

Department of Industrial Engineering and Management

# Dyadic perspectives on supplier integration

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Mervi Vuori



# Dyadic perspectives on supplier integration

**Mervi Vuori**

A doctoral dissertation completed for the degree of Doctor of Science (Technology) to be defended, with the permission of the Aalto University School of Science, at a public examination held at the lecture hall AS1 of the school on 25 May 2018 at 12.

**Aalto University**  
**School of Science**  
**Department of Industrial Engineering and Management**

**Supervising professor**

Professor Eero Eloranta, Aalto University, Finland

**Preliminary examiners**

Professor Mickey B. Howard, University of Exeter, UK

Professor Jukka Hallikas, Lappeenranta University of Technology, Finland

**Opponents**

Professor Sylvie Lacoste, Kedge Business School, France

Professor Jukka Hallikas, Lappeenranta University of Technology, Finland

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**Abstract**

Suppliers' resources and capabilities have become increasingly important for companies as they strive for competitive advantages. Supplier integration (SI) can be seen as key means of tapping and utilizing suppliers' resources and capabilities. The topic is highly relevant managerially and academically, yet extant research focuses on the buyer and rarely takes the dyadic approach. Thus, enhanced knowledge on SI in buyer-supplier relationships has been called for.

This dissertation focuses on supplier integration in the context of B2B dyads. The purpose is to contribute to the literature by advancing knowledge on SI from relational, process as well as system & information integration perspectives. These perspectives are based on extant literature and used in the compilation part of the dissertation.

With regard to relational integration perspective, the results enhance understanding of how attractiveness influences buyer-supplier relationship development. The findings suggest that attractiveness and adaptations performed by the buyer and the supplier are interlinked in a mutually reinforcing or deteriorating manner, forming a mechanism that influences relationship development. With regard to process integration in complex solution delivery project, the results elucidate how activities are coordinated across inter-organizational boundaries between the buyer and its suppliers. The buyer was mainly responsible for cross-organizational integration, yet the suppliers actively participated and initiated integrative activities when motivated by future collaboration opportunities with the buyer. With regard to process integration in new product development, the results enhance understanding of supplier challenges during early supplier involvement. The challenges were found to relate to developing technical and managerial interaction capabilities and the findings suggest that capabilities based on contract manufacturing may not optimally support being an early involvement partner. Finally, with regard to system and information integration, the findings elucidate the role of IT in strategic buyer-supplier relationships. IT is suggested to form a key element in the relationship infrastructure that supports business exchange and enables the supplier to link to the buyer's value creation context or content. Through relationship management, the consistency between systems and activities can be improved whereby a better fit is suggested to associate with a well-performing relationship. The findings emphasize that IT needs to be managed in a holistic way in a buyer-supplier relationship.

In sum, the findings provide a balanced and comprehensive view of SI with regard to relational, process and system perspectives and complement earlier research that is focused predominantly on the buyer.

**Keywords** supplier integration, relational integration, process integration, system integration, buyer-supplier relationships

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**Tekijä**

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Toimittaja- ja ostajajarityksen välisiä näkökulmia toimittajaintegraatioon

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Materiaali- ja palvelu-toimittajien resurssit ja kyvykkyudet ovat tärkeitä kilpailuedun lähteitä ostajajarityksille ja toimittajaintegraatio voidaan nähdä keinona hyödyntää toimittajien resursseja ja kyvykkyksiä. Toimittajaintegraatio onkin tärkeä tutkimusaihe tieteellisessä mielessä ja käytännön yritysjohtamisen kannalta. Ilmiötä on tutkittu pääosin ostajajarityksen näkökulmasta, luoden tarvetta uudelle tutkimustiedolle.

Väitöskirjassa tutkitaan toimittajaintegraatiota toimittajaritysten ja ostajajaritysten välisissä liiketoimintasuhteissa. Tavoitteena on tuottaa uutta tietoa kolmesta eri tarkastelunäkökulmasta. Nämä liittyvät liiketoimintasuhteen integraatioon, prosessien integraatioon ja tietojärjestelmien integraatioon. Johdanto-osassa esitetyt ja käytetyt näkökulmat perustuvat kirjallisuuteen.

Liiketoimintasuhteen integraation näkökulmasta väitöskirja tuottaa uutta tietoa houkuttelevuuden vaikutuksesta toimittaja-asiakassuhteen kehittymiseen. Löydösten mukaan houkuttelevuus liittyy toimenpiteisiin, joilla yritykset sopeuttavat toimintaansa liiketoimintasuhteen toiseen osapuoleen nähden. Houkuttelevuus ja sopeuttamistoimenpiteet muodostavat toisiaan vahvistavan tai heikentävän mekanismin, joka vaikuttaa suhteen kehittymiseen. Prosessien integraation näkökulmasta väitöskirja tuottaa uutta tietoa liittyen yritysten välisten toimintojen koordinointiin toimitusprojektissa. Ostajajarityksen havaittiin olevan päävastuussa toimittajien integroinnista, mutta myös toimittajat osallistuivat aktiivisesti integraatioon: tätä motivoi tulevaisuuden yhteistyömahdollisuudet ostajan kanssa. Väitöskirjassa tutkittiin myös toimittajajarityksen haasteita tämän osallistuessa ostajan tuotekehitysprojektiin. Haasteiden havaittiin liittyvän toimittajan tekniseen kyvykkyuteen sekä johtamiskyvykkyuteen ja näiden kehittämiseen. Väitöskirjassa esitetään, että toimittajan kyvykkyudet, jotka edesauttavat sopimusvalmistajana toimimista eivät tue tuotekehityskumppanuutta optimaalisella tavalla. Lopuksi tietojärjestelmien integraation näkökulmasta väitöskirja tuottaa uutta tietoa informaatioteknologian roolista liiketoimintasuhteessa. Tietojärjestelmien havaitaan olevan osa suhteen rakennetta ja järjestelmät mahdollistavat ostajan ja toimittajan arvontuottoprosessien yhdistymisen. Liiketoimintasuhdetta johtamalla yritysten välisten järjestelmien ja prosessien yhteensopivuutta voidaan edesauttaa, luoden edellytyksiä hyvin toimivalle suhteelle. Työssä ehdotetaan, että yritysten välisiä tietojärjestelmiä voidaan johtaa kokonaisvaltaisesti liiketoimintasuhteen keskeisenä osana.

Työssä esitetyt löydökset syventävät ymmärrystä toimittajaintegraatiosta liiketoimintasuhteen, prosessien ja tietojärjestelmien integraation kannalta, ja ilmiön tarkastelu toimittajajaritysten ja ostajajarityksen näkökulmasta täydentää aikaisempaa tutkimusta.

**Avainsanat** toimittajaintegraatio, liiketoimintasuhteen integraatio, prosessien integraatio, tietojärjestelmäintegraatio, toimittajasuhteet

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Espoo, May 1<sup>st</sup> 2018  
Mervi Helena Vuori

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# List of Publications

This doctoral dissertation consists of the compilation part and of the following publications:

**I.** Vuori, M. & Kaipia, R. (2017). Review of supplier integration research in operations management and purchasing & supply management literature. 26th IPSERA conference. Balaton, Hungary, 9-12 April 2017.

**II.** Makkonen, H., Vuori, M., & Puranen, M. (2016). Buyer attractiveness as a catalyst for buyer–supplier relationship development. *Industrial Marketing Management*, 55, 156-168.

**III.** Ahola, T., Vuori, M. & Viitamo, E. (2017). Sharing the burden of integration: an activity-based view to integrated solutions provisioning. *International Journal of Project Management*, 35, 1006–1021.

**IV.** Vuori, M., Johnsen, T.E. & Viitamo, E. (2016). Supplier challenges in early supplier involvement projects: in-depth case study findings. 25th IPSERA conference. Dortmund, Germany, 20- 23 March 2016.

**V.** Makkonen, H. & Vuori, M. (2014). The role of information technology in strategic buyer–supplier relationships. *Industrial Marketing Management*, 43(6), 1053-1062.



# Author's Contributions

**Article I:** Vuori, M. & Kaipia, R. (2017). Review of supplier integration research in operations management and purchasing & supply management literature. 26th IPSERA conference. Balaton, Hungary, 9-12 April 2017.

The initial idea, research design, literature search, analysis and writing the paper were the sole responsibility of M. Vuori. R. Kaipia contributed to formulating the discussion and to writing the final version of the paper. M. Vuori presented the article at IPSERA conference in Balatonfured, Hungary, 9-12 April 2017.

**Article II:** Makkonen, H., Vuori, M., & Puranen, M. (2016). Buyer attractiveness as a catalyst for buyer–supplier relationship development. *Industrial Marketing Management*, 55, 156-168.

