Reinartz & Ulaga, 2008; Wise & Baumgartner, 1999) described the transition process from products to services/solutions very well. The transition has typically been described in a continuum starting from product-logic (services seen as add-ons) and ending with the adoption of a

service-logic (tangible products seen as add-ons). Figure 3 presents the product-service continuum in manufacturing companies.

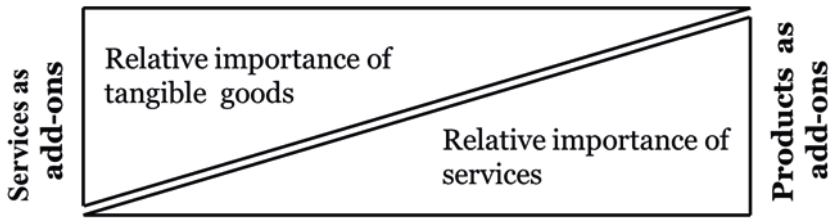


**Figure 3.** The continuum of products-services. (Adapted from Oliva & Kallenberg, 2003: 162)

Scholars have usually described the transition from products to solutions as a systematic process (Baines et al., 2017). For instance, Oliva and Kallenberg (2003) suggest that a manufacturer should start its servitization process by consolidating product-related services under one roof. After that, the manufacturer should enter the installed base (IB) service markets by creating a separate service organization to market, sell, and deliver services effectively. Third, the manufacturer should decide whether it will expand to offer either relationship-based services or process-centered services. Finally, the manufacturer takes over the end-user's business operation. Oliva and Kallenberg (2003) thus propose that the change process is incremental rather than radical. Reinartz and Ulaga (2008) support this observation, in that they found the most successful companies progressed rather slowly from a product-based logic toward a service-based logic. Reinartz and Ulaga (2008) recognize a certain path from products to services. They suggest that the firm cannot move to another level before it has achieved certain goals at the previous level. They suggest that the industrial company should recognize that it is already providing services to its clients (whether for a fee or free of charge). Second, they suggest that a manufacturer should industrialize its back-office by standardizing its service processes in a comparable way to its equipment production. Third, a manufacturer should create a service-aware sales force that is able to sell services to its clients. Finally, a manufacturer should focus on developing its customers' business processes. However, the transition process is not always that straightforward. Gebauer, Fleisch and Friedli (2005) developed the term *service paradox* to describe a phenomenon where a manufacturer adds services to its offerings but fails to profit from them in relation to investments made because of increased costs accruing from adding those services. The difficulty of making services scalable has been identified as one of the key reasons why manufacturers fail to profit from the solutions they provide (see Shankar, Berry & Dotzel, 2009). The extant literature presents the multiple challenges related to servitization (see

Brax, 2005). It is difficult to identify the optimal scale of services the manufacturer should provide to its customers. At some point, this expansion can lead to a new situation regarding the competitive environment and raises questions of whether manufacturers will start to compete with their existing customers, and of whether doing so is a good idea.

### 2.1.4 Reflections on the examples of servitization in Finland

Finland can be considered to have a small, highly industrialized, and open economy. The role of export is vital for such an economy as the value of Finnish export in 2015 was EUR 58.8 billion (the value of imports was EUR 54.3 billion). Investment goods and services each accounted for 29 percent (a total of 58 percent) of the export value. The main export products for Finland are petroleum products (e.g., Neste Oil Oyj), stainless steel (e.g., Outokumpu Oyj), sawn wood, and wood pulp. Machinery products accounted for 13.5 percent of the total exports, thus generating almost EUR 8 billion in export value. Finland has become famous for designing, manufacturing, and exporting investment goods such as paper machines, elevators, and escalators, forestry equipment, agricultural machinery, power plants, industrial cranes, mining equipment, and marine propulsion systems. As Tauno Matomäki, who holds the Finnish honorary title of *vuorineuvos*, stated some time ago: *"Finland should not export anything that is smaller than a horse*." These investment goods typically contain also service components because they need regular maintenance, customer training, software updates, spare parts, and modernization during the product life-cycle. Increasingly, these products have become more intelligent through embedded software, sensors, and automation. This fourth industrial revolution (or industrial internet, internet of things/IoT, industry 4.0) has been forecast to change traditional manufacturers' strategies, the competition landscape, value chains, and business models (Allmendinger & Lombreglia, 2005; Porter & Heppelmann, 2014; 2015). For manufacturers, this can mean that they become like software companies in the future (Porter & Heppelmann, 2015) as the data collected through sensors will be their key asset. Most of the Finnish listed product manufacturers have been developing these types of intelligent solutions, and for instance, listed manufacturers such as Konecranes, KONE, Cargotec, Wärtsilä, Valmet, Ponsse, Raute, Metso, and Outotec have been investing heavily in the IoT. All of these manufacturers have previously developed automation competencies and sold life-cycle services to their customers. Accordingly, data-oriented business logic can be basis for their future business model, after established product-, and service-oriented business logics.

Servitization has recently attracted considerable attention from Finnish scholars as the Finnish government has supported this research topic through the SHOK programs (Strategic Centres for Science, Technology, and Innovation) overseen by Tekes (The Finnish Funding Agency for Innovation). Such research projects have focused on studying topics related to servitization including projects such as Serve, System1, FutIS, and S4Fleet, to name but a few. Topics related to the IoT subsequently attracted the attention of Finnish scholars from different sectors (technology, business strategy, marketing, operations management, etc.) as digitization has been seen as a key driver or a potential success factor for the Finnish exporters. In addition, most of the listed Finnish machinery manufacturers have been successful in adopting servitization strategies, as evidenced by services accounting for a considerable share (20–60%) of the listed manufacturers' revenues and total profits. In addition to the relatively large manufacturers, Finnish SMEs have also adopted servitization strategies. For instance, Kohtamäki and Partanen (2016) reported how SMEs can profit from knowledge-intensive business services (KIBS) if they are able to build deep relationships with their customers and facilitate learning in the relationships. Kowalkowski, Witell, and Gustafsson (2013) found that SMEs should focus on building different value constellations (altogether nine different value constellations) with their customers to create wealth from services and solutions.

Leading Finnish business-to-business researchers have published many servitization-related articles and business books. To name a few, Kaj Storbacka, and Suvi Nenonen, have been investigating servitization business models and organizational capabilities, Marko Kohtamäki, Jukka Vesalainen, and Kristian Möller have been studying the network capabilities required in servitization. Petri Parvinen and Pekka Töytäri have been studying the anatomy of solution sales, Christian Grönroos has conceptualized the value co-creation models in the B2B-context, and Risto Rajala has been studying industrial companies' service systems and innovations. In addition, Hannu Makkonen, Elina Jaakkola, and Anna Salonen have been studying value creation processes in the servitization context. Moreover, there have been a few Finnish doctoral dissertations focusing on the servitization phenomenon published recently. Esko Penttinen studied the transition process from goods to services in his dissertation published in 2007. He presented findings on the relevance of developing information systems and deep relationships for the manufacturer to master the transition process. Saara Brax's doctoral dissertation published in 2013 reviewed extant service definitions and contributed to the process-based nature of services in manufacturing companies. Taija Turunen's doctorial dissertation published in 2013 examined how organization structure characteristics and the operational premises enable a manufacturer to move from a product to a service orientation. Max Finne's

doctoral dissertation published in 2014 studied the external situational factors that determine if broadening the offering to cover services is a feasible strategy for manufacturers. In 2015, Pekka Töytäri studied the anatomy of value-based exchanges between B2B-companies, thus contributing to the value-based selling and pricing literature. Recently (in 2016), Ville Eloranta's dissertation examined the nature of platform-based business models and how service platforms affect manufacturers' business strategies.

This doctoral dissertation differs from previous dissertations in that it concentrates purely on identifying the organizational capabilities required to boost servitization in manufacturing companies. The dissertation's theoretical grounding is strictly based on the resource-based perspective on strategy. That resource-based perspective has established its position in the sphere of strategic management, fits within the organizational economics paradigm, and complements industrial organization research (Lafley & Martin, 2013; Mahoney & Pandian, 1990). The resource-based perspective is one paradigm that explains why some firms are able to gain a competitive edge (economic rents) in the markets while others are not.

## 2.2 The resource-based perspective on strategy

The resource-based perspective (the resource-based view; the RBV) proposes that a firm's sustainable competitive advantage (SCA) is primarily based on the firm's unique, idiosyncratic, endogenous, and immobile resources. If a firm's resources are valuable, rare, inimitable, and un-substitutable (Barney, 1991), and if they are effectively organized (Barney, 1995), they can sustain above-average returns (economic rents) for the firm. These resource characteristics are given the acronym VRIN (valuable, rare, inimitable, non-substitutable) or VRIO (value, rarity, inimitability, organization). The fundamental logic of the VRIO model is that the more constituent characteristics a firm's resources have, the better the firm will perform against its peers.

The roots of the resource-based perspective lie in Edith Penrose's (1959) work related to the growth of the firm. She reasoned that a firm's growth was initially based on the firm's scarce human resources—how they were managed and how new ones were recruited. She rationalized that the expansion process was dynamic in nature as the new recruits required time to be fully developed. Penrose described resources as the firm's physical things it buys, leases, or produces for its own use, and the people recruited to make them effectively part of the firm. Penrose (1959) highlighted that *services* are the contributions of

these resources that can make a difference to the firm's productive operations, and that a resource can be seen as a bundle of services. Birger Wernerfelt (1984) coined term *the resource-based view of the firm* and suggested that resources are only half of the issue; products and services comprising the other half. He rationalized in a similar way to Penrose that the firm is able to extend its extant resources to produce multiple products/services, thus enabling that firm to expand into new product areas and markets (tertiarisation/resource leverage). Resources are thus the important antecedents to products, and ultimately to firm performance (Gruber et al., 2010; Priem & Butler, 2001). Some research holds that the external perspective was always present in Penrose's work as the *productive opportunity* refers to the dynamic interaction between internal and external business environments (see Spring & Araujo, 2013). To sense this opportunity, managers need to understand their customers' technologies, processes, and challenges. In order to seize this opportunity, a firm's managers need to identify, build, and utilize interfirm resources effectively (Spring & Araujo, 2013).

Researchers and practitioners have acknowledged that *intangible resources* such as staff expertise, organizational culture, and a brand are more likely to be the origins of a firm's sustainable competitive advantage than *tangible resources* such as production lines or other physical assets because tangible resources are easier for a firm's rivals to identify, duplicate, and transfer (Barney, 1986: Hatch & Dyer, 2004). Prahalad and Krishnan (2008) stress that in today's dynamic environment, the old sources of competitive advantage such as possessing labor, technology, and financial capital are no longer relevant. Instead, access to those resources through partners will become essential because the resources should be considered global and scalable.

The *knowledge-based view* (KBV) considers knowledge the most strategic resource a firm possesses (Grant, 1996; Kogut & Zander, 1992). The KBV thus considers tangible and intangible assets hierarchically constructed and treated. Sometimes identifying the firm's most valuable assets is difficult even for the firms' managers. *Causal ambiguity* refers to how well managers are aware of the linkage between the firm's resources and outputs (Peteraf, 1993). Causal ambiguity is more likely to occur if the resource is knowledge-based or otherwise complex. As services and solutions are typically complex constructions, it might be difficult for the managers to identify the mechanism by which they are created or delivered in practice in a valuable way. For instance, it can be difficult to analyze the performance impact of organizational culture because of its intangible nature. It can be difficult for managers even to shape the understanding of the key factors behind an extraordinary organizational culture.

In short, the origins of the resource-based view suggest that the firm's growth and competitive advantage are based primarily on resource bundles the firm possesses and controls, including its external assets. These capabilities that contribute to competitiveness are scarce, relatively immobile, and take time to evolve. In addition, these resources must be well organized and properly managed to create wealth, and they can be leveraged to cover new product/service markets (tertiarisation).

Even though the RBV's roots lay back in the 1950s, the paradigm did not become popular until the 1990s, particularly after the contributions of Wernerfelt (1984; 1995), Barney (1991; 1995), Grant (1991), Prahalad and Hamel (1990), Amit and Schoemaker (1993), Peteraf (1993) and Rumelt (1984). The RBV is in essence introspective and centered on the firm itself (Porter, 1991). This inside-out view of strategy suggests that the firm's sustainable competitive advantage cannot be based on the special characteristics of an industry, the firm's positioning within the industry, the industry structure, or temporary disruption in the markets (Hansen & Wernerfelt, 1989). Instead, the RBV suggests that those firms outperforming their peers in the long term possess heterogeneous resources that are valuable to the firm and its customers, scarce in the industry, durable, difficult for their rivals to duplicate, and offer core products/services that are not easily substitutable. Moreover, the extant RBV literature stresses the importance of an organization's ability to deploy resources (Barney, 1995; Eisenhardt & Sull, 2001; Long & Vickers-Koch, 1995; Ray, Barney & Ruhanna, 2004). Accordingly, managers' ability to develop strategic business processes to steer how resources are reallocated and organized has been studied recently (Bingham, Eisenhardt & Furr, 2007). Configuring strategic business processes has long been a *black-box* for strategy researchers, because observing how resources are managed and deployed in real-life requires a remarkable volume of research resources, typically involving an ethnographic research method, or extensive observation within the organization because management practices and systems, and organizational procedures differ considerably between firms. These management processes and practices have been extensively studied mainly in large American blue-chip companies such as Google, Apple, or IBM (see Gerstner, 2003; Isaacson, 2011; Lashinsky, 2012; Levy, 2011).

*Strategic* or *core capabilities* are the most critical and distinctive resources a firm possesses. Strategic capability consists of a firm's core competencies and strategic business processes (Long & Vickers-Koch, 1995). For instance, Honda's core competencies consist of the skills and knowledge to design and build small engines and powertrains (Long & Vickers-Koch, 1995; Prahalad & Hamel, 1990) whereas Canon has core competencies in optics, imaging, and microprocessor

controls. These core competencies are utilized to produce *core products and services* in different domains such as Canon's image scanners, copiers, desktop printers and cameras (Prahalad & Hamel, 1990). *Strategic business processes* refer to those business processes that firms use to deliver a firm's special expertise in the form of the products and services that are valuable to their customers and other stakeholders (Long & Vickers-Koch, 1995). *Strategic/core capabilities* are therefore those capabilities that enable a firm to achieve a competitive edge in a particular industry. One of the world's most admired investors, Warren Buffet, has stated that he looks for economic castles protected by unbroachable *moats*. These moats are built by the firm's valuable, rare, and inimitable sets of resources such as the firm's brand or the top management team's competencies to run the dedicated businesses. The wider the moat, the more likely it is that the company can secure long-term economic rents.

Coyne (1985) emphasizes that not only must a firm have a resource or a skill that its rivals do not have, but this capability gap must make a difference to the customer. On the other hand, Itami (1987) notes that some of a firms' intangible assets are not under the control of its employees but are basically dependent on the perception of its customer base. Hence, in order for a competitive advantage to be sustainable, key buying criteria and the existing capability gap must be enduring (Bharadwaj, Varadarajan, & Fahy 1993). Day (1994) describes these strategic capabilities as strategic orientations. A firm's strategic orientation is its philosophy of how to conduct business, as manifested through its beliefs and values. These beliefs and values are considered intangible, interaction based, and difficult to trade, and imitate resources. Amit and Schoemaker (1993) state that as a result of deploying and bundling resources for instance in functional areas such as in brand marketing, firms can build corporate capabilities such as a highly reliable service, a dublicable process, product innovations, or responsiveness to market trends.

The RBV as such is also static in nature and also assumes that sustainable competitive advantage can be attained. Therefore, existing capabilities are just a snapshot of a firm's current situation but do not guarantee the firm's future success. This is paradoxical because, for instance, Nokia achieved its best profitability level in 2007 even though the iPhone had already been launched and Nokia had the same key resources as during the period of its later downfall. In today's high-velocity business markets, particularly in the software industry, a firm's existing resources can even hinder its growth. This has been termed *core rigidity* (see Leonard-Barton, 1992), meaning that a firm's core competencies or capabilities can become obsolete as the business conditions change, and can even lead to competitive disadvantage (Atuahene-Gima, 2005). For instance, Kodak

Eastman had core competencies related to traditional photography, but these competencies did not help Kodak to succeed in the era of digital photography, thus making Kodak's existing core competencies obsolete. As a result, the company was declared bankrupt in 2012. Kodak's old rival, Fujifilm, has on the other hand made different choices after struggling in the traditional photography industry. Fujifilm succeeded by reinventing itself by leveraging its resources into new market areas (e.g., expanding into the healthcare and pharmaceutical markets) and developing new organizational capabilities (e.g., through the acquisition of new technologies such as digital imaging) to support a new business orientation. *Path dependency* is a key element in neoclassical economics (see Nelson & Winter, 1982) and it means that a firm's actions undertaken in its past affect its current and future outcomes negatively or positively (Vergne & Durand, 2010). For instance, a manufacturer's equipment sold in the past provides opportunities to service that same equipment in the future. In contrast, a manufacturer's processes and incentives might have been built based on assumptions derived from the product business and can hinder the adoption of service-oriented processes and incentives. Therefore, the RBV does not strictly address how firms transform and reinvent themselves to meet new business requirements, as it focuses on explaining a firm's current advantage in the market. The *dynamic capability* approach attempts to explain how firms recreate themselves by sensing and seizing new business opportunities and modifying their organizational resources and routines (patterns to deploy resources).

The RBV typically takes a focal company as its unit of analysis and suggests that the origin of a firm's competitiveness lies primarily in its deployment of internal resources. However, as vertical disintegration and outsourcing have increased, the importance of interfirm cooperation to a firm's competitive advantage has increased. This has been termed the *relational view of strategy* (Dyer & Singh, 1998) or the *extended resource-based view* (or ERBV; see Mathews, 2003; Spring & Araujo, 2013). Overall, the RBV has many extensions. In this dissertation, in addition to strategic capabilities, the focus is particularly on dynamic capabilities and the relational view, both of which are examined in some detail in the following sections.

### 2.2.1 Dynamic capabilities (DC)

The RBV has rightly been criticized for its static nature (Priem & Butler, 2000). Even though resources can meet VRIN criteria today, the same resources can be useless tomorrow, as the examples of Kodak and Nokia indicate. The DC approach addresses this fundamental problem and suggests that resources and

capabilities must be developed, changed, and revamped as the market conditions change (Augier & Teece, 2009). Long and Vickers-Koch (1995) distinguished between the core capabilities that provide today's competitive advantage (*critical core capabilities)* and the core capabilities that will provide tomorrow's competitive advantage (*cutting edge core capabilities)*. Cutting edge core capabilities are not the source of today's competitive advantage but can become valuable as markets and business conditions change. Some scholars have stated that there is no such thing as a sustainable competitive advantage anymore because of the turbulence and turmoil in many industries (D'Aveni, 1994). The DC approach became popular in the late 1990s. Scholars were first interested in understanding how some firms were able to succeed in high-velocity markets (Eisenhardt, 1989a), particularly during the dot-com boom (Eisenhardt & Sull, 2001). Accordingly, the original idea behind DC was outside-in as the approach stressed the importance of developing capabilities to address rapidly changing business conditions. However, later on, the dynamic capability concept has been used to explain how firms redirect themselves by changing their resource bases. The DC approach views strategy as something created both inside-out and outside-in and thus borrows elements from both the Industrial Organization (IO) and the resource-based perspectives. In the era of Web 2.0 (including social media companies and platform-based business models), the term *New Dynamic Capabilities* has been used to highlight that the pace of change is ten times faster in a globally networked business environment, which poses several challenges for the development and deployment of organizational capabilities (Shuen & Sieber, 2009). Hence, the discussion of new dynamic capabilities traces the discussion of DC back to its roots.

IBM has been used as an example in both the academic literature and managerial books to illustrate how firms can recreate themselves through reorganizing structures, renewing strategy work, revamping procedures, and modifying resources (see Gerstner, 2003; Hamel, 2000; Harreld, O'Reilly & Tushman, 2007; Lloyd & Phillips, 1994; O'Reilly & Tushman, 2009; Tushman & O'Reilly, 1996). IBM, also known as the *Big Blue,* has become a textbook example of how a large corporation can undertake a total makeover from a product-based firm toward a pure service company. A corporation capable of accomplishing such a strategic renewal is labeled an *ambidextrous organization* (see Birkinshaw & Gibson, 2004; Cyert & March, 1963; March, 1991; O'Reilly & Tushman, 2009) meaning that the firm is able to apply both *exploration* (radical innovation) and *exploitation* (taking advantage of current resources) strategies simultaneously. Tushman and O'Reilly (1996) call this an ability to manage both *evolutionary* and *revolutionary* change, meaning that the firm is able to pursue both incremental improvement and discontinuous innovation at the same time.

Teece (2007) has conceptualized dynamic capability as a firm's capability to *sense* and *seize* new business opportunities in the markets and *reconfigure* its intangible and tangible resources to address rapidly changing environments. Therefore, the DC approach holds that a firm can be successful by changing the market conditions proactively or by adapting to changed circumstances reactively. Wang and Ahmed (2007) found in their literature review that the dynamic capabilities include three main component factors: 1) adaptive capability, 2) absorptive capability and 3) innovative capability. Having adaptive capability means a firm has the ability to identify and take advantage of emerging market opportunities (Chakrawarthy, 1982), while having absorptive capability refers to the firm's ability to recognize the value of new, external information, and to absorb and commercialize it (Cohen & Levinthal, 1990). The roots of innovative capability lie in Joseph Schumpeter's (1970) concept of *creative destruction* and it addresses a firm's ability to shake up and destroy existing market structures by developing new products, services, organizational processes, or technologies. The main idea is that entrepreneurs and new technologies can create disequilibrium in the market, thus providing opportunities to gain economic rents through new market shaping innovations.

Researchers view the relation between the firm's sustainable competitive advantage and dynamic capabilities differently. For instance, Eisenhardt and Martin (2000) do not consider dynamic capabilities as the source of a firm's SCA. Some scholars compare DC to a firm's *threshold capabilities* (see Long & Vickers-Koch, 1995), thus suggesting that dynamic capabilities only allow a firm to achieve the minimum requirements in the markets, not necessarily to exceed them. On the other hand, some scholars (see Teece, 2007) stress that DC is the key source of a firm's SCA. Eventually, these firm's regenerative capabilities (see Ambrosini, Bowman & Collier, 2009) facilitate a firm's learning capability (learning to learn) to adopt to new circumstances. *Strategic learning* refers to a firm's competence building and leveraging processes (Sirén, Kohtamäki & Kuckertz, 2012), including the creation, assimilation, and internalization of strategic knowledge in a way that improves the firm's competitiveness (Kuwada, 1998; Thomas, Sussman & Henderson, 2001). Strategic learning resembles the concept of traditional *organizational learning,* which refers to a process of creating, retaining, and transferring knowledge within a firm (Easterby-Smith, Crossan & Niccolini, 2000; Huber, 1991; Levinthal & March, 1981). *Learning orientation* (see Calantone, Cavusgil & Zhao, 2002) refers to the components of commitment to learning, shared vision, open-mindedness, and intraorganizational knowledge sharing. Strategic learning is thus close to, yet somewhat distinct from, the concept of dynamic capabilities. Typically studies that have adopted the strategic learning concept use quantitative research

methods whereas studies applying the dynamic capabilities concept utilize qualitative research methods. Because the articles in this dissertation are mainly based on the qualitative research method, the term dynamic capabilities is used throughout the dissertation.

*Organizational routines* refer to the patterns of activities that enable a firm to find a solution to specific problems (Teece, Pisano & Shuen, 1997) and advance the dynamic capability theory. These routines enable a firm to get things done and are established in both group and individual behavior (Teece, 2012). Extant literature on organizational change considers dynamic capabilities "*as the organizational and strategic routines by which firms achieve new resource configurations as markets emerge, collide, split, evolve, and die"* (Eisenhardt & Martin, 2000: 1107). These new strategic assets are increasingly formulated through developing routines to execute successful acquisitions and alliances (Dyer, Kale & Singh, 2004; Eisenhardt & Martin, 2000), suggesting the importance of external assets to the firm's success (Möller & Svahn, 2003). Organizational routines need to be revamped to address changes in the business environment. In sum, organizational routines are described as repeatable working methods and practices that organization members have adapted to get things done now and in the future.

### 2.2.2 The relational view of strategy

The relational view of strategy (Dyer & Singh, 1998) or the extended resource-based view (ERBV) (Mathews, 2003; Spring & Araujo, 2013) proposes that a firm's competitive advantage can be based on its idiosyncratic interfirm linkages (Lavie, 2006; Madhok & Tallman, 1998). Through different collaboration practices, firms can access their partners' resources (Danneels, 2011; Gulati, 1999; Prahalad & Krishnan, 2008) and utilize their own external resources more effectively. According to this theoretical perspective, this access to external resources is more valuable to the firm than the acquisition of the equivalent resources. The key idea of the collaboration is that cooperation creates mutual benefits for both parties. These advantages have been termed relational rents or collaborative advantage (Dyer & Singh, 1998). From the relational view, providing solutions to the firm's customers by utilizing its network, network management capability can be a key source of manufacturer's rents as this network enables the solution provider to develop, sell, and deliver more complex solutions than the firm would be able to develop alone (Davies, Brady & Hobday, 2007; Ferreira et al., 2013). This capability can also fulfill the VRIN

characteristics, indicating that the management of external resources can be a key source of a solution provider's sustainable competitive advantage.

Extant studies suggest that to successfully exploit its external resources and generate mutual benefits, a firm should create long-term relationships (Dyer, 1997), build trust among the parties (Dyer, 1997; Dyer & Chu, 2003; Kohtamäki, Partanen, & Möller, 2013), and improve knowledge-sharing routines (Dyer & Singh, 1998). The existing studies have also emphasized the importance of partner fit, indicating that the partners should be compatible with each other and possess complementary capabilities (Dyer & Singh, 1998). Scholars have suggested that firms should be careful in partner selection and that they should pay special attention to evaluating potential candidates before starting to cooperate (Eisenhardt & Schoonhoven, 1996). Researchers have also warned managers about using the so-called arm's length mechanism (the price-based governance mechanism) in strategic relationships and the threat of opportunism (Dyer, 1997) as they can hinder a partner's motivation to innovate, seek cost-benefits, and develop the relationship. However, as not all business relationships are strategic, the price-based mechanism can be useful in less-strategic business relationships or sourcing categories with less information asymmetry or strategic relevance and fit.

### 2.2.3 Critique of the resource-based view

As the resource-based view has become more influential, questions about the value of the view have been raised (e.g., Porter, 1991; Priem & Butler, 2001). Priem and Butler (2001) observe that the resource-based view might not constitute a theory as it carries the risk of tautology and lacks specificity. The risk of tautology arises because resource characteristics such as being valuable and rare capabilities are offered to explain competitive advantage, while at the same time value and rarity also define the competitive advantage (Priem & Butler, 2001). Accordingly, at its worst, the resource-based view is circular, and there is a question mark over the chain of causality. To demonstrate this, successful firms outperform their rivals because they have unique resources and they should nurture those resources to be successful. Researchers are interested in what a unique resource is and what makes it valuable; how can a firm create or acquire a unique resource; why the current owner of the resource did not bid the value away, and what allows a resource to retain its value in the future? (Porter, 1991). The criticism of a lack of specificity in the resource-based view refers to the literature not being very specific about the activities and processes that comprise capabilities. The resource-based view has also been criticized for not providing

practical assistance for managers (Lockett, Thompson & Morgenstern, 2010; Priem & Butler 2001; Vesalainen 2010). To address that criticism, Barney (2001) asserts that the resource-based view helps managers to identify and develop the most critical capabilities of the firm. Nonetheless, he concedes that there is a certain need to gather more information about how the resources are deployed or how people act when a firm is in the process of gaining competitive advantage.

## 2.3 Prior studies investigating servitization capabilities

As the RBV has become the predominant theoretical paradigm among strategy, management, and marketing scholars, servitization researchers have adopted this theoretical background to study the capabilities required in the industrial service business. Researchers have studied the servitization phenomenon through the lenses of the RBV, the KBV, DC, and the relational view. The prior literature has found that manufacturers that have benefited from services have developed deeper relationships with their dedicated customers (Kohtamäki & Partanen, 2016; Penttinen, 2007; Tuli et al., 2007), suppliers and intermediaries (Gebauer, Paiola & Edvardsson, 2012; Johansson & Olhager, 2004; Parida et al., 2014; Raddats & Burton, 2014), utilized the data acquired from the IB (Porter & Heppelmann, 2015; Ulaga & Reinartz, 2011; Wise & Baumgartner, 1999), reorganized their sales processes (Reinartz & Ulaga, 2008; Sheth & Sharma, 2008; Storbacka, 2011) and organizational structures (Kindström, Kowalkowski & Sandberg, 2013; Oliva & Kallenberg, 2003; Turunen, 2013), and enhanced their project-management capabilities (Davies & Brady, 2000).

It should be noted that most of the extant capability studies on servitization have been published in marketing journals (Lightfoot, Baines & Smart, 2013; Tronvoll et al., 2011). Accordingly, the original nature and linkage to strategy has to some extent been overlooked in many studies as the studies have concentrated on marketing-related concepts such as customer-relationship management (e.g., Tuli et al., 2007), customer demand creation (e.g., Storbacka, 2011), and various value-constellation conceptualizations and descriptions (Kowalkowski, Witell & Gustafsson, 2013). Moreover, previous studies have mostly applied qualitative research methods and used mainly relatively large manufacturers to describe the phenomenon. In their seminal study, Ulaga and Reinartz (2011) found that servitized manufacturers possess four critical resources: product usage and process data derived from the firm's installed base, product development, and production assets, an existing product sales force and distribution network, and a field service organization. To leverage these resources to provide a competitive edge (whether through cost leadership or differentiation), manufacturers build

five key capabilities: 1) a service-related data processing and interpretation capability, 2) an execution risk assessment and mitigation capability, 3) a design-to-service capability, 4) hybrid offering sales capability, and 5) hybrid offering deployment capability. The authors suggest that future studies should take the customer perspective into account to verify their findings. Moreover, Ulaga and Reinartz (2011) do not discuss *how* these capabilities are built in practice. Accordingly, management processes to deploy resources are a black-box in their study and not discussed in detail. On the other hand, Storbacka (2011) sheds light on business processes by considering commercialization, industrialization, and a solution platform as parallel processes within the company. Based on a cross analysis of these three processes and four specific solution development phases (solution development, demand creation, solution selling, and solution delivery), Storbacka lists 64 (operational) capabilities and management practices pertinent to the effective management of the solution business. Spring and Araujo (2013) build purely on the work of Penrose (1959). In their single-case study based on one firm's individual projects and products, they highlight the role of sensing and seizing the productive opportunity, and that of network reconfiguration to address this opportunity.

In sum, the extant servitization literature has identified capabilities required to develop solution business. However, the extant studies neglect the importance of strategic business processes, or list a wide array of different operational capabilities and management practices. The extant literature overlooks how capabilities are linked to a corporation's overall strategy creation and execution. Article 1 offers a detailed review of the previous capability studies on servitization, their key contributions, and main limitations.

# 3 METHODOLOGY

Porter (1991: 99) stresses that "*academic journals have traditionally not accepted or encouraged the deep examination of case studies, but the nature of strategy requires it. The greater use of case studies in both books and articles will be necessary for real progress at this stage in the field's development*." By building on that observation, this dissertation will increase understanding of the strategic and dynamic capabilities required in the industrial solution business by providing case-based evidence of the resources and capabilities manufacturers' possess, develop, integrate, and release when adding more complex services to their existing offering. The following chapter discusses the dissertation's underlying philosophical assumptions and choices, the methodology used, and the research design and methods.

## 3.1 The study's philosophical assumptions

This chapter explains the reasoning behind the study's underlying philosophical assumptions and the selection of the chosen method. According to Myers and Avison (2002), qualitative research can be *positivist, interpretive*, or *critical*. Studies based on *positivism* are mainly meant to test a theory. Positivist studies thus assume that the environment is similar for everyone and highlight the reasoning through regularities, labels, structures, and causalities. Positivist studies seek objectivity, and therefore highlight rational and logical approaches to conducting research (Carson et al., 2001). *Interpretive* studies assume that people experience the same things differently, and thus adopt a viewpoint that regulation (not radicalism) drives changes to society (Burrell & Morgan, 1979). Interpretive studies are based on hermeneutics, which leans on interpretation and an in-depth understanding of the subject (Kusch, 1986). In interpretive studies, the researcher's observations go hand in hand with the theory. *Critical* studies attempt to overcome the status quo, thereby viewing the existing social conditions as restrictive and estranging (Orlikowski & Baroudi, 2002).

This research is an interpretive study. It is not based on positivism as it assumes that different actors can experience the existing situation, environment, and domain differently; nor is the study is a critical study, as it does not attempt to seek to change the solution providers' way of doing things during the research. Instead, the research is an interpretive study where observed data (e.g., transcripts, secondary text) are considered to be a reflection of a reality. In the current research, the data are based on primarily on interviews and are

complemented with secondary data such as firm histories, public documents (e.g., annual reports, press releases etc.), and other strategic documents. Moreover, the researcher's observations, and theory go hand in hand, reminiscent of an *abductive reasoning* logic. Accordingly, this research does not attempt to test hypothesis like positivist studies or formulate new theories as might be found with a *grounded theory* approach.

According to Guba (1990), scientific work is always based on ontology, epistemology, and methodology. *Ontology* refers to a researcher's understanding of the world and basic assumptions about reality. Ontology has been defined as the science of being and is related to the question of whether objective reality exists (Burrell & Morgan, 1979). *Epistemology* refers to how we perceive the world, how research can increase the knowledge of the phenomenon and asks how we know what we know. Epistemological choices are typically consequences of ontological assumptions. All researchers should be aware of these underlying philosophical underpinnings and select lenses through which they view and investigate the phenomenon (Burrell & Morgan, 1979). Alvesson and Sköldberg (2010; see also Guba & Lincoln, 1994) emphasize that ontology and epistemology determine the chosen *methodology*. Accordingly, methodology depends on the philosophical assumptions made, not the other way around. The methodological questions should answer the question: "How should the researcher inquire into the knowledge?"

### 3.1.1 The study's ontological choices

Guba and Lincoln (1994) classify ontological paradigms into 1) positivism, 2) post positivism, 3) critical theory and 4) constructivism. Positivism assumes that reality is not dependent on observers' perceptions. Ontologically, natural sciences typically represent positivism as they attempt to explain causalities and lawlike generalizations (e.g., a firm exhibiting the largest output-to-input ratio is more productive than other firms). In positivist studies, researcher and respondent are viewed as not being dependent on each other. In post positivism (or post empiricism), reality is assumed to be imperfect because human beings are assumed not to fully understand reality. Post positivism takes the view that a researcher's background and values can affect what is observed. In critical theory, reality is shaped by different values that evolve over time (e.g., social and economic values). In constructivism, reality is intangible, and socially constructed, thus shaped by people's experiences of the world and dependent on the informants' personal perceptions (Schwandt, 1994). In addition, reality can change as the individuals acquire and assimilate new knowledge. Ontologically,

this research presents social constructivism as it assumes that reality is socially constructed and shaped by informants. Reality is thus constructed from respondents' interpretations and consciousness of the world.