The paper bases on original idea and research design by H. Makkonen. Data collection was carried out by H. Makkonen and M. Puranen. M. Vuori contributed to research design of case NOKIA, performed related analysis together with M. Puranen and was responsible for writing the within-case accounts. H. Makkonen was responsible for the overall research framework, M. Vuori contributed by commenting, suggesting improvements and revising the theory section. Both M. Vuori and H. Makkonen contributed to the results section and theoretical implications, and all authors contributed to managerial implications. All authors contributed equally to writing the final version of the paper.

**Article III:** Ahola, T., Vuori, M. & Viitamo, E. (2017). Sharing the burden of integration: an activity-based view to integrated solutions provisioning. *International Journal of Project Management*, 35, 1006–1021.

The initial idea and research design were a joint effort by all authors. T. Ahola and M. Vuori were equally responsible for theoretical framing and writing the literature review. T. Ahola and M. Vuori contributed to data collection, yet the data collection was mainly carried out by K. Kalpala as part of his Master's thesis work. All authors contributed to data analysis and writing the results section. T. Ahola had overall responsibility for the theoretical and managerial implications whereby M. Vuori and E. Viitamo contributed by commenting, suggesting improvements and revising the text. All authors contributed equally to writing the final version of the manuscript.

**Article IV.** Vuori, M., Johnsen, T.E. & Viitamo, E. (2016). Supplier challenges in early supplier involvement projects: in-depth case study findings. 25th IPSEERA conference. Dortmund, Germany, 20- 23 March 2016.

The initial idea and research design were a joint effort by all authors. M.Vuori and T.Johnsen shared the responsibility for literature review and theory section. All authors contributed to theoretical framing of the manuscript. M. Vuori had the main responsibility for empirical fieldwork, collecting interview data and performing data analysis in Atlas.TI, followed by a joint effort in refining the analysis. She was responsible for methods section and writing the first version of the results. All authors contributed equally to formulating the paper, M. Vuori had responsibility for the final version.

**Article V.** Makkonen, H. & Vuori, M. (2014). The role of information technology in strategic buyer–supplier relationships. *Industrial Marketing Management*, 43(6), 1053-1062.

The authors are listed in alphabetical order as both authors contributed equally into the manuscript. The initial idea and research design were joint effort by both authors. Idea of the paper, framing the purpose, sketching and writing the theoretical approach and the research model were responsibilities of H. Makkonen. M.Vuori conducted the fieldwork, collected the data and was responsible for the analysis, producing within-case descriptions and writing the first versions of the results. M.Vuori presented an earlier version of this article at the IMP conference in Atlanta, USA, 30 Aug- 2 Sept 2013.

# 1. Introduction

## 1.1 Background

Companies today are increasingly concentrating on their strategic activities and outsourcing non-core activities, processes and functions to external suppliers. As a result, companies are becoming increasingly dependent on suppliers, their knowledge, capabilities and skills in running company operations (Hätönen & Eriksson, 2009; Schoenherr et al., 2012). The importance of suppliers is elucidated by the notion that external spend i.e. purchased goods and services in manufacturing companies may account for as much as 60-80% of company turnover (Iloranta & Pajunen-Muhonen, 2015). Reflecting this development, it has been suggested that purchasing and supply management is evolving towards management of external resources (Cox & Lamming, 1997; Iloranta, 2017; Tanskanen et al., 2017), with the emphasis is on finding, managing and leveraging external resources i.e. suppliers' skills, expertise, knowledge and capabilities in order to reach company goals (Cousins & Spekman, 2003). These may relate to achieving operational efficiencies, but also to improving new product development and sourcing novel ideas and innovations from the supply base (Laiho, 2015). Thus, from buyer company perspective, relationships with suppliers represent potential sources of performance improvement and value across operations and new product development (Terpend et al., 2008).

Adhering to the increasingly important role of suppliers as providers of components, raw materials, services as well as knowledge and capabilities, buyer-supplier relationships have become important sources for value creation whereby collaboration, networking and integrating with suppliers are emphasized as key activities (Kähkönen et al., 2015). Indeed, managing and developing buyer-supplier relationships and integrating key suppliers into company operations and new product development represent a strategic issue for many companies (Das et al., 2006; Frohlich & Westbrook, 2001; Sjoerdsma & van Weele, 2015) forming a research domain of both managerial and academic relevance. The term integration refers to the extent to which separate entities such as company internal functions or organizations across the supply chain work together in collaborative ways to achieve mutually beneficial outcomes (O'Leary-Kelly & Flores, 2002, p. 226; Pagell, 2004). Supplier integration takes place on the upstream part of the value chain with suppliers that are the most important and valuable for the buyer (Paulraj et al., 2006; Swink et al., 2007). The aim is to combine internal resources and capabilities of the buyer with those of selected



key suppliers to generate competitive advantages (Thun, 2010; Wagner, 2003) in terms of quality, delivery, flexibility, cost excellence or improved time-to-market, as examples (Schoenherr & Swink, 2012; Y. Zhao et al., 2014). The relationship between the level of integration and company performance has received plenty of scholarly interest (van der Vaart & van Donk, 2008; Vuori & Kaipia, 2017) generally advocating the notion that higher degrees of integration lead to greater benefits (Alfalla-Luque et al., 2013; Das et al., 2006;).

However, integrating with suppliers is not straightforward and the desired outcomes may be difficult to achieve. Recent studies have pointed out that the findings concerning the impact of supplier integration on company performance are mixed (Vanpoucke, Vereecke & Wetzels, 2014; Wiengarten et al., 2016). Indeed, whilst some studies find that supplier integration has a positive impact on focal company performance and outcomes (e.g., Wiengarten et al., 2016; Yu et al., 2013) there is evidence suggesting that customer and internal integration are more important than supplier integration with respect to improving performance (Flynn et al., 2010). In new product development context, supplier integration, also termed supplier involvement, has been associated with various positive outcomes, such as increased product quality, shortened cycle time and reduced development costs at best (T.E. Johnsen, 2009; see Sjoersdsma & van Weele 2015 for related literature). Studies have highlighted the importance of tapping into suppliers' technical expertise for effective project work and decision making during new product development, leading to improved outcomes in terms of design and financial performance (Petersen et al., 2005). Yet, some studies find that integrating suppliers into new product development does not lead to expected benefits (Hartley et al., 1997) and various challenges in managing supplier integration in new product development have been acknowledged (Van Echtelt et al., 2008; Wynstra et al., 2001).

Reflecting the increasing importance of external resources for company performance and value creation, supplier integration forms a key activity in effective sourcing and supplier management (Spekman et al., 1999). Extant research recognizes integration as a vital aspect in the strategic and operational management of external resources, with regard to both how to best utilize external resources, and how to work with them in practice (Tanskanen et al., 2017). Yet, studies on supplier integration are predominantly survey-based, conducted from the buyer company perspective and focused primarily on the impact of supplier integration on buyer company performance (Vuori & Kaipia, 2017). Recent studies have raised the need for more knowledge on "how to achieve integration and what is involved" (H. Chen et al., 2009, p.75) and how supplier integration can be implemented (Eriksson & Pesämaa, 2013; Lockström et al., 2010). On the same token, there has been a call for more focused, dyadic studies on relationships between buyers and their most important suppliers that provide insight into the mutual mechanisms and tools that can be deployed in order for both parties to derive value (Terpend et al., 2008). Considering that supplier

integration is not a one-way street but a collaborative and strategic effort involving both the buyer and the supplier (Flynn et al., 2010), investigating supplier integration from both sides of the dyad appears highly warranted. This dissertation builds on this knowledge gap.

## 1.2 Research objective and research questions

Integration can take place internally, on the supply-side as well as on the customer-side of a company. It is closely related to co-ordination and collaboration with the purpose of breaking down boundaries between company functions or across organizational borders (Romano, 2003). Integration can be defined as “merging of parts into a whole” (Vijayasathy, 2010, p. 489), and in supply chain context, this involves the purposeful use and implementation of structures, processes, technologies and practices of co-ordinative and collaborative nature aiming at establishing efficient flows of materials, finished goods and information along the supply chain (Vijayasathy, 2010). A key element in external integration is working together with both suppliers and customers and moving from arms-length relationships towards relationships of long-term and strategic nature (Morash & Clinton, 1998).