### 3.1.2 The study's epistemological choices

Epistemology is best viewed as knowledge about knowledge. It addresses the question of how a researcher knows what he/she knows or does not know, and what constitutes scientific knowledge. Epistemology can be defined as the relationship between observer and reality (Carson et al., 2001). Epistemologically, this research is interpretivist as the reality is seen as multifaceted, relative, and complex. In addition, the knowledge has been acquired in this research flexibly and personally, unlike in positivist studies where the collection of data is relatively rigid and distanced from the informants. The researcher also perceives the respondents' discourses as reflections of reality. Moreover, the researcher also entered the field with some prior insight into the subject but developed the research design during the research process when necessary because of the complexity and unpredictable nature of the reality. The researcher also believes that the knowledge held deepens during the research process as the informants give additional insights into the subject. Therefore, interpretivist studies are open to the knowledge as knowledge is viewed as evolving and accumulating. Instead of predicting cause and effect, this interpretivist research aims to understand and interpret the meanings, reasons, and subjective experiences affecting the respondent, and to draw a picture based on these socially constructed realities. In sum, this means that the researcher assumes that reality exists but that a person's experiences and environment shape his/her understanding and perspective on the reality. Hence, the data gathered for the research purposes construct reality but the reality depends on the experiences of the data sources (e.g., interviewees, storytellers, authors). The researcher accepts these constructs and considers the information given by the interviewees is real. Simultaneously, however, the researcher must be aware that his/her understanding of the research objective and research process represents his/her own interpretation of the subject.

Service researchers focusing on methodological issues (e.g., Luoto, Brax & Kohtamäki, 2016; Ostrom et al., 2010; Tronvoll et al., 2011) claim that there has been little discussion of ontological and epistemological issues or paradigmatic assumptions that shape the service research field because service research has focused mainly on managerial relevance, such as measuring and managing service quality, blueprinting the service delivery process, developing new

services, or establishing service strategies (functional paradigm/positivist studies). Based on this observation, prior service studies focusing on philosophy of science have encouraged service researchers to reflect their ontological and epistemological foundations more clearly. Extant studies have found that the positivistic option has been the dominant paradigm employed by service scholars and these studies suggest that service researchers should pay attention to three other paradigms (the hermeneutic, dialogic, and monologic) to enrich and extend the service research discipline. This dissertation addresses these concerns in that the research is an interpretivist/hermeneutic study that attempts to understand the phenomenon of servitization capabilities through rich empirical qualitative data.

### 3.1.3 The study's methodological choices

Tronvoll et al. (2011) state that alongside ontology and epistemology, methodology is a vital element of a paradigmatic foundation. Methodology is the study of the epistemological assumptions implicit in dedicated methods, including the angle adopted to look at the phenomenon. Methodology explains the relationship between the theory and the method, and how a researcher obtains knowledge of the phenomenon. The chosen research strategy is a set of choices that guide method selection through the research process. In service research, scholars have typically used different snapshot methods, such as surveys, to acquire an understanding of the phenomenon, or to understand the current state of the phenomenon. In addition, researchers have increasingly started to use methods that allow them to follow actors (focal firms, personnel, and business relationships) over time. Recently, researchers have increasingly started to acquire and utilize longitudinal data to study service processes for a longer period.

A case study is a suitable method when seeking to answer the question "how and why is the phenomenon like it is in real-life?" Accordingly, it seeks to understand the phenomenon in a more detailed way than surveys can deliver. Unlike when basing findings on survey data, generalizations to the population cannot be made (Eisenhardt & Graebner, 2007). However, theoretical propositions can be advanced based on case studies (Yin, 1994). Case studies can be divided into intensive, comparative, and action research case studies. Intensive case studies are used to develop theories from exploration, and they potentially face a threat of lack of external and internal validity (Cunningham, 1997). Using a single case as a study's unit of analysis could be an example of an intensive case study (see e.g., Danneels, 2011). Comparative case studies are utilized to develop concepts

based on case comparisons between multiple cases. This form attempts to seek patterns across the cases to verify the phenomenon's existence. Action research case studies are especially useful when attempting to understand change in detail. Typically, the action research method utilizes the researcher's active participation in the process through ethnographic research methods such as intervention or observation, and attempts to analyze the reality through deep involvement. This research is a qualitative comparative case study as multiple organizations or business relationships have been compared to develop concepts related to organizational capabilities.

### 3.1.4 Research design

Research design refers to process of linking the collected data to the initial research questions (Edmondson & McManus, 2007). It includes sample selection, data collection, and data analysis. This dissertation investigates how manufacturing firms manage and alter their organizational resources to create wealth from solutions. To address this main research question, four different qualitative research strategies have been applied. In Articles 1, 2, and 4, quantitative methods have been utilized to select outlier cases that represent exceptionally successful solution providers or dyadic business relationships. In Article 4, the cluster analysis was applied to select the representative cases (business relationships that were outliers) for in-depth analysis based on the generalizable quantitative dataset. Article 3 is an exception with regards to the case selection process and utilizes a purposive sampling method as the cases were selected from the population of listed Finnish machinery manufacturers that were evidently successful in the solution business. Moreover, Articles 1, 2, and 3 utilize longitudinal data (collected during the years 2010–2016) whereas Article 4 analyzes cross-sectional data to obtain knowledge of a learning in complex B2B-relationships. The unit of analysis in Article 4 is the business relationship, whereas the other articles focus on studying the focal company's competitiveness or strategic renewal. All of the studies include the usage of a triangulation technique. This technique was used to verify the executives' interpretations and conclusions on the subject by utilizing secondary data and interviewing managers that did not represent focal companies (these external interviewees represented strategic customers' or suppliers' viewpoints of the sources of focal companies' competitive advantages).

### 3.1.5 Data collection

Every article discusses the data collected in some detail. According to Yin (1994), qualitative case studies typically utilize documentation, interviews, archival data, observation (participating or direct observation), and physical artifacts to collect the data. This research has utilized documentation, archival data, and interviews as its main sources of data. Collecting data from different sources enabled the researcher to triangulate the data, and seek patterns across the cases. As interviews were the main source of the data, the researcher has utilized semi-structured interviews when interviewing the executives. However, even though a number of different research topics and questions were prepared before the interviews were conducted, the researcher improvised during the interviews if something new arose that required further elaboration during the interview. Therefore, using semi-structured interviews provided the researcher with both a structured and flexible method of data collection. This was necessary because the research is not a positivist study nor is it intended to develop new theory (the grounded theory approach).

In total, in collaboration with his co-authors, the researcher has studied 28 different manufacturers, conducted 68 executive interviews, participated in 19 service-related strategy workshops, organized six strategy research seminars and collected/analyzed extensive secondary data to formulate, test, and utilize this dissertation's findings and contributions. Additionally, during the research process, the researcher was involved in two action-based research projects in two Finnish-based companies. These action-based research projects included 40 senior manager interviews and 21 service business development meetings with the firms' executives. The researcher led the discussion on how the service business could be developed in each company in these service business development meetings. These research projects were important when developing new ideas, testing those ideas in practice, and getting unpolished information from practitioners to understand the challenges related to solution business development in manufacturing companies.

### 3.1.6 Validity and reliability of the research

In qualitative case studies, reliability refers to how well the research method produces the same results each time the same research is carried out. Therefore, it accords with the repeatability of the research. Validity refers to how well the research gives a correct answer and measures something that is of research interest. Yin (1994) suggests four tests to evaluate the quality of empirical qualitative research: 1) construct validity, 2) internal validity, 3) external validity,

and 4) reliability. Although some researchers (e.g., Eriksson & Kovalainen, 2008) have criticized these measures, and suggested other dimensions to measure the trustworthiness of qualitative research through the credibility, transferability, dependability, and confirmability dimensions, the traditional classification is used in this study. Construct validity refers to the operationalization of test measures for the studied concepts. To enhance construct validity, a researcher can use multiple sources of evidence, establish a chain of evidence, and an inquiring review from the key informants in an inquiry. To increase construct validity, multiple sources of evidence such as interviews, secondary data, and quantitative data were employed to supplement the research. A chain of evidence was generated in this research by citing the quotations appropriately, and illustrating the theoretical concepts or phenomenon of the subject through citations (see Richardson, 1990). The researcher also created a database of the interviews (e.g., time, place, and length of the interviews) and transcripts (e.g., length of the transcribed text). Internal validity refers to causal relationships, where certain conditions are proved to lead to other conditions, hence distinguishing them from spurious relationships (Yin, 1994). This is important especially in positivist studies to explain and show the linkages (for instance, to show the effect of an independent variable on a dependent variable). Therefore, this does not concern descriptive or exploratory case studies. External validity accords with the generalization of the findings. External validity can be achieved through the usage of the replication method in multiple-case studies. The current research achieves this by establishing a cross-case analysis in every article (28 different internationally operating manufacturers were studied; see Huberman & Miles, 1994). Reliability can be achieved by following a case study protocol such as that advocating designing a case study, preparing data collection, collecting evidence, analyzing evidence, and reporting case studies (Eisenhardt, 1989b; Huberman & Miles, 1994; Yin, 1994). The interview process in this research has followed a common list of themes with more detailed questions under each theme. All of the interviews in this study were recorded with permission and transcribed.

Table 5 summarizes how the researcher has attempted to ensure the study's reliability, credibility, and validity. Furthermore, Table 5 lists research practices applied to ensure better reliability and validity of the research. It also points out how the researcher acquired a pre-understanding of the subject and how the results have been utilized in practice.

**Table 5.** Reliability and validity of the research

| Criterion | Research practice to address criterion |
|---|---|
| Pre-understanding of the subject | Becoming familiar with the topic by exploring services marketing and management literatures before starting the research process<br>Pilot studies to develop a semi-structured interview template and obtain a pre-understanding of the phenomenon (servitization capabilities) in the companies |
| Construct validity | Collecting and utilizing multiple sources of data (e.g., interviews, secondary data)<br>Use of citations to illustrate the phenomenon<br>Inquiring review from the key informants in an inquiry<br>Creating a database of the interviews/interviewees |
| Internal validity | Both within-case and cross-case analyses were executed<br>Use of longitudinal data<br>Use of a Gioia-method to build explanations from the data |
| External validity (generalization) | Use of a purposive sampling technique to select cases<br>Use of a systematic case selection method to select cases (utilizing the results from the quantitative study)<br>Dozens of internationally operating Finnish solution providers (exporters) from different industries (machinery, technology sectors) were studied (both MNEs and SMEs) |
| Reliability | Designing a case study<br>Preparing data collection (e.g., phone calls to the executives)<br>Collecting evidence (all the interviews were recorded with permission and transcribed shortly after the interview took place)<br>Memos of the research interviews and meetings were created<br>Analyzing evidence (NVivo software was utilized to analyze the data)<br>Reporting case studies (case descriptions are presented in the articles)<br>Use of a triangulation technique to verify the explanations |
| Practical relevance | Discussion of the studies' findings in the companies<br>Workshops related to the study's findings were arranged<br>Researcher's suggestions related to service business development were implemented in the participating companies |

# 4 ARTICLE SUMMARIES

The dissertation consists of four separate articles that focus on modeling a servitized manufacturer's capability building processes. Three of the articles were published in refereed international journals and one article was published as a conference proceeding (a review process was carried out in this proceeding). This chapter summarizes up the articles' key results and contributions. The published articles are incorporated in the second part of the dissertation.

## 4.1 Solution providers' strategic capabilities

Article 1, entitled *Solution Providers' Strategic Capabilities* studies the strategic capabilities of an industrial solution provider. Specifically, the manuscript investigates how a manufacturer transfers its distinctive resources into strategic capabilities through strategic business processes. This is one of the first articles to describe, define, and illustrate how resources are deployed in practice. The key to this *wealth creation* from solutions lies in the clever usage of strategic business processes, namely *productivity-increasing*, *customer-value enhancing*, and *innovation-enabling strategic business processes*. As strategic capabilities emerge from the combination of a firm's distinctive resources and strategic business processes, the solution provider's distinctive resources are categorized as 1) the installed base of products and service contracts, 2) physical and technological assets, 3) intellectual capital, 4) human capital, 5) financial assets and 7) external assets. In leveraging these distinctive resources, the studied solution providers built a total of seven strategic capabilities: 1) fleet management capability, 2) technology-development capability, 3) M&A (mergers and acquisitions) capability, 4) value quantifying capability, 5) project-management capability, 6) supplier network management capability and 7) co-creation capability.

These identified capabilities explain why some solution providers outperform their competitors in the business markets. Some companies are better able to exploit their installed base data than others; some are technology leaders and more innovative in terms of developing new products, services, and processes than others; a few manufacturers possess the ability to identify undervalued firms, and acquire, and integrate them; some are better at identifying, quantifying, communicating, and verifying the value obtained by the customer, or to convince the customer of the usefulness of the solution; a few manufacturers have better project-management abilities than others; some manufacturers

generate a competitive edge in the markets by leveraging their supplier network more effectively, and some manufacturing companies are better at building long-lasting business relationships with their (strategic) customers. Figure 4 illustrates how the solution providers' strategic capabilities might be materialized.

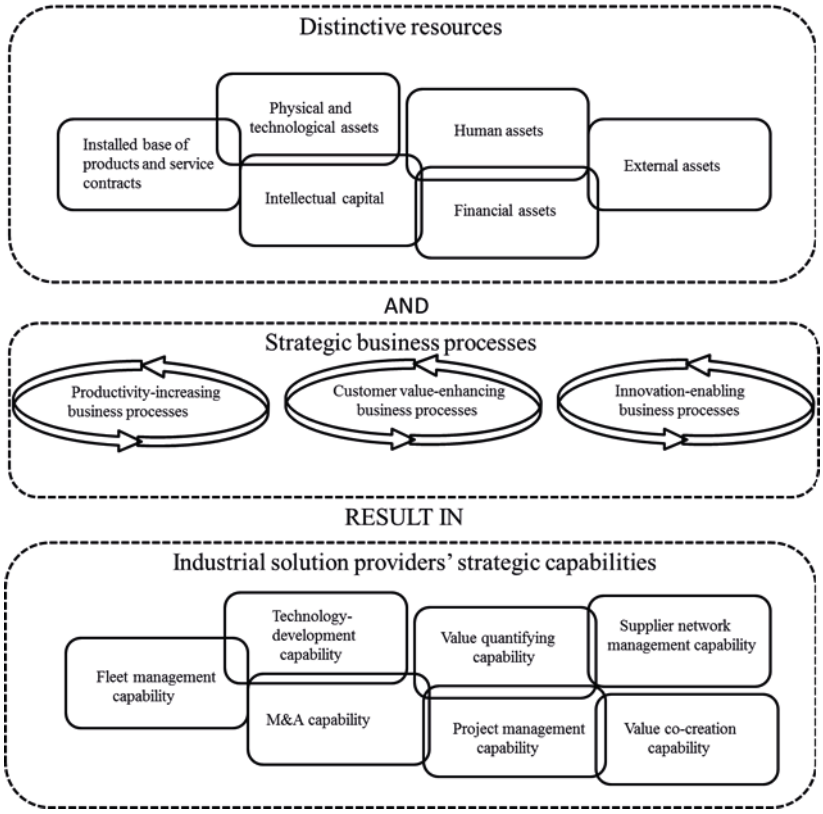


**Figure 4.** Materialization of industrial solution providers' strategic capabilities

The presented model could help managers to identify how strategic capabilities can be built. In addition, the model could be utilized to prioritize capability development initiatives. For instance, managers could use the model to establish dedicated strategic development programs (SDP) to build or enhance a dedicated strategic capability. For instance, if a manufacturer estimates that digitization will affect the firm's competitive landscape in the near future, it could establish a strategic development program related to fleet management capability for the next 3–5 years. The firm might also appoint a top executive responsible for the service business as owner of the particular development program to lead and measure the implementation of the strategic development program.

## 4.2 Resource realignment in servitization

The dissertation's second article, *Resource Realigment in Servitization* examines how a manufacturer can successfully alter its organizational resources as it becomes a solution provider. The article's theoretical grounds are the dynamic capability approach, that is, in those skills and behaviors that support the firm's strategic renewal from the inside out. The study maps three key resource alteration modes to change a manufacturer's strategic orientation: 1) *creating* new resources, 2) *leveraging* existing resources and 3) *releasing* existing resources. The study finds that successful Finnish solution providers acquired and built new organizational capabilities and structures to promote closer interaction and collaboration with their customers, leveraged their existing resources into new service products that enabled them to increase their share of the customer's wallet, and dropped their existing administrative and non-core resources to focus on nurturing future and other strategic resources. Table 6 describes the alteration modes and associated practices the studied solution providers implemented to transform their orientation from a product business toward a solution business.

**Table 6.** Alteration modes and associated practices in servitization

| | Alteration Modes | Specific Practices * |
|---|---|---|
| Creating | • Reorganization<br>• Appointment of influential person as service business director<br>• Competence-based training program<br>• Mergers and acquisitions<br>• Hiring for specific skills<br>• Job rotation and management team restructuring<br>• Joint ventures, strategic alliances | • Creating a separate, flexible organization to develop, sell, and deliver services (7)<br>• Nominating a service director to a top management group (4)<br>• Establishing a strategic development program to sell services and solutions (5), separating service teams from the product sales force (6), and developing value-based selling techniques (6)<br>• Acquiring (small) service firms (6)<br>• Creating a concept for remote diagnostics (5) and hiring new people with a service mindset (9)<br>• Rotating management team and personnel between different business units (6)<br>• Creating strategic alliances or joint ventures to deliver services and solutions (9) |
| Leveraging | • Attracting new customer segments<br>• Searching for new solutions, products, and services<br>• Acquiring service companies to increase the installed base of products and service contracts and to improve route density<br>• Servicing competitors' products<br>• Leveraging existing customers and suppliers to deliver increased scale, scope, and innovations | • Leveraging existing resources for new customers and markets/industries (5)<br>• Leveraging existing technologies and staff expertise to benefit new products and services (9)<br>• Acquiring companies to increase installed base (5)<br>• Servicing competitors' or third-party products (5)<br>• Making relationship-specific investments (site, physical, and social investments) and building relational structures (management and development teams, mutual IT systems) with dedicated customers and suppliers (9) |
| Releasing | • Outsourcing<br>• Offshoring<br>• Divestments<br>• Layoffs<br>• Transforming fixed costs to variable costs<br>• Compressing supplier network<br>• Joint ventures with planned exits | • Outsourcing administrative and non-core resources (9)<br>• Releasing and offshoring standard products (6)<br>• Divesting component production, process, product businesses (6)<br>• Initiating layoffs in product business (9)<br>• Developing from fixed to variable costs (8)<br>• Reducing the number of component suppliers and centralizing the sourcing of systems (9) |

*Numbers in parentheses indicate how many firms in the sample engaged in the particular practice.

The presented framework describes how companies change themselves by altering their resources. The study suggests that all of the modes must take place when a manufacturer is changing its strategic domain toward a solution business one because of the lack of financial and managerial resources. The modes can be also counteractive; so, for instance, a firm might reduce its supplies from component providers to source more comprehesive solutions from its strategic system suppliers (and thus leverage its existing suppliers' resources), or shed its purely production resources to acquire service-related competencies. The presented framework helps executives to identify the required change modes and specific practices that could boost a manufacturer's strategic renewal process. The framework could guide executives planning dedicated initiatives and activities to steer the change, and is thus reminiscent of a map that links a firm's vision and developmental processes into its strategic guidelines.

## 4.3 How manufacturer's organizational routines are transformed to facilitate a transition from goods to services?

The third article is entitled *How Manufacturer's Organizational Routines Are Transformed to Facilitate a Transition From Goods to Services?* The study contributes at the intersection of the dynamic capability perspective and servitization literature by investigating how organizational routines are transformed in those manufacturing companies that have successfully transitioned from a goods to a services orientation. According to the findings of extant organizational routine literature, the article underlines that routine rigidity occurs more often than resource rigidity. Therefore, it is easier to alter a firm's resource base than its underlying organizational routines. The study's results indicate that a manufacturer needs both ostensive and performative routines to manage its strategic renewal successfully. Ostensive routines refer to the ideal, schematic, abstract, and general form of a routine that is typically managed from the top down. Performative routines, however, refer to those behavioral changes and particular actions that happen at the individual or team level, typically occurring from the bottom up. In addition to these two regular forms, based on the content of a routine, the article classifies three distinct initiatives related to routine changes, namely strategic, structural, and operational initiatives. Figure 5 presents the dedicated initiatives and routines the studied manufacturing companies undertook to foster the strategic change toward the solution business.

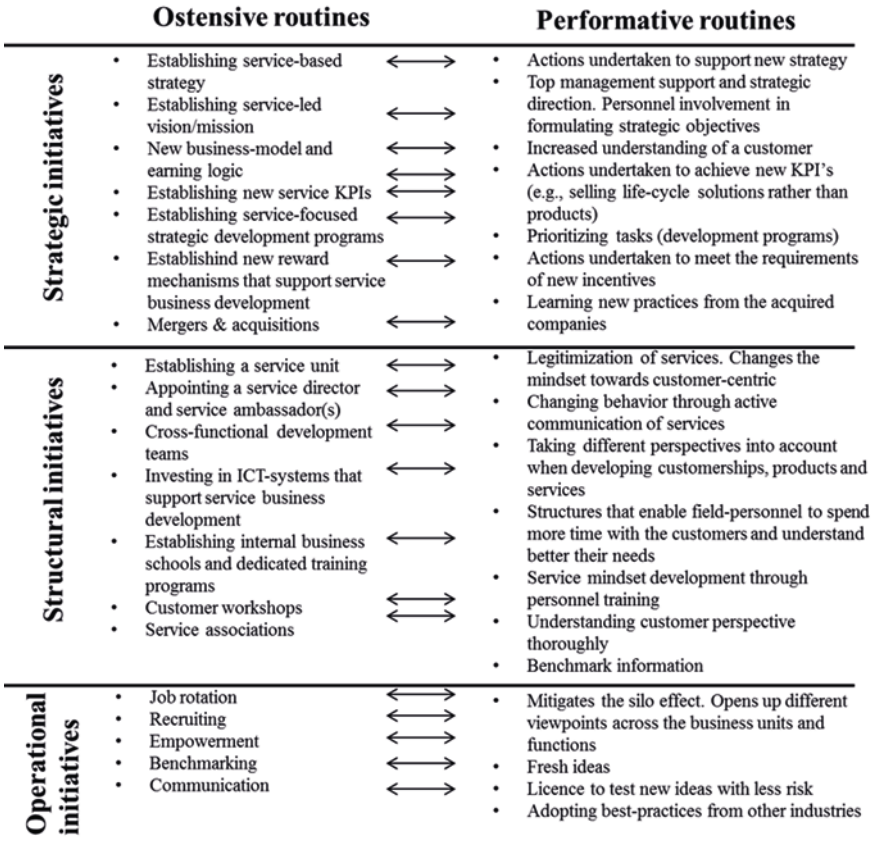


**Figure 5.** Routine changes to develop the solution business

The presented framework allows managers to develop strategies, structures, and initiatives that aid a manufacturer to develop and track new customer-related routines. Managers should pay special attention to the adoption of new routines. Managers should ensure that in addition to ostensive routine changes, personnel behavior and everyday practices also change. For instance, managers can decide to invest in new agile ICT-systems, but they should ensure that these investments result in the desired new habits being adopted.

## 4.4 Joint learning in R&D collaborations and the facilitating relational practices

Article 4, entitled *Joint Learning in R&D Collaborations and the Facilitating Relational Practices* studies the mutual learning in dyadic and complex R&D collaborations between R&D solution providers and their most strategic customers. The study contributes to the intersection of the dynamic capability perspective and R&D literature by investigating relational practices that enable learning in B2B relationships with high information asymmetries. The article

suggests that relational learning in deep strategic dyads requires joint relational investments, structures, and capital that support knowledge sharing, joint sense-making, and integration into relationship memory. Relational learning enables collaborating companies to outperform their rivals by developing new innovative solutions for the industrial markets, and by adapting to changing market conditions rapidly. Figure 6 presents the holistic framework that describes the mechanism of mutual learning in a B2B relationship.

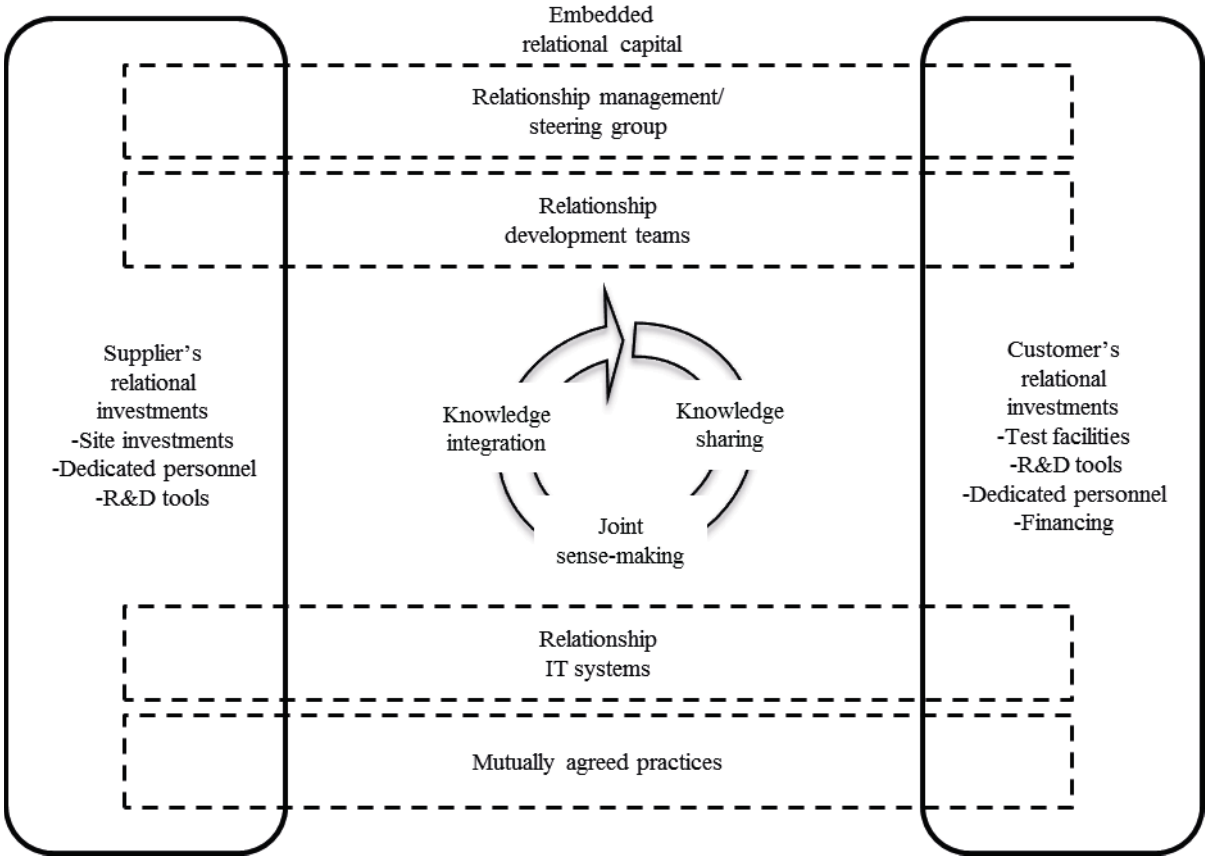


**Figure 6.** Joint learning and relational practices in dyadic R&D collaboration

The study could guide executives evaluating which relational structures and investments enable firms to achieve mutual benefits through collaboration, increase mutual learning in the business markets, and reduce the risk of opportunism on the part of the counterpart. The framework can be applied in several partnerships across the value system, whether with customers, or system suppliers. It is at its most useful when the company is attempting to foster learning in its most strategic, interdependent, and deepest business relationships.

# 5 DISCUSSION AND CONCLUSIONS

This dissertation intends to understand how manufacturing companies manage and alter their organizational resources, capabilities, and routines to execute servitization strategies successfully. The dissertation addresses gaps in the extant servitization literature by modeling how manufacturers build, acquire, develop, exploit, and shed different organizational capabilities and procedures to increase solutions development, sales, and delivery. Moreover, the dissertation advances the resource-based perspective by conceptualizing how both strategic and dynamic capabilities are materialized in the context of servitization. The final section of the first part of the dissertation outlines the dissertation's theoretical and managerial contributions, its main limitations, and potential future research avenues.

## 5.1 Theoretical contributions

The overall aim of this dissertation is to improve understanding of how manufacturing companies manage their organizational capabilities to support wealth creation from solutions. The dissertation attempts to address this concern from four different perspectives presented in four articles. Each article contributes to the specific research question by providing empirical evidence of the phenomenon.

The first article seeks to answer the question: What determines the solution provider's strategic capabilities? This research question has been formulated because the extant servitization literature lacks the clarity of the strategic capability concept. In particular, the extant literature overlooks the concept of strategic business processes that are used to steer a firm toward achieving its strategic objectives. The key contribution of the article is the identification of a solution provider's seven strategic capabilities. These are fleet management capability, technology-development capability, M&A capability, value quantifying capability, project-management capability, supplier network management capability, and value co-creation capability. All of these strategic capabilities are distinct, and make it possible for a solution provider to create economic rents in the markets. Compared to the prior studies that have investigated wealth creation capabilities in solution provision settings (e.g., Spring & Araujo, 2013; Storbacka, 2011; Ulaga & Reinartz, 2011) and as a second contribution, this study aditionally clarifies the critical component of strategic business processes in the emergence of strategic capabilities. The identified strategic business processes are

productivity-increasing, customer-value enhancing, and innovation-enabling business processes. Moreover, this study extends the concept of strategic capability by taking into account the importance of managing the firm's boundaries to the firm's performance. As a third contribution, this article classifies the solution provider's distinct resources (those resources that do not generate sustainable competitive advantage *per se*), namely 1) the installed base of products and service contracts, 2) physical and technological assets, 3) intellectual capital, 4) human capital, 5) financial assets and 7) external assets (including suppliers' and customers' resources). These categorized resources can be utilized to evaluate, benchmark, and manage a firm's existing resource base. Article 1 also has methodological implications. First, the article identifies the studied case firms based on results derived from a generalizable quantitative dataset. Second, the article utilizes triangulation technique to verify the study's results and conclusions. This triangulation technique has been encouraged in the prior servitization studies (see Ulaga & Reinartz, 2011) in addition to several methodological papers' suggestions (see Beverland & Lindgreen, 2010; Eisenhardt, 1989b). Article 1 is the only article in the dissertation that strictly contributes to the traditional resource-based view (and thus the static nature of capabilities). The paper is important because it describes the strategic capabilities that help a solution provider to take advantage of its extant markets and capabilities. The paper is published in the *Journal of Business and Industrial Marketing*.

Article 2 seeks to answer the research question: How does a manufacturer realign its resource base when becoming a solution provider? This research question has been crafted because the existing servitization and dynamic capability studies do not explain how product-based companies strategically renew themselves by changing their resource bases when becoming service-led companies. The article's main contribution is that it defines the key modes to reconfigure a firm's resources. These modes are 1) creating new resources, 2) leveraging existing resources and 3) releasing existing resources. The second article builds on the grounds of dynamic capabilities and advances the theoretical perspective by identifying the alteration modes and associated practices that support each mode in the context of solutions provision. However, the developed framework that describes a firm's dynamic capability is general and can be applied in different industries, firm types, and contexts. The paper is important because it addresses how a manufacturer can renew itself successfully in practice. The paper is published in *Research-Technology Management*.

The third article deepens the understanding of dynamic capabilities in servitization. It contributes to the organizational routines and servitization

literatures by answering the following research question: How do a manufacturer's organizational routines evolve when becoming a solution provider? This article is a continuation of Article 2, in that it addresses how organizational routines evolve when altering a firm's resource base. This paper was prompted by the observation that it is typically more difficult to change personnel behavior, and established routines and norms than it is to change resources. It is not particularly challenging for a top management team to reallocate resources, but changing routines typically requires leadership skills such as motivation, empowerment, and active communication. The article's first contribution is that it classifies routines as ostensive or performative. Ostensive routines are more abstract, general, and management-driven than performative routines that are defined as the actions undertaken by personnel. Article 3 differs from other articles in terms of case selection. As the other articles select cases based on results derived from quantitative datasets, the third article applies a purposive sampling technique. The cases used were selected from the Nasdaq OMX Nordic-listed manufacturing firms headquartered in Finland that have outperformed their peers through the adoption of servitization strategies. The paper is published as a conference proceeding at the *Industrial Marketing and Purchasing Conference 2016* in Poznań, Poland.

The fourth article sets out to answer the research question: How do manufacturers and their customers facilitate joint learning in dyadic business relationships? Article 4 contributes to the relational view and R&D collaboration literatures. The article builds on the grounds of evolutionary economics (Nelson & Winter, 1982) and the existing organizational research on dynamic capabilities by defining joint learning as a relational dynamic capability. The main contribution of the study lays in providing a broad and holistic illustration of how joint learning is a relational dynamic capability in conjunction with the relational practices that support it. The interplay between these relational practices and the dimensions of joint learning (knowledge sharing, mutual sense-making, knowledge codification) is central, and the latter are particularly important. Whereas knowledge sharing enables the spread of development ideas and knowledge, mutual sense-making facilitates the search for shared understanding with regard to new ideas that enable joint knowledge development. Moreover, relationship-specific memory reinforces the memorization and implementation of knowledge so that it can be utilized in the future. As a second contribution, the results extend the extant literature on relational investments in the development of relational dynamic capabilities. These relational investments facilitate dyads to share information, make sense of that information and integrate the information into relationship memory. The third contribution is the study's finding of relational structures for mutual learning. Relational structures such as mutual

ICT-systems, relationship steering groups, and development teams facilitate mutual learning in the relationships through establishing a more systematic way of collaborating. The study's final contribution is the finding of relational capital to relational learning. This finding suggests that relational capital generates commitment through the social norm of reciprocity, which further facilitates the dimensions of learning. Article 4 also has methodological implications as the study's relationships (n=7) were selected systematically from a quantitative dataset of manufacturer–customer relationships (n=91) by clustering the relational cases in terms of the extent of the R&D services (the higher value the better) and joint learning (the higher value the better) involved in the relationships. This article is particularly important when explaining the mechanism of the sources of relational rents (see Dyer & Singh, 1998) in the markets. As the management of a company's supplier network has been acknowledged as a key source of a competitive advantage for the manufacturer (e.g., Dyer & Singh, 1998; Dyer & Nobeoka, 2000; Gulati, 1999; Ryals & Humphries, 2007), this article highlights the importance of relational renewal and learning to the manufacturer's competitive advantage. The paper is published in *Industrial Marketing Management*.