In this dissertation, the focus is on supplier integration (SI) in buyer-supplier dyads. Supplier integration has been defined as the combination of buyer’s internal resources with key suppliers’ resources and capabilities (Wagner, 2003), and as linking the work of material and service suppliers with that of the buyer (Bowersox et al., 2003). Supplier integration can be regarded as an outcome i.e. a “state of synergy” that the buyer and the supplier have accomplished (Das et al., 2006, p. 563) as well as a process (Swink et al., 2007), where the parties engage in strategic initiatives in order to achieve a higher level of integration (Paulraj et al., 2006). A company is considered to have high levels of supplier integration when there are seamless links and co-ordination between the buyer and supplier in terms of business processes and activities (process integration); information systems between the buyer and the supplier are connected and there is frequent communication, information and knowledge sharing between the companies (system and information integration) and when there are strong and close buyer-supplier relationships in place whereby the buyer and its key supplier(s) are aligned with regard to incentives and objectives, as examples (relational integration) (Alfalla-Luque et al., 2013; Paulraj et al., 2006; Wong & Boon-itt, 2008). For the purpose of this dissertation, supplier integration is defined as the linking of the buyer and the supplier in terms of their mutual relationship, processes as well as systems and information. Consequently, this dissertation views SI from these three different perspectives. Each perspective provides focus for a particular domain or form of integration within the SI phenomenon and thus they are not considered as mutually exclusive.

Whilst the majority of extant research assumes a positive link between higher levels of integration and company performance, recent findings point to the fact

that this should not be taken for granted, advocating a need for more qualitative, in-depth inquiries into integration (Fabbe-Costes & Jahre, 2008). Earlier findings also support the notion that integration is difficult to achieve and requires constant involvement from both the buyer and the supplier (Cousins & Menguc, 2006), pointing to a need to investigate integration in individual buyer-supplier relationships in order to enhance understanding of the phenomenon as well as related actions and practices (van der Vaart & van Donk, 2008). Likewise, a need for in-depth studies that take into account the multiple dimensions and the complex nature of supplier integration has been voiced (Swink et al., 2007; Vijayasarathy, 2010). Consequently, the objective of this dissertation is to contribute to SI literature by advancing knowledge on supplier integration from process, relational and system integration perspectives. By adopting a dyadic perspective throughout all empirical studies, this dissertation sheds light on the less investigated supplier side with regard to integration. This is important given that the majority of SI studies in purchasing and operations management literature have been conducted from the buyer perspective (Vuori & Kaipia, 2017).

Given the objective, the following research questions are formulated.

### **1. *What is known about supplier integration?***

The first research question is based on the observation that SI is a complex, dynamic and multidimensional phenomenon (Lockström et al., 2010; Vanpoucke, Vereecke & Wetzels, 2014) whereby more in-depth understanding of the phenomenon is needed (Swink et al., 2007). The purpose is to provide an overview of extant SI research in operations management and purchasing & supply management fields by analyzing utilized theories, research methods and definitions and by identifying contemporary research themes and research gaps. Knowledge of the SI phenomenon with regard to extant research provides background to the other studies and lays the ground for positioning the findings of this dissertation. To answer the first research question, a structured literature review on supplier integration research published in six highly rated operations management and purchasing & supply management journals during 2006-2016 is conducted. The findings are reported in Article I “Review of supplier integration research in operations management and purchasing & supply management literature”.

With regard to the objective of advancing knowledge on supplier integration from relational integration perspective, the second research question reads:

### **2. *How does attractiveness influence buyer-supplier relationship development?***

The relational integration perspective stresses the importance of partnering and developing long-term relationships with suppliers in achieving higher levels of integration (Alfalla-Luque et al., 2013; Paulraj et al., 2006). A few studies have

addressed relational factors in facilitating supplier integration and found that trust, commitment and mutual dependence can be regarded as antecedents for supplier integration (Vijayarathy, 2010; Yeung et al., 2009). Accordingly, developing high levels of dependence, trust and commitment between the buyer and the supplier and improving the mutual relationship associate with achieving higher levels of integration (Vijayarathy, 2010; Yeung et al., 2009). The importance of trust, dependence and commitment for building close and strong buyer-supplier relationships has been stressed also elsewhere (Golicic & Mentzer, 2006). Further studies have linked integration with strategic collaboration where the focal company builds and manages on-going partnerships with its key business partners both upstream and downstream (Flynn et al., 2010; Thun, 2010). However, in SI studies, the buyer perspective dominates, leaving the supplier side to lesser attention. Yet according to recent findings, the supplier's co-operative behavior, indicated by attitudes, intentions and willingness to collaborate towards key buyers leads to improved information sharing and joint developments and ultimately to better performance (van der Vaart et al., 2012). Hence, it appears that the question, why the supplier would be willing to dedicate resources and capabilities to the buyer, develop and pursue the underlying relationship warrants closer attention. This links with recent discussions in the purchasing and supply management and business relationship fields where attractiveness has been acknowledged as a potential contributor to the willingness and motivation of business partners to engage with each other, develop and continue their mutual relationship (Hald et al., 2009; Mortensen, 2012; Tanskanen & Aminoff, 2015). Given the notion that long-term relationships are an essential element in developing and achieving a higher level of integration between business partners (Alfalla-Luque et al., 2013), understanding how attractiveness influences the development of the underlying buyer-supplier relationship appears highly relevant. For this purpose, a qualitative, empirical, dyadic case study of attractiveness in buyer-supplier relationships between two buyer companies and their multiple suppliers is conducted. The answers to RQ2 are provided by Article II "Buyer attractiveness as a catalyst for buyer-supplier relationship development".

With regard to the objective of advancing knowledge on supplier integration from process integration perspective, the third research question reads:

### **3. *How are activities coordinated across organizational boundaries?***

The process perspective to integration focuses on linking external work that is performed by material and service suppliers with buyer's internal processes (Bowersox et al., 2003). In other words, process integration emphasizes the supplier's role as an active participant in the procurement, production and design processes as well as in new product development of the buyer (Huo et al., 2013; Wagner, 2003). This can, however, be a complex task in practice and thus there has been a call for enhancing understanding of how integration can actually be achieved (H. Chen et al., 2009). Extant studies have provided knowledge

on the activities and practices that can be deployed by the buyer company in order to integrate suppliers to operations and / or new product development processes, yet these pertain mainly to manufacturing industries (e.g., Das et al., 2006; Lockström et al., 2010; Swink et al., 2007). How integration can be achieved in project-based industries has received less attention (Eriksson & Pesämaa, 2013), and earlier studies have noted lack of empirical research on the tangible means and ways to integrate with suppliers in complex delivery projects (Martinsuo & Ahola, 2010). By taking an activity-based view into integration, this dissertation scrutinizes integrative activities between systems integrator and its suppliers in a complex solution delivery project. A dyadic empirical case study is conducted concerning a project where ABB, a large multinational manufacturer acted as a systems integrator and involved six of its material and service suppliers in developing and delivering a complex solution to its customer. The findings are reported in Article III “Sharing the burden of integration: an activity-based view to integrated solutions provisioning”.

Whereas the third research question focuses on the provision of a complex solution, the fourth question focuses on new product development (NPD) and also aims to advance knowledge on supplier integration from process integration perspective. The research question is formulated as follows:

#### **4. *What challenges does early supplier involvement pose for the supplier?***

Challenges that relate to supplier integration are investigated in the context of NPD project where the buyer involved their contract manufacturing supplier as an early involvement partner for the first time. Some studies on supplier integration in NPD concentrate on the impact of integration on buyer company innovation and NPD outcomes (e.g., He et al., 2014; Perols et al., 2013; von Haartman & Bengtsson, 2015; Wagner, 2012). All these studies are however conducted from the buyer perspective leaving the supplier perspective to lesser focus. Furthermore, some studies focus on measuring the degree or level of supplier participation in NPD (e.g., Paulraj & Chen, 2007b; Peng et al., 2013; Salvador & Villena, 2013), thus giving a snapshot to SI in NPD and ignoring the complexities and challenges that the supplier may experience during early supplier involvement. The fact that the supplier possesses capabilities and culture that are compatible with the buyer has been found to be important for effective decision making during NPD, leading to better designs and financial outcomes (Petersen et al., 2005). Yet from the supplier perspective, the required capabilities may be novel and only emerging, especially if the supplier has only limited experience on being an early involvement partner. The challenges of early supplier involvement (ESI) are investigated through an empirical, dyadic single case study of a new product development project where a global manufacturing company involved its contract manufacturer as an early involvement partner for the first time. The respective findings are reported in Article IV “Supplier challenges in early supplier involvement projects: in-depth case study findings”.