## 5.2 Managerial contributions

All of the published articles in the dissertation have been designed to add practical value to the managers responsible for developing solution business. Some of the developed models have been tested in companies that have involved in the various DIMECC research projects funded by The Finnish Funding Agency for Innovation (Tekes).

This dissertation's results suggest that the manufacturing companies can create wealth from solutions if they are able to manage and realign their organizational capabilities properly. This inside-out view of strategy enables the manufacturer to create and execute new strategies or exploit existing ones successfully by adapting to the changing business enviroment or reshaping the competitive environment proactively. Executives should keep open dialogue with their staff on the firm's future direction and strategic choices. This conversation helps executives to understand what directions the firm's existing capabilities allow for the level of diversification or what new types of capabilities and strategic initatives will be required to achieve a firm's vision with regards to servitization.

As most of manufacturers fail to profit from services/solutions (see Reinartz & Ulaga, 2008; Shankar, Berry & Dotzel, 2009; Ulaga & Reinartz, 2011), top

executives should critically evaluate if there is a realistic possibility they will succeed in the solution business. In particular, executives should evaluate if they already possess the resources and capabilities required to provide solutions, or if they need to build and acquire new resources to execute the new solution-based strategy. Regardless, executives should make a general plan and a roadmap for the resources required to implement a successful servitization strategy. Specifically, executives should answer the following questions: 1) What resources do we need to acquire and build to develop, sell, and deliver solutions in the future? 2) What businesses should we enter in the future? What is the level of diversification? How should we leverage our extant resources to extend our product-service portfolio? 3) What businesses should we divest and which resources should we drop to develop and strengthen dedicated business/capability areas? By addressing these questions, managers can decide what businesses they are in and what types of resources are required in the dedicated business areas.

From the strategic renewal perspective, the results in the articles that apply dynamic capability theory imply that organizational renewal is primarily managed from the inside out. This means that the organization should alter its resource base by creating new resources, leveraging existing resources in new service products, and releasing non-core resources to focus on developing strategic resources. Second, an organization should focus on changing organizational procedures and routines to boost solutions development, sales, and delivery. Therefore, executives should ensure that in addition to resource development and modification, their staff's behavior also changes. In practice, managers can change the routines through establishing various strategic, structural, and operational initiatives. For instance, an organization can establish cross-functional development teams, invest in agile ICT-systems, create new organizational structures, establish new incentives to boost solutions sales, and empower personnel to develop new routines that foster solution business development.

The dissertation's results emphasize that forerunner companies can overcome the status quo of the commoditization trap when they master change, whether internal or external change. Adapters are those who are able to manage their internal change successfully, but they are not the executives able to reshape the industry's structures or fundamental business logic. Adapting to the changing business environment requires learning and adapting capabilities, and the ability to screen and assimilate changes that occur in the external business environment. On the other hand, manufacturers that are able to manage and control the external environment, are in a good position as their decisions affect

industry's basic structures and the assumptions among customers. This strategy is, however, the most demanding strategy as it requires substantial innovation capabilities and pioneer spirit. Solution providers can identify and classify their firms based on Miles and Snow's (1978) established classification of firm types based on a firm's applied decision-making processes. Miles and Snow (1978) suggest that there are four different strategy types in the markets: *prospector*, *defender*, *analyzer*, and *reactor*. A prospector is a risk taker and focuses on seeking growth and new markets/opportunities. A defender focuses on protecting its current markets and customers, and maintaining steady growth. An analyzer resembles a combination of prospector and defender, attempting to pursue innovations and simultaneously maintain stable growth. A reactor does not have a clear strategy and drifts with environmental events, usually failing to affect those events. Manufacturers can thus categorize themselves and their main competitors based on these classic strategy types. Capabilities and the strategic business processes emphasized are likely to differ depending on the firm's type. When prospectors focus more on innovation-enabling processes, defenders concentrate more on exploitative behavior such as serving existing customers and seeking advantage through continuous cost-savings.

Article 1 sheds light on the solution provider's strategic capabilities. The main managerial contribution in this article is it identifying three strategic business processes that successful manufacturers apply: 1) productivity-increasing, 2) customer-value enhancing and 3) innovation-enabling business processes. The first two strategic business processes refer to a firm's exploitative behavior, that is, advantage-seeking behavior in the current markets, whereas the third strategic business process accords with the firm's explorative behavior, that is, opportunity-seeking behavior outside a firm's current scope. As the prior studies on strategic learning have shown, firms tend to invest in exploitative activities at the expense of explorative ones, thus leading firms into an *exploitation trap* (Sirén, Kohtamäki & Kuckertz, 2012). This exploitation trap (see also *core rigidity*; Leonard-Barton, 1992, and *tragedy of commonness*; Shelton, 2009) indicates that companies overinvest in developing existing markets, products/services and customers. Furthermore, this short-term profit seeking behavior can hinder a firm's ability to achieve long-term advantages through expanding into new markets, technologies, customers, and business areas. The difficulty lies in finding the optimal level of investment to support certain behavior. Doing so involves ascertaining how much resource should be reallocated or how much capital should be invested in insecure initiatives that might move the company away from its current focus. Some managers have also misunderstood the concept of *core competence* and think it is about staying in a certain market, no matter what. The key concept of core competence is its

*extensivity*. For instance, Apple Inc. has been able to leverage its software competencies in multiple business markets, ranging from computers to mobile phones. Google, on the one hand, has taken this to a completely different level, and diversified into hundreds of different market areas through investments and acquisitions. One recommendation to a manufacturer is to invest no more in explorative actions/behavior than it is prepared to lose. Typically this ranges from 5% to 10% of the annual profits or R&D budget, or 15% to 30% of the personnel work load. Iconic (blue-chip) companies such as Google, Hewlett-Packard, Yahoo!, and 3M have become famous for systematically investing in exploration activities by giving license to their engineers/personnel to work on projects that are not strictly connected to their firm's current focus area during their working time. This has become known as the *Innovation Time Off* model (see Eisenhardt & Sull, 2011; Levy, 2011; Schmidt & Rosenberg, 2014). This model has resulted in unconventional products such as Gmail, HTML, MyYahoo or the Post-It Note (Schmidt & Rosenberg, 2014). In sum, the dissertation suggests that companies should consider using their slack resources to boost their personnel innovativeness and test their eccentric ideas. This model is not restricted only to companies operating in consumer markets but industrial manufacturers could also apply the same idea. For instance, elevator and escalator manufacturer KONE invented UltraRope, an ultra-light elevator rope with a carbon fiber core that reduces energy consumption in high-rise buildings, rope stretching, and downtime. This discovery was orginally tested by an individual engineer in his personal facility. The same unconventional thinking model might be applied in different organization functions such as procurement or HR. For instance, 5% of purchases could be made from small firms who are introducing revolutionary business concepts or every fifth recruitment decision could be based purely on a recruiter's intuition and gut feeling, thus bypassing the traditional education or proficiency requirements. In the marketing unit, some of the budget might be allocated to risky marketing initiatives.

The dissertation also suggests that managers should look beyond their firm's boundaries when analyzing and building the firm's competitive advantage. As it is no longer accepted that all the available expertise resides inside focal companies (see Chesbrough, 2003; Pittaway et al., 2004; Prahalad & Krishnan, 2008), the importance of suppliers' and customers' capabilities has been stressed recently. As it is presumed vertical disintegration will increase in the future in many industrial sectors (Jacobides, 2005; Macher, Mowery & Hodges, 1998), a focal company's ability to co-create value with its customers and work with its suppliers and third-parties to co-innovate have been stressed recently. As a Chief Information Officer from one of the firms studied in the course of the current research stated: "*99% of the industry's innovations are developed outside this*

*corporation. That's why the key thing is how to involve the partners in the development work*." As the significance of external parties increases, firms should pay special attention to partner identification, selection, and management processes. Following the similar logic of comparative advantage of a nation, firms can gain similar benefits through collaboration and product/service exchanges. However, this means that the firm will also simultaneously lose a degree of control. That risk can be mitigated by applying a dual sourcing strategy (competition), decreasing the risk of opportunism, increasing trust among the parties, and building cooperative competencies (Dyer, 1997; Dyer & Singh, 1998; Sivadas & Dwyer, 2000).

## 5.3 Limitations and future research avenues

As with any research, this dissertation research has limitations that must be acknowledged. These limitations can offer suggestions for future research avenues. In each article, the individual article's main limitations are discussed in detail, but this section focuses on describing the dissertation's general limitations and possible future research avenues.

First, all of the articles are based on a comparative qualitative case method, which does not permit further generalization of the results (Eisenhardt & Graebner, 2007). This leaves room for quantitative (functional/positivist) studies that could test the presented models in practice. For instance, future research could investigate which strategic capabilities and combinations of strategic capabilities enable manufacturers to outperform their peers in the markets. Quantitative studies would provide more generalizable results and help managers to understand which capability areas should be nurtured based on generalizable data.

Second, the dissertation examines solution providers operating in the machinery manufacturing and technology sectors. Accordingly, the results cannot be generalized to describe capabilities in other sectors and contexts. Future studies could study organizational capabilities, routines, and their evolution to provide solutions in sectors such as medical equipment, construction, chemicals, or the consumer markets. Specifically, future studies could investigate the servitization phenomenon in consumer product markets, and we might expect the results to differ remarkably from the form in B2B relationships. In B2B markets, business relationships are typically long-lasting, buyers are risk averse (see Luoto, Brax & Kohtamäki, 2016), and to some extent, more rational in their decision-making processes than consumers. Even though this is not necessarily an absolute, the

business logic in the B2B and B2C sectors seems to vary considerably as those managers operating in firms might be responsible to someone else for their decisions, personnel motivation and drivers differ because of their agent role, and they probably do not use their own money. Therefore, it could be intereresting to study how customers' roles as entrepreneurs and business managers are different, and how sales arguments should be tailored based on decision-makers' cognitions and decision-making styles. For instance, the way of selling performance-based services (i.e., the outcome economy) could be different because of the characteristics or the role of the decision-maker. When dealing with the risk-averse buyer, a seller should perhaps emphasize stability, safety issues, or reduced risk, whereas when talking to a risk taker, the seller should probably stress the increased profit and sales opportunities, and improved reputational issues. Future studies could investigate in more detail the customer's decision-making processes when they are sourcing solutions.

Third, a deeper understanding of the servitization process in individual firms is needed, and therefore future studies could use more single-case studies (intensive case studies) to examine the servitization phenomenon in-depth. Future studies could follow a similar research logic to that used by Danneels (2011) to report on typewriter giant Smith Corona's failure and lack of dynamic capabilities in the industry. In a similar vein, servitization researchers could investigate the successes and failures in servitization of individual companies, projects, or business relationships. Studies of iconic and successful servitized manufacturers such as GE, KONE, SKF, or Rolls-Royce could provide a detailed understanding of how the service business has developed during a corporation's history. Equally, Intel's or Rautaruukki's (SSAB at present) failures to go downstream could be studied academically in different business contexts to understand the key rigidities related to service business model implementation. This deservitization phenomenon should be conceptualized and studied systematically and in detail in future studies (see e.g., Kowalkowski et al., 2017; Valtakoski, 2016) from different capability perspectives, in single firm, project, or customer-relationship contexts.

Fourth, although longitudinal data are utilized in Articles 1, 2, and 3, more longitudinal quantitative studies are required to study the servitization effects on manufacturing companies' performances in the long term. Future studies could utilize panel data when studying the impact of servitization on manufacturer's profits, revenues, and the stability of income. Furthermore, future studies could apply a similar research method to Leitner and Güldenberg (2010) when they studied Austrian SMEs generic strategies (cost leadership, differentiation, focus, and stuck-in-the-middle strategies) and performance between 1995 and 2003.

They found that SMEs that pursued a *stuck-in-the-middle* strategy (mix of differentiaton and cost-leadership) achieved equal or greater financial performance to SMEs with a pure form of general strategy, and those that did not have any strategy performed weakest and were the most likely to go bankrupt. Following a similar method to that of Leitner and Güldenberg (2010) by taking snapshots of the same firms at different points in time, servitization researchers could repeat their quantitative studies in the future, follow-up the changes in servitization strategies, and analyze the performance effects during the reviewed research period. The future studies could thus answer the questions: how has servitization affected the manufacturer's performance? Have the manufacturer's changes in the usage of servitization strategies affected the manufacturer's performance? How have manufacturers applying servitization strategies performed against those manufacturers who have not applied servitization strategies or have not applied any strategies? Similarly, future studies could investigate solution providers' strategies and strategic capabilities at different points in time. Scholars could investigate the performance effects of certain strategic capability areas possessed and changes that have occurred in the usage of capabilities during the studied time frame. This research protocol would address the general concerns of measuring the effects of dynamic capabilities on a firm's performance.

Fifth, even though the dissertation acknowledges the importance of external assets to the firm's competitiveness, it does not adopt the network perspective as its unit of analysis. The extant servitization literature has in general overlooked how the focal company's network affects its financial and learning performance. Accordingly, future studies could take the network as the unit of analysis and analyze how focal companies might facilitate supplier network learning, or how suppliers interact and collaborate in the network. As the solution business requires system integration capabilities (see Davies, Brady & Hobday, 2007; Gebauer et al., 2010), a solution provider's ability to manage, steer, and control its network of suppliers, universities and intermediaries has become crucial (Watanabe, 2005). Future studies could follow a method similar to that of Dyer and Nobeoka (2000) who studied how Toyota facilitates knowledge sharing, learning, and identity in its supplier network. Future servitization studies could thus examine the black-box of knowledge sharing and learning within solution providers' networks. This would advance the knowledge of the sources behind *network rents*.

Finally, as the *outcome economy* is predicted to grow in the future (see Barkai, 2016), this business phenomenon would benefit from further investigation from different theoretical viewpoints. The outcome economy means that companies

are beginning to move from selling specific products/services to selling the quantifiable end results they produce such as operations and maintenance services (O&M) (see also the definition of PSS). This shift will prompt companies to focus on delivering what their customers actually need to achieve. New technology such as the IoT and sensors is key to acquiring customer-critical data. Armed with the resulting *big data* (huge volume data), today's manufacturers can obtain significant insights into their customers' business processes. Future strategy studies should examine what business models, organization structures, networks/ecosystems, organizational capabilities, and strategies are required to be successful in the outcome economy.

## 5.4 Conclusions

Understanding the origins of economic rents has long been the holy grail for strategy scholars, consultants, and executives (Herrman, 2005), and alternative explanations for firm competitiveness have been advanced. The *structure conduct performance* model (SCP; see Porter, 1980) has emphasized the importance of industry forces and structures to a firm's performance. In the 1990s, a firm's dedication to its core competencies became a major paradigm to explain a firm's above-average profits. Today, scholars and practitioners increasingly discuss *economic disruption,* meaning that disruption typically originates outside the market-leading companies. These market-leading companies are not able to pursue strategies of disruption because new business concepts are not initially profitable enough, and the firms are not able to adequately assess the threat posed by newcomers. Finally, the disruptor is able to conquer the markets from the established players by acquiring a majority of their mainstream customers through cheaper and sufficiently good solutions. From the strategy perspective, this can require *guerilla logic* from the companies. Guerilla logic emphasizes the firm's ability to sense and seize market opportunities rapidly, and act surprisingly in chaotic markets (see D'Aveni, 1994). More knowledge of the disruption in traditional sectors is needed. Future studies should thus investigate the strategies required from manufacturers to create disruption or protect themselves from the effects of disruption.

This dissertation builds on the resource-based perspective and takes a viewpoint that the capabilities a firm possesses and controls are the key sources of competitive advantage. This dissertation sheds light on how solution providers manage and alter their capabilities to create wealth from solutions in the industrial markets. In particular, this dissertation finds that manufacturing companies should develop their consultative selling capabilities. New sales

capabilities are needed because the focus is no longer on the technical features or small process improvements anymore. Instead, the solution provider must be able to identify and truly understand the customer's real value drivers. When selling to the executives higher in the customer's hiearchy, a solution's effects on business operations are stressed. Therefore, the solution provider must be able to communicate the sales, profit, or balance sheet benefits to the customer's decision-makers, and ensure that those benefits are achievable. In brief, the manufacturer's focus changes from emphasizing product features and product benefits toward emphasizing the needs of the customer and the business advantages the customer can reap.

As the access to resources has possibly become more important than owning them (Prahalad & Krishnan, 2008), the management and development of these external resources has become essential. As the solutions are increasingly developed, sold, and delivered in collaboration with different organizations, solution providers should pay attention to developing their interfirm collaboration practices. Pioneering manufacturers have started to use their existing supplier networks to generate new ideas and innovations. In addition, the studied solution providers involved their customers in their solution development work to better understand their actual needs, gains, and pain. This co-creation, co-development, and co-production with customers requires a new mindset among the organization's members (see Allmendinger & Lombreglia, 2005) as well as active knowledge sharing and trust, joint sense-making, and relational investments, and structures among the parties. Briefly, the solution providers studied in this dissertation research invested heavily in developing both upstream and downstream activities. In the upstream sphere, they focused on co-developing solutions with their existing and established system suppliers. In the downstream, the studied solution providers concentrated on co-creating value with their dedicated customers, thereby involving customers in the solution development process relatively early on.

Finally, as products become smarter and more connected (see Porter & Heppelmann, 2014; 2015), this development presents new capability requirements for the manufacturers in the future. The studied solution providers had invested in their automation, Internet of Things (IoT) applications, and remote diagnostics systems and also their capabilities to develop smart, connected products. The IoT affects solution providers' future business models, earning logics, organizational capabilities, solution development activities, customer-relationship and supplier-network management practices, and even identities and organizational culture. When data become the manufacturer's key resource, the manufacturer should ask if it will resemble more a product

manufacturer or a software company in the future. New technologies also enable manufacturers to gain more business critical data on the customer, hence increasing their role in the customer's value system and becoming the customer's strategic partner. Currently the studied solution providers possess fleet management capabilities, that is, those capabilities needed to track their IB information in real-time. In the future, augmented reality (AR), virtual reality (VR), artificial intelligence (AI) and machine learning (ML) are predicted to change manufacturing companies' competitive environment, value chains, business models, and organizational capabilities considerably (Porter & Heppelmann, 2014; 2015). This is an area that manufacturing companies and future service studies should pay special attention to.

Identifying and developing the capabilities needed to innovate, sell, and deliver solutions is at the top of manufacturing companies' executives' current to-do lists. Researchers from marketing have addressed these concerns, but the literature from the strategy perspective is scarce. Using theoretical concepts from the strategy and organizational learning literatures, this dissertation proposes models for solution providers to recognize and build organizational capabilities that support downstream operations. Based on empirical findings, manufacturers can escape the commoditization trap by acquiring and building capabilities and structures that enable close interaction with their customers and system suppliers. This interaction can protect them from the customer's usage of an arm's length governance mechanism, and create novel solutions that help them to save the customer's money or increase its sales. Moreover, a manufacturer's ability to learn and change is another capability that helps it to overcome the status quo of price-based competition. Internal renewal helps a manufacturer to avoid the emergence of core rigidity or the exploitation trap. This renewal is facilitated by the alteration of a firm's resource base and routines. In addition, the manufacturer needs to look beyond its boundaries in terms of change and learning. This renewal in business relationships requires relationship-specific investments (RSI), relational structures, and social capital from the parties. Furthermore, it requires active and continuous knowledge sharing, mutual sense-making, and knowledge codification into relationship memory.

Creating wealth from solutions is possible for a manufacturer, but is not an easy task. This strategic transition or transformation does not happen overnight, as for instance the IBM case has taught (and in fact, the strategic renewal seems to be an ongoing discussion in the corporation). Instead, the dissertation's results suggest that by systematically investing in solution-based strategy creation and implementation, and capability development activities, a manufacturer can

outperform its key rivals by establishing service capabilities and a culture to overcome the status quo of the product business.

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## Articles

# Solution providers' strategic capabilities

**Abstract**

**Purpose** – Drawing on the resource-based view of the firm, this study analyzes solution providers' strategic capabilities that facilitate above-average returns.

**Design/methodology/approach** – The study applies a qualitative comparative case method. In addition to an extensive set of secondary data, the results are based on interviews with 35 executives from nine leading industrial solution providers, their strategic customers, and suppliers. The analyzed solution providers were identified based on quantitative survey data.

**Findings** – By observing six distinctive resources and three strategic business processes, the present study identifies seven strategic capabilities that occur in different phases of solution development and deployment: 1) fleet management capability, 2) technology-development capability, 3) M&A (mergers and acquisitions) capability, 4) value quantifying capability, 5) project management capability, 6) supplier network management capability and 7) value co-creation capability.

**Research limitations/implications** – The study develops a generic model for the strategic capabilities of servitization. Application of the developed model to different contexts would further validate and enhance it.

**Practical implications** – Managers can use the developed model to benchmark, identify, build, and manage solution providers' strategic capabilities and associated practices.

**Originality/value** – The study develops a valuable conceptual model based on the comparative case data. Case firms were selected for the study based on a representative quantitative dataset. The results were verified and triangulated with external data.

**Keywords:** Solution business, solutions, strategic capability, resource-based view, servitization

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## 1. Introduction

Product manufacturers are transforming themselves into solution providers to attain sustainable competitive advantage (Kindström, Kowalkowski and Nordin, 2012; Kucza and Gebauer, 2011; Story, Raddats, Burton, Zolkiewski and Baines, 2016; Windahl, 2015) by sensing and seizing business opportunities in their customers' value chains (Kucza and Gebauer, 2011; Wise and Baumgartner, 1999). The business model change from standardized products to solutions or advanced services has been labeled *servitization* (Baines and Lightfoot, 2013; Vandermerwe and Rada, 1988), *moving from products to services* (Oliva and Kallenberg, 2003), *going downstream* (Wise and Baumgartner, 1999), *tertiarisation* (Léo and Philippe, 2001), and *service infusion* (Kowalkowski *et al.,* 2012). The extant literature has described solutions as a set of products, services, and software (Nordin and Kowalkowski, 2010) that require relational processes and collaborative learning among solution providers and their customers and suppliers (Barry and Terry, 2008; Jean, Chiou and Sinkovics, 2016; Tuli, Kohli and Bharadwaj, 2007). Despite the encouraging examples of successful industrial solution providers such as Ericsson or Wärtsilä, prior studies have reported that perhaps only 20% of manufacturers succeed in implementing their strategies to develop, sell and deliver solutions (Reinartz and Ulaga, 2008; Ulaga and Reinartz, 2011). Studies have reported that manufacturers fail to develop capabilities either to assess the markets, differentiate, scale, or price their solutions (Gebauer, Saul, Haldimann and Gustafsson, 2017; Indounas, 2015; Shankar, Berry and Dotzel, 2009). Consequently, it becomes increasingly important to identify, analyze, and develop those strategic capabilities that enable manufacturers to create economic rents by providing solutions.

The extant literature provides evidence of manufacturers' solution business strategies (Gebauer, Fleisch and Friedli, 2005; Raddats, 2011; Wise and Baumgartner, 1999), operational capabilities (Storbacka, 2011; Windahl and Lakemond, 2006), dynamic capabilities (Huikkola, Kohtamäki and Rabetino, 2016; Kindström, Kowalkowski and Sandberg, 2013), and business models (Kujala *et al.* 2010; Storbacka, Windahl, Nenonen and Salonen, 2013; Visnjic Kastalli and van Looy, 2013) in a context of solution offerings. Studies have identified the core capabilities of pure service firms (Aung and Heeler, 2001), the capabilities required for new solutions development (Kindström *et al.* 2013; Kindström and Kowalkowski, 2014) and the capabilities underlying manufacturers' solution units (Bustinza, Bigdeli, Baines and Elliot, 2015; Davies, Brady and Hobday, 2006; Eloranta and Turunen, 2015; Oliva and Kallenberg, 2003). Despite the recognized importance of this topic (Ostrom *et al.,* 2010;

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Paiola, Saccani, Perona and Gebauer, 2013; Story *et al.,* 2016), and acknowledging a few exceptions (see Ceci and Masini, 2011; Raddats and Burton, 2014; Storbacka, 2011), the existing studies do not address solution providers' organization-wide strategic capabilities that are centrally related to the provision of solutions or product-service systems (PSS); that is, the integration of products, services, and software. Furthermore, even though an inter-organizational network has been seen as a central resource in the previous resource-based literature (Dyer and Singh, 1998; Gebauer, Paiola and Saccani, 2013; Teece, 1986), prior research on solutions capabilities has lacked a relational and network perspective (Kohtamäki *et al.*, 2013). Moreover, many of the existing studies, despite the centrality of case selection, rarely use a systematic selection process but instead select cases based on convenience, resulting in somewhat biased results (Beverland and Lindgreen, 2010). Studies often apply data only from the focal company calling for a customer perspective to triangulate the data and verify the conclusions (Ostrom *et al.*, 2015; Ulaga and Reinartz, 2011; Windahl, 2015). In sum, the existing literature lacks any in-depth analysis of the strategic capabilities of the systematically selected leading solution providers.

The present study intends to fill this gap by building on the grounds of the resource-based view and solution business literature. The purpose of the paper is to identify those strategic capabilities that enable solution providers to outperform their rivals in the industrial markets. The paper answers the research question: *what determines the solution provider's strategic capabilities*. The findings contribute to the literature on the solution business and PSS by utilizing the identified resources and strategic business processes to understand how manufacturers combine to form strategic capabilities of solution provision. The present study utilized representative quantitative data to select nine extreme manufacturing cases where 35 interviews with senior managers were conducted to complement an analysis of extensive secondary data.

## 2. Theoretical background

### 2.1. Resource-based view of the firm (RBV)

The RBV suggests that a firm's sustainable competitive advantage is based on its valuable, scarce, and inimitable set of resources and capabilities (Barney, 1991; Grant, 1991). Resources are productive assets the firm possesses or controls whereas capabilities are described as something that the firm can do to deliver value (Day, 1994). This inside-out view of strategy proposes that a firm's

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resources must be deployed effectively—through strategic business processes, routines, managerial systems, and organizational procedures, rules, and norms—to create exceptional value for the firm's key stakeholders (Ray, Barney and Muhanna, 2004; Long and Vickers-Koch, 1995; Wright, Dunford and Snell, 2001). Prior literature has defined resources, processes, and capabilities as hierarchically-categorized concepts (Kraaijenbrink, Spend and Groen, 2010). Pure resources and assets have been defined as zero-level capabilities or threshold capabilities that allow firms to stay in the market in the short term. Strategic capabilities (Winter, 2003), on the other hand, consist of first-order elements of deploying capabilities, and "are the most critical and distinctive resources a company possesses" (Long and Vickers-Koch, 1995: 13). In sum, strategic capabilities emerge from the company's effective use of its distinctive resources that are highly valuable to the firm's key stakeholders.

### 2.2. Capabilities in the solution business

The extant literature has defined solutions in a variety of ways (Nordin and Kowalkoski, 2010), including as *integrated solutions* (e.g., Davies, Brady and Hobday, 2006), *customer solutions* (e.g., Tuli *et al.*, 2007), *total solutions* (Matthyssens and Vandenbempt, 1998), *product-service systems* (PSS) (Baines *et al.,* 2008; Tukker, 2004), *complex product systems* (CoPS) (Davies and Brady, 2000; Kohtamäki and Partanen, 2016) or *hybrid offerings* (Ulaga and Reinartz, 2011). Solutions have typically been defined as a bundle of products, services, and software (Vandermerwe and Rada, 1988) that can resolve customer-specific problems (Miller *et al.,* 2002; Tuli *et al.*, 2007) and increase the total value to the customer during the product life-cycle (Wise and Baumgartner, 1999). The extant studies suggest that the solutions enable manufacturers to strategically differentiate themselves from their competitors (Kindström *et al.*, 2012; Raddats, 2011), acquire a more stable source of revenues (Sawhney Balasubramanian, S. and Krishnan, 2004) and increase customer loyalty and profits (Tuli *et al.*, 2007). Moreover, Fang, Palmatier and Steenkamp (2008) (see also Kohtamäki *et al.*, 2013) have highlighted the non-linearity between the provision of solutions and firm performance, suggesting the necessity of building a critical mass of solutions to make a positive performance impact. Existing research also underlines the importance of standardizing solutions to create cost advantages (Böttcher and Klingner, 2011; Davies and Brady, 2000; Matthyssens and Vandenbempt, 1998), helping firms avoid losing strategic focus by cautioning them against creating too much variety (Ceci and Masini, 2011; Fang, *et al.*, 2008). Thus, the transition

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from products to solutions requires careful balancing (Ceci and Masini 2011; Matthyssens, Vandenbempt and Goubau, 2008; Miller *et al.*, 2002).

Studies provide evidence of the importance of legitimating solutions by organizing them under profit-and-loss-responsible business units to facilitate organizational renewal (Oliva and Kallenberg, 2003), but also paradoxically highlight the importance of product-service bundling and broader system-integrator capabilities (Davies, Brady, and Hobday, 2007; Storbacka, 2011; Story *et al.*, 2016; Paiola *et al.,* 2013). Transforming a manufacturer into a provider of solutions is particularly difficult because of the influence of path dependency—a factor highlighted by the RBV. Path dependency refers to firms' past decisions, strategies, structures, and cultures that affect future actions, suggesting that a prior history of operating as a product-manufacturing company may hinder the firm's capability to add, sell, and deliver solutions (Neto, Pereira and Borchardt, 2015). In other words, a manufacturer may be trapped by its manufacturing history (Huikkola, Ylimäki and Kohtamäki, 2013). Thus, when expanding the company orientation from products to solutions, a manufacturing firm first needs to unlearn the lessons learned from its history as a dedicated manufacturer, so as to learn how to sell and deliver products, software, and services as solutions (Gebauer and Friedli, 2005; Huikkola, Kohtamäki and Rabetino 2016; Kindström, Kowalkowski and Sandberg, 2013). Hence, firms must create a new resource/capability base while continuing to leverage existing resources—in other words, to explore solutions provision while exploiting product-related capabilities (Birkinshaw and Gibson, 2004). The present study adopts the viewpoint that solutions are combinations of products, services, and software, which require relational processes across the organization and its boundaries to develop, sell, and deliver them successfully. The study intends to study the solution provider's capabilities suggesting that the advantage is embedded in its ability to integrate the benefits of these logics by balancing and stretching development of products, software, and services into solutions.

Table 1 presents the selected extant studies on the key capabilities in the solution business, their key contributions, and main limitations. Studies focusing on dynamic capabilities in the solution business have been excluded from the table.

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**Table 1.** Studies reflecting solution provider's capabilities.

| Author(s) | Data/methodology | Key findings/contribution | Main limitations |
|---|---|---|---|
| Ceci and Masini (2011) | Mixed method. Ten IT solutions firms operating in Italy were examined through an analysis of documentary and archival data and interviews with project managers, marketing directors, and sales directors | The provision of integrated solutions is generally a more valuable option that the sale of pure hardware or software. The literature review suggests that firms need seven key capabilities to provide customized solutions. These are 1) software development capabilities, 2) hardware and infrastructure manufacturing capabilities, 3) consulting capabilities, 4) financial capabilities, 5) delivery capabilities, 6) post-sales capabilities and 7) systems integration capabilities | The results are applicable to solution providers operating in IT sector. Capabilities required in different business models vary |
| Davies and Brady (2000) | Case study including interviews from two companies: 1) Ericsson and 2) Cable & Wireless | Systems integration and project management are core capabilities when supplying solutions | Strategic, dynamic, and operational capabilities are intertwined. No customer/supplier interviews. Studied companies provide specific customized solutions |
| Davies, Brady and Hobday (2006) | The qualitative research involved in-depth collaboration with five international companies based in manufacturing and services. Detailed interviews included 100 CEOs, directors, senior project managers, heads of functional department and project managers | Study suggests three levels of building an organizational capability. At Level 1, the company must build a new face to the customer, at Level 2, it needs to strengthen its back-end capabilities and, at Level 3, the organization — front and back — must be refocused around customers' needs and around repeatable, customized solutions delivery | Paper focuses on specific customized solutions. Results are applicable mainly to MNE's |
| Hobday, Davies and Prencipe (2005) | The study compares evidence from two high-volume industries (automobiles and HDD) | Systems integrators of capital goods move downstream into service-intensive offerings while producers of high-volume components and consumer goods use systems integration capabilities (modern corporation's core capability) to exploit upstream relationships with input suppliers | The study focuses purely on one dedicated capability area: systems integration capability |
| Magnusson, Tell and Watson (2005) | Established and large engineering firms such as GE, Siemens, Alstom, and ABB, are the main subject of the analysis. These studies were based on a broad range of data sources and methods of analysis. Primary data (approx. 100 interviews between years 1994-2002) were collected from loosely structured interviews with representatives from equipment manufacturers, utilities, regulators, etc. | The results indicate that systems integration is a core capability for the supply of large power plants | The paper focuses on firm-level technology strategy rather than organization-wide strategic capabilities |
| Matthyssens, Vandenbempt and Weyns (2009) | Qualitative case study (systematic combining). 26 interviews + secondary data + 2 focus group meetings | A transition from basic offerings to value-added offerings requires a combination of building marketing competences and marketing of competences (real competence-based marketing) | No customer perspective used for triangulation |

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| | | | |
|---|---|---|---|
| Miller *et al.* (2002) | Longitudinal study of 30 solutions organizations. Both primary and secondary data applied | Solution providers create a profitable solutions surplus by 1) exploiting distinctive capabilities to provide outcomes otherwise unavailable to a client. 2) They sustain that surplus by managing the tensions between client and capability requirements — balancing the two and, when possible, finding complementarity between them. Client centricity is embraced at little peril to capability creation. 3) They manage these tensions by employing a three-faceted organizational design comprising the following: comprehensive and empowered front-end units to represent client perspectives; responsive back-end units to exploit and develop capabilities; and strong leadership and infrastructure at the center to promote the constant collaboration required between front and back | Results are applicable mainly to MNE's |
| Paiola, Saccani, Perona and Gebauer (2013) | Qualitative research. 20 exploratory and 4 in-depth case studies. The empirical research was conducted between 2006 and 2010. The study included 23 executive interviews | The developed framework suggests four distinct strategic approaches relating the service components and the development of capabilities: 1) selling after-sales services, 2) integrating after-sales solutions, 3) selling life-cycle solutions and 4) orchestrating total solutions | No customer/supplier interviews conducted to validate the results. The results are applicable mainly to small-and-medium sized OEMs |
| Parida, Sjödin, Wincent and Kohtamäki (2014) | Mixed method. Quantitative study included 122 companies and 7 were eliminated from the analysis. Qualitative research included 30 interviews from 11 Finnish and Swedish manufacturing companies | Based on qualitative analysis, the researchers found four distinctive capabilities common to successful product-service providers: 1) business model design capability, 2) network management capability, 3) customized development capability and 4) service delivery network management capability | The qualitative analysis was conducted based on interviews collected from relatively large manufacturers, and thus, the results might not be applicable to SMEs |
| Raddats, and Burton (2014) | A multiple case research design including six UK-based manufacturers from three different industries. 12 interviews | Three capabilities were identified which distinguish multi-vendor solution providers from single-vendor solution providers given the complexity of multi-vendor solutions (expertise specifying the solution, engineers trained in implementing/supporting solution, partnerships with component suppliers of the solution). These capabilities are underpinned by both technical capability and impartiality in solution specification | The case firms were operating in three sectors: aerospace/defense, IT and Telecommunications. No information on company size was provided. No customer/supplier interviews were conducted to triangulate the results |
| Spring and Araujo (2013) | Qualitative single case study (project/product focus) | The article presents a model of service development in manufacturing firms, consisting of a network trigger, an opportunity to change the 'productive opportunity', the 'revelation' of resources and Penrose-services, a reconfiguration of the network, leading to an expanded productive opportunity and hence a platform for marketing new service capabilities | Case study focusing on one focal company does not provide generalizable results. No customer and supplier interviews conducted. Focus is on individual projects and products |

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| | | | |
|---|---|---|---|
| Story, Raddats, Burton, Zolkiewski and Baines (2016) | Researchers conducted 24 interviews with senior executive from 19 UK-based manufacturers, intermediaries and customers across multiple sectors | The study identified six key business activities, within which advanced services capabilities were grouped. The unique and critical capabilities for advanced services for each actor were identified as follows: manufacturers; the need to balance product and service innovation, developing customer-focused through-life service methodologies and having distinct, yet synergistic product and service cultures; intermediaries, the coordination and integration of third party products/services; customers, co-creating innovation and having processes supporting service outsourcing | The study does not investigate relational capabilities in dyadic or network relationships |
| Storbacka (2011) | Qualitative study. 10 multinational firms, 5 industry expert interviews, 10 senior manager interviews + research workshops | The framework consists of a solution process with four phases (develop solutions, create demand, sell solution, and deliver solution) and three groups of cross-functionality issues (commercialization, industrialization, and solution platform). The framework identifies twelve capability categories, and 64 capabilities and management practices pertinent to the effective management of the solution business | Results not verified by customers. No systematic case selection applied. Extensive list of operational capabilities categorized |
| Tuli, Kohli and Bharadwaj (2007) | 49 customer managers and 55 supplier managers + 21 managers in two focus groups interviewed | Vendors view a solution as a customized and customized combination of goods and services to meet a customer's business needs. In contrast, customers view a solution as a set of customer–supplier relational processes comprising 1) customer requirements definition, 2) customization and integration of goods and/or services and 3) their deployment, and 4) post-deployment customer support, all of which are aimed at meeting customers' business needs. The relational process view and social capital can help suppliers deliver more effective solutions at profitable prices | Focus is purely on dyadic supplier-customer relationships |
| Ulaga and Reinartz (2011) | Qualitative case study, 22 senior manager interviews | Successful vendors build five critical capabilities: 1) service-related data processing and interpretation capability, 2) execution risk assessment and mitigation capability, 3) design-to-service capability, 4) hybrid offering sales capability, and 5) hybrid offering deployment capability. These capabilities influence manufacturers' positional advantage in two directions: differentiation and cost leadership | Results not verified by customers (only vendor perspective). Strategic business processes not described. No network perspective (only intra-firm capabilities identified). Relatively large companies studied |

Table 1 indicates that the prior studies have identified manufacturers as possessing solution delivery capabilities (Davies and Brady, 2000; Parida *et al.,* 2014), solution-selling capabilities (Reinartz and Ulaga, 2008; Storbacka, 2011), system-integrator capabilities (Ceci and Masini, 2011; Davies and Brady, 2000; Magnusson, Tell and Watson, 2005) and customer management capabilities (Miller *et al.,* 2002; Story *et al.,* 2016; Tuli *et al.,* 2007). Many studies have investigated only some particular capability blocks, thus neglecting other

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capabilities that may create wealth for the solution provider. Moreover, most of the studies do not discuss the enabling role of strategic business processes or key activities that form strategic capabilities. Hence, we concur with the advice of Rabetino, Kohtamäki and Gebauer (2016) "*In future research, we suggest the adoption of Long and Vickers-Koch's (1995) perspective that companies use processes and management systems to generate value via resources and competences.*" Table 1 also shows that the prior studies have not widely applied triangulation techniques to verify their results, the case selection process has been defective, the unit of analysis has typically been the focal company, project or business relationship, the sample has been skewed toward multinational enterprises, and the research context has been limited to reviewing companies operating in narrow business sectors.

## 3. Methodology and data

### 3.1. Data collection

The present study was implemented in the manufacturing sector in Finland. Finland has a small, highly industrialized, and open economy, in which the relative proportion of multinational manufacturers is higher than in other Scandinavian countries or in Austria, Germany, or Switzerland, which are well-known for their established and economically important engineering and manufacturing sectors and "mittelstands." KONE, Metso, Outotec, and Wärtsilä are a few examples of listed machinery manufacturers established in Finland that have succeeded within their industries by providing solutions to their customers. In addition to domestic manufacturers, large multinationals such as ABB, AGCO, and Sandvik have located their development functions in Finland. Therefore, considering the special characteristics of the Finnish manufacturing sector, the population of Finnish machinery manufacturers provides an interesting case setting in which to analyze firms that have outperformed their competitors by successfully developing, selling, and delivering solutions.

For this study, two different datasets were utilized. First, quantitative data were collected to select interesting cases systematically from representative quantitative data collected in Finland in 2010. Before the survey was sent to the targeted firms' representatives, both authors and one research assistant telephoned all 404 targeted firms' CEOs to identify the managers responsible for developing the manufacturers' solution business. The quantitative data were collected using a survey sent to all Finnish machinery manufacturers (SIC 28)

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employing 20 or more people. We received responses from 115 of the targeted 404 firms, corresponding to a response rate of 28.5%.

Second, we selected nine successful manufacturers to provide a qualitative dataset. These nine extreme cases were identified as candidates for in-depth qualitative analysis based on each firm's solution sales as a percentage of the firm's total revenue (see Fang *et al.*, 2008), long-term profitability (ROI% / EBITDA, see Homburg, Fassnacht and Günther, 2003) and global market position (numbers 1–3 in their industries; see Ulaga and Reinartz, 2011). These selection criteria were applied because of the need to conduct an in-depth study of leading manufacturers that were evidently successful based on their provision of solutions, profitability, and market positions. The number of cases studied here aligns with Eisenhardt's (1989: 545) suggestion that "*while there is no ideal number of cases, a number between 4, and 10 cases usually works well.*"

All of the studied case firms are global industry leaders, and solutions accounted for 15–50 % of their total revenues (with a median value of 20.0 % and a mean value of 27.2 %). The sub-sectors where the studied firms operated were mature, consolidated, cyclical, and capital intensive, thus representing the characteristics of industries where solution-based strategies are typically adopted (Matthyssens and Vandenbempt, 2008). Table 2 describes the sample of the nine solution providers with pseudonyms.

**Table 2.** Sample description.

| | Firm size | Solutions share of revenues | Core products | Core solutions and services |
|---|---|---|---|---|
| **Lifting Equipment Plc (LEP)** | 7000 million €<br>43,000 employees | 46 % | Lifting equipment | Spare parts, maintenance, modernization, full-service contracts, customer business analyses, remote services, project management |
| **Lifting Machine Plc (LMP)** | 2100 million €<br>12,000 employees | 40 % | Lifting equipment | Spare parts, maintenance, outsourcing, modernization, service contracts, remote services, operating services |
| **Heavy Vehicle Plc (HVP)** | 350 million €<br>1,000 employees | 20 % | Heavy vehicles | Spare parts, maintenance, service contracts, remote services for fleet management |
| **Agro Plc (AP)** | 650 million €<br>2,300 employees | 20 % | Heavy vehicles | Spare parts, maintenance, financial services |
| **Armachinery Plc (ArP)** | 740 million €<br>3,600 employees | 30 % | Military equipment | Full-service contracts, spare parts, maintenance, modernization |

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| | | | | |
|---|---|---|---|---|
| **Foodline Plc (FP)** | 140 million €<br>300 employees | 15 % | Production lines | Turnkey solutions, spare parts, maintenance, modernization |
| **Logger Inc (LI)** | 30 million €<br>60 employees | 15 % | Heavy vehicles | Spare parts, maintenance |
| **Metal Works Inc. (MWI)** | 140 million €<br>1000 employees | 35 % | Metal products | Turnkey solutions, engineering, welding solutions |
| **Valves and Pumps Inc. (V&P)** | 35 million €<br>130 employees | 20 % | Industrial valves and pumps | Spare parts, maintenance, customer process optimization |

### 3.2. Description of data

The nine firms were selected to conduct an in-depth study of the solution providers' strategic capabilities. All of the interviewees held senior manager positions such as CEO, Chair of the Board, Service Director, Marketing/Sales Director, and (Global) Key Account Manager. Interviewees from the customer firms held positions such as CEO, Director of Real Estate and Procurement, and General Manager, and respondents from the strategic suppliers held positions such as CEO, Head of Business unit, and (Global) Key Account Manager. Each respondent had profit-and-loss responsibility and was responsible for developing a particular business unit or business relationship. The lead researcher conducted 35 semi-structured interviews between spring 2010 and autumn 2013. All the interviews were recorded with permission, and lasted between 45 and 200 minutes, and were transcribed verbatim shortly after they took place. The process produced 557 pages of transcribed text (single spaced text in a 12-point font). The interview topics were directly related to the studied firms' capabilities and sources of competitive advantage. The lead researcher controlled the discussions by steering conversations to the target topics when necessary and appropriate. Because each interviewee had a personal view on his or her firm's competitive advantage, the content of the interviews was interpretative in nature. Given these potential biases, the responses of the external interviewees (who were not focal companies' executives) were compared to those of the studied firm representatives to ensure the study's reliability and credibility (Bowman and Ambrosini, 1997). Additionally, extensive secondary data were analyzed to complement the primary data and to address possible topics that were not discussed in the interviews. Table 3 represents the data utilized.

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**Table 3.** Data description.

| | Primary data | Secondary data |
|---|---|---|
| **Data source** | Focal companies' executives (e.g., CEO, chair of the board, service director, marketing director, sales director, director of new service and product development) interviews (19 interviewees/interviews) | Annual reports, 2000-2014 (3953 pages) |
| | Suppliers' executives (e.g., CEO, unit head, global key account manager, key account manager) interviews (8 interviewees/interviews) | Histories (3174 pages) |
| | Customers' executives (e.g., CEO, business owner, purchasing director) interviews (11 interviewees/8 interviews) | Press/stock exchange releases, 2000-2014 (996 documents) |
| | | Business magazine stories, 2000-2014 |

### 3.3. Data analysis

The collected data were repeatedly compared with the literature on the solutions and firm resources and capabilities, thus we followed an abductive reasoning process (Nag, Corley and Gioia, 2007). The researchers used memoranda and notes to clarify and organize the data from different cases and sources, and engaged in several rounds of discussion to identify similarities and differences between the cases. The discussion stage was followed by data analysis, proceeding from the more concrete and unambiguous (resources) to the more abstract and ambiguous (capabilities) (Huberman and Miles, 1994). To analyze the data and to discern and organize substantive issues in terms of the firms' use of their resources, researchers undertook a within-case analysis of each firm to understand each firm's resource base as a stand-alone entity. Next, we looked for patterns through the application of a cross-case technique (Huberman and Miles, 1994). The QSR NVivo program was used to code, list, and structure the themes found in the data.

When analyzing the data, we coded each interview based on the respondents' interpretations of the subject. These codes were compacted into first-order categories representing the language used by the respondents (Nag *et al.*, 2007). This first-order category emerges purely from the data, thus illustrating the

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interviewees' voices and perceptions of the topic. The next step concentrated on the analyses of the first-order items. This second-order label consists of theoretically distinctive items and the abstraction level is higher in the second-order category than in the first-order one. The data were analyzed through qualitative content analysis technique. This technique helps researchers to find similarities between the cases, helping them to convert empirical content into theoretical concepts (particularly to the categories of distinct resources and strategic business processes). The third and final step included the creation of the most abstract third-order label through an abductive reasoning process in the light of the resource-based view of the firm. Figure 1 depicts the study's coding and reasoning processes in outline. The left side shows the first-order items, that is, the terms and themes presented by the respondents (the themes on the left-hand side are not exhaustive but reflect the relevant themes regarding the capability block). These themes were further assembled into second-order theoretical categories. The right-hand side of the figure shows the overarching dimensions that emerged from the final cross-case analysis, presenting the seven strategic capabilities identified among the studied solution providers.

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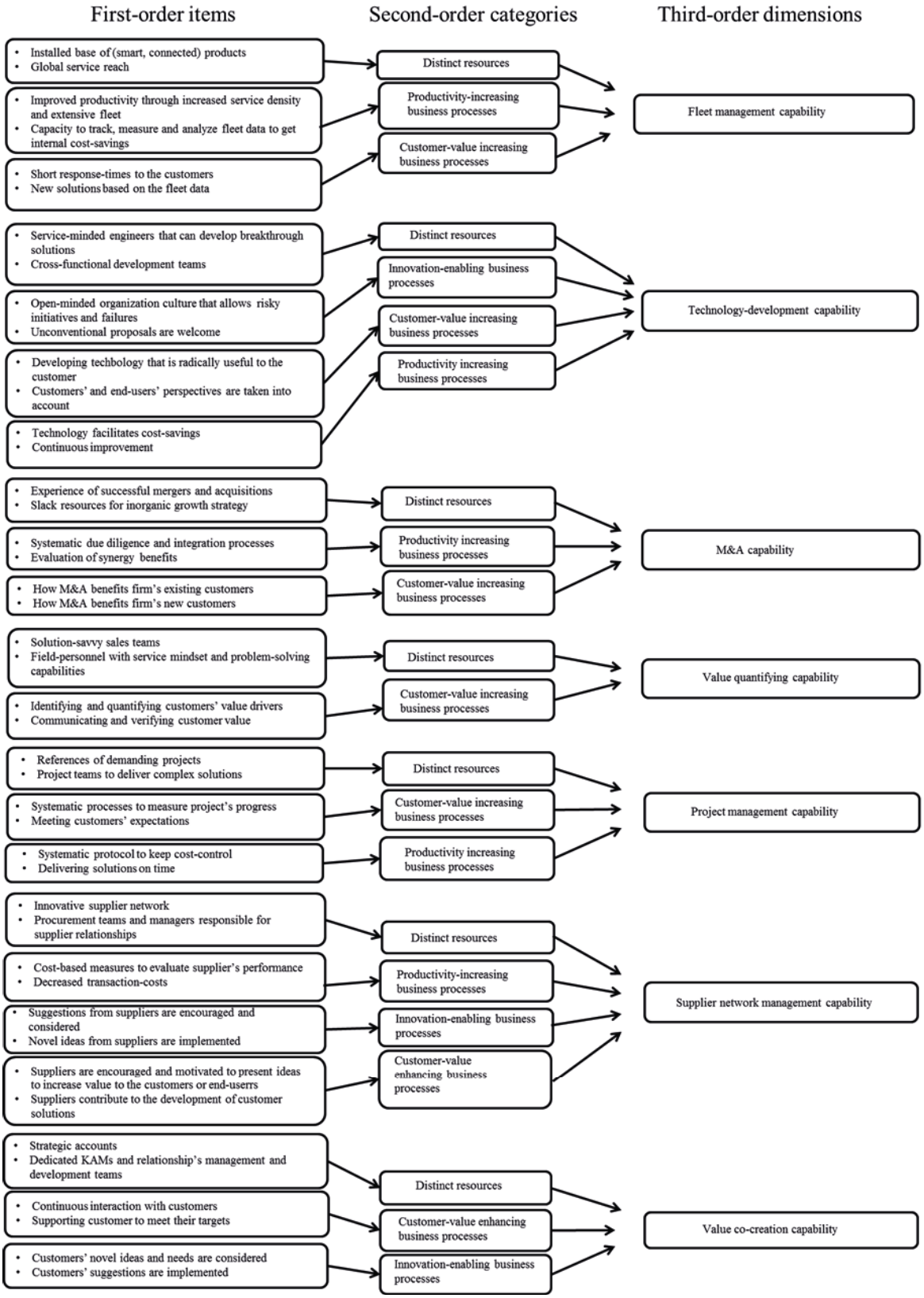


**Figure 1.** Study's coding and reasoning processes.

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Using multiple sources of data confirmed that the investigated firms' representatives' responses were not biased and that multiple actors shared the same sentiments regarding the studied firms' most valuable, scarce, and inimitable capabilities (Bowman and Ambrosini, 1997). A pattern-matching logic was applied to verify the conclusions (Yin, 1994) and the cases were reviewed over a lengthy period spanning spring 2010 until the autumn of 2015, to examine the sources of sustainable competitive advantage. Furthermore, a data auditing technique was applied (Huberman and Miles, 1994), which involved one independent researcher (a PhD specializing in industrial services and strategic management) reading and verifying the conclusions.

## 4. Results

### 4.1. Solution providers' distinctive resources

Although single resources and processes rarely create a sustainable competitive advantage in technology companies, they need to be identified to create an optimal combination to create strategic capabilities and further, sustainable competitive advantage. We identified six categories of resources available to the solution providers: 1) the installed base of products and service contracts, 2) physical and technological assets, 3) intellectual capital, 4) human capital, 5) financial assets, and 6) external assets. Table 4 presents these resource categories and examples of distinctive resources in the context of solution provision.

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**Table 4.** Solution providers' distinctive resources.

| Resource category | Examples of distinctive resources |
|---|---|
| Installed base of products and service contracts | Manufacturer's own fleet<br>Competitors' products<br>3rd party products<br>Existing service contracts |
| Physical and technological assets | R&D facilities<br>Service depots<br>Manufacturing sites |
| Intellectual capital | Brand<br>Reputation and customer references<br>Fleet data<br>Database of the customers and suppliers<br>Patents |
| Human capital | Technicians and service workers<br>R&D personnel and engineers<br>Front-line personnel<br>Solution sales teams |
| Financial assets | Cash (flow)<br>(Negative) working capital<br>Loans from the lenders |
| External assets | Customers' expertise of knowledge<br>Suppliers' expertise of knowledge<br>Universities' expertise of knowledge<br>Intermediaries' expertise of knowledge<br>Developers' expertise of knowledge |

### 4.2. Solution providers' strategic business processes

A firm's management systems, structures and organizational culture facilitate (or hinder) the deployment of resources within the firm. In the case companies, three types of strategic business process that steered the exploitation of resources were identified: 1) productivity-increasing business processes, 2) customer-value-enhancing business processes and 3) innovation-enabling business processes. Table 5 illuminates how these strategic business processes occur in practice in the context of solution business development. The identified strategic business processes are generic, but the difference is in the firm's systematic application of them and how disciplined solution provider applies them in their daily business operations.

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**Table 5.** Solution providers' strategic business processes and associated practices.

| | Strategic business processes | | |
|---|---|---|---|
| | *Productivity-increasing business processes* | *Customer-value enhancing business processes* | *Innovation-enabling business processes* |
| Example of practice(s) | Lean-method application; back-office industrialization; service modularity; standardization of procedures; dynamic dispatching | Customer's process optimization; provision of critical equipment data to the customers; identifying, quantifying, communicating and verifying business critical customer data | Breakthrough solutions development; free work time (e.g., 20%) allocation to alternative projects; investments in insecure initiatives (70/20/10 rule); continuous questioning; encouraging personnel to take risks; fast piloting; allowable to fail |
| Illustration of the dedicated strategic business process occurrence | "We have improved the productivity of our service business through an innovative map tool, which enables us to plan and show our maintenance routes. The tool enables us to achieve excellent response times with the shortest possible arrival times, and it reduces our costs…In addition, implementation of our modular maintenance method increases our customer satisfaction and our own productivity…Field personnel have been trained in the predictive maintenance technique, which ensures the quality, and uniformity of maintenance operations globally. Both new equipment and modernization installation procedures have been industrialized" (Annual report 2005/LEP) | "We can enhance our customers' production effectiveness by training them and producing data on production efficiency. For example, we can compare the productivity of different users and approach the customer if we consider there to be a need for personnel training etc. This is our aspiration: to maximize the capacity of the equipment and to guide and train the customer to achieve their production's full potential" (Service director/LMP) | "Some may say that our success is based on our technology, management team, or on the whole, good people. However, if I mention one thing, our success is based on the organization's embedded ability to question existing things. We have to question our decisions, and we have to want to change" (Chair of the Board/LEP) |

Productivity-increasing and customer-value enhancing strategic business processes are *exploitative* by nature. They aim to improve a firm's performance in the short term. An innovation-enabling business process, on the other hand, is *explorative* by nature and is intended to improve a firm's performance in the long term. Managers of solution providers need to balance the application of these strategic business processes.

### 4.3. Solution providers' strategic capabilities

Strategic capability is an outcome of a firm's ability to combine its resources and strategic business processes in a unique and valuable manner. The empirical data gathered and the subsequent data analysis revealed seven strategic capabilities

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that determined the emergence of the solution providers' sources of competitive advantage. Figure 2 shows how the solution providers' strategic capabilities are materialized through the combination of solution providers' distinctive resources and strategic business processes.

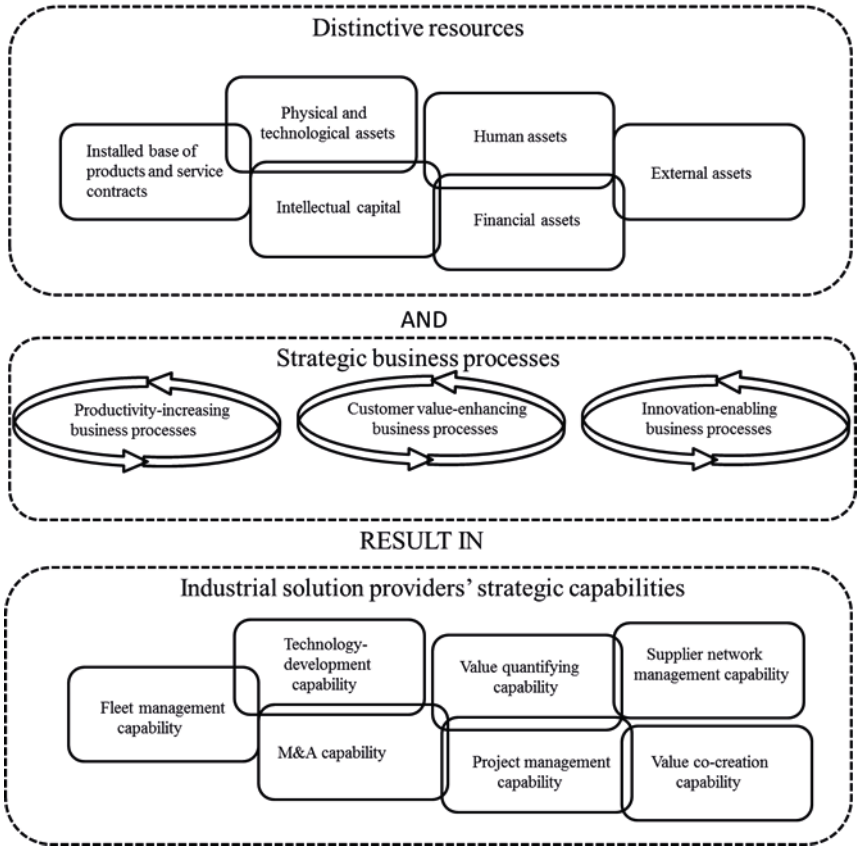


**Figure 2.** Materialization of solution providers' strategic capabilities.

*A fleet management capability* allows a solution provider to gather economic rents through an improved understanding of its customers' processes and product usage. The installed base of products, service contracts, service-related technology, and field personnel provide valuable data on the customer's key processes, customer profitability, and product usability. A firm's capacity to collect, analyze, and exploit this data provides interesting profit opportunities for a solution provider to achieve economic rents whether by developing new solutions (growth) or increasing the efficiency of its internal operations (productivity):

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> Our focus will be on making machines intelligent and aware of their own condition and networking them to create real-time visibility for enhanced safety and productivity. This unique service will differentiate us from our competitors and warrants a price premium. (Annual report 2013/LMP)

Solution providers possess valuable *technology-development capabilities* that provide opportunities for differentiation. Technology-development capability emerges from a solution provider's ability to leverage its customer understanding and in-house development (R&D) activities. This requires active collaboration, knowledge sharing and joint sense-making between field-service workers, and sales and R&D personnel. Patents and innovations are manifestations of this technology-development capability:

> Our history of innovation is one of our success factors. We have always made systematic and long-term investments into our R&D capabilities. In striving toward serving customers to perfection, we explore technologies in other industries and monitor changing markets, trends, customer needs, and working methods. We have introduced a wide range of major innovations throughout the years and have over 3,000 industry related patents. (Public document 2015/LEP)

Another key strategic capability is that of *mergers and acquisitions,* a term that encapsulates a solution provider's capability to conduct successful corporate acquisitions following the identification of undervalued firms in the market, and to integrate the acquired firms into the focal company to enhance performance and shareholder value. Five of the nine solution providers investigated demonstrated growth strategies employing an aggressive M&A strategy. One of the case firms executed very risky and large-scale acquisitions in its early years to challenge established manufacturers. In the course of acquiring over 250 companies in the previous 15 years, this firm also acquired a competitor that was twice its size. Through acquisitions, the studied firms have aimed to increase the number of service contracts, acquire new customers, develop new technologies and competencies, and increase their market knowledge and presence.

> Much of our growth has been organic, although we have a strong acquisition track record as well. We have acquired almost 100 companies over the last 40 years since the beginning of the internationalization in the early 1970's. (Public document 2016/LMP)

A *value quantifying capability* plays a critical role in providing a solution provider with competitive advantage. The term refers to the solution provider's

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ability to sell solutions and life-cycle services to its customers because of its capability to quantify and communicate customer value appropriately. The extant literature acknowledges that product-centric firms lack the preparedness to sell solutions because they do not have the skills to identify, quantify address customers' value drivers during the product life-cycle. Respondents highlighted the need to identify customers' value drivers, focus on customers' business needs, and create connections with managers ranking high in the customer's organizational hierarchy. Solution sales require longer sales cycles and an understanding of the customer's strategic movements, needs, and business goals.

> You can sell the product to the designer or to the maintenance guy, but when we are selling solutions, we are moving higher up in the customer's hierarchy. It's futile to tell people working on the operative level that we can do the job on their behalf. That wouldn't be a good message for them. (CEO/V&P)

*Project management capability* refers to the field personnel's ability to handle moments of truth and to keep the firm's value promises such as project delivery times. This capability is required when preparing bids and executing projects successfully. These capabilities include the ability to orchestrate resources and processes from both internal and external actors to eliminate waste and increase customer value. Case companies' project management capabilities enabled them to participate in invitation for bids (IFB) by submitting proposal on a specific project and executing the project in time.

> After we have sold the project, I think that the value of our other activities increases. We are capable of managing the entire project from installation to delivery. We are quite independent when coordinating the project. We don't disturb the customer too much during the project but when delivering the solution to the customer, they are involved in implementation too. (Chair of the board/FP)

The solution provider's ability to effectively manage its supply chain was highlighted as a critical capability, and labeled *supplier network management capability*. This accords with solution provider's ability to create, maintain, and develop its supplier network to ensure that suppliers support the firm's quest for competitiveness, innovativeness, and cost-efficiency. The case companies need supplier network management capabilities to foster flexible delivery when providing solutions. The effective orchestration of a supplier network supports an improved capacity to utilize a supplier's resource base when additional capacity is needed. The studied firms created their own (mini) ecosystems, consisting of

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their system suppliers, component manufacturers, dealers/distributors, and pilot customers. Their collaboration was characterized by close physical and social cooperation, open and active knowledge-sharing practices, mutual goal setting, moderate interdependence, and a high level of trust among the parties. One executive summarized the importance of key suppliers to the solution provider:

> For a successful company, key suppliers and subcontractors are strategic partners that create added value …Supplier who understands what our customers expect from us and can help us to support us in our operations, is valuable asset for us. Utilizing our suppliers' innovativeness, we can faster increase our competitiveness and create added value for our customers (CPO/LMP)

*Value co-creation capability* accords with a solution provider's ability to create, develop, and retain long-term customer relationships, to address changing customer needs and requirements, to co-produce offerings, and to co-create value. Building such a capability typically requires relationship-specific investments, relational structures, and social capital from both dyads. Many of the case companies highlighted the importance of creating strategic partnerships with the dedicated customers:

> Our operations with our customers are based on close collaboration with them. We talk about strategic partnership which means that we are having a very long-term and close interaction with them (Marketing and Sales Director, ArP)

The identified strategic capabilities typically require a long time to evolve, as does managers' cognition of critical and distinctive resources, resource-specific investments, and operational excellence. Strategic capabilities enable the industrial solution provider to acquire economic rents within the industry because of scarcity, rareness, inimitability, and value derived from the implementation of resource–process combinations. Table 5 wraps up the solution providers' capability components, illustrations of manifestations of the dedicated capability blocks and the case firms possessing the dedicated strategic capabilities.

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**Table 6.** Solution providers' capability components.

| Dedicated strategic capability | Components of strategic capability (Key resources + strategic business processes) | Quotation | Interpretation | Companies in the sample possessing the capability |
|---|---|---|---|---|
| *Fleet management capability* | Resource combinations<br>-Installed base of products, smart technologies and existing service contracts<br>-After-sales service depots, field personnel and service network<br>Strategic business processes<br>-Productivity-increasing business processes<br>-Customer-value enhancing business processes | "Over the next few years, LEP will connect its global maintenance base of more than one million units to cloud-based services. By gathering the vast amounts of data from equipment operations and using sophisticated analysis and connectivity, downtime can be minimized, and repairs carried out more quickly" (Press release/LEP) | Fleet management capability creates economic rents when the firm is able to combine product usage and customer data to optimize its service operations and develop solutions that enable its customers to better follow and track equipment-related data | 5/9 (LEP, LMP, HVP, AP, V&P) |
| *Technology-development capability* | Resource combinations<br>-Collaboration between R&D personnel and field-service workers<br>-Linking customer understanding to technology development process<br>Strategic business processes<br>-Innovation-enabling business processes<br>-Customer-value enhancing business processes<br>-Productivity-increasing business processes | "We have a group of product managers who receive a great deal of feedback. They filter and prioritize that information for our R&D. In addition, we have a product council system in which all relevant fields are involved and all of the big decisions are made and channeled. Thus, we aim to achieve a consensus. This means that nobody is a rainmaker or a king and that he/she could come from a sales trip and completely renew our R&D work…This means that we have structures that enable us to systematize our processes and increase our speed…Continuous improvement means that R&D receives feedback straight from the maintenance and product managers". (CEO/HVP) | Integrated solution provider benefits from the integration of product and service business information as product development receives straight end-user feedback from the field-personnel and customers whereas service business gets newest product information from the R&D | 7/9 (LEP, LMP, HVP, AP, ArP, FP, LI |
| *M&A capability* | Resource combinations<br>-Financial resources<br>-Back-office analysts and strategy team involvement | "The acquired firm is integrated into ours immediately. Our policy is that we possess only a few brands. There are | Creating an M&A capability is difficult because most of the acquisitions fail. However, firm can benefit from M&A's | 5/9 (LEP, LMP, FP, ArP V&P) |

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| | | | | |
|---|---|---|---|---|
| | -Top management commitment<br>-Post-merger integration (human resources management)<br>-Technology, offerings and organization cultures integration<br>Strategic business processes<br>-Productivity-increasing business processes (due diligence)<br>-Customer-value enhancing business processes | always exceptions, which are strategic decisions, but essentially, acquired firms are immediately renamed" (Area manager/LEP) | if it succeeds to evaluate and integrate different organizational cultures in a complementary way. Also experience from the acquisitions increases likelihood of their success | |
| *Value quantifying capability* | Resource combinations<br>-Dedicated integrated-solutions sales force<br>-Field personnel (technicians and service workers)<br>Strategic business processes<br>-Customer-value enhancing business processes | "Quantifying the delivered value to the customer is really important today. Developing sales competencies has become vital. We need to improve our productivity in the field and simultaneously establish the value to the customer of the service we deliver" (Area manager/LEP) | Quantifying and communicating customer value appropriately enables solution provider to sell integrated solutions to the customers' top managers | 5/9 (LEP, LMP, HVP, MWI, L&P) |
| *Project management capability* | Resource combinations<br>-Field personnel<br>-Network management<br>-Communication to the customers<br>Strategic business processes<br>-Productivity-increasing business processes<br>-Customer-value enhancing business processes | "Compared to our competitors, our project management, and product installation competencies are superior. Our long-time management traditions, refined customer-oriented organization, high service level, and ability to manage our competent field personnel enable us to achieve process benefits. We differentiate ourselves from our competitors through total excellence in services" (Area manager/LEP) | Project management capability contributes to the effective delivery of integrated solutions to the customers | 3/9 (LEP, FP, MWI) |
| *Supplier network management capability* | Resource combinations<br>-Suppliers' resources and capabilities<br>-Procurement team<br>-Relationship-specific investments and relationship's management and development teams<br>-Trust between the partners<br>Strategic business processes | "We want to be the preferred partner in our industry.<br>We want to be the first choice among our suppliers, our end-customers, and the contractors who buy our products. Partnership is a modus operandi that aims at transferring knowledge from one partner to another partner, which | Managing the upstream network effectively enables manufacturer to develop solutions cost-effectively. Moreover, utilizing suppliers facilitates manufacturer to create novel solutions | 5/9 (LEP, LMP, HVP, AP, LI) |

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|---|---|---|---|---|
| | -Productivity-increasing business processes<br>-Innovation-enabling business processes<br>-Customer-value enhancing business processes | creates earnings for all the actors within the chain" (Chair of the Board/HVP) | | |
| *Value co-creation capability* | <u>Resource combinations</u><br>-Customers' resources and capabilities<br>-Key account managers and relationship's management and development teams<br>-Relationship-specific investments and structures<br>-Social capital (trust among the parties)<br><u>Strategic business processes</u><br>-Customer-value enhancing business processes<br>-Innovation-enabling business processes | "We have a very long historical collaboration. We have a named contact person from them who represents the company. He has been collaborating with us for 40 years. We also have a joint steering group. I am the chair of this steering group, and we meet with their managers with regularity. Additionally, the real estate manager, and a few managers responsible for upkeep are involved from our side. We also have a manager who collaborates with their account managers on a daily basis. We have joint development projects in which they can present their suggestions, ideas, and proposals" (Director of Real Estate and Procurement/LEP customer) | Ability to create, develop and retain customer-relationship enables solution provider to make long-term profits during the product life-cycle | 8/9 (LEP, LMP, HVP, ArP, FP, LI, MWI, V&P) |

## 5. Discussion and implications

### 5.1. Theoretical contribution

The present study was conducted to understand the underlying capabilities that generate competitive advantage to the solution providers. The study's theoretical contribution is threefold. First, it identifies the manufacturers' distinctive resources that support the formulation of strategic capabilities. Second, the study sheds light on the strategic business processes that convert resources into capabilities (Day, 1994; Long and Vickers-Koch, 1995; Rabetino, Kohtamäki and Gebauer, 2016). Finally, this study advances the literature on solution provider's capabilities by identifying seven strategic capabilities that support a solution provider's ability to generate above-average profits.