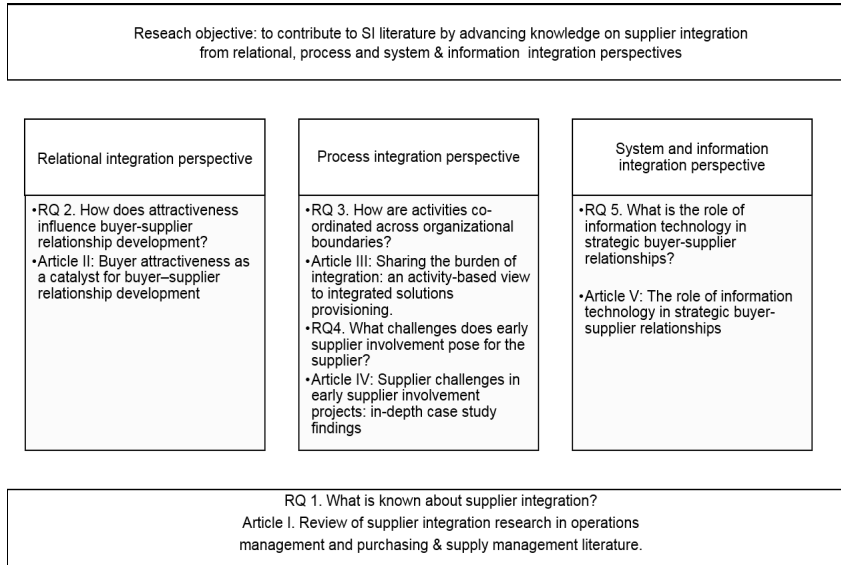
Finally, with regard to the objective of advancing knowledge on supplier integration from system and information integration perspective, the fifth research question reads:

**5. *What is the role of information technology in strategic buyer-supplier relationships?***

Information and communication technologies and inter-organizational systems form the backbone for efficient information flows and information sharing between buyers and suppliers and support the management and co-ordination of activities across organizational boundaries (Saeed et al., 2005; Vijayasarathy, 2010). The use of technologies such as the Internet with supply chain partners has been associated with achieving improvements in operational performance, visible through faster delivery times, reduced transaction costs and improved inventory turnover (Frohlich, 2002). Sharing information with suppliers, establishing efficient communications, using common databases and implementing systems that enable linking of the buyer and supplier in real-time have been suggested to foster integration with suppliers (Alfalla-Luque et al., 2013). Various scholars include information sharing with suppliers and the use of information technology and systems in their measurement items of supplier integration (e.g., Flynn et al., 2010; Lii & Kuo, 2016; G. Zhao et al., 2015). Yet, the focus of these survey studies is on the extent and contents of information exchange (e.g. exchange of inventory levels or demand forecasts) and on the use of particular systems (e.g. quick ordering systems or vendor managed inventory) between the buyer and the suppliers. There is less consideration how information technology links with the underlying buyer-supplier relationship. Indeed, the role of IT in supporting and enabling operational product and information flows between business partners tends to be emphasized (Lindh, 2006), yet how inter-organizational IT is positioned vis-à-vis the structures and processes in a buyer-supplier relationship is not adequately understood. This is investigated by conducting a qualitative dyadic case study into two strategic and long-term buyer-supplier relationships where IT plays a substantial role. The findings are reported in Article V “The role of information technology in strategic buyer-supplier relationships”.

In sum, the aim of this dissertation is to contribute to SI literature by advancing knowledge on SI from relational, process and system & information integration perspectives. From relational perspective, the focus is on attractiveness and its influence on relationship development. From process integration perspective, the focus is on co-ordinating activities in a complex system delivery project and challenges related to early supplier involvement. Finally, from system and information integration perspective, the focus is on the role of information technology in strategic buyer-supplier relationships. In addition, by analysing extant SI literature, this dissertation contributes to providing knowledge regarding the SI phenomenon in light of current research published in the selected operations

management and purchasing & supply management journals. The research objective, questions and contributing articles are shown in Figure 1. As indicated by the table, each research question is answered by one article.



**Figure 1.** Research objective, research questions and contributing articles.

Research questions in the dissertation and in the original articles are shown in Table 1. In comparison to the original articles, research questions in the dissertation have been shortened in order to provide clarity; otherwise, the questions are similar to a great extent.

**Table 1.** Overview of research questions in the dissertation and in the original articles<sup>1</sup>.

| Research questions in dissertation  | Research questions in original articles   |
|---|---|
| RQ 1. What is known about supplier integration?   | AI. What is the state and nature of SI research in operations management and purchasing & supply management fields?   |
| RQ 2. How does attractiveness influence buyer-supplier relationship development?            | AII. How are buyer and supplier attractiveness connected? How does attractiveness catalyze relationship development?  |
| RQ 3. How are activities co-ordinated across organizational boundaries ?                    | AIII. How are activities co-ordinated across organizational boundaries in integrated systems deliveries?  |
| RQ 4. What challenges does early supplier involvement pose for the supplier?                | AIV. What challenges does ESI pose for the supplier when the required capabilities are novel and emerging? What are the challenges for ESI suppliers to engage in a NPD project when it does not have pre-existing capabilities to be an ESI partner yet needs to transition towards such a role? |
| RQ 5. What is the role of information technology in strategic buyer-supplier relationships? | AV. What is the role and position of information technology in strategic buyer-supplier relationships?  |

### 1.3 Scope and structure of the dissertation

This dissertation focuses on supplier integration. Thus, the scope includes external integration in the upstream part of the supply chain whereas customer and internal integration are excluded. However, this is not to undermine the importance of internal integration that has been suggested to be a pre-requisite for external integration (Romano, 2003) or customer integration that has been found to impact positively on focal company performance (Flynn et al., 2010). In this dissertation, supplier integration is regarded to compose of relational, process and system & information integration, whereas financial or commercial integration is excluded (see Alfalla-Luque et al., 2013).

The focus of this dissertation is on buyer-supplier dyads. Both manufacturing and service companies from different industries are included in the empirical studies (see Chapter 4.2 for details). The suppliers in the original studies are considered as key suppliers: they possess technologies, capabilities and expertise that are essential for the buyer, and/ or they represent the buyer's major or main suppliers. The dyadic approach is implemented across all empirical articles corresponding to calls for acknowledging both buyer and supplier perspectives in research concerning supplier integration and management of buyer-supplier relationships (Terpend et al., 2008; Wagner, 2003).

The dissertation is structured as follows. After the presentation of the background, research objective, research questions and respective original articles

<sup>1</sup> In the original articles I, II and V, research questions are not explicitly stated in question format, but expressed as the purpose of the underlying study.



in Chapter 1, Chapter 2 describes the theoretical background for this dissertation, followed by relevant literature and research gaps in Chapter 3. The research design and methodological choices are addressed in Chapter 4 and Chapter 5 presents the findings based on the original articles. Finally, in Chapter 6, the findings and their theoretical and managerial implications are discussed and the limitations and further research avenues presented.

## 2. Theoretical foundation

In this chapter, the theoretical background that underpins this dissertation is presented with focus on the resource-based-view (RBV) and on its extension into the inter-organizational context i.e. the extended RBV (eRBV). The chapter ends with discussion on the implications of the extended RBV for purchasing and supply management and supplier integration.

### 2.1 Resource-based view, competitive advantage and value creation

The resource-based view (RBV<sup>2</sup>) proposes that creating and sustaining competitive advantages and superior performance is based on possessing and controlling resources i.e. bundles of tangible and intangible assets that are valuable, rare and that cannot be substituted or copied easily by competitors (Barney, 1991; Barney, 2001; Barney et al., 2011; Peteraf, 1993;). As defined by Barney (1991, p.101), resources “include all assets, capabilities, organizational processes, firm attributes, information, knowledge” that a company uses to develop and deploy its strategy. Resources may encompass physical assets (technologies, plants, access to raw materials, specialized equipment); human assets (training, experience, intelligence, relationships, expertise) and organizational assets (i.e. reporting structure, planning and controlling systems, superior personnel in certain function), as examples (Barney, 1991; Eisenhardt & Martin, 2000). Some authors distinguish between resources and capabilities (Hoopes et al., 2003) whereby capabilities refer to the company’s ability to deploy and utilize resources (Amit & Schoemaker, 1993). In this sense, capabilities can be regarded as special type of resources or dynamic capabilities, referring to company-specific routines and processes that are used by a company to modify its resource base in order to create new value-enhancing strategies (Eisenhardt & Martin, 2000; Makadok, 2001; Teece et al., 1997). Yet, as noted by Ray, Barney and Muhanna (2004), the terms resources and capabilities are used interchangeably and according to some scholars, the literatures on resources and capabilities can be considered “as one and the same” (Hoopes et al., 2003, p. 890).

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<sup>2</sup> It is acknowledged that RBV is today often referred to as resource-based theory (see Hitt et al, 2016). Yet the term resource-based-view (RBV) is used throughout this dissertation due to the reason that extant literature and early articles also use this term.

According to RBV, competitive advantage results when a company is able to pursue a value-creating strategy (such as reducing costs, utilizing market opportunities or neutralizing threats) that is not being pursued simultaneously by anyone else i.e. a current or a potential competitor on the marketplace (Barney, 1991). Consequently, having competitive advantages enables the company to improve its performance or generate profits, which can be regarded as the fundamental goal for any economic activity (Conner, 1991). The RBV thus holds that the resources and capabilities of the firm, creation of competitive advantages as well as company performance are interlinked. The basic assumption in RBV is that since companies own different types of resources i.e. differ in terms of their resource and capability bundles, there are also differences in terms of competitive advantages and hence in value creation (Barney, 1991; Barney, 2001). In other words, differences in the bundles of resources and capabilities that companies own i.e. resource heterogeneity explains why companies differ in terms of competitive advantages (Peteraf, 1993). However, not all resources and capabilities contribute to creating and sustaining competitive advantages alike. In order to do this, the resource must be valuable (i.e. the resource has the potential to enable a company to execute value-creating strategies, i.e. reduce costs, or produce unique products and/or services); rare (in case the resource is possessed by all companies alike, all companies would be able to implement similar strategies which would thus not lead to competitive advantage); isolated from imitation (due to the resource being developed in a company during a long period of time, and because the resource's impact on competitive advantage is not evident to outsiders and the use of the resource is socially intertwined, it is difficult for competitors to imitate) and isolated from substitution (competitors cannot easily replace the resource with a similar one) (Barney, 1991; Barney, 2001; Hoopes et al., 2003). Out of these characteristics, resources that are valuable (i.e. resources that enable the deployment of value-creating strategies in terms of cost reduction or product/service differentiation and function as the basis for company's success in the marketplace) as well as unique are the most important drivers for the creation of competitive advantage (see Medcof, 2001; Newbert 2007, 2008).

Peteraf and Barney (2003) suggest that competitive advantages relate to the company's potential to outperform competitors in terms of market share and profitability as examples of performance outcomes. Competitive advantage refers to the ability of a company to create more economic value than its competitors (Peteraf & Barney, 2003). Here, economic value refers to customer perceived benefits (i.e. the usefulness of the product or service as perceived by customers) net of related economic costs (Peteraf & Barney, 2003). For a company to outperform its competitors, it must produce either superior benefits to the customer for the same cost or the same benefits for a lower cost by means of product or service differentiation and/or by being cost-efficient (Day & Wensley, 1988; Newbert, 2008; Peteraf & Barney, 2003). For a company to succeed in the marketplace, it thus needs to have resources and capabilities that either

enable it to lower its costs, and/or enhance the development of customer perceived benefits (Bowman & Ambrosini, 2001). Having competitive advantage (i.e. being able to create more economic value than its competitors) may lead to superior financial performance, which indicates the company ability to capture economic value from selling products and services that are based on unique resource and capability combinations (Newbert, 2008). Thus in this sense, value creation and value capture are distinct concepts.

## **2.2 Extending the resource-based view outside company boundaries**

The traditional RBV stresses the possession, control and ownership of valuable and unique resource and capability bundles and thus assumes an inherently inward-looking perspective to creating competitive advantages (Mathews, 2003b). Yet, with the increasing speed of technology and globalization and especially in fast-moving markets, it is merely impossible for companies to possess all the needed resources to compete in effective ways (Arino & DeLaTorre 1998; Ireland et al., 2002). Indeed, the RBV has been criticized of being overly concerned with the company's internal resources and capabilities, while neglecting external resources and capabilities that reside outside company boundaries (Zaheer & Bell, 2005). In particular, scholars in strategic alliance management (Afuah, 2000; Ireland et al., 2002), evolutionary economics (Mathews, 2003a, 2003b) and strategic networks (Gulati, 1998; 2007) have acknowledged the importance of external resources that reside outside company boundaries and the role of inter-organizational relationships for company performance. For example, Afuah (2000) has suggested that competitive advantages of a company may be based on relationships that the company establishes with external actors (such as suppliers, customers, or other actors), or on the capabilities (as for example, knowledge) that reside within the company's external networks. In addition, Mathews (2003b) has emphasized the ability of a company to tap on various kinds of external resources through relationships that enable resource exchange and leverage. Thus, the internal focus of RBV is challenged by the notion of valuable resources and capabilities residing in external networks, the importance of relationships between companies for accessing, integrating and leveraging external partners' resources as well as the activities related to managing resource flows (Gulati et al., 2011; Hitt, 2011).

Given the abundance of alliances and related studies and the fact that traditional theories have not been able to explain the creation of competitive advantages of companies that participate in alliances has created an impetus for extending the traditional RBV into the context of inter-connected companies (Lavie, 2006). Strategic network literature has stressed that companies are not isolated but embedded in networks of inter-organizational relations that bear a substantial impact on company performance, behaviour and actions (Gulati et al., 2000; Gulati, 2007). As participants in strategic networks, companies form purpose-

ful, long-term relationships with other parties and distribute value-chain activities across network members, enabling joint value creation between member companies such as the buyer and its supplier (Jarillo 1988, 1989). Other companies and organizations in the network possess resources that the focal company can access through inter-organizational ties such as strategic alliances, joint ventures and buyer-supplier partnerships (Gulati et al., 2000; Gulati, 2007; Gulati et al., 2011). Network resources comprise the partners' information, trained personnel, financial assets, intellectual property, marketing channels and production facilities, as examples (Gulati, 2007; Gulati et al., 2011). By building and managing relationships with other network members, the focal company can gain access to, integrate and leverage resources residing in external networks, resulting in competitive advantages where the partners' resources have an impact on (Gulati et al., 2011). According to Gulati et al. (2000), the network perspective can enrich the internally focused resource-based view by regarding the company's relationships of both competitive and collaborative nature as well as network resources as part of focal company's potentially valuable resources.

In view of interconnected companies and creation of competitive advantages, the relational view focuses on inter-organizational relationships and acknowledges that critical resources may exist outside the boundaries of a company (Dyer & Singh, 1998). According to the relational view, inter-company collaboration whereby companies jointly invest in, combine and exchange assets, resources and capabilities can be a source of competitive advantages (Dyer, 2000; Dyer & Singh, 1998). In contrast to RBV, the relational view emphasizes that generation of competitive advantages takes place at the relationship level, through on-going collaboration, whereby both parties contribute (Dyer & Singh, 1998). In the relationship context, the specialization of assets, knowledge sharing between the parties, combining resources and capabilities that are complementary as well as effective governance form sources of relational rents i.e. profits that either company would not be able to achieve on its own (Dyer & Singh, 1998). In other words, competitive advantages emanate from inter-organizational relationship context, emphasizing the company's ability to interact with its partners whereby collaboration becomes the means for extending and developing capabilities through sharing and extending resources (in the sense of forming a dynamic capability) (Lorenzoni & Lipparini, 1999). The relational view and collaborative advantage have contributed to the development of supply chain management and conceptualization of buyer-supplier dyadic relationships and their management (Chen & Paulraj, 2004).

The extended resource-based view (eRBV) stems from the notion that the traditional RBV falls short in explaining how companies create competitive advantages when they are involved in an alliance with external partners (Lavie 2006). The eRBV draws from the relational view advocating that competitive advantages can be created jointly by partners that engage in inter-company re-

relationships (Dyer & Singh, 1998). Furthermore, the eRBV recognizes the meaning and role of external resources residing in company networks that can be accessed through relationships (i.e. Gulati, 2007; Gulati et al., 2011). In this sense, eRBV neglects the traditional and atomistic RBV assumption of the company having to own and control resources and capabilities in order to generate competitive advantages: instead, accessing resources of external partners (as in having the right to utilize, employ and enjoy benefits that are related to these resources) may be adequate (Arya & Lin, 2007; Lavie, 2006).

In the consideration of competitive advantages, the eRBV theory according to Lavie (2006) distinguishes between shared/non-shared resources of companies that engage in alliances with external partners and associated private/common benefits, respectively. Accordingly, when the focal company engages in a relationship with an external partner where both companies contribute to the relationship by creating complementary resource bundles or by pooling similar resources, the shared resources may become a source of joint benefits. In addition, the focal company can also attain company-specific, or private benefits that are based on its non-shared and shared resources. Further private benefits to the focal company can accrue from the resources owned by the partner company for example through resource leakages, yet this resource leakage can occur both ways. Both private and joint benefits thus form the basis of the focal company competitive advantages (Lavie, 2006). Thus, the extended RBV emphasizes that value-generating resources may exist outside the company boundaries that can be accessed through relationships with external partners (Gulati et al., 2011; Lavie, 2006). To this end, the competitive advantages of a company can emanate from its internal resources and capabilities as well as from those of its external partners, such as suppliers with whom the company collaborates (Squire et al., 2009). Consequently, the focus shifts from managing company internal resources and capabilities to managing the underlying relationships and interactions with external partners with a view on potential synergies or scale associated with combining internal and external resources (Lavie, 2006). As stated by Lavie (2006, p. 650), the “capacity to form and maintain valuable interactive relationships with alliance partners” is of key importance in generating and sustaining competitive advantages.