Regarding the first contribution, the present study identifies six distinctive resources for the solution providers: 1) the installed base of products and service

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contracts (e.g., global installed based, quality data of the installed base and servicing), 2) physical and technological assets (e.g. product knowledge, remote diagnostics), 3) intellectual capital (e.g., patents, brand, references), 4) human assets (e.g. top- and middle-management, solution personnel), 5) financial assets (e.g., cash flow, loans), and 6) external assets (e.g., supplier network, intermediaries, customer base). These pure resources that do not create competitive advantage *per se*, correspond the concepts of threshold capabilities (Long and Vickers-Koch, 1995) or simply, resources (Spring and Araujo, 2013), in the prior literature. In line with the extended resource-based view (see Spring and Araujo, 2013; Tuli *et al.*, 2007), our study suggests that manufacturers should consider their suppliers' and customers' capabilities as their key resources. Paradoxically, the ability to exploit the supplier network was a bottleneck for many manufacturers. As the manufacturer has to rely on other firms, it loses a degree of control. However, the best solution providers studied were able to utilize their supplier network to reduce their production and transaction costs and increase the number of innovations and value to the end-users (Dyer, 1997; Paiola *et al.*, 2013; Story *et al.*, 2016). As it is assumed vertical disintegration among manufacturers will increase in the future (Jacobides, 2005), solution providers should develop capabilities related to their supplier networks. Finding an optimal combination of resources creates the basis for strategic capabilities. Finding the appropriate combination is a constant struggle in the course of reconfiguration (Huikkola *et al.,* 2016).

As the second contribution, we distinguish three strategic business processes that steer a firm's activities toward its strategic objectives, namely: 1) productivity-increasing business processes, 2) customer-value enhancing business processes and 3) innovation-enabling business processes. Regarding the productivity-increasing business processes, the results demonstrated that the most successful solution providers continuously and systematically tended to seek new ways to do more things with fewer resources. They were also disciplined in terms of increasing their operations' productivity—we found evidence of processes, such as lean management, solution standardization, or back-office industrialization (Davies, Brady and Hobday, 2006; Reinartz and Ulaga, 2008) being utilized to reduce costs or improve output to inputs ratio. The data demonstrated that the studied solution providers applied customer-value enhancing business processes to increase their customers' productivity, address their needs and business processes, and identify, quantify, communicate, and verify that they were providing value to the customers (Töytäri and Rajala, 2015). These customer-value-addressing business processes were also the most difficult for the solution providers because of their history as product-oriented companies. Changing the

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mindset and capabilities from the development of product features to customer value is something that does not happen overnight: It requires active collaboration with the customers, and an ability to understand the business needs and processes of the customer and even of the customers' customers. Finally, innovation-enabling business processes steer the firm's objectives beyond the ongoing business development activities. Innovation-enabling business processes target delivering growth in the long-term from new business areas. The biggest challenge in applying this strategic business process successfully relates to a short-term mindset prevailing among management; however, in the long run, this might be the only viable business process the managers should pay attention to.

Regarding the final contribution, seven strategic capabilities were identified that deepen and extend the current understanding of the sources of solution providers' competitive advantage. A fleet management capability accords with a solution provider's ability to track and utilize fleet data (e.g., production efficiency and product usage data) in a way that creates cost-benefits for the solution provider or increased value for the customer. A technology-development capability offers a competitive edge for those solution providers able to cement their positions as technology leaders. This technological leadership originates from the firm's ability to develop breakthrough solutions through attracting, motivating, and retaining talented engineers and cross-functional development teams. Furthermore, the data extracted for the current research suggests that building an organization culture that permits risky initiatives, failures, and unconventional thinking resonates with the firm's ability to innovate. This capability allows the solution provider to maintain premium pricing, hence creating economic rents for the firm. Solution providers who possess an M&A capability are able to profit through synergy, density, and customer benefits. As only a minority of M&As is successful for the buyer (Dyer, Kale and Singh, 2004), building this capability is both rare and difficult because of information asymmetries and integration challenges. However, when the screening, timing, execution, and integration processes are accomplished successfully, a solution provider can generate above-average profits in the markets. The solution provider's ability to execute complex projects is a strategic capability that manifests itself in delivering projects on time and cost-effectively. A firm's ability to sell solutions, that is, a value quantification capability, accords with a solution provider's ability to identify, quantify, communicate, and verify customer value appropriately (Töytäri and Rajala, 2015). In the context of solution provision, this capability requires understanding the customer's key business and decision-making processes. In practice, selling solutions requires a capability to

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communicate with the customer's top managers, to understand their business environment, and to address their business rather than merely their technical concerns. The form of strategic capability addressing solution provider's upstream control was termed supplier network management capability. Hence, the supplier network is a valuable asset for any company, but few are able to exploit this exogenous resource base successfully because of harmful management practices or lack of trust (Dyer, 1997; Dyer and Singh, 1998). The findings of this study indicate that building an innovative and cost-efficient supplier network can be a key source of a competitive advantage for the solution provider. Finally, value co-creation capability refers to a solution provider's downstream control, that is, the capability to build long-lasting and profitable customer relationships that generate life-cycle benefits for both of the parties.

### 5.2. Managerial implications

The results of this study can guide managers responsible for solution business development in steering their strategic initiatives toward dedicated capability areas. Specifically, the present study provides valuable information for manufacturing firms' executives that attempt to profit from the provision of solutions. First, managers can utilize the presented model to identify capability gaps and prioritize their development activities. As the firms typically lack both managerial and financial resources, managers can decide which capabilities they should create, invest in, reinforce, or even release in the future. Establishing strategic development programs based on strategic capability for the next three to five years is an example of a concrete practice executives might use to follow-up the development of a dedicated strategic capability. For instance, if a manufacturer considers that it is not able to take full advantage of its extant supplier base, the firm could establish a dedicated strategic development program focusing on supplier network development. Although such a program would not improve the situation alone, its strategic role within the company is likely to be justifiable. Following the development of different KPIs relating to dedicated capability areas (such as supplier innovativeness and cost-efficiency) would permit a firm to invest in this particular capability area, and potentially, increase the solution provider's revenues, profits, or balance sheet benefits in the long run. Furthermore, establishing a strategic development program ensures an initiative receives executive-level approval, which can increase its chances of success. Second, managers can benchmark practices related to the application of strategic business processes, particularly to those enabling innovation. For

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instance, a firm might apply a 70/20/10 rule or free work time allocation model to help itself in its resource allocation decisions. A 70/20/10 rule means that 70% of investments are allocated to firm's core business development, 20% of investments are allocated to emerging businesses, and 10% of total investments are allocated to new initiatives (see Schmidt and Rosenberg, 2014). A free work time allocation means that personnel can spend a dedicated share of their total work time (typically 15–20%) to advance their own projects (see Eisenhardt and Sull, 2001). These examples can potentially facilitate the creation of breakthrough solutions and eventually foster a competitive edge for the solution providers.

### 5.3. Limitations and further research

As with any research, the present study has limitations that should be addressed. As the study is qualitative in nature, the results cannot be generalized to the population of solution providers (Eisenhardt, 1989). Therefore, future research could cover generalizable quantitative studies that review capability gaps, and strategic business processes that have the greatest impact on business performance in different industries. As the studied firms operate in capital-intensive, cyclical, and mature industries, and because strategic capabilities are considered to be static, future research would benefit from studying firms operating in more dynamic and R&D-intensive industries, where the ability to change capabilities plays a more critical role. This approach would increase understanding of how manufacturers alter their resources when moving toward solutions. Moreover, as the competition in service markets grows stiffer and some of the after-sales services (e.g., spare parts) become commoditized, it would be fruitful to study the capabilities required to provide pure performance-based solutions such as operations and maintenance services. Future studies should investigate what type of capabilities (e.g., ecosystem or platform capabilities) manufacturers need to build, leverage, and release to adapt value-based business models to ensure customers pay for outcomes rather than products and services. Future studies should move toward a micro-level perspective on capabilities, and begin to study the micro-foundations or micro-level practices behind capability development, and the coproduction of offerings, resources, and processes. Moreover, critical research is needed to understand the narratives of capability development, as alternative narratives may exist (Luoto, Brax and Kohtamäki, 2017). No single correct path to success exists, but alternative paths should be considered.

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FEATURE ARTICLE

# Resource Realignment in Servitization

*A study of successful service providers explores how manufacturers modify their resource bases in transitioning to service-oriented offerings.*

**Tuomas Huikkola, Marko Kohtamäki, and Rodrigo Rabetino**

**OVERVIEW:** When transitioning from a product-centered business model to one focusing on providing services and solutions, manufacturers must realign and reallocate resources to support the new business model. Based on a study of nine leading solution providers that have successfully transitioned from products to services, we demonstrate how manufacturers create new resources and organizational structures to facilitate co-creation of value with customers, leverage existing resources to develop new service products and markets, and systematically release non-core upstream resources to nurture downstream resources.

**KEYWORDS:** Servitization, Resource realignment, Dynamic capabilities

Manufacturers have increasingly transitioned toward services-based business models to acquire strategic, economic, and marketing advantages (Gebauer, Fleisch, and Friedli 2005). Researchers and practitioners have been almost unanimous in suggesting that integrating services into a company's offerings, a process typically called servitization, represents a potential goldmine for manufacturers; this belief is supported by the experiences of a number of large companies, such as GE, KONE, and Rolls-Royce, that have garnered well-documented benefits from their shift to services. However, some studies suggest this is not necessarily true. For example, Ulaga and Reinartz (2011) find that only 20 percent of manufacturers who attempt servitization succeed. Clearly, then, the question of how to transition effectively from products to services is a significant one.

One key to a successful transition is realignment of the firm's business model, organizational structure and processes, and resources to support the new focus (Parida et al. 2014). Revision of the resource base is particularly important if the company is to avoid competency traps—that is, becoming a prisoner of its existing product-centered business model (Fischer et al. 2010; Huikkola, Ylimäki, and Kohtamäki 2013). Resource realignment, defined as "the comprehensive process of structuring the firm's resource portfolio, bundling the resources to build capabilities, and leveraging those capabilities with the purpose of creating and maintaining value for customers and owners ... using processes (i.e., acquiring, accumulating, and divesting) to obtain the resources that the firm will use for bundling and leveraging purposes" (Sirmon, Hitt, and Ireland 2007, p. 273), is critical for creating value through a business model shift. In the move from a product to a services focus, realignment of resources might include developing new customer-related capabilities and shedding production-related resources. Accomplishing this realignment requires the firm to develop dynamic capabilities—competencies that support its ability to reshape its organizational structure and resource base to adapt to changing market contexts (Teece, Pisano, and Shuen 1997).

The importance of dynamic capabilities in general has been recognized by a number of scholars (see, for instance, Fischer et al. 2010; Gebauer 2011), but few studies have specifically explored how manufacturers' resources

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are realigned in the process of servitization. This is unfortunate, as understanding resource realignment and reconfiguration is vital for manufacturers aiming to develop the capabilities required to implement servitization effectively (Raddats, Burton, and Ashman 2015). We aim to address this gap by clarifying the role of resource realignment in servitization through a multiple-case study that explores how manufacturers modify their resource bases to facilitate the transition to service-oriented offerings.

**Effectively implementing service-led business models requires that manufacturers create new capabilities while balancing existing capabilities.**

## Background

Researchers have long suggested that manufacturers seeking to move from product-centric to service- and customer-centric models turn their attention downstream, to sense and seize business opportunities in customers' value chains (Wise and Baumgartner 1999; Davies 2004). Often, these opportunities take the form of services that support end users' use of a product or replace the product altogether. As competition has intensified in the traditional product markets as a result of price erosion and commoditization, such opportunities represent opportunities to pursue greater profits and create differentiation in the market. This shift, from product to customer, has been variously called servitization (Vandermerwe and Rada 1988), service infusion (Kowalkowski, Witell, and Gustafsson 2013), servicisation (Quinn, Doorley, and Paquette 1990), servicizing (Rothenberg 2007), tertiarisation (Léo and Philippe 2001), and value migration (Davies 2004).

Previous studies suggest that manufacturers pursuing servitization must create new structures to meet the requirements that emerge as they reorganize to sell services and lifecycle solutions rather than products (Gebauer, Fleisch, and Friedli 2005; Reinartz and Ulaga 2008; Kohtamäki, Partanen, and Möller 2013; Gobble 2015; Rabetino et al. 2015). Effectively implementing service-led business models requires that manufacturers create new capabilities while balancing their existing service and manufacturing capabilities (Tuli, Kohli, and Bharadwaj 2007; Kohtamäki et al. 2013; Spring and Araujo 2013). That means revising resources in a wide range of domains, including system integration, project management, IT systems, consulting, finance, delivery, and post-sales service (Davies 2004; Brady, Davies, and Gann 2005; Parida et al. 2015). This revision might involve creating new resources, leveraging existing resources, or releasing resources no longer required.

Creating new resources is difficult because it requires higher-order capabilities (for instance, learning capabilities that enable the acquisition and integration of new knowledge) and the development of new skills, processes, and mindsets. Firms must develop explorative learning capabilities to identify new knowledge (Levinthal and March 1993) and integrative capabilities to embed the new resources in the organization through internal and external interaction, collaboration, and learning (Tuli, Kohli, and Bharadwaj 2007; Kohtamäki and Partanen, forthcoming). The effort to acquire and integrate new resources may take a variety of forms that affect various parts of the firm. For instance, researchers have highlighted the importance of creating stand-alone service business units to support the development of service offerings (Oliva and Kallenberg 2003); implementing service-friendly human resource practices to support the recruitment, development, and retention of personnel who have a service mindset (Tuli, Kohli, and Bharadwaj 2007); encouraging sales teams to focus on selling solutions rather than products (Ulaga and Reinartz 2011); nurturing acquisitions and alliances that bring needed resources into the firm (Kindström, Kowalkowski, and Sandberg 2013); and developing service-related technologies to acquire customer process data needed to support services offerings (Porter and Heppelmann 2015).

In addition to developing new resources, firms transitioning to a services orientation must also reconfigure existing resources for application in the new context (Danneels 2011). Manufacturers typically build on existing resources to launch their reorientation to services. Often, firms begin the servitization process by increasing the number and complexity of services provided to existing customers (usually product-related services such as financial and maintenance services) and might start servicing equipment sold by competitors in order to broaden the scope of their service portfolio (Oliva and Kallenberg 2003). Eventually, manufacturers start to provide total solutions, which may include performance-based services (such as Rolls-Royce's power-by-the-hour service concept) or operation and maintenance (O&M) solutions. In an O&M solution, a manufacturer typically takes full responsibility for the customer's dedicated business process in order to optimize its performance.

Firms must also release resources no longer needed in the new orientation, in order to free up capacity to accelerate their transition. The product-dominant approach requires substantially different resources—in terms of both physical assets and organizational culture and behavior—from those employed in a service-focused model. Organizations pursuing servitization must release product-centered resources to allow the integration of new, services-focused ones. In this context, releasing resources refers both to the shedding of resources no longer needed (Sirmon and Hitt 2003) and to the process of organizational unlearning, or abandoning established behaviors that do not fit with the new model. This unlearning is necessary for organizational change to establish itself (Tsang and Zahra 2008); for instance, traditional manufacturing firms might need to unlearn conventional product logic in order to adopt a service logic (Vargo and Lusch 2004). Failure to adapt in this way may lead to

**The creation of new resources was particularly aimed at building capability in the sales process.**

competitive disadvantage: "An inefficient firm that downsizes, without improving its capacity for resource leverage, will find that productivity improves—for a while. Technological leadership, brand loyalty, distribution reach, and customer service won't deteriorate immediately, but unless a firm discovers new approaches to resource leverage, it will find, in a few months or few years, that the numerator has shrunk and another round of nonelective surgery is required" (Hamel and Prahalad 1994, p. 173).

Researchers have amply explored the nature of the resources needed to support servitization and suggested how resources might shift in the transition. A number of studies also provide frameworks and change management models for managing the transition process (Oliva and Kallenberg 2003; Bustinza et al. 2015). However, there are no studies that describe how manufacturers actually realign resources during the transition from producing goods to offering services. Describing the resource realignment process in this way could offer a roadmap for firms seeking to renew their business by revising their resources.

## The Study

To explore how manufacturers revise their resources during the transition from goods to services, we conducted a comparative, qualitative case study of nine Finnish technology firms that produce and export investment goods (that is, the machinery, plant, or equipment used in the production of other goods). The participating firms were selected from among 115 firms that responded to a survey distributed in 2010 to all 404 Finnish machinery manufacturers (SIC 28) that employed 20 or more people. The survey was designed to collect data on the role of services in Finnish manufacturing companies and to identify firms that were evidently providing services successfully. Participants in the current study were selected based on service sales as a percentage of total revenues, long-term profitability, market position, and the proportion of services invoicing related to produced customer value versus all services invoiced. These selection criteria allowed us to scrutinize manufacturers that were evidently successful at implementing service strategies, based on their profitability and market positions.

We ultimately selected nine firms that best met our criteria; this number fell in the range accepted as the optimal number for qualitative studies (Eisenhardt 1989) and provided data saturation. Our final sample comprised a diverse set of firms (Table 1). The nine manufacturers operate in the forest machinery, elevators and escalators, industrial cranes, armaments, food production lines, industrial valves and pumps, agricultural machinery, and engineering sectors. Revenues for the year 2014 ranged from €30 million to €7 billion (median = €350 million), and the firms employed between 60 and 45,000 employees (median = 1,000). The firms held service contracts for up to 1 million products, and services accounted for 15 to 50 percent of their total revenues (median = 20 percent). The firms' subsectors were mature, consolidated, cyclical, and capital intensive, all characteristics of industries in which manufacturers typically apply servitization strategies (Matthyssens and Vandenbempt 2008).

Data collection proceeded through a total of 35 semi-structured interviews with both senior managers in the case firms and strategic customers and suppliers. Case firm interviewees, who were each interviewed once, held a range of senior positions, such as CEO, chair of the board, service director, marketing/sales director, area/country manager, and global key account manager. For eight of the nine case firms, we also conducted interviews with key people at customer and supplier firms; these interviewees also held senior management positions such as CEO, global key account manager, purchasing director, and unit head. All of the interviews, which ranged in length from 45 to 200 minutes, focused on the focal firm's development of its service business, the competitive advantage offered by servitization, and the resources and capabilities required to facilitate servitization.

Interviews were recorded (with permission) and transcribed verbatim. In addition to the primary interview data, researchers also analyzed extensive secondary data, including annual reports, press releases, journal and magazine articles, and other sources; these data were used to complement and verify the primary data. Both interviews and secondary data explored the firm's action over a lengthy period of time—spring 2010 through autumn 2015—to allow researchers to track the development and evolution of resources as the firms evolved.

Data analysis began with processing the more concrete, unambiguous, and descriptive data and moving to the more abstract, ambiguous, and explanatory analyses. QSR NVivo was used to code, list, structure, and analyze the themes identified in the data. First, a within-case table was constructed for each case to understand how each firm's resource base had evolved. This procedure was followed by cross-case analysis to discover patterns and illustrate variations across the cases (Eisenhardt 1989; Huberman and Miles 1994). Then, the interviews and complementary data were coded under subthemes that captured particular mechanisms firms used to reshape their resource bases, which we refer to as alteration modes. A within-case table was created to capture the modes each firm engaged to alter its resource base. Cross-case analysis was then utilized to investigate how these modes manifested in different cases. Finally, the results were audited to improve the study's reliability. Specifically, one independent senior researcher specializing in industrial services reviewed and verified the study's analyses and conclusions.

**TABLE 1.** Participating firms

| | Firm Size (Sales/Employees) | % Revenues from Services | Core Products | Core Services |
|---|---|---|---|---|
| Processing Equipment Plc (PEP) | > €3,500 million 10,000 employees | 59% | Processing equipment | Spare parts, maintenance, service contracts, customer process optimization, turnkey solutions |
| Lifting Equipment Plc (LEP) | > €7,000 million 43,000 employees | 46% | Lifting equipment | Spare parts, maintenance, modernization, full-service contracts, customer business analysis, project management |
| Lifting Machine Plc (LMP) | > €2,000 million 12,000 employees | 40% | Lifting equipment | Spare parts, maintenance, outsourcing, modernization, service contracts, operations |
| Heavy Vehicle Plc (HVP) | > €400 million 1,000 employees | 20% | Heavy vehicles | Spare parts, maintenance, service contracts |
| Agro Plc (AP) | €650 million 2,300 employees | 20% | Heavy vehicles | Spare parts, maintenance, financial services |
| Armachinery Plc (ArP) | €740 million 3,600 employees | 30% | Military equipment | Full-service contracts, spare parts, maintenance, modernization |
| Foodline Plc (FP) | €140 million 300 employees | 15% | Production lines | Turnkey solutions, spare parts, maintenance, modernization |
| Logger Inc. (LI) | €30 million 60 employees | 15% | Heavy vehicles | Spare parts, maintenance |
| Metal Works Inc. (MWI) | €140 million 1,000 employees | 35% | Metal products | Turnkey solutions, engineering, welding solutions |
| Valves and Pumps Inc. (V&P) | > €35 million 130 employees | 20% | Industrial valves/pumps | Spare parts, maintenance, customer process optimization |

## Results

Analysis of interview and secondary data revealed a number of modes firms used to reshape their resources, which we categorized according to whether they were intended to create new resources, leverage existing resources, or release unneeded resources (Table 2). Each of these modes was expressed in specific practices, some of which were quite prevalent across our sample. The practices listed are not exhaustive but represent those most prevalent in facilitating the servitization process in the firms we studied.

### *Creating New Resources*

The firms we studied pursued a number of avenues to develop new resources. They created, built, and acquired new technologies, competencies, and market knowledge to support the development of a services mindset. Specifically, they focused on developing capabilities to improve services and solutions sales, and on creating strategic alliances to improve the development and delivery of services and solutions. The interview data capture the participating firms' strategic motivation to explore new service offerings and technologies and highlight the importance of creating, building, and acquiring resources and structures to facilitate the development, sales, and delivery of those offerings.

The most significant move to support the development of new resources—engaged by seven of our study firms—was the establishment of a separate service unit. This approach is supported by the literature. Oliva and Kallenberg (2003) found that "the most successful firms in extracting value from the IB [installed base] services were those that ran this service organization as a profit center (or a separate business unit) with profit-and-loss responsibility" (p. 167). This observation holds true especially in the early stages of service development, as concentrating service provision in a separate organization legitimates the role of services within the firm. One interviewee described how such organizational restructuring enabled the firm to drive a shift in mindset:

> We established new service business units and noticed that this initiative increased services growth. This ensures that we can develop services per se. It is still linked to the installed base of products, but it also enables us to pursue activities beyond the existing installed base. When product business looks at the customer from a product perspective, the viewpoint is the opposite to that in a service business. In services, we turned our previous viewpoint upside-down and started to develop our service portfolio based on customer needs and problems. Even though the capabilities we possess are partly the same as we had previously, taking the customer perspective into account has changed our mindset significantly. (President, Service Business, PEP)

Creating a separate unit also allows for agility in decision making, which is required as the firm seeks to sense and seize new market opportunities in the value chain. As one firm reported in its corporate history, agile organizational structures allowed field personnel to take risks and make quick decisions:

> In a rapidly changing environment, those firms succeeded that were flexible and effective when reacting to new opportunities. Flexibility was created by strong

**TABLE 2.** Alteration modes and associated practices

| | Alteration Modes | Specific Practices* |
|---|---|---|
| Creating | • Reorganization<br>• Appointment of influential person as service business director<br>• Competence-based training program<br>• Mergers and acquisitions<br>• Hiring for specific skills<br>• Job rotation and management team restructuring<br>• Joint ventures, strategic alliances | • Creating a separate, flexible organization to develop, sell, and deliver services (7)<br>• Nominating a service director to a top management group (4)<br>• Establishing a strategic development program to sell services and solutions (5), separating service teams from the product sales force (6), and developing value-based selling techniques (6)<br>• Acquiring (small) service firms (6)<br>• Creating a concept for remote diagnostics (5) and hiring new people with a service mindset (9)<br>• Rotating management team and personnel between different business units (6)<br>• Creating strategic alliances or joint ventures to deliver services and solutions (9) |
| Leveraging | • Attracting new customer segments<br>• Searching for new solutions, products, and services<br>• Acquiring service companies to increase the installed base of products and service contracts and to improve route density<br>• Servicing competitors' products<br>• Leveraging existing customers and suppliers to deliver increased scale, scope, and innovations | • Leveraging existing resources for new customers and markets/industries (5)<br>• Leveraging existing technologies and staff expertise to benefit new products and services (9)<br>• Acquiring companies to increase installed base (5)<br>• Servicing competitors' or third-party products (5)<br>• Making relationship-specific investments (site, physical, and social investments) and building relational structures (management and development teams, mutual IT systems) with dedicated customers and suppliers (9) |
| Releasing | • Outsourcing<br>• Offshoring<br>• Divestments<br>• Layoffs<br>• Transforming fixed costs to variable costs<br>• Compressing supplier network<br>• Joint ventures with planned exits | • Outsourcing administrative and non-core resources (9)<br>• Releasing and offshoring standard products (6)<br>• Divesting component production, process, product businesses (6)<br>• Initiating layoffs in product business (9)<br>• Developing from fixed to variable costs (8)<br>• Reducing the number of component suppliers and centralizing the sourcing of systems (9) |

*Numbers in parentheses indicate how many firms in the sample engaged in the particular practice.

> liquidity, continuous technological renewal and effective management, through which resources were reallocated rapidly to new emerging opportunities. CEO at the time highlighted flexibility, a trimmed organization, the ability to seek new opportunities, firm-level intelligence of itself and know-how of the changes in the business environment. (LEP history)

All of the firms we studied reported that they further supported the development of the services mindset by hiring people who acted from a service mindset. Field personnel operating at the customer interface represent the company and directly influence customer satisfaction. They are also key to identifying new business opportunities and selling additional services. Recruiting, training, and retaining technicians with a service mindset and technological competencies was seen as a key process, albeit one that is challenging to maintain:

> We emphasize the recruits' service attitude and technological know-how. The starting point is that if the attitude is right, we can develop other areas. Service business requires a certain attitude but also technological competencies. (Service Director, LMP)

Developing the service business also sometimes involved inorganic growth, such as mergers and acquisitions. Typically, the bigger firms in the sample engaged in acquisitions more often, but some of the smaller firms also implemented growth strategies that included mergers and acquisitions. Six of the firms continually acquired small service firms to expand their talent base and build their service capabilities, as a press release announcing one company's acquisition noted: "[This acquisition] not only provides us the opportunity to expand our critical maintenance business, but also allows us to grow our talent base through the retention of key employees" (LEP press release).

The creation of new resources was particularly aimed at building capability in the sales process. Researchers have acknowledged that manufacturers typically lack the capacity to sell services and solutions, for a variety of reasons (Oliva and Kallenberg 2003; Reinartz and Ulaga 2008). Existing customer contacts may lack the authority to make decisions about long-term service contracts, but the sales force is also a key building block. Shifting to selling services rather than products requires sales personnel to develop new capabilities and a different mindset. As one interviewee

told us, "A service business needs people who understand customer needs and the link between the service business and technology and how important it is. These people need to be recruited, trained, and further developed" (Area Manager, LEP).

In recognition of this reality, some of our case firms restructured their service sales to better support the transition:

> We have separated our product and service sales, and noticed that this is a good practice. Those who sell products are product-centric and sell the product benefits such as technical features and small process improvements. But when we sell services, we talk about the customer's balance sheet and the customer's ability to make profit, and how our services can create business opportunities for the customer. Thus, our staff are operating several steps further up the level of discussion. (CEO, V&P)

To develop the capabilities needed to sell services, companies took a variety of actions. Five companies in our sample established strategic development programs that focused on developing solution sales. Value-based selling—the process of identifying, quantifying, communicating, and verifying the value a service provides to the customer (Töytäri and Rajala 2015)—was a key development area for six companies in our sample. That is because one of the cornerstones of a successful service business is a deep understanding of customers' key decision-making drivers, equipment lifecycle costs, and productivity of equipment ownership. Thus, as one interviewee told us, "One of our strategic development programs is to develop sales competencies. Selling solutions, selling value and quantifying the value delivered during the sales process are our focus areas" (Area Manager, LEP).

The case firms also sought to collaborate with other firms to support their servitization efforts. They developed strategic alliances and joint ventures to develop new technologies, enter new markets, or improve productivity. Strategic alliances helped firms mitigate the risks related to developing solutions and also allowed access to other firms' resources and enhanced joint learning.

Some of the new resources required by the transition were technologies needed to support operational and performance-based services. For instance, remote sensing technology can facilitate product lifecycle analysis and improve understanding of how customers actually use a product. In addition to providing customer benefits, such service-related technologies also help manufacturers increase the productivity of service operations, and thus harvest more value. Developing these technologies wrought change across the firm; one CEO (HVP) told us that the company now has more software engineers than traditional mechanical engineers on its staff. This kind of change requires organization-wide commitment. Our interviewees stressed the importance of vision and support from top management in this effort:

> Basically our CEO took the initiative to develop this technology. As a visionary, he saw that this is a big thing in this business. He was able to get the top management team behind the initiative and commit to it. In 2008, we started to build the technology and develop the business roadmap of what this [remote service concept] means in practice and what resources we should acquire. (Director of Product and Services Development, LMP)

**In addition to integrating new resources, the firms we studied continually expanded their existing capabilities to support their new orientation toward services.**

The firms we studied took a variety of approaches to build the capabilities they needed to move to a services-based business model. This included engaging in acquisitions, creating new organizational structures, establishing strategic development programs, hiring and training personnel with appropriate skills, and engaging in strategic alliances.

***Leveraging Existing Resources***

In addition to integrating new resources, the firms we studied continually expanded their existing capabilities to support their new orientation toward services. The firms clearly viewed the product and service businesses as highly interconnected; increasing the installed base provided growth and sales opportunities for services and vice versa. As one CEO told us, this kind of expansion promised astronomic growth:

> Our installed base consists of 8,000 machines and an active fleet. If we can manufacture even the same amount of products in the following 10 years as we have manufactured so far, the fleet will be doubled, which is historic. This means that the service growth is just beginning. (CEO, HVP)

The know-how of both field personnel and suppliers is another resource firms leveraged to power the transformation to a services focus. Field personnel know-how enabled firms to develop new businesses and new service categories and to increase the scalability of services. Five case firms reported that they were servicing competitors' or third-party equipment, an undertaking that relied directly on field personnel know-how and required continuous personnel training. This practice illustrates how the case firms sensed and seized business opportunities, in this case related to other equipment, and focused on providing comprehensive service to existing customers.

The firms in our study also leveraged their understanding of customers' processes and needs to develop new

**Organizational structure represents another key resource to support servitization.**

offerings, business processes, and operations. As one CEO told us:

> We outperform expectations in many markets because we are thorough in our service provision. That superiority in service terms comes from our founder's history, because he used to be a contractor . . . Our product innovations and maintenance procedures emerge from our thorough understanding of the customer. (CEO, HVP)

Leveraging customer understanding enabled the firms to increase their business by expanding the scope of the services and solutions they provided. These new services and solutions were often developed in collaboration with customers. The firms in our study also looked upstream for support in their transformation, seeking to exploit suppliers' resources in developing new service offerings. As one CEO said, in a corporate history document:

> In the 1990s, we started to understand that we needed to work upstream and closely with the most forward-looking partners. It was possible to build competitive advantage and differentiate ourselves from the competitors by mutually developing activities and learning with selected component and module suppliers. (CEO, LEP history)

As the firms began relying more on external resources, supplier network management became critical. This led all of the firms to reduce the number of suppliers they worked with, consolidating upstream activities to a few established, strategic suppliers. Instead of fostering wide networks, these firms made specific relationship-specific investments (physical, site, and social) with their most strategic suppliers; created organizational structures such as relationship management teams and mutual IT systems, to facilitate mutual learning; and worked to improve supplier trust to build more effective cooperation and enhance innovation.

#### *Releasing Unneeded Resources*

Activity to release resources includes divestments, layoffs, outsourcing, joint ventures with planned exits, and reductions in the number of suppliers, all of which permit a firm to reduce costs, transform fixed costs into variable costs (allowing costs and margins to be more consistent), or reallocate resources to other areas. Our case firms systematically released resources to decrease vertical integration and organizational rigidity. The overall aim was to make the organization nimbler, more innovative, and more proactive.

Releasing resources also includes action to change behavior and give up routines and mindsets that are no longer applicable. The firms we studied adopted strategic, structural, and operational practices to encourage and measure behavioral change. These included strategic measures such as involving personnel in defining the firm's vision, mission, and values; structural changes such as new IT systems and the establishment of cross-functional solution development teams, internal business schools, and other mechanisms to encourage collaboration; and operational changes such as new human resources and knowledge-sharing practices. As one marketing director explained, all of this was part of a continual search for new approaches: "Service business should never be stationary but you should always be able to renew methods in services" (Marketing Director, MWI). A key element in the effort was the adoption of new key performance indicators (KPIs) to measure the delivery of services—for instance, total cost of ownership, profit per installed unit, customer retention, net promoter index, and personnel satisfaction. These new KPIs replaced or complemented product-related KPIs such as production efficiency, cycle times, product sales, or product margins.

Our case firms also sought to release resources they no longer needed and to outsource non-core functions, such as administration, to allow the organization to focus on more valuable activities, such as developing cutting-edge technologies to support service offerings. Notably, as customers started to buy services and total solutions (solutions that consist of a combination of products and services), the case firms reacted by purchasing total solutions from their own strategic suppliers and consolidating their supplier network. This move helped to reduce the resources required to manage the supplier network, as one purchasing officer described in an outside publication:

> There is a huge risk that an extensive supplier network would hinder our growth. Many small suppliers don't have enough resources to grow by themselves, and deploying our resources to facilitate their growth would not be reasonable. Increased demand for components cannot be satisfied by increasing the number of suppliers because that would tie up our resources even more, and then we couldn't develop our strategic activities as much as we would like to. Reducing the number of suppliers shouldn't be an end in itself . . . Our objective is to manage fewer suppliers to facilitate their innovativeness and cost efficiency. (Hernesniemi and Nikinmaa 2009, p. 21)

Manufacturers' ability to break free of path dependency and change behavior becomes critical when developing a service business. The manufacturers we studied streamlined their organizations by releasing resources and changing behavior to create space for the growth of the service business.

### The Role of Dynamic Capabilities

The journey of our case firms in realigning resources illustrate how dynamic capabilities—the skills and behaviors that support strategic renewal of the organization—arise in practice. Our firms engaged three dynamic capability

modes—creating, leveraging, and releasing—to facilitate their transition to a service business.