### **2.3 Summarizing the RBV and extended RBV**

Both RBV and extended RBV highlight the meaning of resources and capabilities in creating competitive advantages and value. The traditional RBV suggests that competitive advantages i.e. the ability to create more economic value compared to competitors is based on owning and controlling resources and capabilities that are valuable, and that enable a company to pursue a value-generating strategy aimed at cost reduction or differentiation of the service or product. Despite focusing on resources and capabilities within company boundaries, the traditional RBV acknowledges the existence of external strategic factor markets, where resources can be purchased and sold (Maritan & Peteraf, 2011). The key

to creating value in this context is to have superior information about the expected value of a resource that is not reflected fully on the price of the resource, enabling the company to acquire the inputs cost-efficiently (Denrell et al., 2003). On the other hand, when resources are not available on the market, the focal company is compelled to develop resource and capability bundles internally, and deploy these in order to create value (Dierickx & Cool, 1989). Thus, the perspective of the traditional RBV into competitive advantages and value creation is pre-dominantly internally focused whereby differences between companies are attributable to the characteristics of company-bound internal resources and capabilities as the basis for implementing value-creating strategies on the marketplace. Nevertheless, the mere possession of resources, even if they are rare and valuable has been claimed to be inadequate for creating competitive advantage (Hitt, 2011).

The extended RBV suggests that value-generating resources may exist outside company boundaries and by being inter-connected, resources and capabilities of external actors may have an impact on a company's competitive advantage. Thus, the traditional RBV assumption of the company's ownership and control of resources that are valuable and rare for creation of competitive advantages is relaxed. Indeed, the extended RBV and literature streams in strategic alliance management and strategic networks emphasize the inter-organizational, collaborative relationship context as the platform for creating competitive advantages and value whereby both internal and external resources and capabilities are regarded as potential sources of value. Through relationships, the focal company can access partner resources and share resources and capabilities in order to generate both joint as well as company-specific competitive advantages and value. Thus from the eRBV perspective, competitive advantages and value creation involves the focal company and an external partner in a relationship, attributing the creation of competitive advantages and differences in company performance to the relationship or dyadic level (Squire et al., 2009). Consequently, the focus moves from a single company to companies that are connected through relationships, from internal resources and capabilities to combinations of internal and external resources, and from managing internal resources and capabilities to managing the relationship and interactions with the external partners. The emphasis of both traditional and the extended RBV and the key differences are summarized in Table 2.

**Table 2.** Traditional RBV and extended RBV: emphasis and key differences (based on Arya & Lin, 2007; Barney, 1991; Gulati et al., 2011; Lavie, 2006; Peteraf, 1993; Squire et al., 2009).

|  | <b>Traditional RBV</b>   | <b>Extended RBV</b>  |
|--|--|--|
| <b>View of the company</b>                 | Isolated   | Inter-connected  |
| <b>Basis for competitive advantage</b>     | Internal resources and capabilities and their characteristics                              | Internal and external resources and capabilities; less emphasis on their characteristics and more on the underlying relationship between the company and its external partner(s) |
| <b>Main resource management activities</b> | Owning and controlling internal resources<br>Acquiring and accumulating internal resources | Accessing, sharing and combining internal and external resources<br>Forming pooling and/or complementary resource bundles with an external partner(s)                            |
| <b>Purpose of relationships</b>            | Acquiring resource inputs cost-efficiently   | Accessing partner's resources, sharing resources   |
| <b>Unit of analysis</b>                    | Company level  | Company, dyadic, network level   |
| <b>Implied nature of relationships</b>     | Competitive  | Collaborative  |

The RBV is one of the main theoretical paradigms that has been adopted by scholars to study phenomena related to operations management, including supply chain management, operations strategy, performance management and innovation of products and services (Hitt et al., 2016). Despite its apparent applicability, RBV has also received criticism. For one, RBV has been criticized for having an internal view, offering a static view into resources and for focusing on the specific characteristics that contribute to competitive advantages instead of the process how competitive advantages are built (Priem & Butler, 2001). A review of RBV critique raises shortcomings with regard to lack of managerial implications, unclear definition of value and an over-encompassing definition of resources that does not differentiate between resources as inputs and resources that enable the management of the input (for the complete review and discussion, see Kraaijenbrink et al., 2010). Despite its limitations, the resource-based view and the extended resource-based view provide a useful lens that helps to explain the nature and dynamics of supply chain related phenomena and activities that take place across supply chain partners in order to create value (Hall-dórsson et al., 2015; Hitt et al., 2016). The RBV has links with operations management and purchasing and supply management related phenomena in particular, which are reviewed next.



## 2.4 Implications of extended RBV for purchasing and supply management

The theoretical lens of extended RBV implies two important issues for purchasing and supply management and activities in managing suppliers. The first implication relates to the acknowledgement that competitive advantages can be based on both internal and external resources. From purchasing and supply management perspective, this relates to recognizing suppliers as sources of valuable resources and capabilities that can potentially influence company competitiveness. Indeed, companies are increasingly relying on resources and capabilities possessed by suppliers. Costs related to purchased goods and services may account for 50-80% of total costs, which points to the significance of suppliers for company performance, efficiency and effectiveness (Gadde et al., 2010; Iloranta & Pajunen-Muhonen, 2015). In addition to products, materials and services, suppliers may provide ideas, innovations, specialized knowledge and technology expertise (Gadde et al., 2010; Gottfredson et al. 2005; Koufteros et al., 2012; Luzzini et al., 2015; Schoenherr et al., 2012;). Recent studies in purchasing and operations management have found empirical evidence for the extended RBV with regard to the impact of supplier capabilities to different performance outcomes of the buyer (Lewis et al., 2010; Squire et al., 2009). The second implication relates to management of external resources in a way that contributes to the enhanced competitiveness of the company (Hitt, 2011). As pointed out by Tanskanen et al. (2017), key issues that relate to managing external resources relate to selecting, finding and combining internal and external resources to capitalize on business opportunities, utilizing external resources effectively and influencing on external business partners. From eRBV perspective, this accentuates the importance of managing supplier relationships with a view on supplier's resources and capabilities and their role in company value creation.

The extended RBV lens provides useful insights for understanding and studying supplier integration. By suggesting that valuable resources exist outside company boundaries that can be accessed and utilized for creating competitive advantages, the theory provides a rationale for supplier integration which can be seen as key means in accessing supplier resources and capabilities. As stated by Petersen, Handfield and Ragatz (2005, p. 383): "A major reason for integrating suppliers into new product development projects is to access more and/or better information earlier in the development process by leveraging the supplier's expertise." Ideal outcomes of supplier integration that are pursued in this context relate to improved quality, faster time-to-market or the cost efficient development of new products (Petersen et al., 2005). In addition, the eRBV holds that combining internal and external resources may contribute to generation of competitive advantages. Considering that supplier integration has been defined as making better use of supplier capabilities and internal capabilities (Monczka & Morgan, 1996) and as combining the resources and capabilities of key suppliers with the internal resources of the buyer across operations and new product development with the aim of improving performance (Wagner, 2003), supplier

integration is at the core of eRBV (see also Hitt et al., 2016). The next chapter reviews extant literature on supplier integration and provides background and motivation for the research questions in this dissertation.

## 3. Literature and research gaps

In this chapter, the literature related to supplier integration is reviewed. The chapter starts by presenting conceptualizations and definitions of supplier integration. This is followed by examination of supplier integration dimensions in extant literature. The chapter ends with literature related to relational, process and system integration perspectives based on which research gaps and motivation for research questions in this dissertation are provided.

### 3.1 Concepts of supply chain and supplier integration

Supplier integration is one form of supply chain integration. The concept of supply chain integration (SCI) has been coined to comprise the activities of a manufacturer that collaborates strategically with its upstream and downstream supply chain partners, i.e. with suppliers and customers, and manages both inter- and intra-organizational processes in collaborative manner (Flynn et al., 2010). The purpose and main benefits of integration have been related to achieving seamless and precise flows of information, materials and finished goods within supply chains through implementing and adopting different structures, processes, technologies and practices in collaboration with supply chain partners (Vijayasarathy, 2010). Indeed, collaborating with suppliers and customers to co-ordinate and manage the flow of products, services, information and money within and across companies efficiently and in integrated manner, is regarded as a key element in striving for supply chain excellence (Bowersox et al., 2003; Stank et al., 2011).

Supply chain integration can be further broken down into internal and external integration, whereby the former focuses on the integration of various parts and/or functions within a single organization and the latter on the integration of and between different organizations (Pagell, 2004). External integration comprises both customer and supplier integration (SI) (Flynn et al., 2010; Lau et al., 2010) whereby SI focuses on upstream supply chain (Lockström et al., 2010). Reflecting the notion that it is merely impossible to own and control all needed resources and capabilities in-house, supplier integration has become an important research topic in operations management and purchasing and supply management literature (Lockström et al., 2010; Paulraj et al., 2006; Swink et al., 2007;). Although integration can be considered as an essential element of

inter-organizational collaboration within supply chains and a particularly critical issue in managing buyer-supplier relationships (Kaipia & Turkulainen, 2016), it has been claimed that as a concept, integration has been used to address various different phenomena and the related definitions are often ambiguous (Danese, 2013; Pagell, 2004). Van der Vaart and van Donk (2008) take a critical look into survey-based research on supply chain integration and find that to a great extent, integration is being measured as an average of the focal company relationships with its partners and the impact of this average measure is related to the company performance as a whole instead of the underlying buyer-supplier relationship. Suggesting that this may lead to ambiguous conclusions, the authors call for more research on integration in individual buyer-supplier relationships with focus on specific activities and practices utilized (Van der Vaart & van Donk, 2008). Recent studies have also emphasized the dynamic and multidimensional nature of supplier integration (Vanpoucke, Vereecke & Wetzels, 2014; Vijayarathy, 2010) and there have been calls for more in-depth understanding of the phenomenon (Swink et al., 2007). In the following chapter, the definitions of supplier integration are investigated in more detail.

### **3.1.1 Definitions of supplier integration**

Early views on supplier integration emphasize supplier integration as being more than building partnerships or allying with suppliers. Rather, SI is seen as an act of aligning with critical suppliers within the supply chain, targeted at accelerating new product development, improving the use of technology and decreasing costs and cycle time (Monczka & Morgan, 1996). Reaching these improvements may require harmonizing of goals with upstream business partners, establishing common systems, sharing information and involving suppliers in design and manufacturing processes (Monczka & Morgan, 1996). As integration is costly, it requires focusing on relationships with the most critical and/or key suppliers (Swink et al., 2007; Thun, 2010; Wagner, 2003). Supplier integration has been described as strategic (Swink et al., 2007) and as a strategy that companies implement in order to improve performance (Danese, 2013). Wagner (2003) regards supplier integration as a supplier management activity, in addition to managing the supplier base and supplier development. The author defines SI as “the combination of internal resources of the buying firm with the resources and capabilities of key suppliers through the meshing of inter-company business processes to achieve competitive advantage” (Wagner 2003, p.4). In similar way Monczka and Morgan (1996, p.110) highlight supplier integration’s role in making “better use of internal and supplier capabilities” in order to improve performance along the supply chain and achieve faster time-to-market.

Extant SI literature emphasizes processes, activities and practices that the buyer company can deploy in order to integrate supplier inputs i.e. resources and capabilities into company operations. Das, Narasimhan and Talluri (2006, p.564)

describe SI as “a state of syncretism” i.e. as the outcome and result of implementing external practices such as solving problems jointly with key suppliers, establishing buyer-supplier councils and efficient communications as well as making joint investments that enable the buyer and supplier companies to achieve synergies. As opposed to an outcome, some authors emphasise SI as a process. As an example, Swink, Narasimhan and Wang (2007, p. 151) regard SI as the “process of acquiring and sharing operational, technical and financial information and related knowledge with the supplier and vice versa”: a similar emphasis of integrating through information and knowledge sharing can also be found in Yu et al. (2013) and Vanpoucke, Vereecke and Boyer (2014).

Extant literature has also characterized SI as a collaborative and partnership-building effort within buyer-supplier dyads (Vuori & Kaipia, 2017). Flynn, Huo and Zhao (2010) relate supplier integration to a manufacturer that collaborates strategically with its upstream supply chain partners and manages intra- and inter-organizational processes in collaborative manner. Vijayasarathy (2010, p.493) describes SI as the “*extent where the buyer and supplier use collaborative and coordinating structures, processes, technologies, and practices for supporting and managing the flow of information and material/goods*” (italics in original). Collaborative activities with suppliers in building synchronized processes to fulfill customer demands are also stressed by Huo et al. (2013) and G. Zhao et al. (2015). Some SI definitions combine the information sharing and collaboration aspects as for example Danese (2013) who regards SI as “the degree to which a firm exchanges information and develops partnerships/collaborative relationships with its suppliers in order to collaboratively manage materials and information flows, thus smoothing and optimizing procurement and production processes” (Danese, 2013, p. 1031, following Tan, 2001).

The concept of supplier integration has been claimed to be ambiguous (Vijayasarathy, 2010) and as the discussion above shows, there are several ways to define SI. Hence, it seems useful to review SI in terms of the dimensions that underpin the phenomenon.

### **3.1.2 Dimensions of supplier integration**

Amongst the 48 articles that were included in the literature review on supplier integration (Vuori & Kaipia, 2017), six articles were identified as relevant for scrutinizing the dimensions of SI. These are reviewed next.

Paulraj, Chen and Flynn (2006) view SI as a multidimensional concept, and suggest that supplier integration consists of four main elements: relational integration, process integration, information integration and cross-organizational teams. In their study on the impact of strategic purchasing on supplier integration in US manufacturing industry, the authors break down these four main elements into lower-level factors. According to the authors, relational integration refers to a limited supplier base and establishing close and long-term relation-

ships with selected suppliers. Process integration refers to co-ordinating material and goods flows i.e. logistics across buyer and supplier companies. Information integration comprises establishing two-way communication, sharing information, and building inter-organizational systems to share operational data. Cross-organizational teams relate to involving suppliers in production and in new product development. The authors find that the more advanced the strategic purchasing function is, the more able the buyer company is to integrate with suppliers across the aforementioned four elements, which ultimately leads to improved company performance (Paulraj et al., 2006).

Lockström, Schadel, Harrison, Moser and Malhotra (2010) study SI in the Chinese automotive industry and find that supplier integration is multi-faceted and takes place through collaborative efforts that the buyer and suppliers conduct with regard to joint production planning and production, product development, communications, strategic planning and organizational integration. According to the authors, joint production planning involves sharing material flow related information, such as inventory level data and master production plans, and ensuring the seamless and potentially automated flow of daily material flows. Joint product development involves collaboration with suppliers during the early stages of the development process. Communication technologies and patterns reflect the tools used for automating communication between the buyer and supplier companies, such as electronic data exchange and Internet applications. Strategic planning involves sharing of higher-level plans as for example capacity and demand, ideas and aligning objectives between the companies. Organizational integration refers to making joint investments into the common infrastructure, the continuous development of supplier activities, alignment of organizational interfaces and development of processes. In addition to identifying the above mentioned supplier integration domains and dimensions, the authors study the frequency of suppliers to adopt integration practices within the identified domains (Lockström et al., 2010). Bennett and Klug (2012) also focus on the automotive industry. Even if the focus is on logistics integration between automotive assemblers and their suppliers, the authors suggest that supplier integration can be observed under different perspectives, including technological, supply, IT, process, logistics, collaboration and lean (Bennett & Klug, 2012).

Vijayasarathy (2010) calls for more complete understanding of the SI concept and examines the multiple dimensions of SI empirically. The author finds support for van Donk & van der Vaart (2005) for characterizing supplier integration as multi-faceted, comprising of integrative practices and structures that enable goods and material flows, information flow, planning and control and building partnerships in upstream supply chain. Consequently, supplier integration can be understood as the outcome of efforts and initiatives taken within these four dimensions (Vijayasarathy, 2010). Integrative efforts can include using technologies such as EDI or bar coding; improving inter-firm processes (e.g. by imple-

menting vendor managed inventory and replenishment systems), taking planning and control systems such as ERP and JIT into use and building collaborative partnerships with suppliers (Vijayasarathy, 2010).

Yeung, Selen, Zhang and Huo (2009) approach SI through two key themes i.e. information sharing and process co-ordination. In their study, information sharing refers to co-ordinating information flows within suppliers and linking systems within the chain in order to improve visibility in terms of production plans and demand information, as examples. Accordingly, the buyer and supplier engage in mutual information exchange concerning production schedules, production capacity and inventory levels. According to the authors, process co-ordination refers to involving the supplier in procurement and production as well as in the design phase; in other words, it implies collaborative linking of the buyer with the supplier to achieve better performance in terms of managing operational processes (Yeung et al., 2009). Huo et al. (2013) regard system integration and process integration as the main dimensions of SI. According to the authors, system integration refers to activities that are implemented in collaboration with suppliers and are based on investments in technologies and information networks. The purpose is to build a technology platform to support information exchange and establishing quick ordering systems. The authors also suggest that process integration refers to collaboration within the buyer-supplier dyad, involving suppliers in procurement, production and design processes and functions of the buyer, working collaboratively within these domains and getting the input from the supplier. System integration has an emphasis on technology and represents the hard side of integration whereas process integration has an emphasis on the human side and thus represents the soft side of integration (Huo et al., 2013).