Because the knowledge component is critical in delivering services, creating new service capabilities is far from easy. Acquiring companies and hiring new people are demanding processes because integrating these kinds of resources poses several challenges. However, they are necessary; in our sample, the firms with the strongest record of growth in services, in terms of the proportion of services to product sales, had a long history of corporate mergers and acquisitions. One firm had acquired nearly 250 companies in the previous 10 years. Interviewees from that firm emphasized the importance of a systematic integration process and the role of human resource management in hiring and training people. Formal, dedicated strategic development programs were also implemented by several firms in our sample as a tool to boost strategic change and renewal, by cementing top management support. It was common among case firms for an executive group member to be the owner of a dedicated strategic development program; top management could then steer the firm toward activities that support the program.

When creating new resources, a manufacturer needs to decide whether it will build its own service network or cooperate with other firms; hybrid options may also be available. Building an extensive service network requires time and money, but enables the firm to maintain direct contact with customers. Developing strategic alliances is a faster way to build service coverage but might lead to lost sales opportunities and missed information about potential new services and product improvements.

Organizational structure represents another key resource to support servitization. In the beginning, our case firms separated their services into business units with profit-and-loss responsibility to legitimate the role of services within the firm and facilitate service sales. However, products and services are closely connected and manufacturers moving to servitization should consider how service and product businesses can be organized in the future to allow them to benefit from each other. Establishing a matrix organization or designing some other structure that facilitates product and service people working together could enable a firm to provide complex, variable services, such as turnkey and integrated solutions.

The second mode, leveraging existing resources, is less risky than creating new resources because the firm is more familiar with existing resources and there are no integration challenges. The biggest risk is related to the level of diversification. The more diversified a company is, the more growth opportunities it has. However, diversification may also lead to a lack of focus. Essentially, a manufacturer considering servitization has two options: 1) focus on product-centered services (financial services or maintenance) or 2) focus on customer-centered services (turnkey solutions or consulting). The firms in our sample tended to develop their customer-centered offerings incrementally. Before selling turnkey solutions or performance services, for instance, the companies made sure they were able to sell and deliver products and services separately. This approach allowed time to build customer trust. This kind of stepwise development allows for organizational learning, but it does mean the service business will not supersede the product business overnight—making such a transition takes time.

**Because the knowledge component is critical in delivering services, creating new service capabilities is far from easy.**

The third mode, releasing existing resources, should not be viewed as a downsizing exercise. Shedding resources reactively, as a response to changes in the business environment, is usually a sign of a management failure and does not allow managers latitude to develop emerging business activities. However, proactively releasing resources to make space for the company to forge new resources and leverage existing ones in new ways is productive. Nevertheless, managers should remember that shedding existing resources can mean losing a degree of control; for example, outsourcing strategic component production means that the suppliers providing these components to some extent control the firm's upstream activities. Therefore, releasing a resource makes sense only if the firm expects to generate more value with the new resources than can be expected to flow from the retention of the existing resources. Managers should therefore evaluate the opportunity costs of releasing resources.

## Conclusion

Altering the firm's resource base to support servitization is challenging, and manufacturers attempting to do so will face a number of challenges. The manufacturers we studied did not complete the transition overnight; in fact, some of the case firms began their servitization process as long as 50 years ago. Developing a service business requires service-related capabilities, and building those capabilities can require the creation of new resources, the leveraging of existing resources in new ways, and the release of resources that are no longer relevant. Our case firms achieved their goals in each of these modes through a wide variety of activities, including acquiring other companies, hiring personnel who have a service mindset, and establishing new organizational structures and practices. They also reached out for support, cooperating with customers and leveraging suppliers' resources.

For our case firms, this comprehensive approach led to more advanced service offerings and steady growth in revenues generated from services. Overall, our results suggest that systematically investing in resource realignment to facilitate the development of dynamic capabilities can significantly boost performance in industrial markets.

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# How manufacturer's organizational routines are transformed to facilitate a transition from goods to services?

**Abstract**

The current study analyzes how a manufacturer's organizational routines change when it transitions from a product-based logic toward a service-based business logic. The results are based on 19 executive interviews and extensive secondary data collected from five manufacturing companies that have successfully made that transition. The results indicate that both ostensive and performative routine changes are required to manage the renewal process successfully. Furthermore, the study presents various practices available to alter a manufacturer's organizational routines to create a strategic renewal supporting a services orientation.

**Keywords:** Routines, servitization, dynamic capability, strategic renewal

## 1. Introduction

Scholars and practitioners acknowledge that firms with a solely product manufacturing orientation (will) face severe challenges to their business (Cohen, Agrawal & Agrawal, 2006; Wise & Baumgartner, 1999). Product commoditization, intensified competition and profit erosion, increased price pressures, and difficulties related to differentiation through products are likely to challenge existing product-based business models. Consequently, several scholars and practitioners have suggested that the manufacturing sector should consider developing services and solutions a new profit imperative (Wise & Baumgartner, 1999) on the grounds that they provide several economic, marketing, and strategic benefits (Gebauer, Fleisch, and Friedli 2005) for those firms capable of successfully implementing what is termed a *servitization* strategy.

While the potential for a more stable source of revenue, increased profits and customer retention rate, an improved reputation among customers, and differentiation of the firm or brand through services sound attractive for most of the manufacturers' stakeholders, the reality appears to be disheartening. Studies have reported that only a minority (ca. 20–25%) of manufacturers are able to profit from services (Ulaga & Reinartz, 2011). Studies have pointed out that manufacturers lack the capabilities necessary to commercialize, sell, deliver, and productize services and solutions effectively (Reinartz & Ulaga, 2008; Shankar, Berry & Dotzel, 2009). Scholars have stressed that the manufacturing logic and path dependency may hinder the adoption of the new competencies and capabilities that are required in the service business. The service business has been described as requiring closer interaction with customers and therefore in-depth understanding of the business processes of the firm's customers or even of its customers' customers (Tuli, Kohli & Bharadwaj, 2007). Furthermore, manufacturers need to develop new capabilities and routines to solve customers' business problems while simultaneously handling their own internal change process (Hamel, 2000). Without the ability to develop new organizational capabilities and competencies through new routines, rigidity is likely to set in, and that can hinder the company's strategic renewal.

Despite the growing number of empirical studies on the servitization phenomenon in the manufacturing context from different theoretical perspectives, there are surprisingly few empirical investigations of how organizational routines evolve. This study is one of the first to study how manufacturers transform their organizational routines during the transition

from goods to services. Thus, the present study contributes to the intersection of dynamic capability theory and servitization literature by analyzing how organizational routines are transformed in those manufacturing companies that have evidently and successfully transitioned from a goods to a services orientation.

The study is organized as follows: in Section 2, the relevant servitization and dynamic capability literatures are briefly discussed, and in Section 3, the study's research design, methodology, and data are presented. Section 4 describes the key results and concepts, while Sections 5 and 6 discuss the study's managerial and theoretical implications, the study's main limitations, and the future research opportunities. Section 7 offers a conclusion to the study.

## 2. Theoretical background

### 2.1. Business servitization

The term servitization, coined by Vandermerwe and Rada (1988), refers to the way a company strategically mixes products, services, software, and expertise. Prior studies have stated that servitization changes almost every dimension of a company (Baines, Lightfoot & Smart, 2011; Davies, 2004) and that it affects the purchasing behavior of the firm's customers (Töytäri & Rajala, 2015), customer and supply-chain management practices (Ryals & Humphries, 2007), firm's overall strategies (Josephons et al. 2016) and renewal (Huikkola, Kohtamäki & Rabetino, 2016), management practices (Neu & Brown, 2008), the key performance indicators (KPIs) applied (Cohen, Agrawal & Agrawal, 2006; Wise & Baumgartner, 1999), sales operations (Reinartz & Ulaga, 2008; Ulaga & Reinartz, 2011), boundary delineations and the competitive landscape (Salonen & Jaakkola, 2015; Wise & Baumgartner, 1999), organizational capabilities (Spring & Araujo, 2013; Ulaga & Reinartz, 2011), organization structures (Gebauer et al. 2010; Neu & Brown, 2005; Oliva & Kallenberg, 2003) and internal processes ranging across functions (Storbacka, 2011).

Prior studies have found that servitization can offer a manufacturer various economic, marketing, and strategic advantages in its markets (Eggert et al. 2014; Gebauer, Fleisch, & Friedli, 2005). However, extant studies indicate that a majority of manufacturers (75–80% is claimed) fail to profit from the services as they lack the capabilities to market, sell, scale and implement services successfully (Reinartz & Ulaga, 2008; Shankar, Berry, & Dotzel, 2009; Ulaga & Reinartz, 2011). It is suggested an existing manufacturing logic may hinder

a company's renewal because organizational processes, capabilities, norms, and routines have been developed to enhance the new equipment business (Capital Expenditure/CAPEX) rather than the service business (Operating Expenses/OPEX). Researchers have suggested that to avoid the stagnating effects of rigidity, companies should break free from the manufacturing path dependency and history, for instance by establishing service units responsible for their own profitability (Oliva & Kallenberg, 2003), obtaining and developing new capabilities (Huikkola, Kohtamäki, & Rabetino, 2016; Reinartz & Ulaga, 2008), and by adopting a service-dominant logic emphasizing value co-creation between manufacturer and customer (Tuli et al. 2007; Vargo & Lusch, 2004). In sum, manufacturers have started to sense and seize business opportunities downstream and reshaped their resources and organizational routines to facilitate their strategic renewal aimed at becoming service-led businesses.

### 2.2. Strategic renewal

Strategic renewal accords with a company's *strategic transition* or *transformation* in the markets. Strategic transition refers to the company's exploitative behavior and incremental and evolutionary change where for instance the manufacturing company keeps its hands with product manufacturing while it simultaneously starts to develop, market, and sell new service-products and to shift its focus incrementally toward service development. The concept of strategic transformation in contrast deals with a company's explorative behavior, revolutionary change, and reorientation that involves the company abandoning the old and focusing entirely on a new business area. IBM offers an example of strategic transformation as the company changed its standard industrial classification (SIC) and relinquished its product business to focus purely on services, namely software and consultancy. Studies and managerial books on IBM's strategic renewal (e.g., Gerstner, 2003; Hamel, 2000; Harreld, O'Reilly & Tushman, 2007; Lloyd & Phillips, 1994; O'Reilly & Tushman, 2009; Tushman & O'Reilly, 2006) reveal that IBM did not urgently need a new strategy but instead new ways to do strategy. The same sources also suggested IBM needed to review how it conducted its marketing and operations, empowered people, and addressed business risks. Furthermore, the commentators mentioned above reported how the firm should have been rebellious and communicated better with shareholders and made better decisions more rapidly. In other words, IBM needed to revamp its organizational processes and routines in a way that would change the mindset within the company and thus affect the corporation's strategic direction and initiatives. Such changes can be implemented from the top down, or

from the bottom up. The first form refers to a structural ambidexterity that revolves around a structural separation of initiatives and activities, whereas the bottom up form refers to the contextual ambidexterity evident on an individual level, and that highlights the role of front-line personnel in decision-making (Birkinshaw & Gibson, 2004).

### 2.3. Dynamic capability perspective

Dynamic capabilities (DC) are described as higher-order competencies that delineate the company's ability to create, integrate, leverage, and release resources to address a changing business environment or to shape it (Eisenhardt & Martin, 2000; Danneels, 2011; Teece, 2007). Wang and Ahmed (2007) identify three main constituent factors of dynamic capabilities, namely 1) absorptive, 2) adaptive and 3) innovative capabilities. These capabilities offer firms an option of whether to shape the markets or adjust to the prevailing new conditions. Teece (2007) has stated that dynamic capability consists of a firm's ability to sense new business opportunities, seize them, and reconfigure its resources to respond to the altered circumstances. Early studies on dynamic capabilities have highlighted the role of a rapidly changing business environment and a firm's ability to overcome the turbulence in high-velocity markets (see Eisenhardt, 1989; Eisenhard & Sull, 2001; Teece, Pisano & Shuen, 1997). Thus, early DC studies investigated renewal particularly in the context of what has been called *the new economy*, which was also referred to as the *dot-com boom* at the beginning of the millennium. Later studies on dynamic capabilities, however, have neglected the role of high-velocity markets and focused increasingly on strategic renewal and organizational learning in general, that is, a company's objective of becoming a different type of organization (Danneels, 2011; Whitney, 1996). Dynamic capability theory therefore suggests that a company can overcome its core rigidity (Danneels, 2011; Huikkola, Kohtamäki, & Rabetino, 2016; Leonard-Barton, 1992) through creating, establishing and nurturing new capabilities, competencies, and routines, and abandoning its former behavior.

### 2.4. Organizational routines

Organizational routines are typically described as a sequence of repeated and recognized actions, rooted in algorithms and heuristics that help various actors to get things done (Feldman & Pentland, 2003; Teece, 2012). In addition, the traditional view suggests that routines are static and unchanging, although some recent studies have acknowledged that routines can be dynamic and evolve over time because of the need to address to the changing

business environment (Feldman, 2000). Rigidity affecting a routine is a result of a failure to change the organizational processes necessary to exploit resources. For instance, Eisenhardt and Martin (2000) report that cross-functional R&D teams, technology/knowledge transfer routines, new product development routines, and performance measurement systems are important facets of dynamic capabilities. Teece (2012) states that some companies have failed to build change routines, or are hampered by the dynamic capabilities required to do so being located outside the company because they have been deemed to be required only occasionally. Paradoxically, even in less volatile markets, organizational norms and procedures are likely to require constant revision (Feldman, 2000; Teece, 2012). Prior studies have found that organizations typically overcome resource rigidity but that the routine rigidity increases when the firm faces a threat (Gilbert, 2005; O'Reilly & Tushman, 2007). Thus, it has been acknowledged that changing resources is typically easier than changing working methods. Studies have illustrated that some iconic companies such as IBM, Cisco, and Apple have routinized their product development, decision-making, resource allocation, searching, new market sensing, seizing, or alliance and acquisition execution processes (Eisenhardt & Sull, 2001; Mayer & Kenney, 2004; Teece, 2012; Williams, 1994; Zott, 2003). On the other hand, Eisenhardt and Martin (2000) state that in high-velocity markets, routines must be simple, experimental, unstable processes that rely on newly created knowledge and iterative execution to create adaptive yet unpredictable outcomes. In sum, routines are required to get things done at the time and must be altered to ensure things get done in the future. The first clause accords with the question of existing core capabilities (how the firm is performing currently) whereas the latter accords with the question of dynamic capabilities (how the firm will be performing in the future).

Feldman & Pentland (2003) state that the organizational routines consist of two aspects: the ostensive and the performative. The ostensive aspect is the ideal, schematic, abstract, general or even utopian form of a routine. The performative aspect consists of particular actions accomplished by dedicated people. Unlike abstract ostensive aspect, the performative aspect materializes how the routines emerge in practice. Hiring is an example of an ostensive routine whereas the question of how the hiring is done manifests the performative routine. Table 1 presents definitions of the organizational routines and their links to dynamic capabilities.

**Table 1.** Definitions of organizational routines and their linkage to dynamic capabilities.

| Author(s) | Extract (bold font is author's emphasis) | Interpretation |
|---|---|---|
| Eisenhardt & Martin (2000) | "Dynamic capabilities thus are the organizational and strategic routines by which firms **achieve new resource configurations** as markets emerge, collide, split, evolve, and die." | Organizational routines are learning routines (learning to learn, regenerative capabilities) |
| Feldman & Pentland (2003) | "An organizational routine is a **repetitive, recognizable pattern of interdependent actions**, involving multiple actors." | Individual routines should not be mixed with organizational routines |
| Gilbert (2005) | "**Repeated patterns** of response involving interdependent activities that become reinforced through structural embeddedness and repeated use." | Routines are ought to be more rigid than the resources |
| Nelson & Winter (1982) | "Our general term for all regular and predictable behavioral patterns of firms is "routine." | Organizational routines embody the primary means by which organizations accomplish what they do |
| O'Reilly & Tushman (2007) | "A dynamic capability can be seen as a set of actions (or routines) taken by senior management that permit the enterprise to **identify opportunities and threats and reconfigure assets** (people, organizational architectures, and resources) to adapt to these." | Organizational routines (e.g., resource allocation) are routines taken by top managers |
| Sirmon, Hitt & Ireland (2007) | "To reduce complexity, the firm codifies as much knowledge as possible into organizational routines. But because **tacit knowledge is critical to successful deployment of integrated capabilities and is highly personal and deeply rooted in an individual's action** within a specific context, **much of the knowledge associated with deploying capability configurations cannot be codified."** | Dynamic capabilities emerge from individual routines and actions that cannot be codified |
| Stene (1940) | "An organization may adjust itself to certain irregularities, with the result that new sequence of interaction becomes routine...**they may serve or promote, or they may impair the accomplishment of an organization's objectives**." | Organizational routines involve the coordination of multiple organizational participants |
| Teece (2007) | "Top management leadership skills are required to sustain dynamic capabilities. An important managerial function is achieving **semi-continuous asset orchestration and corporate renewal, including the redesign of routines**." | The more dynamic or turbulent the markets are, the more revamping the organizational routines require |

| | | |
|---|---|---|
| Teece (2012) | "A routine is a **repeated action sequence**, which may have its roots in algorithms and heuristics about how the enterprise is to get things done. Organizational routines, including those related to organizational transformation, transcend the individuals involved, although the routines can, for some purposes, be usefully studied as developed and embedded in the minds of multiple employees." | Routines help firms to get things done |
| Teece, Pisano & Shuen (1997) | "Routines are **patterns of interactions** that represent successful solutions to particular problems." | Organizational routines are patterns of current practices or learning |
| Winter (2003) | "An organizational capability is a high-level routine (or collection of routines) that, together with its implementing input flows, **confers upon an organization's management a set of decision options for producing significant outputs** of a particular type." | Improvisation and ad hoc problem solving are not routines |
| Zollo & Winter (2002) | "Routines are **stable patterns of behavior** that characterize organizational reactions to variegated, internal or external stimuli." | The application of routines in different contexts facilitates organizational learning and performance |
| Reuer, Zollo & Singh (2002) | "**Stable patterns of interaction** among two firms developed and refined in the course of repeated collaboration" | Routines determine the way companies operate and collaborate together |
| Zott (2003) | "Dynamic capabilities are treated as **a set of routines guiding the evolution of a firm's resource configuration."** | Operational routines are regular and predictive. These routines may be socially complex and embody the firm's current stock of knowledge that constrains and shapes the development of new knowledge |

Table 1 illustrates the different ways in which scholars describe organizational routines. Some argue that they are management-driven (from the top down) while others consider that routines emerge from personnel practices and behavior (from the bottom up). Some authors claim that routines are long-term patterns and require time to evolve while others' argue that routines can be changed instantly to address quick market changes. Some scholars have viewed routines from the individual (employee) perspective while others emphasize the organizational perspective. This study is based on extant studies on organizational routines and considers organizational routines *those routines that an organization's members adopt to get things done now and in the future*.

## 3. Theoretical background

### 3.1. Methodology

The present study applies a qualitative comparative case method to conduct a detailed analysis of how manufacturers change their routines to facilitate an organizational renewal that transforms their orientation from a goods to a services logic. Qualitative methods allow the researcher to gain a deep understanding of the studied phenomenon, in this case highlighting *how companies change* their routines and behavior to boost their strategic renewal.

### 3.2. Sample

The study investigates how five Finnish global manufacturers altered their organizational routines and behavior to create wealth from services. All of the studied companies had been able to implement their service strategies successfully as evidenced by their service business revenues accounting for 20–45% of their total revenues, and services had clearly made a remarkable impact on their overall profits per se. Furthermore, the studied companies' absolute service sales had increased from nearly 13% to 80% during the period 2010–2015 investigated (no inflation adjustment was considered). However, the companies had started to develop their service businesses at different times owing to their own strategic choices and failures, market changes, the maturity of their markets, and the evolution of adaptability among their customer base. Each of the studied companies were public firms manufacturing machinery, which allowed researchers access to extensive secondary data from multiple sources such as annual reports, press releases, histories, and other public documents. Table

2 describes the five companies (whose identities are disguised by the use of aliases) and the primary and secondary data that was collected and analyzed. The total of five case companies was considered an appropriate number to study as data started to saturate, and increasing the number of cases would not have significantly increased the overall understanding of the phenomenon. The focus on five cases also accords with Eisenhardt's (1989) recommendation of scrutinizing between four and ten cases.

. **Table 2.** Sample and data description

| | **Company** | | | | |
|---|---|---|---|---|---|
| | **Alpha** | **Beta** | **Gamma** | **Delta** | **Omega** |
| **Revenue**<br>**Share of services**<br>**Service business growth rate**<br>**(from year 2010 to 2015)** | >2€billion<br><40%<br>12.8% | >7€ billion<br>~45%<br>27.2% | >2€ billion<br>>40%<br>25% | <400€ million<br>>20%<br>52.4% | <2€ billion<br><40%<br>83.7% |
| **Face-to-face interviews (audiotaped)** | President/services<br>Senior manager/ services | Area director/services<br>Service-development director<br>Service manager | Service director<br>Director/product and services development<br>Area manager*3 (services) | CEO<br>Service director<br>Global service manager<br>Service manager | HR Director<br>VP/Account management and service development<br>VP/Market operations<br>Service sales director<br>Product manager, services + pricing manager, services |

| | | | | | |
|---|---|---|---|---|---|
| **Other primary data (memos created)** | CEO presentation (45min/investor event)<br>Head of investor relations' presentation (30min/investor event)<br>Vice President, Strategy and M&A (60min/research seminar) | CEO presentation (45min/manufacturing seminar)<br>Former CEO's presentation and memoir<br>Senior vice president/Integrated solutions presentation (60min/research project's seminar)<br>Design director's presentation (60min/research project's seminar)<br>CIO's presentation (30min/IoT seminar) | CEO presentation (45min/manufacturing seminar)<br>Head of investor relations presentation (30min/investor event)<br>CDO presentation | CEO presentation (45min*2/manufacturing seminar*2)<br>Software project leader presentation (30min/IoT seminar) | CEO's presentation (60min/investor event)<br>Strategy director (60min/research seminar) |
| **Archival data** | Annual reports 2000-2014<br>Business magazine stories (CEO interviews) | 4 histories<br>Annual reports 2000-2014<br>Business magazine stories (CEO interviews) | Annual reports 2000-2014<br>Book of business cases (CPO)<br>Business magazine stories (CEO interviews) | History<br>Annual reports 2000-2014<br>Business magazine stories (Chairman of the board interviews) | Annual reports 2000-2014<br>Business magazine stories (CEO interviews) |

### 3.3. Data collection

The data were collected between spring 2010 and spring 2015 and offered the opportunity to review how the machinery manufacturers attempted to establish and maintain strategic change and the renewal process targeting a stronger services orientation through changing their organizational routines. As all of the studied manufacturers are relatively large companies leading their fields that employ thousands of people, interview data were collected from 19 senior managers representing the studied solution providers. The applied method is also the study's main limitation as performative changes often occur at lower hierarchical levels and particularly in supplier-customer exchanges. However, because of technical reasons affecting the research (observing field personnel would have required extensive research resources and owing to the lack of micro-level evidence), the focus is on senior manager interviews and their interpretations of changes in organizational routines. Interviewees held top management positions such as CEO, President of Service Business, Service Director, HR Director and Marketing/Sales Director. All of the respondents had profit-and-loss responsibility and extensive experience within their industries and firms. The interviews ranged from 60 to 90 minutes in length, and all were audiotaped with permission and transcribed verbatim shortly after they took place. In addition, a researcher participated in investor meetings and various strategy-related seminars to gain a deeper understanding of the companies' strategic initiatives. That researcher wrote memoranda and collected seminar materials such as executives' presentation documents to facilitate a detailed analysis of each case. Moreover, the researcher reviewed the companies' histories, articles on them published in business magazines, and other publicly available documents to complement and verify the primary data.

### 3.4. Data analysis

The researcher repeatedly compared the collected empirical data with the extant literature on servitization and organizational routines, thus following an abductive reasoning research process (Dubois & Gadde, 2002). The data analysis began with a within-case analysis of each case to understand how each case company changed its organizational routines and behavior when moving toward a service orientation. After completing the within-case analysis, the researcher attempted to establish similarities and differences across the cases. This cross-case analysis revealed the general patterns in the cases. The QSR NVivo10 program was utilized to code themes on the evolution of routines in the studied companies.

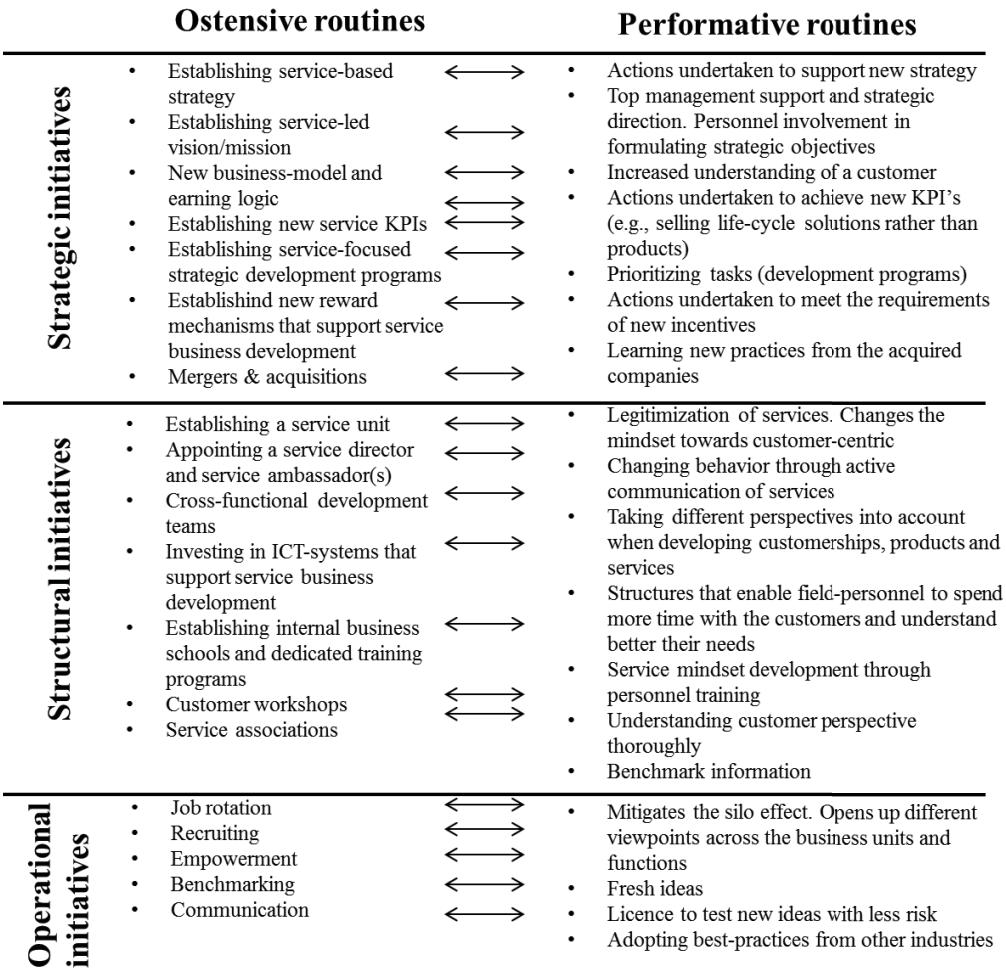
## 4. Results

The results of this study indicate that the studied manufacturers use various mechanisms to facilitate strategic change to progress their service orientation. Most of the changes take a considerable time to influence personnel behavior. The changes have been classified as ostensive and performative routine changes (see Feldman & Pentland, 2003). According to the extant routine literature (e.g., Feldman & Pentland, 2003), both aspects are required as the ostensive routine changes typically facilitate performative (behavioral) changes. However, performative changes can force an organization to change its formal structures to support the development of its service business. Hence, strategic change can be boosted from the top down (starting from the structures) or from the bottom up (starting from the behavior). These two forms may also occur simultaneously, or back and forth.

The initiatives have been classified as strategic, structural and operational. Those initiatives are related to the content of the action undertaken. For instance, investing in ICT systems that support salespeople selling life-cycle solutions is a structural initiative that is supposed to help salespeople to sell more services with less effort. Behavioral change is manifested when the structural changes enable salespeople to spend more time with the customers (e.g., new ICT systems require less time is spent on reporting) and they enable salespeople to identify, quantify, communicate, and verify customer's value drivers because of the increased customer-related work.

The respondents stressed that establishing new procedures and learning new methods is never easy, and doing so required time and managerial focus. Specifically, the respondents stressed that an organization needs to adopt new practices on several different levels of the hierarchy to foster change. Moreover, the company representatives highlighted the need to unlearn old methods to learn new ones.

**Figure 1.** Routine changes to develop service business.




### 4.1. Strategic initiatives effect on organizational routines

Strategic initiatives refer to those initiatives that affect an organization's strategy work such as practices that (re)define the firm's mission, vision, strategy, business model, and earning logic. Strategic initiatives are the most complex actions as they are inherently rather abstract and intangible. Therefore, managers employ metaphors, specific examples, and various actions such as the communication of strategy to make an abstract strategy understandable across the organization and among the organization's members.

Because each of the studied firms had taken the strategic initiative to develop services/solutions, their strategy work was dominated by service/solution business development. The studied companies not only established pure service strategies but also established corporate strategies emphasizing the increased role of services, solutions, and

customers to firm's overall strategy. As services are customer-focused, creating new strategies requires new ways to do strategy work and get people involved in formulating strategy. In practice, when people were involved in redefining a firm's vision, mission, and strategy, the personnel were able to better understand the customer perspective:

> *Our vision's redefinition turned out to be successful. Through the new vision, an increased number of our personnel learned to view our company from the right perspective, i.e., through the lenses of our customers.* (CEO/Beta)

One interviewee described that one development project related to remote technology concept development eventually led the firm to redefine the entire corporate vision. This indicates that some strategic changes are prompted by bottom-up initiatives:

> *When I came to the company in spring 2008, we defined the remote vision for 2010…Later we completely changed our vision and eventually, our project's key output became our corporation's vision. This was a real pearl.* (Director of Product and Service Development/Gamma)

The studied companies established strategic development programs (SDPs) that focused on developing the service/solution business. These programs enabled firms to make their strategic actions more tangible and visible. The idea of these SDPs was to prioritize the most strategic development areas and allocate those areas top management support (typically one executive board member was nominated as an owner of the dedicated strategic development program). One respondent described how SDPs enabled the firm to translate its strategy into action:

> *Only [strategic] development programs could bring our strategy to life and show we would put our money where our mouth is...The successful completion of development projects requires the personnel to be able to forget the old methods and learn new ones.* (CEO/Beta)

One practice, establishing new KPIs at the different organizational levels, was seen as key to steering the firm's objectives to ensure they became actions. Thus, the worn out saying "you get what you measure" illustrates relatively well how the organization scrutinizes its actions. The studied companies established KPIs that measured their success in services, a typical example being services share of revenues. Other examples the studied manufacturers started to deploy included customer and service-oriented metrics such as total cost of

ownership (TCO) or net promoter score instead of pure product metrics (e.g., product margins). The following quotation exemplifies the linkage between the measured metrics and the actions undertaken in the sales context to meet those requirements:

> *We started to measure the number of sales meetings…The number of these meetings doubled in just two years.* (CEO/Beta)

One executive stated how public objectives and statements steer managers' and other employees' work:

> *In our sustainability report we have set targets for the organization and top management team. Personnel engagement and enablement are key metrics. We measure how we can enable personnel to do their best and perform the best way they can.* (HR Director/Omega)

The metrics used also served to determine incentives. The compensation mechanisms were typically built on mix of individual, team, business-unit, and organization-wide performance. The respondents highlighted that the objectives must be ambitious and challenging enough to change the current behavior:

> *Goal setting needs to be ambitious enough so it forces the development of new types of thinking models and achieves new breakthroughs.* (CEO/Beta)

> *Also, compensation influences how attractive service business is seen to be. In our business it's typical that people or salespersons in the CAPEX business have been valued more. OPEX has been valued less and viewed as if it was something dirty. It has been seen that it is fancier to sell equipment. This mindset-shift has been one issue in our* [executive group] *to-do list to make OPEX business as highly valued as our CAPEX business. This is important because OPEX is our most profitable business area and it is vital that we get the best people to work there.* (HR Director/Omega)

The company representatives also mentioned one practice applied to concretize the new working methods. The studied companies started to shorten the timespan between gathering metrics when problems arose:

> *We started to follow the development of our key metrics over a shorter time period in those teams who were deviating from their targets. This practice meant that goals became concrete in everybody's minds and the willingness to achieve the goals increased. When the period of measurement was one*

> *week, everybody saw and felt the relevance to his/her work since Monday. This improved our productivity.* (CEO/Beta)

All of the studied manufacturers reported that they had acquired local service companies to capture service competencies and bring them in-house. This strategic initiative enabled them to acquire local knowledge that helped selling more services/solutions:

> *Here are all the service-related acquisitions. We attain more service volume because the acquired firm has strong service competencies and a spare parts business. We acquired a strong service organization.* (Director of Service Sales/Omega)

In sum, to translate strategy into action and new ways to behave, the studied manufacturers redefined their vision, mission, and strategy by involving personnel and customers. To steer the firm toward the provision of services and solutions, the respondents' companies had established SDPs highlighting the importance of the service/solution business and developed capabilities to support this strategic initiative. Moreover, the studied case firms established service- and customer-related KPIs and goals to measure personnel performance and change staff behavior.

### 4.2. The effect of structural initiatives on organizational routines

Structural initiatives refer to those formal organizational structures and systems that help an organization to systematize its working procedures. This study builds on those studies on created structures, whether coercive or enabling. Coercive structures are those structures that force an organization to get things done. Enabling structures, on the other hand, are those structures or platforms that encourage organizational members to achieve their goals in a systematic manner.

The most concrete and visible structural change for the studied manufacturers was the establishment of a separate service unit. Those business units, which were assigned responsibility for their own profitability, allowed the firm to develop services per se. The formal organization also allowed the firm to manage its service operations as a separate entity with the legitimate freedom to develop services/solutions alone, a strategy that increases the power of the service business within the organization. This organizational initiative changed employee behavior in the manufacturing companies because it enabled the staff to look beyond products and to focus on customer needs and business processes:

> *The company established a separate service organization in the 1960s. In the beginning we only had few men and it was repair focused. Little by little the focus has moved toward service contracts, predictive maintenance and total responsibility for the equipment's functioning.* (Service Director/Gamma)

When the studied companies started to provide more complex total/turnkey solutions to their customers, some considered that having a separate service unit was not, however, ideal. This conclusion followed the realization that separate business units tended to give rise to knowledge silos, and hence neglect the importance of cooperation, synergies, and the interdependence between business units:

> *Previously we had a separate service business unit. Two years ago this structure was pulled down because services are mostly developed and produced inside the business lines. That's why we have a matrix organization nowadays and we don't have a separate global service organization anymore. Of course we are having a director and personnel for services but essentially they collaborate with the business lines. Altogether, we have three business regions and they have their service units inside* [business lines]. (Vice President, Key Account/Omega)

This organizational initiative further changed the manufacturers mindset on its responsibility to the customer:

> *Previously we sold and delivered the project, and that's it. We have criticized ourselves over why we weren't more customer-centric before. Now we live together with our customers and it is very service-based and we focus on fulfilling the customer needs.* (Vice President, Account Management/Omega)

Another structural initiative was establishing service-focused meetings and workshops to raise the profile of the service business:

> *We have had service-business meetings. These meetings have never taken place before. Also HR has been involved in arranging these service management meetings together with the service business. This has raised the profile of services.* (HR Director/Omega)

One structural initiative involved appointing a service ambassador or facilitator to boost the services role within the company. This structural practice was implemented to highlight the role of services/solutions within the corporation and emphasize the importance of adopting

a service mindset. One executive described how he used facilitators as a means of communication:

> *Another way to communicate about change in addition to workshops was the use of facilitators. Those selected as facilitators were energetic people with good communication skills.* (CEO/Beta)

Communication was not the only practice to raise the service business profile. The studied manufacturers established cross-functional teams to ensure that the development of customer relationships, products, services, and solutions included people operating in different business units and organizational functions:

> *We pushed heavily this kind of Account Team thinking where different businesses come together and work together to manage the customer relationship. That's the only way to bring different businesses together and it's based on customer need. Customer needs evolve during the product life-cycle. (Vice President, Account Management/Omega)*
>
> *For example, when developing new products, people from different functions are involved in different phases of the process.* (CEO/Beta)

One particularly important structural initiative was investments in new ICT systems that enabled manufacturers to develop, sell, and deliver services/solutions more effectively. The studied companies stressed that ICT systems should support service business development and time spent with the customers, not hinder service sales by imposing increased reporting time and bureaucracy:

> *We decided to invest in salesforce.com…It's a SaaS [Software as a service] based solution and is extremely flexible and user-friendly. The implementation of a new system improved the quality of our customer information, and our sales follow-up, forecasting, and management rose to a completely new level…It would be wrong to demand impressive performance from the salespeople if they didn't have the appropriate tools.* (CEO/Beta)
>
> *Our people need to know the right people from our customer when they send them an e-mail or call them. In the new system it would be possible to save information into collaboration tools and the system would automatically report that these are issues that have already been discussed with the customer. It would also be easier to save the information. Our existing system doesn't support this. We believe that our new system enables us to save all the themes we have already discussed so we don't need to talk about the same things several times.* (Vice President, Account Management/Omega)

The respondents reported that existing ICT systems have typically been built to support product business performance and measurement. Therefore, the transition toward a services and solutions orientation requires ICT systems that enable the firm to follow relevant customer information such as product life-cycle profit levels and individual customer profitability:

> *A general problem in traditional manufacturing companies is that financial-systems are built based on product-dimension needs. Typically, traditional manufacturers haven't been able to follow customer sales, much less customer-specific profitability.* (Vice President, Account Management/Omega)

The studied manufacturers invested heavily in personnel training. Many of the training programs were service-specific and tailored to different organizational levels. For instance, top managers, middle managers, supervisors, and technicians/field personnel had dedicated training programs. Top managers focused on strategy-related issues, middle managers focused on strategy implementation themes, supervisors focused on leadership skills development, and field personnel focused on developing competencies related to improving customer-service. One interviewee described two options to fill an available position:

> *We found that it's easier for us to develop our own personnel to become Account Managers than to recruit qualified Account Managers who then have to be trained to get familiar with the industry. These were the two options.* (Vice President, Account Management/Omega)

All the respondents highlighted the need to develop new types of sales competencies because selling services/solutions differs remarkably from selling products, particularly at the customer interface:

> *We have to understand that selling solutions is primarily based on understanding the customer perspective. It's not about what you can offer. The way to sell changes completely. You need to understand the customer's business logic and needs, and find the best solution for it. Not many are capable of doing this. I have seen that there are a lot of engineers who are good at talking about technological features and functionalities. They understand the products really well. Unfortunately, they usually don't understand that selling solutions is about consulting the customer. I'm talking about consultative selling, that's real solution selling in my opinion. It's a completely different way to sell.* (Vice President, Account Management/Omega)

The studied case firms were also active in several associations, and belonging to them enabled the firms to learn of best practices in their industry:

> *We belong to this non-profit association. I'm a member of the board and through this association, we get a lot of benchmark information from this industry.* (Vice President, Account Management/Omega)

Overall, created structures allowed the studied manufacturers to systematically develop and establish the routines required to develop their service business. Structural initiatives legitimized the role of services/solutions within the corporations, emphasized the need to systematically develop service competencies, and changed organizational practices to support service business development.

### 4.3. Operational initiatives' effect on organizational routines

Operational initiatives accord with investments related to improving the effectiveness of operations. Operational initiatives are more specific than strategic initiatives and eventually help a company to implement its strategic initiatives. Compared to strategic initiatives, operational initiatives are clearer and more specific, and far easier and simpler to execute in practice. Operational initiatives may refer to recruiting practices, people empowerment practices, and budget planning. As there is an extensive list of operational initiatives in each company, the operational initiatives mentioned below are the most influential with regards to service/solution business development across the case companies.

The studied manufacturers used job rotation techniques to rotate personnel to promote flexibility, facilitate people learning, motivate employees, and increase their understanding of other people's tasks. This practice took place not only on the operational level but also at the executive level where the practice increased executives' understanding of different business areas, enabled them to view business units' procedures from different angles, and to share best practices across the firm's business units and organizational functions.

> *We wanted to know who is suitable for sales and who is not. We rotated the employees' tasks, recruited new people, and above all, started extensive personnel training.* (CEO/Beta)

> *We have emphasized the importance of compensation, sales rewards, and recognition. In practice, we have highlighted the role of service business talents and through internal job rotation, we persuade future talents from other units to lead our service business.* (HR Director/Omega)

> *We need to change our mindset. If you have worked as a salesperson in the CAPEX business, there might be thoughts that you cannot move to other areas. These kinds of silos exist everywhere. But if you can encourage people through successful examples, people can see the benefits. These benefits emerge when somebody from one silo opens the eyes of the staff of another silo.* (HR Director, Omega)

When moving toward a service-based business model, the studied manufacturers reported the critical role of hiring the right people:

> *Services accounted for only 10% of revenues in this particular country when the share of services was approximately 40% globally. Therefore, the main mission was to ensure that all key personnel adopted the service business logic thoroughly. This means that these key people needed to devote enough time to understanding the service business. It is clear that ensuring the quality of recruiting and personnel development have been key activities in this situation.* (CEO/Beta)

> *It is possible to change the corporate culture. First, you can change the culture by defining the values of the corporate culture and developing those values. Another important way to develop corporate culture is the selection of key people.* (CEO/Beta)

Moreover, all of the studied case firms stressed the need to promote the trial and error method to test which businesses, products, or services are most likely to succeed and be adopted among customers. To pursue this method, top managers continuously empowered people to actively seek new markets and seize the business opportunities available to find out if the new idea is worthy of a (global) launch and further development. One representative condensed this into a few words:

> *One of the best ways to develop a person is to give him/her more responsibility.* (CEO/Beta)

> *We have encouraged people to test new ideas and take more risks.* (CEO/Gamma)

> *The management team has encouraged us to fail. All the initiatives don't need to be successful. If you have never failed, you haven't tried enough.* (CIO/Beta)

To facilitate organizational change and inspire people to seek out and try new working methods, the studied organizations benchmarked companies from other industries such as the software and medical industries:

> *We sought best practices from our daughter companies. If there were none, we sought them from other industries or developed the best practices by ourselves.* (CEO/Beta)

One key initiative was top management's focus on communication. As communication needs to be repeatable, visible, transparent, and clear, the manufacturers concentrated on developing their internal communication practices. The company representatives highlighted the need to use specific examples to recognize and convey success stories:

> *We constantly reported in our personnel magazine on which countries had achieved their service businesses' financial targets and adopted our best practices.* (CEO/Beta)

Top executives highlighted direct and more personal contact with the employees. They reported that they sent out e-mails and visited sites across the globe to get touch with the personnel:

> *The third way to communicate about change was that I sent an e-mail every two months to everyone in the organization.* (CEO/Beta)

In summary, operational initiatives include various practices such as job rotation, recruiting, people empowerment, benchmarking, and business communication. These routine changes were evident in most of the studied firms and represented key operational practices to develop service business at the operational level.

## 5. Discussion and implications

### 5.1. Theoretical implications

The existing servitization studies have viewed business servitization phenomenon from several theoretical perspectives, including that on dynamic capabilities. Specifically, prior studies have investigated how to manage the transition process successfully and how resources must be realigned to support the transition from goods to services (Huikkola, Kohtamäki, & Rabetino, 2016). However, fewer studies report how organizational routines are transformed to support the strategic transition toward services. The current investigation of organizational routines takes into account both strategic and operational perspectives as

both forms of change (organizational and behavioral) are required to foster strategic change. This study is one of the first to investigate how organizational routines are transformed to support a strategic change toward a services/solution orientation.

As a first contribution, the study's results extend the existing literature on the role of organizational routines in servitization. The study conceptualizes two types of routine changes: ostensive and performative changes. The ostensive routine changes refer to those changes implemented at the organizational and top-management level, whereas behavioral changes accord with changes that occur at the individual or personal level. These two forms of changes may be boosted by top-down or bottom-up. These initiatives can occur in parallel or back-and-forth. Changes are typically driven from the top down but highly influential experts can compel a firm to change its organizational mechanisms to support new working methods. For instance, consumerization is an example of such a change; people have got used to having more user-friendly consumer products at home than the employer can offer at work. This phenomenon has led to the adoption of the BYOD model (bring your own devices) in some firms but has also forced employers to critically evaluate if their existing methods and tools are the most suitable for the organization.

As a second contribution, the study's results extend the existing knowledge of how initiatives affect organizational routines. The study defines three categories of initiatives: strategic, structural and operational. The initiatives are built based on content of certain actions. First, the study's results indicate that strategic initiatives require actions that enable firms to achieve their strategic objectives such as services share of total revenues. Strategic initiatives typically require not only the establishment of a new strategy, vision, and mission but new ways to involve people in contributing to the creation of these strategic initiatives. Second, structural initiatives refer to those initiatives that help firms to systematize their procedures in a consistent manner. For instance, establishing new organizational structures or ICT systems allows a firm to develop, sell, and deliver services more systematically and effectively. Third, operational initiatives are the most tangible forms of practice supporting the transition toward a services orientation. Operational initiatives enable a firm to achieve its strategic objectives in practice and include job rotation, recruiting, benchmarking, empowerment, and the communication of goals.

### 5.2. Managerial implications

The current research presents interesting cases that offer useful benchmarking opportunities for directors and managers operating in a traditional manufacturing sector whose firms seek to create wealth from services/solutions. Managers should pay attention not only to organizational changes but also ensure that the performative routine changes take place. Even if the managers are invested heavily in strategic domains, they should also ensure that the targeted changes occur in everyday business practices among personnel, customers, and other stakeholders. This means that if the company establishes a strategic development program related to service business development, it must measure how well the employees actually perform those business development activities, and identify the actions necessary to support the development of the service business. Firms must also ensure that objectives, metrics and incentives have been set and understood properly. For instance, if the overall goal is to create long-term customer relationships, salespeople need to spend enough time with the customers to understand their business needs. Thus, sales staff should be rewarded for time spent with their customers and compensation should not be based purely on transactions or outcomes but should reflect the revenues accrued from the business relationship.

## 6. Limitations and future research

As with any research, this study has limitations that should be addressed. The main limitations are related to the research method applied. As the data are qualitative in nature, the results cannot be generalized to the population of servitized manufacturers. Second, the studied companies were relatively large public companies and thus, routines may be transformed in small and medium-sized companies in different ways as larger companies tend to be more bureaucratic and rigid. Third, the data are based on top management interviews and interpretations. Hence, the data overlook the micro-level perspective and do not provide evidence of how the changes occur in everyday supplier-customer interactions.

These limitations also open up further research avenues. Future research should look into the practical manifestations of different initiatives. Applying the action research method would offer interesting opportunities to follow how field personnel adopt new working methods in practice. Moreover, observing interactions between field personnel and customers would increase our understanding of how routines change in supplier-customer

interactions. Finally, researchers could observe interactions in customer workshops or in internal strategy meetings to understand how the management team attempts to create and fix the changes in routines, and how the routines are deployed in practice.

## 7. Conclusion

Manufacturers are increasingly interested in creating wealth from services/solutions. However, most manufacturers fail in this strategic transition or transformation because of the lack of capabilities or wilingness to pursue change. In addition to altering a firm's resource base, this study suggests that manufacturers should also consider changing their organizational routines to support the transition toward a services orientation. Overall, the results of this study suggest that the manufacturers who actively develop and follow their adaptation of service-based routines, have the potential to implement their service strategies successfully and attain competitive advantage in the industrial markets.

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# Joint learning in R&D collaborations and the facilitating relational practices

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ABSTRACT

The present study considers joint learning as a relational dynamic capability and examines the role of relational practices as enablers of joint learning in R&D collaboration between suppliers and their customers. The study applies a qualitative comparative case method to analyze seven dyadic cases, selected based on a quantitative dataset and cluster analysis. Our results indicate that in dyadic relationships, firms would benefit from developing practices related to relational investments, relational structures, and relational capital that facilitate joint learning and yield collaborative advantages from R&D interactions. This paper contributes to the existing literature on joint learning in R&D collaborations by defining joint learning as a relational dynamic capability and by focusing on the practices that facilitate it in R&D collaboration.



## 1. Introduction

Business relationships and relational exchanges have received considerable attention in the relationship marketing and business network literature (Ford, 2011; Håkansson & Ford, 2002; Henneberg, Naudé, & Mouzas, 2010). Existing studies have considered the antecedents, mechanisms, and outcomes of relational product exchanges (Palmatier, Dant, Grewal, & Evans, 2006) using causal modeling techniques. In addition to product exchanges, the existing interorganizational network research has analyzed research and development (R&D) collaborations between firms and universities (Un, Cuervo-Cazurra, & Asakawa, 2010), supplier involvement in customers' product development (Johnsen, 2009; Song & Di Benedetto, 2008), and, to a lesser extent, customer involvement in manufacturing companies (Campbell & Cooper, 1999; Ritter & Walter, 2003). The existing literature emphasizes the importance of customer interactions in the development of industrial products (Von Hippel, 1978; Wren, Souder, & Berkowitz, 2000), services (de Brentani, 1995) and integrated solutions (Windahl & Lakemond, 2006). For instance, Alam (2006, p. 468) notes that "a firm can benefit substantially by optimizing and improving the fuzzy front-end of an innovation process" and that "customer interaction is very useful in the front-end stages of an innovation process." Li, Eden, Hitt, Ireland, and Garrett (2012, p. 1193) add that "it is important for partner firms to exchange information, share knowledge, and make relationship-specific investments in order to realize the alliance's potential for joint value creation. R&D alliances are therefore designed to encourage intended knowledge sharing."

Nevertheless, the existing research falls short in its analysis of the relational practices in dyadic R&D collaborations in supplier–customer relationships. Relatively little attention has been paid to R&D collaborations between suppliers and customers, which is surprising considering the value creation potential of such R&D collaborations, especially in the development of complex solutions (Alam, 2006; Bonner, 2005). Moreover, the existing R&D collaboration literature, which has been mainly quantitative, provides minimal information about the activities and mechanisms behind joint learning that occur through R&D interactions between suppliers and their customers. Indeed, Davis and Eisenhardt (2011, p. 160–161) state that R&D (innovation) collaboration "research strikingly neglects the collaborative process. Yet as a handful of process studies indicate, the interactions between partners in intensely participative alliances such as technology collaborations seem likely to influence performance." In addition, many studies view alliance capability as a firm-level phenomenon (Kale, Dyer, & Singh, 2002; Walter, Auer, & Ritter, 2006), whereas relatively little research can be found on relational capabilities in which such capabilities are viewed as relational-level phenomena (Kohtamäki, Partanen, & Möller, 2013; Mitrega, Forkmann, Ramos, & Henneberg, 2012). Kale and Singh (2007, p. 996) call for studies on practices that firms deploy in business relationships, suggesting that "a firm's alliance learning process leads to greater overall alliance success by presumably improving its first-order alliance management skills… Scholars could attempt to do that either through case-based research or by collecting detailed data on these practices for a small subset of

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firms and their alliances." In summary, the network literature suffers from the lack of relational case-based research on the practices that facilitate joint learning in R&D collaborations between suppliers and their customers.

The present study is designed to fill this gap through an examination of the relational practices that enable joint learning in R&D collaborations between suppliers and their customers. Specifically, we ask the following research question: *How do suppliers and their customers facilitate joint learning in R&D collaborations*? We apply the concept of joint learning to an examination of the relational learning process, where joint learning is defined as a relational dynamic capability. We utilize the concept of relational dynamic capability to build on the dynamic capability view, according to which "dynamic capability refers to the capacity of an organization to purposefully create, extend, or modify its resources or skills" (Helfat, 2007; Kale & Singh, 2007, p. 982). Joint learning, as a relational dynamic capability, is critical for the renewal that takes place in the relationship between the parties. In relationships with high information asymmetries, knowledge sharing, joint sense-making, and knowledge integration are needed to continuously renew and reconfigure resources. Moreover, practices related to relational investments, relational structures, and relational capital are needed to enable joint learning (Chang & Gotcher, 2007; Kohtamäki, Vesalainen, Henneberg, Naude, & Ventresca, 2012). We omit generalizable causal considerations, leaving them for quantitative studies. We also distinguish this study from the deductive approach, make only a brief theoretical synthesis of the existing research, focus particularly on those empirical practices that are found in the relational case studies, and note how the observed practices reflect the existing theory (Eisenhardt, 1989). Our case-based relational data are particularly well suited to this task because the cases were selected systematically from a quantitative dataset of manufacturer–customer relationships by clustering the relational cases in terms of the extent of the R&D services and joint learning involved in the relationships. Our cases were selected from the cluster where both R&D services and joint learning were most extensive.

## 2. Theoretical background

Building on the perspective of evolutionary economics (Nelson & Winter, 1982) and organizational dynamic capability (Teece, 2007; Zollo & Winter, 2002), the relational view considers interorganizational relationships as sources of innovation, learning and renewal (Corsaro, Cantù, & Tunisini, 2012; Jiang, Henneberg, & Naudé, 2011; Kale & Singh, 2007; Ritter, 1999) for both suppliers and customers (Helander & Möller, 2007; Kale & Singh, 2009; Madhok & Tallman, 1998). Typically, studies of alliance capability take the firm as the unit of analysis, neglecting inter-firm relationships. For instance, studies view alliance learning capability as a firm-level dynamic capability that enables learning from alliances—a definition that approaches absorptive capacity (Dushnitsky & Lenox, 2005; Kale & Singh, 2007, 2009). We define joint learning as a relational dynamic capability that takes place at the level of R&D collaboration and is facilitated by such practices as relational investments, relational structures, and relational capital (Heimeriks, Duysters, & Vanhaverbeke, 2007; Kohtamäki et al., 2012).

This study analyzes joint learning and the facilitating relational practices in R&D collaboration and adopts the supplier–customer relationship as its unit of analysis. Specifically, R&D collaboration refers to complex services offered and exchanged, such as product design, feasibility studies, usability analyses, prototype development and testing, manufacturability analyses, and product customization (Bettencourt, Ostrom, Brown, & Roundtree, 2002; Kohtamäki et al., 2013). These services involve vast knowledge asymmetries that generate high transaction costs (Baldwin, 2007; Rindfleisch & Heide, 1997; Stump, Athaide, & Joshi, 2002). In particular, effective R&D collaboration requires an exchange of tacit knowledge in which joint learning becomes critical. For instance, Martinez-Noya, Garcia-Canal, and Guillen (2013, p. 24) highlight that "the way partners manage the collective learning process plays a key role in the success or failure of strategic alliances, as the opportunistic learning strategies followed by partners may undercut the collective knowledge development in the alliance." Prior studies caution about the effects of opportunism, competition, and hostages in R&D collaboration (Adler, 2001; Katila, Rosenberger, & Eisenhardt, 2008) and emphasize the roles of in-depth interaction (Grönroos & Voima, 2012), dialog (Ballantyne, Williams, & Aitken, 2011) and learning (Chang & Gotcher, 2007), where such activities may be related to product, service, or solution development (Shankar, Berry, & Dotzel, 2009). In the present study, we focus on practices that facilitate joint learning because that is the critical element in R&D interactions that involve exchange of tacit experimental knowledge that is difficult to share, make sense of, and implement.

### 2.1. Joint learning

This study draws on the extensive organizational learning literature (Crossan, Lane, & White, 1999; Kandemir & Hult, 2005; Kuwada, 1998; Sirén, Kohtamäki, & Kuckertz, 2012) in which organizational learning is viewed as a dynamic capability (Kale & Singh, 2009). We build on the work of Selnes and Sallis (2003, p. 80), who define joint learning as a joint activity between the supplier and customer, where the parties 1) share knowledge, 2) jointly make sense of that knowledge, and 3) integrate that knowledge into relational memory. We consider joint learning to be a relational dynamic capability that yields collaborative advantages for both of the parties.

Knowledge sharing refers to the transfer of knowledge through informal and formal interactions between the supplier and customer (Chang & Gotcher, 2007; Selnes & Sallis, 2003; Sluyts, Matthyssens, Martens, & Streukens, 2011). Interaction has been viewed as "an important means of gaining and transferring new knowledge, gathering relevant information about new businesses, and finding external support and services" (Corsaro et al., 2012, p. 780). An open atmosphere is a central factor in the sharing of tacit R&D knowledge (Garvin, 1993; Kohtamäki & Bourlakis, 2012; Nahapiet & Ghoshal, 1998).

*Joint sense-making* highlights the importance of seeking a shared understanding, building consensus between the parties, and finding an appropriate fit between the customer's expectations and the supplier's capabilities (Chang & Gotcher, 2007; Crossan et al., 1999; Kuwada, 1998). Sense-making is the social process of searching for a common understanding (Narayanan, Zane, & Kemmerer, 2011; Weick, 1995) and is particularly difficult in a relational context, where physical, psychological, and cultural distances between actors are often greater than in intra-organizational contexts. Appropriate interaction platforms are needed to reduce the cognitive distance between parties (Fang, Fang, Chou, Yang, & Tsai, 2011; Henneberg et al., 2010).

*Knowledge integration into relationship-specific memory* involves the establishment of knowledge in relational structures, working procedures, routines, products, or services, all of which are relatively independent of individuals' actions (Johnson, Sohi, & Grewal, 2004; Lukas, Hult, & Ferrell, 1996; Moorman & Miner, 1997). Prior studies refer to this phase as knowledge implementation or institutionalization (Crossan et al., 1999; Kuwada, 1998; Sirén, 2012). During this phase, created, shared, and combined knowledge is transferred from individuals to become an organization or relationship-specific property (Lukas et al., 1996; Moorman & Miner, 1997). Moreover, Song and Di Benedetto (2008; see also Petersen, Handfield, & Ragatz, 2003, 2005) find that supplier involvement in product development improves new product performance. The role of relationship-specific memory in relationships is critical because the relational actors inevitably change, affecting the relationship's continuity (Fang et al., 2011). Thus, the existing research underlines the importance of joint learning dimensions, such as knowledge sharing, joint sense-making, and relationship-specific memory in complex business networks. Additionally, relational investments,

relational structures, and relational capital are required to facilitate joint learning (Kohtamäki et al., 2012).

### 2.2. Relational investments

The role of relationship-specific investments has been emphasized by several authors (Dyer & Singh, 1998; Madhok & Tallman, 1998; Yu, Liao, & Lin, 2006). The effects of relationship-specific investments on joint planning activities (Claro, Hagelaar, & Omta, 2003), joint learning (Chang & Gotcher, 2007), trust (Suh & Kwon, 2006), transaction costs (Rindfleisch & Heide, 1997; Williamson, 1985), and economic performance (Jap, 1999; Kohtamäki et al., 2012) have been recognized. However, as most prior studies have examined relational investments from the perspective of transaction cost economics, consideration has been limited to relationship-specific investments and specifically to safeguarding mechanisms applied to the supplier–customer relationship. Thus, the role of relational investments as a source of learning and innovation has been neglected (Chang & Gotcher, 2007).

### 2.3. Relational structures

Relational structures refer to the systematic practices and work routines shared by supplier and customer (Adler, 2001; Kohtamäki et al., 2012). We build on those organizational studies that have considered the Janus-faced role of organizational structures as coercive or enabling (Adler & Borys, 1996; Hallett & Ventresca, 2009), and we concentrate on those relational structures that enable in-depth R&D collaboration between a supplier and customer. Existing studies on R&D collaborations, customer involvement, supplier involvement, and supplier–customer relationships provide many examples of structural practices in R&D relationships. Studies identify central practices, such as 1) supplier participation in new product development teams (Ragatz, Handfield, & Scannell, 1997), 2) management control, incentive structures and mutual dependency on relational learning (Farrell, Oczkowski, & Kharabsheh, 2011; Storey & Kocabasoglu-Hillmer, 2013; Wathne & Heide, 2004), 3) relational steering groups (Kohtamäki et al., 2012), 4) network learning teams (Dyer & Hatch, 2004; Hines, Holweg, & Rich, 2004), 5) training conducted jointly by the supplier and customer (Petersen et al., 2003; Ragatz et al., 1997), 6) relational process descriptions (Bonner, 2005), and 7) equity ownership (Dyer, 1997; Gulati, 1995; Ragatz et al., 1997).

### 2.4. Relational capital

The literature on interorganizational networks underlines the roles of social relationships, trust, and interactions between suppliers and customers. Classic papers on social embeddedness have suggested that all economic exchanges are embedded in social interactions (Granovetter, 1985; Uzzi, 1997). It has also been argued that social capital is a broad umbrella concept encapsulating various social phenomena, for which the concept has also been criticized (e.g. Adler & Kwon, 2002). Moreover, interorganizational relationship literature has used the concept of relational capital to assess the level of social capital in exchange relationships (Chang & Gotcher, 2007). Consequently, we decided to define relational capital, in the context of R&D collaboration, as a combination of relational trust, relational structures, and relational interaction (Kohtamäki et al., 2013; Krause, Handfield, & Tyler, 2007). Relational capital has been suggested to play a particularly important role in joint learning, relational innovation, and intellectual capital (Chang & Gotcher, 2007; Muthusamy & White, 2005), while creating a safe space for open relational interaction that enables knowledge sharing, joint sense-making, and the integration of knowledge into relationship-specific memory.

## 3. Data and methodology

This paper relies on a multiple case study approach based on an analysis of seven dyadic R&D collaborations. Considering the complexity of evolving relationships and interactions in business networks, the multiple case study approach allows for the collection of in-depth information through interviews and provides evidence of the practices that companies follow in such relationships (Beverland & Lindgreen, 2010; Dubois & Araujo, 2007).

We decided to study multiple cases to a) establish an area of focus, b) obtain an in-depth view of each relationship, and c) achieve data saturation. To increase the study's reliability, we applied a data triangulation technique (e.g., Beverland & Lindgreen, 2010; Huberman & Miles, 1994) that involved collecting information from firms' websites and annual reports both before and after interviewing the supplier and customer, first by phone and then in face-to-face interviews. This procedure follows the approach suggested by Brennan and Turnbull (1999), who call for relational studies that involve interviewees from both sides of the relationship to validate the analysis.

### 3.1. Case-selection and sample

The dyadic relationships were selected based on a quantitative dataset collected in Finland in 2010. Selecting cases from a quantitative dataset through cluster analysis has been described as an "innovative practice" (Piekkari, Plakoyiannaki, & Welch, 2010, p. 114). First, the quantitative data were collected using a survey that had been sent to Finnish manufacturers employing 20 or more people. In total, 91 of the 404 firms targeted responded, corresponding to a satisfactory response rate of 22.5%. To identify interesting extreme cases, we applied k-means clustering with two validated average variables: 1) the breadth of the R&D services and 2) the extent of joint learning in the relationships.

Based on the k-means cluster analysis, we identified 22 relationships where both the R&D service offering and joint learning were remarkably high. From this group, we chose the seven relationships exhibiting the highest values in terms of R&D services and relational learning. The number of relational cases investigated also accords with Eisenhardt's (1989, p. 545) proposal regarding an appropriate number of cases. Fig. 1 describes the three clusters derived from the k-means cluster analysis of the 91 relational cases. The cluster on the upper right describes the 22 cases from which we chose the seven cases that scored highest in both dimensions for in-depth analysis. The cases on the upper left represent high joint learning but only with few R&D services provided, and the cases in the lower left corner exhibit few R&D service offerings and low joint learning.

### 3.2. Pilot study

We conducted a pilot study to familiarize ourselves with the method and gain insight from the relational dynamic capability viewpoint in R&D collaboration. The pilot study allowed us to test, develop, and validate our semi-structured interview template. Furthermore, it increased our understanding of the topic, the appropriateness of the planned data analysis procedures and assisted us to improve the interview template (Yin, 1994). At this stage, we interviewed the senior executives responsible for the development of the supplier–customer relationship. Based on the collected data, we produced a within-case table representing relational information on 1) the scope of R&D services in the relationship, 2) the type of R&D cooperation undertaken (white/gray/black box), 3) the interdependency between the partners (evaluated partner switching-time), 4) relational investments, 5) relational structures,

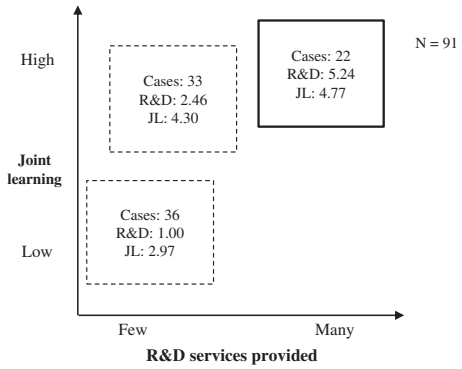


**Fig. 1.** The three clusters found from analysis of the quantitative data; the seven cases selected originated from the upper-right cluster.

6) relational capital between the parties, 7) joint-learning practices, and 8) the relationship's contribution to new product development.

### 3.3. Data collection process

Interviewees were selected based on the respondent's knowledge of and responsibility for the relationship; our respondents held such positions as Area Manager, Key Account Manager, Sales and Marketing Director, Business Manager and CEO. The face-to-face interviews lasted from 60 to 90 min and all interviews were recorded with permission and transcribed verbatim shortly after each interview took place. The interviews were conducted by two researchers, and the researchers applied equivalent semi-structured interview templates to encourage open and detailed discussion of the topics covered. In summary, we conducted 26 interviews, comprising 13 telephone interviews and 13 face-to-face interviews, with key decision makers from both sides of the relationships.

The interview data collection started with a phone call to the firms' respondents to establish convenient times for the telephone and face-to-face interviews. The aim of the telephone interview was to collect general information on the products and R&D services provided within the relationships and on how the relationships had evolved. Phone interviews prepared respondents for the face-to-face interviews to be conducted at the firms' headquarters. Once the interview was concluded, the two researchers discussed their initial feelings about the basic issues raised and made notes that later provided additional material when the transcribed interviews were analyzed. To protect interviewees' confidentiality, the quotations in this article are identified only by the interviewee's position and the firm type. However, in the case of relationship G we were unable to interview the customer because the supplier's policy prohibited revealing customer contact information.

The interviews focused on R&D services, relational practices, and capabilities within the identified dyadic relationships. The interview content was interpretative in nature, as the interviewees held their own views about the relational history, applied practices, and capabilities of each company. All the interviewees held senior positions and so had specific knowledge of the relationship. Additionally, their interpretations may have been influenced by their previous working history or their personal views about the relationship, making the data interpretative in nature. However, these issues were controlled for and discussed during the interview. Given the potential biases, the suppliers' responses were compared with those of their customers and vice versa to enhance the study's reliability.

Table 1 describes the selected cases and the characteristics of the collaboration. The extended-case method was used to apply the theory of relational dynamic capabilities because the method involves many cycles of data and theory, forcing researchers to collect complementary data and imagine alternative concepts because the data analysis and examination of the literature are conducted simultaneously (Eisenhardt, 1989).

### 3.4. Data analysis

When analyzing the literature and transcripts, we repeatedly compared the collected empirical data with the literature on relational/dynamic capabilities, joint learning, and R&D collaboration. To clarify and organize the data, we took notes, held several rounds of discussion regarding the cases, and compared data from different cases to establish similarities and differences. We then started analyzing the data, proceeding from a descriptive to an explanatory analysis and from the more concrete to the more abstract (Huberman & Miles, 1994).

We draw from Huberman and Miles (1994, p. 432), who present guidelines on how to generate meaning from data. To analyze the data and to discern and structure substantive issues in terms of relational dynamic capabilities, we began by discussing each case separately and then trying to find patterns across different cases. We used NVivo 9 software to compare the cases by listing and categorizing all the practices that the firms employed in the analyzed relationships. We documented the distinct resources/capabilities that firms possessed within the relationship and coded the interviews under the sub-themes of relational investments, relational structures, relational capital, and joint learning. This effort culminated in the production of a within-case table constructed based on the categories of relational investments, relational structures, and relational capital and the dimensions of joint learning. Then, cross-case analyses were conducted by categorizing substantive issues in terms of how relational investments, relational structures, and relational capital facilitated joint learning.

To avoid misinterpretation of the data, the researchers thoroughly read all the transcripts several times, cross-checked each other's independent interpretations in both within-case and cross-case analyses and compared their interpretations with those of others on the team, highlighting possible topics that were not covered in the first analysis (Eisenhardt, 1989). We verified our results with data triangulation by application of various data sources, such as interviews, annual reports and websites, and data auditing technique (Huberman & Miles, 1994) that involved two researchers reading the transcripts thoroughly and reviewing the researchers' interpretations against the data for accuracy and representativeness. Eventually, the results were sent to the interviewees via e-mail for further comments and to validate the analyses.

## 4. Results

### 4.1. Relational case description and within-case analyses

*Relationship A* was established when a customer divested its operations into a separate firm. The supplier supports the customer in its strategic activities by customizing products and branding them at the customer's request. The supplier has also established spare part centers in proximity to the customer's international facilities to achieve optimal service levels. Interestingly, the owners of the supplier hold a large number of shares of the customer company and managers from both sides share strategic information and seek out business opportunities to place the supplier's products with the customer's other business units.

*Relationship B* concentrates on the exchange and development of a product that is critical to the customer. The firms belong to the same group of companies and most of the supplier's revenues are derived from the particular customer relationship examined. The customer's divisional manager is also the CEO of the supplier. The customer actively influences the development of the supplier by working with the

**Table 1**
Description of relational cases.

a)

| | Pilot study | | Relationship A | | Relationship B | | Relationship C | |
|---|---|---|---|---|---|---|---|---|
| | Pilot customer | Pilot supplier | Customer A | Supplier A | Customer B | Supplier B | Customer C | Supplier C |
| Total revenue | €1000 million | €20 million | €1300 million | €15 million | €300 million | €12 million | €100 million | €7 million |
| Number of employees | 800 | 20 | 3000 | 100 | 1000 | 30 | 200 | 15 |
| Main products/ services | Plants and delivered turnkey projects. | Metal components. | Product machines and turnkey technological solutions. | Industrial valves, pumps, and services. | Pipe systems and delivered turnkey technological solutions. | Specific technology products and subcontracting. Modernization and maintenance services for installed base. | Material–handling systems. | Metal components for material-handling systems. |
| R&D services provided in the particular relationship | Product tailoring, product design services, and building prototypes. | | Product tailoring, product development, prototyping, and testing services. | | Product tailoring, product development, prototypes (to some extent), and modernization. | | Product tailoring, consultation in product configuration, product development, prototyping, technical testing of materials, and inspections during the lifetime of the product. | |
| Type of R&D collaboration | White box/gray box. | | Gray box/black box. | | Gray box/black box. | | Gray box. | |
| Partner's evaluated switching time | < 3 months. | 24–36 months. | 6–12 months. | 24–48 months. | 1–3 months. | 36–48 months. | 2–4 months. | 36–48 months. |

b)

| | Relationship D | | Relationship E | | Relationship F | | Relationship G | |
|---|---|---|---|---|---|---|---|---|
| | Customer D | Supplier D | Customer E | Supplier E | Customer F | Supplier F | Customer G | Supplier G |
| Total revenue | €500 million | €16 million | €20 million | €25 million | €400 million | €60 million | €600 million | €6 million |
| Number of employees | 1500 | 50 | 60 | 100 | 700 | 150 | 1500 | 30 |
| Main products/ services | Infrastructure maintenance. | Maintenance equipment. | Power transmission equipment. | Spare parts, maintenance services, product tailoring, and design services. | Paper products. | Lubrication systems (including information and communication technology (ICT) systems). | Industrial material processing systems. | Special technology and services related to specific technologies. |
| R&D services provided in the particular relationship | Product tailoring, dedicated product development, and prototype construction (testing facilities offered by the customer). | | Product tailoring, particularly for demanding products. | | Mainly process–related services (process–analyzing services). | | Product development services, product tailoring, product design services, prototype construction, prototype components, special component manufacturing, and modeling services. | |
| Type of R&D collaboration | Gray box. | | Black box/gray box. | | Gray box/black box. | | Gray box. | |
| Partner's evaluated exchange time | 6 months. | > 36 months. | – | – | 12–24 months. | 3–6 months. | 24–36 months. | 12–24 months. |

supplier's product developers and challenging accepted solutions and working methods. The supplier develops sub-systems for the customer's products. R&D collaboration and joint projects encourage trust and joint learning through reciprocal interactions. Projects are carefully tracked using documentation recorded in IT systems.

The supplier in *Relationship C* was founded as the result of a divestment by the customer to expedite the unit's sales growth. The supplier's products are critical to the reliability of the customer's end products and the supplier is dependent on the customer because a considerable proportion (20%) of the supplier's revenue is derived from that relationship. Some of the customer's managers serve on the supplier's board of directors, and the supplier's CEO reports economic information to the customer's senior management on a weekly basis. The parties regularly share market knowledge, and the customer has even been known to pay its invoices before their due date at the supplier's request to ease cash flow problems.

*Relationship D* has changed dramatically over the last 10 years because of market deregulation, which has increased competition and forced the customer to seek competitive/collaborative advantages from its supplier relationships. The supplier develops products in close collaboration with the customer, while the customer offers test facilities for the supplier's new products and prototypes. The customer's employees test products, provide feedback, and share their knowledge.

The firms in *Relationship E* possess highly complementary and distinctive capabilities. The firms belong to the same group of companies, and the relationship has been built on mutual dependence to accelerate the benefits of vertical integration. The parties share knowledge regarding changes in their customer markets and provide

**Table 2**
Within-case table on relational cases.

| | Relationship A | Relationship B | Relationship C | Relationship D | Relationship E | Relationship F | Relationship G |
|---|---|---|---|---|---|---|---|
| Relational investments (site, physical, human) | 1. Supplier has established spare part centers in proximity to the customer internationally.<br>2. Product branding in the customer's specification.<br>3. Supplier has a team dedicated to this customer and a Key Account Manager. Supplier's business owner personally holds a large share of the customer's stock. | 1. Supplier's plant is physically proximate to customer's headquarters.<br>2. Supplier has internationalized, largely due to this customer relationship.<br>Customer finances supplier.<br>3. Customer's executive is also the CEO of the supplier. Supplier's employees frequently work on the same projects with the customer. | 1. Plants are located next to each other.<br>2. Product planning for this customer only. Customer finances supplier and pays invoices before due date at the supplier's request.<br>3. CEOs meet with each other occasionally. | 1. Supplier's plant is physically proximate to customer's main strategic business unit.<br>2. Customer offers testing facilities for the supplier. Product planning for this customer only.<br>3. Supplier has employees in the plant performing only relationship-specific tasks. | 1. Physically proximate plants.<br>2. Product tailoring at the customer's request.<br>3. Top management team and development team collaborate actively (seeking new manufacturability solutions). | 1. Supplier's spare parts warehouses located near customer.<br>2. Supplier has tailored analytical and lubrication systems to this customer.<br>3. Supplier's personnel operate at the customer's facilities (open access to IT systems). Only one person collects data. | 1. Plants are located in different countries in Europe (Finland/Germany).<br>2. Product tailoring on demand. Customer helps finance the supplier.<br>3. Top managers and project engineers know each other well and communicate regularly. |
| Relational capital (trust, open interaction, shared destiny) | 1. High levels of trust, particularly among top managers.<br>2. Open discussion, particularly among top managers.<br>3. Agreement to expand collaboration to customer's other business units. | 1. Open discussion about projects, customers, and markets.<br>2. Open interaction, particularly on projects.<br>3. Overall profit of the parties affects bonuses paid by both firms. | 1. High levels of trust across the companies.<br>2. Completely open interaction between companies at all levels.<br>3. Mutually agreed profit margin for the supplier guides both companies toward a shared economic goal. | 1. Voluntary spare time events along with high interdependency facilitate trust between companies.<br>2. In cases of incremental development, communication is fully open.<br>3. Joint interest in terms of development work not documented. | 1. Open discussion about joint processes and joint development projects create trust among the parties.<br>2. Open interaction through participation in joint development projects and managerial processes.<br>3. Joint tax planning reflects common economic goals. | 1. Long-lasting relationships and written (global) agreements create trust between the parties.<br>2. Straightforward meetings between the parties.<br>3. Both parties dependent on each other. | 1. Parties share cost data and market information openly to adapt to market changes more rapidly.<br>2. Open interaction on markets, demand conditions, and technology.<br>3. Parties rely on each other due to highly complementary resources/capabilities. |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Relational structures (management/ steering groups, development teams, joint IT systems, process descriptions) | 1. Strategic management team includes members from top management.<br>2. Developing a team to concentrate on operative issues.<br>3. Customer has access to dedicated online product database.<br>4. Relationship's process description jointly compiled between supplier and customer's business unit. | 1. Management teams meet monthly.<br>2. Simultaneous development activities on projects.<br>3. Joint enterprise resource planning (ERP) system (the main user is the customer's business controller).<br>4. No process description of the relationship. | 1. Customer represented on supplier's board.<br>2. Project-based development teams.<br>3. Both parties have access to the other's databases. Customer has access to the supplier's cost information.<br>4. No process description of the relationship. | 1. Joint discussions at strategic level annually. Development collaboration and operative actions are strictly separate.<br>2. Project-based development team uses technical resources from both parties.<br>3. No joint IT systems in the relationship. Information on product details is not fully shared.<br>4. No mutual process descriptions. | 1. Top managers meet a few times each month.<br>2. Joint development projects related to projects and processes.<br>3. Parties save data to the same IT system. | 1. Top managers meet each other at least once per month.<br>2. Supplier's key account manager arranges for technical engineers to execute certain development tasks.<br>3. Customer owns the system of measurement, which the supplier maintains.<br>4. Mutual process description in general collaboration and project manual.<br>4. Processes and responsibilities are described in the quality system. | 1. Top managers (Supplier's CEO/ Marketing Director and Customer's CTO/Plant Manager discuss markets and production volumes weekly.<br>2. Project managers and people responsible for technology development discuss feasibility and risks related to technology.<br>3. Supplier is connected to the customer's financial measurement systems. Customer has access to all measurement data related to the products.<br>4. Process description of the overall relational and order delivery process. |
| Joint learning (knowledge sharing, joint sense-making, relationship-specific memory) | 1. Local units around the world obtain feedback directly from the customer's local staff.<br>2. Top managers' intervention is key when parties seek mutual commitment.<br>3. Supplier uses global online CRM to save all relevant data on the relationship. | 1. Systematic sharing of knowledge between management groups. Parties engage in discussions during common projects.<br>2. Social interaction is open and informal.<br>3. Every project and initialization is documented and reported. | 1. Market information is shared at the CEO level on a weekly basis.<br>2. When there are defects, both parties invest in objective investigations to prevent the same defects in the future.<br>3. Informal data storage on both sides. Data stored mainly in e-mail accounts. | 1. Customer provides supplier with completely open and direct access to users.<br>2. Close physical proximity allows parties to establish mutual commitment in face-to-face meetings.<br>3. Both sides save information about the relationship in their own systems. | 1. Daily interaction regarding markets, products, and deliveries.<br>2. Top managers meet occasionally.<br>3. All meetings, plans, processes, and orders are documented. Reports of the reclamations and service work are prepared. | 1. Sharing of information on markets between managers. Parties also share knowledge via e-mails and spreadsheets.<br>2. Global representatives of the corporations negotiate prices, and local key account managers meet the customer's local representatives at least once per month.<br>3. Supplier possesses data information on processes and shares it when required. | 1. Parties use videoconference systems to share knowledge on a daily basis. Product orders are made via e-mail/fax.<br>2. Parties compare data collected separately to increase data reliability. They also agree on their targets.<br>3. Shared product data management (PDM) and ERP systems and connected customer relationship management (CRM) and financial administration systems. |

constructive feedback on the functionality and effectiveness of the other's processes. Due to quality requirements, the firms have codified their joint processes and responsibilities. In addition, all joint meetings, plans, orders, reclamations, and service work are documented in the databases of both firms.

The firms involved in *Relationship F* collaborate on a global scale and both ensure that relational best practice is shared globally. The firms have a long joint history and long-term partnership. The supplier operates and develops one of the customer's core processes and collects and interprets data on the customer's other processes. The supplier and customer often jointly analyze the data, seeking ways to develop the customer's processes and reduce breakdowns and downtime. Collaboration is active and based on trusting relationships that have resulted from cooperation spanning decades.

The supplier in *Relationship G* develops knowledge-intensive products that are critical to the operation of the customer's product. The customer had acquired the supplier several years before the survey took place to obtain access to the supplier's highly valuable technology. The supplier's products indirectly enable the customer to generate almost 10% of its total revenue. Communication between the top managers and development teams within the relationship is exhaustive, as the top managers from both sides collaborate on a weekly basis through videoconferences. Both parties share knowledge about their product development activities and market conditions. The parties compare and match their separately collected market data to achieve a better understanding of market developments (Table 2).

### 4.2. Cross-case analysis

According to Eisenhardt (1989), cross-case analysis forces researchers to go beyond their initial impressions, thereby increasing the likelihood of extracting novel findings from the data. Table 3 synthesizes the relational dynamic capabilities of R&D collaboration. In this cross-case section, we analyze how relational investments, relational structures, and relational capital facilitate each dimension of joint learning.

#### 4.2.1. Relational investments and joint learning

In our cases, investments in relational-level IT systems play an important role in facilitating knowledge sharing. Indeed, all but one of our studied relationships include joint information systems. Investments in relational information systems, such as CRM systems, supplier management systems, and CAD systems, are considered important for knowledge sharing. The information systems supporting collaboration vary in our cases, from a dedicated product database in an extranet to extensive partnering using PDM, ERP, CRM, and financial administration systems. In addition, both suppliers and customers emphasize the importance of having the suppliers' site in close proximity to the customer. Close proximity facilitates effective face-to-face contact and product development meetings, which are important for the explication and sharing of tacit knowledge.

> "We have a shared IT system with a customer. We have this common program that both of us use…Of course, there are parts where we don't have access or they don't have access, but basically it's a shared system."
>
> [(Export Manager/Supplier)]

> "The geographic location is important. One good thing is that our customer is Finnish, so the main activities are close."
>
> [(Area Manager/Supplier)]

Relational IT investments also encourage joint sense-making by providing a virtual platform for interaction. For instance, interaction is necessary to acquire a shared understanding when developing solutions. Moreover, knowledge investments play an important role in joint sense-making. Arriving at a mutual understanding requires significant investments in time and effort from the staff of both parties. In addition, knowledge investments, in terms of dedicated employee resources, may also increase relational trust and commitment (Dyer, 1997; Dyer & Singh, 1998). Furthermore, the close proximity of sites, as noted above, facilitates joint meetings in which parties can work collaboratively on solutions. Joint meetings are important because R&D knowledge is often conceptual and tacit and finding a common understanding requires explanation and discussion (Kogut & Zander, 1992; Szulanski, 1996). Therefore, close proximity facilitates joint sense-making, as described by our interviewees.

> "Since we are located in the same city, it's easy to go to their site or they can come here. Thus, we can sit around the same table and think about mutual issues."
>
> [(Export Manager/Supplier)]

> "Trust is also important because when you have a partner in Finland who knows you and you have collaborated for a long time, then it's also more efficient because you don't always have to cover your back."
>
> [(Maintenance Specialist/Customer)]

> "Well, both of us had been developing this idea by ourselves, but one time, we sat around the same table and started to take this forward."
>
> [(Sales Manager/Supplier)]

**Table 3**
Synthesis of the shared mechanisms of relational capabilities and joint learning dimensions.

| | | Joint learning | | |
|---|---|---|---|---|
| | | Knowledge sharing | Joint sense-making | Integration into relationship-specific memory |
| Relational capability | Relational investments | Investments in relational information systems. Investments in physically proximate sites that enable effective collaboration. | Time investments in finding a shared language. | Investments in relational information systems and time spent on careful documentation. |
| | Relational structures | IT systems and meetings for knowledge sharing. | Development teams create social platform for sense-making and open discussion. | Relationship steering group management of knowledge implementation. |
| | Relational capital | Mutual trust and familiarity enable knowledge sharing and effective collaboration. | Relational capital enables open dialog, critical considerations and provides a basis for agreement with the partner. | Relational capital generates commitment to knowledge implementation and integration. |

Moreover, the integration of knowledge into relationship-specific memory requires investments in knowledge management systems that can be utilized for documentation and knowledge retrieval. Documentation in each case is time consuming and requires discipline and effort from both parties. Our interviewees' highlighted the importance of knowledge documentation and retrieval:

> "We conclude every [mutual] project with a final meeting. Users from salespeople to the employees report how the solution operates throughout the product life cycle."
> [(Sales Manager/Supplier)]

*4.2.2. Relational structures and joint learning*

Relational structures facilitate knowledge sharing through relational forums that enable interaction. In our analysis, we found examples of various types of relational structures, such as relational steering groups (Farrell et al., 2011; Malhotra, Gosain, & El Sawy, 2007), development teams (Dyer & Hatch, 2004), and IT systems (Subramani, 2004), all of which facilitate knowledge sharing. Interviewees highlighted the importance of interaction and the proactive sharing of market knowledge in these relationships. Some noted both exploitation and exploration at a relational level, suggesting that some customers support suppliers in the search for new business.

> "Today, our joint objective in this relationship is to bring suggestions to the customer's other business units as well, but it requires a lot of work from us because it also means that we are heading toward global markets because the customer also does R&D work abroad."
> [(Area Manager/Supplier)]

> "We have weekly video conferences when we handle these technical issues. In addition, we use e-mails, we make phone calls, and once in a week, we have this kind of continuous project meeting."
> [(Sales and Marketing Director/Supplier)]

> "The market information still goes through the top managers. There, we discuss certain customer relationships, their demands and volumes, and what might come up in the future. Technical specifications are shared through the meetings. At the top management level, during the meetings on weekends, we discuss upcoming cases, technical requirements, and possible problems. However, these business issues are discussed between the top managers; what the volumes have been, to whom the products have been sold, what the requirements are, and what's coming next."
> [(Sales and Marketing Director/Supplier)]

Relational structures play an important role in relational sensemaking. Interviewees involved in relationships B, F, and G, describe the importance of relational top management meetings in forging a common understanding of existing markets, technological developments, and the future of the industry. Relational structures, such as relationship steering groups and development teams, provide relatively continuous forums that encourage discussion and improved understanding of the strategies and expectations of both firms. In the relationships investigated, relational steering groups included business managers from the customer's side and top managers from the supplier's side. Relationship development teams would be expected to include key personnel relevant to the development of the relationship.

> "We openly discuss the market information and competitors. If one of us sees something new or big over there, I think we receive the information quite well, whether through informal or more formal meetings."
> [(Sales Manager/Supplier)]

> "They have one key account manager whose job is to represent the company. I only have to call him, and he will tell me what help I will need."
> [(Maintenance Specialist/Customer)]

> "We discuss [issues]; we share knowledge between us. Similarly, we try to figure out whether this picture is accurate, and we try to ensure that everybody has the same understanding of the overall market situation."
> [(Sales and Marketing Director/Supplier)]

Our results did not provide clear evidence on the usability of process descriptions for the purpose of joint learning. Formal process descriptions were applied to a significant extent in only two relationships (relationships E and G). In those relationships, process descriptions were followed and updated occasionally and the firms' organizational cultures were geared to the practice. However, our interviewees noted that in complex business relationships such as in R&D collaborations, formal process descriptions may not be feasible because working procedures among different actors are fairly unique, complex and heterogeneous (Corsaro et al., 2012). Formal process descriptions are instead perhaps more useful in more standardized exchange processes (Alvarado & Kotzab, 2001; Spekman & Carraway, 2006).

> "We try to evaluate [the process description of the relationship] biannually in terms of whether we do still act according to it. However, at least once a year, we thoroughly evaluate whether this is reality… and in special cases, we have discussions if they are exceptions or if they happen regularly and why we did it this way. Then, we have a conversation about whether we need to make changes or not in our procedures."
> [(Sales and Marketing Director/Supplier)]

> "We have documented these processes even though it's rather difficult because the projects are different. However, we tried to describe it, and we have made a project handbook."
> [(Key Account Manager/Supplier)]

Relational structures, such as relational IT systems, provide a tool for the integration of knowledge into relational memory. Interviewees highlighted the importance of relational IT systems in documenting and codifying relational information, such as memoranda on relational meetings, operational delivery, and quality information, as well as agreed strategies, other agreements, and contracts. IT systems like customer relationship management and supplier management systems are important for storing relational data and promoting a close supplier–customer relationship:

> "The meetings are documented, and somebody takes the minutes of the meetings. These [minutes] are saved and sent to the parties via e-mail."
> [(Export Manager/Supplier)]

> "When we have had a meeting, there is also a memorandum of what happened in the meeting."
> [(Director of Sales Support/Supplier)]

> "Everything is documented: meetings, plans, processes, and customer orders."
> [(Director of Sales Support/Supplier)]

*4.2.3. Relational capital and joint learning*

Relational capital plays an important role in facilitating knowledge sharing. Trust enables the parties to share strategically important knowledge critical to R&D collaboration without prohibitive transaction costs. The relationships studied highlighted the importance of close physical and psychological proximity, familiarity between people and trust that the other party will not behave opportunistically.

> "We don't really have any contracts. We have a contract only about the price of the component, and I think it's a two-sided trust."
>
> [(Business Division Director/Customer)]

> "There is this kind of mutual respect for each other, trust for one another's skills and mutual trust that neither of us will stab the other one in the back."
>
> [(Business Division Director/Customer)]

> "When the supplier's personnel don't change all the time, it increases trust."
>
> [(Maintenance Specialist/Customer)]

> "We have been able to inspire confidence. In these joint projects, the more successful the projects have been, the more likely they will ask for our help again, which means more work, which is a good thing."
>
> [(Sales and Marketing Director/Supplier)]

Relational capital plays an important role in joint sense-making because it enables partners to talk openly and share ideas in-depth. Sense-making is not a straightforward task because it necessitates looking at the existing problem from different angles. Interviewees emphasized the role of trust and open dialog in joint sense-making:

> "[R&D collaboration] is a really close interaction, and [there is] continuous joint discussion between us."
>
> [(Sales and Marketing Director/Supplier)]

> "When we're creating something new and we want to achieve the targets, then we'll find the solution together…When we have our target, we don't focus on insignificant details in a discussion that sidetracks attention from the main issue."
>
> [(Maintenance Specialist/Customer)]

One particular practice we found to improve sense-making is pair work (vis-à-vis practices) as observed in supplier–customer relationship G, which facilitates familiarity and trust, thus supporting joint sense-making. In other relationships, we observed team-level collaboration across organizational boundaries.

> "We have tried to achieve a point in mutual processes where the person on the opposite side responsible for a certain area, such as purchasing, communicates with our production managers so that we have a connection between decision makers. For instance, if we have technical problems or technical questions, then we have a meeting once a week between the people responsible for technical issues. Then, once a week, the customer's purchasing/production team talks to our people responsible for logistics or production. Therefore, we are always aware of what's happening on both sides."
>
> [(Sales and Marketing Director/Supplier)]

> "Today, the collaboration between us is relatively active. In this kind of cooperation, we are having multi-level activities: the top management level, the middle management level, and the operational level. At every level, there are regular meetings where different kinds of topics are discussed… [At the top management level], the collaboration's longer-term performance is followed, whereas at the middle management level, the focus is on annual basis activities, which means updating and fixing things…We have appointed main contacts at the top management level, and at the middle management level, we have dedicated persons who are responsible for the relationship. In addition, we have a team in the factory that performs only these tasks [with respect to the customer]."
>
> [(Area Manager/Supplier)]

Relational capital facilitates the effective integration of knowledge into relationship-specific memory. It also facilitates the emergence of social norms, which increases reciprocal relational commitment to knowledge implementation.

> "If the cost level that we report is in line with the customer's experience, they will trust that the information we provided matches with reality. Then, they have much more interest in collaborating."
>
> [(Sales and Marketing Director/Supplier)]

> "The information documentation is rather weak because the information is useful only for the people who were involved. Of course, the individual responsible for the product will remember it."
>
> [(CEO/Customer)]

> "We can trust that we can work with them [supplier] over the long-term and that we can collaborate with them next year, too. We don't have to think about whether we should change to someone else. On the other hand, I also trust that they don't want to milk us. They want to keep this [relationship], and we can keep this process cost-efficient, so they take care of it."
>
> [(Maintenance Specialist/Customer)]

To summarize, the present study has defined joint learning as a relational dynamic capability and has examined joint learning and the practices that facilitate it. Fig. 2 provides an overview of the study's results and findings, demonstrating how social capital, relational practices, and joint learning are interrelated and embedded in R&D collaboration between a supplier and customer. Furthermore, it encapsulates the issues discussed in previous chapters.

## 5. Discussion and implications

### *5.1. Theoretical implications*

Whereas existing studies have paid considerable attention to organizational learning and knowledge absorption from partnerships and strategic alliances, relatively little research has been conducted on joint learning and enabling practices in the context of R&D collaboration between suppliers and their customers. Building on evolutionary economics (Nelson & Winter, 1982; Nelson & Winter, 2002) and the existing organizational research on dynamic capabilities (Eisenhardt & Martin, 2000; Teece, 2007; Zollo & Winter, 2002), our study is one of the first to define joint learning as a relational dynamic capability.

As a first contribution, our results extend the existing literature on the role of relational investments in the development of relational dynamic capabilities (joint learning). These findings add to prior empirical research on the role of relationship-specific assets, research that has paid considerable attention to both transaction costs and the collaborative rents derived from such relationships (Dyer & Hatch, 2006). Our study contributes to the existing literature by demonstrating the important role of relational investments in various aspects of learning. We

find that knowledge sharing is facilitated by investments in relational information systems and in physically proximate service sites. The former supports effective virtual collaboration, whereas the latter brings suppliers' services physically closer to the customer. Moreover, time invested plays an important role in joint sense-making, allowing for the development of a common language that supports solution development. Knowledge implementation in relationship-specific memory is facilitated by investments in relational information systems and time invested in careful documentation. These findings add value to the theory regarding the enabling role and effects of relational investments (Chang & Gotcher, 2007; Dyer & Hatch, 2006).

The second main contribution of the current research is to extend existing knowledge of relational structures by revealing the important mechanisms through which they influence joint learning. Our results highlight how relational interaction platforms can support knowledge sharing, joint sense-making, and the integration of knowledge into relationship-specific memory. The existing literature offers several examples of relational structures that facilitate improved interaction and joint learning between suppliers and customers (e.g., Johnsen, 2009; Kohtamäki et al., 2012; Ragatz et al., 1997). The present study extends that literature by demonstrating how relational structures enable improved interaction and joint learning, by documenting managers' experience with such relational structures. Prior studies also indicate that relational structures facilitate learning (e.g., Kohtamäki et al., 2012), but do little to describe the mechanisms through which they contribute to joint learning. In this study, we find that IT systems and meetings in particular support knowledge sharing by providing virtual platforms for document sharing and discussion. Furthermore, we find evidence that development teams provide an important social platform for joint sense-making and open discussion, allowing for the development of a shared language that facilitates dialog, as suggested by Ballantyne (2004). We wish to emphasize that interorganizational teams are far more difficult to coordinate than conventional teams. In these complex conditions, finding a shared language that facilitates dialog is more challenging than in intra-organizational contexts, upon which much of the existing research draws. Finally, the results highlight the importance of relationship steering groups in the management of knowledge implementation as a critical phase in the acquisition of relational knowledge. These results build on customer relationship management research but extend it, suggesting a more balanced model in which the supplier–customer relationship is guided by joint steering groups that achieve improved participation, commitment, and loyalty. Participation may be an effective way to promote loyalty (Collier, Fishwick, & Floyd, 2004; Liedtka, 2000). In addition, relational structures appear to support improved coordination and generate peer pressure that is important in furthering the development of the relationship. Shared steering groups and development teams create social forums where participants jointly control the progress of shared development projects, creating social pressure for timely implementation. Our results contribute to the existing literature on relational structures by providing evidence of the importance of such relational steering groups and development teams in effective R&D collaboration (Dyer & Hatch, 2004; Farrell et al., 2011; Malhotra et al., 2007).

Our third main finding concerns those mechanisms and practices through which the relational form of social capital affects joint learning. First, our results support the conclusions drawn by others that relational capital affects learning and interacts with relational structures and relational investments (Chang & Gotcher, 2007; Kohtamäki et al., 2012). Based on our results, relational capital appears to play an important role in alleviating fears of unbalanced benefits and in facilitating knowledge sharing, joint sense-making, and the integration of knowledge into relationship-specific memory. More specifically, our results confirm that mutual trust increases with familiarity (Gulati & Sytch, 2008; Lewicki, Tomlinson, & Gillespie, 2006). As trust alleviates the fear of opportunism, it enables knowledge sharing and reduces the transaction costs of R&D collaboration (Zaheer, McEvily, & Perrone, 1998). Moreover, trust in the capabilities of the other party appears to facilitate joint sense-making by enabling open dialog, critical consideration, and the mutual acceptance of ideas (Ballantyne, 2004). Finally, in terms of knowledge implementation, our results suggest that relational capital plays an important role in generating commitment through the social norm of reciprocity, which then contributes to knowledge implementation and the integration of knowledge into relationship-specific memory.

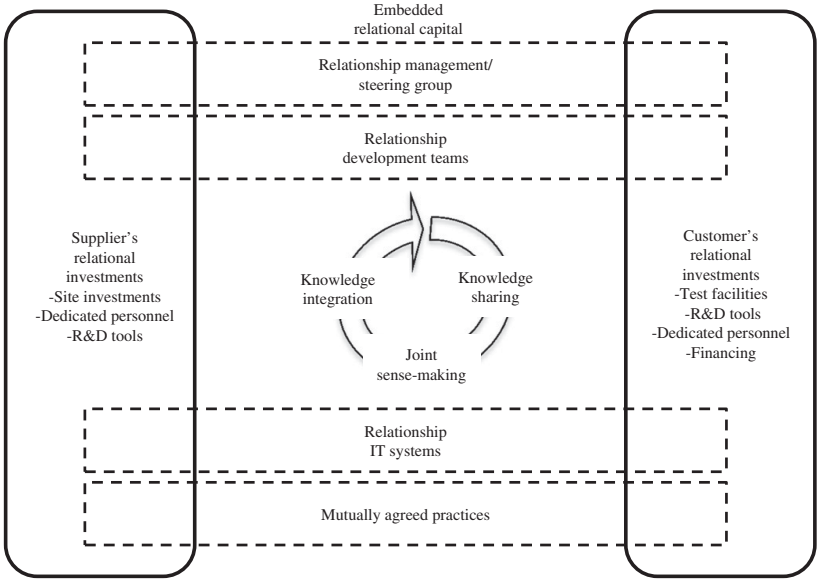


**Fig. 2.** Joint learning and relational practices in R&D collaboration.

Fourth, we provide a broad overall illustration of how joint learning is a relational dynamic capability, together with the relational practices that support it. Fig. 2 captures the learning processes (knowledge sharing, joint sense-making, relationship-specific memory) and the practices that facilitate joint learning (relational investments, relational structures, and relational capital) alongside social capital. Fig. 2 suggests that certain factors are embedded in the R&D collaborations between a supplier and customer. It is important to notice that the practices interact and jointly enable learning. For instance, relational investments and relational structures interplay with the relational form of social capital to facilitate knowledge exchanges, sense-making and implementation. This has been suggested, and to an extent established, by prior quantitative studies (Chang & Gotcher, 2007; Kohtamäki et al., 2012), but our Fig. 2 presented at the end of the Results section nicely illustrates these practices in a holistic framework. The interplay between these relational practices and the dimensions of joint learning is central, and the latter are particularly important. Whereas knowledge sharing enables the spread of development ideas and knowledge, joint sense-making facilitates the search for shared understanding with regard to new ideas that enable joint knowledge development. Finally, relationship-specific memory reinforces the memorization and implementation of knowledge so that it might be utilized in the future. We believe that the model developed offers valuable insight for both researchers and managers (Dyer, Kale, & Singh, 2001; Ford & Håkansson, 2006; Håkansson, Havila, & Pedersen, 1999; Henneberg et al., 2010).

### 5.2. Managerial implications

With regard to managerial impact, our study presents interesting cases that provide useful benchmarking opportunities for directors and managers involved in relational interactions. This study highlights the importance of relational investments, relational structures, and relational capital in joint learning. The results indicate the importance of time and IT system investments that facilitate knowledge sharing, joint sense-making, and knowledge implementation. It is a finding that should persuade firms to make relational investments to facilitate joint learning. Moreover, managers should be aware of the important role of relational capital, which is critical in all phases of joint learning (Chang & Gotcher, 2007). Trust is particularly important in knowledge sharing and joint sense-making, where participants must engage in open discussions to understand each other's viewpoints. In addition, relational structures are important in creating platforms for interaction (Kohtamäki et al., 2012). Such platforms promote increased trust and dialog that may further facilitate relational investments.

The roles of joint learning and the individual mechanisms are particularly critical. Managers should pay attention to joint learning processes, such as knowledge sharing, joint sense-making, and relationship-specific memory. In the absence of joint learning, a relationship may end up in a relational learning trap, where relational resources are only being exploited, rather than being explored for their innovative potential. The existing literature on organizational learning focuses on organizational competence traps (Levitt & March, 1988), exploitation traps (Sirén et al., 2012), and success traps (Levinthal & March, 1993). To avoid being trapped in a cycle of exploitation, parties involved in R&D collaboration should be alert to the possibilities of joint learning and invest in learning practices. One particularly interesting practice managers could promote in R&D relationships is systematic independent data collection, where data collected by each partner is subsequently compared. This practice is particularly useful in joint sense-making.

Managers must also decide whether to facilitate relational learning at the team or individual level. Whereas team-level collaboration is more risk averse and promotes knowledge sharing with the various parties to the relationship, for example, individual-level collaboration facilitates strong communication between individuals within the relationship, making the firm-to-firm relationship more dependent on individuals.

Relational investments, relational structures, and social capital influence learning if the parties can learn jointly, share information, develop a common understanding, and embed their joint knowledge into relationship-specific memory. In the absence of relational learning capability, the parties will repeat errors and fail to adapt to changing circumstances.

Our study also indicates that formal relationship process documentation is not particularly useful in complex R&D collaborations even though the potential of formal documentation should not be ignored. At its best, process documentation steers the activities of a relationship by establishing standardized, effective working methods in the relationship. However, at its worst, formal process documentation hinders joint learning and makes management of the relationship bureaucratic and unnecessarily rigid. Firms should carefully consider how to utilize process descriptions in knowledge-intensive collaborations.

The results highlight the importance of relational investments and joint learning as activities that enable a partner to observe the other partner's relational commitment, which is critical for joint development. The overall observation is that these factors are largely interconnected and systemic, as the IMP school of network research has argued.

### 5.3. Limitations and future research

This study has some limitations that should be considered. First, because our data are qualitative in nature, the results are not generalizable to the population (Dubois & Gibbert, 2010; Eisenhardt & Graebner, 2007). However, the cases were selected based on quantitative cluster analysis and were chosen from a cluster of extensive R&D service exchanges and joint learning, suggesting that these relational cases provide some interesting insights into the relational capabilities involved in R&D collaborations between suppliers and their customers. Future research might benefit from a similarly mixed approach, where cases are systematically selected based on quantitative data to ensure that they will offer insight into the phenomenon under study. Second, because we examined relational capabilities and dynamic relational capabilities in the context of relationships, perhaps future qualitative case-based research could explore multi-level research settings, where the mediating mechanisms of absorptive capacity in firm-specific learning from R&D relationships are analyzed. Third, our data are cross-sectional in nature and further evidence could be provided by longitudinal research settings. However, our results and reports were read and commented on by the interviewees and external researchers, providing support for the validity and reliability of our interpretations. Finally, future research should look into the interactions between various relational practices and joint learning. Prior studies, such as Kohtamäki et al. (2012) and Chang and Gotcher (2007) have provided some evidence on the interplay between different relational practices, but more is needed. Moreover, we encourage future studies to consider non-linear relationships between practices, their interactions, and outcomes.

## 6. Conclusion

The present study contributes to the interorganizational network literature by providing evidence on relational practices, such as relational investments, relational structures, and relational capital that facilitate joint learning in dyadic R&D collaborations. We introduce the concept of dynamic relational capability to highlight the importance of joint learning as a source of relational renewal. The results of this study suggest that firms should consider how to reconfigure practices within complex R&D interactions to facilitate continuous product, service, and solution development. This study provides a holistic framework for managers to apply to consider the organization of R&D collaboration.

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