According to Bennett and Klug (2012), supplier integration can be seen from different perspectives. Following this and using the terminology in Paulraj et al., (2006), the above conceptualizations on SI dimensions are collapsed into three perspectives on supplier integration: relational integration, process integration and system and information integration (see Figure 2). Adhering to the multidimensionality of SI, some authors specifically include relational and organizational integration in their SI conceptualization. Vijayasarathy (2010) refers to inter-organizational practices such as collaborative partnerships and joint actions, that enable moving towards deeper relationships with suppliers compared with arms-length relationships; Paulraj et al. (2006) refer to building closer relationships with a limited set of suppliers and Lockström et al. (2010) relate organizational integration to aligning interfaces with suppliers towards optimal forms and making joint investments. Bennett and Klug (2012) follow Dyer & Hatch (2004) in discussing the collaboration integration perspective that refers to joint work between the buyer and the supplier in order to increase efficiency, partnering and sharing knowledge.

Process integration, included in all above conceptualizations, points to involving suppliers in design and new product development, production and procurement (Huo et al., 2013; Lockström et al., 2010; Yeung et al., 2009); integrating the supplier into specific internal processes within a single function such as logistics (Paulraj et al., 2006); introducing or innovating new processes with key suppliers in order to improve the goods and material flows within the supply chain (Vijayasathy, 2010) as well as creating and co-ordinating operations between manufacturers and suppliers in seamless manner (Bennett & Klug, 2012). Another SI dimension in the above conceptualizations features system and information integration, including the sharing of information and the use of technology. This dimension is featured as information integration (Paulraj et al., 2006); information sharing (Yeung et al., 2009); system integration (Huo et al., 2013); information flows and technology investments (Vijayasathy, 2010); communication patterns and technologies (Lockström et al., 2010) and electronic integration (Bennett & Klug, 2012). The three perspectives derived from the articles are shown in Figure 2.

| Relational /<br>organizational integration   | Process integration   | System /information integration   |
|--|---|---|
| <ul style="list-style-type: none"> <li>• Building collaborative relationships with key suppliers</li> <li>• Aligning inter-company interfaces</li> </ul> | <ul style="list-style-type: none"> <li>• Involving suppliers in NPD, production and procurement</li> <li>• Implementing function-specific links</li> <li>• Innovating new processes with suppliers</li> </ul> | <ul style="list-style-type: none"> <li>• Information sharing and managing information flows</li> <li>• Building system-to-system links with suppliers</li> <li>• Establishing efficient communication flows with suppliers</li> </ul> |

**Figure 2.** Supplier integration dimensions (based on Bennett & Klug, 2012; Huo et al., 2013; Lockström et al., 2010; Paulraj et al., 2006; Vijayasathy, 2010; Yeung et al., 2009).

The literature on supply chain integration points to similar classifications concerning integration dimensions, or forms of integration. Mackelprang, Robinson, Bernardes and Webb (2014) note that supply chain integration can be investigated with regard to process, behavioural / relationship or information technology / infrastructural aspects and call for deeper insight into the specific dimensions. In a review of 38 papers analysing the relationship between supply chain integration and performance, Fabbe-Costes and Jahre (2008) find that there are four forms of integration (the authors call these aspects, or layers) that are used to define supply chain integration. According to the authors, these include the integration of physical, information and financial flows; the integration of processes and activities; the integration of technologies and systems as well as the integration of actors, referring to structures and organizations. The authors further note that these integration layers are intertwined and that supply chain integration can be seen as a composite of these four layers (Fabbe-Costes & Jahre, 2008, p. 135). Alfalla-Luque, Medina-Lopez and Dey 2013 (p. 808) conceptualize supply chain integration to comprise three main dimensions that encompass information integration (including e.g. information sharing and



the use of compatible information systems with supply chain partners), co-ordination and resource sharing (including process integration) and organizational relationship linkage (including fostering and maintaining long-term relationships). Basing on extant literature, Kauremaa (2010, pp. 10-11) conceptualizes supply chain integration into co-operative, operational and commercial integration. Here, co-operative integration points to inter-organizational co-operation in order to foster buyer-supplier relationships (similar to relational integration) and operational integration points to the linking of systems, procedures and routines of the buyer and the supplier (similar to process integration and system / information integration as above) (Kauremaa, 2010). The commercial integration perspective is excluded in the SI conceptualization used in this dissertation, alike Alfalla-Luque et al. (2013). Based on the above discussion, it can be concluded that the three perspectives on supplier integration identified above correspond with the recent conceptualizations of supply chain integration and with the exception of integration of financial flows, they cover the dimensions and forms of integration addressed in extant literature. In the next chapters, each perspective is viewed in closer detail.

## **3.2 Perspectives on supplier integration and motivation for research questions**

### **3.2.1 Understanding supplier integration from the relational integration perspective**

In addition to information technology and processes, supply chain integration literature emphasizes the importance of relationships between organizations as one of the key dimensions in integration (Alfalla-Luque et al., 2013; Fabbe-Costes & Jahre, 2008). Strong long-term relationships with supply chain partners supporting interaction and collaboration are related to various beneficial outcomes in terms of operational performance and supply chain excellence (see Rungtusanatham et al., 2003). Accordingly, studies on supply chain integration have included relationships with supply chain partners and the mindset of the focal company towards their partners into the variables measuring supply chain integration (van der Vaart & van Donk, 2008). Consequently, relationship quality and strength both upstream and downstream, the focal company attitude towards suppliers indicated by long-term orientation, joint decision making, trust, commitment and orientation of supply management, the alignment of the buyer and the supplier in terms of performance measures and cultures as well as sharing skills and ideas can be used to operationalize the relational integration dimension (Alfalla-Luque et al., 2013; van der Vaart & van Donk, 2008). Many companies today recognize the central role of their most important suppliers and customers in striving for improved performance along the supply chain; thus fostering and maintaining long-term partnerships with supply chain members are considered as necessary for developing integration (Alfalla-Luque et al., 2013).

With regard to the upstream side of the supply chain, relationships with suppliers have been influenced by a shift from arms-length relationships towards more collaborative forms of working together with the most important suppliers (Schoenherr et al., 2012). Companies are reducing their supply base and consolidating their purchases and expenditure to fewer suppliers, thus focusing their efforts in developing relationships with key or preferred suppliers (Lockström & Lei, 2013). Close and collaborative buyer-supplier relationships can be increasingly regarded as sources of value in terms of operational performance, integration, capabilities and financial performance (Terpend et al., 2008) and recent findings indicate that compared with transactional relationships, collaborative relationships offer higher levels of satisfaction and performance for the buyer (Whipple et al., 2010). The importance of strategic collaboration between the focal company and its supply chain partners both upstream and downstream is highlighted in the widely deployed supply chain integration definition by Flynn et al. (2010 p. 59) which considers integration as “the degree to which a manufacturer strategically collaborates with its supply chain partners and collaboratively manages intra- and inter-organizational processes, in order to achieve effective and efficient flows of products and services, information, money and decisions, to provide maximum value to the customer.” Here, strategic collaboration refers to building and maintaining an on-going strategic partnership with key or preferred suppliers that allows the manufacturer and the supplier to reach mutual understanding in terms of fulfilling requirements and meeting the needs of the other party through improved information exchange (Flynn et al., 2010). Strong buyer-supplier partnerships encourage mutual planning and problem solving efforts (Thun, 2010) and previous research has associated buyer-supplier partnerships and collaboration with enhanced efficiency, effectiveness and improved market position (Min et al., 2005). Nevertheless, close relationships or partnerships are not established with all suppliers alike but with the most important and strategic suppliers (Paulraj et al., 2006).

From relational integration perspective, establishing close, collaborative and long-term relationships with frequent interactions between the company and its key suppliers form a key element of supplier integration (Droge et al., 2012; Flynn et al., 2010; Paulraj et al., 2006; Thun, 2010;). Accordingly, the act of partnering (Droge et al., 2012; Salvador & Villena, 2013); having a partnership with suppliers (Koufteros et al., 2012; Petersen et al., 2008) and the degree of strategic partnership with suppliers (Huo et al., 2016; Wong et al., 2017; G. Zhao et al., 2015) are used to operationalize the relational dimension of supplier integration. The findings point to the importance of partnering and collaborating with key suppliers in order to achieve a higher level of integration, which may lead to improvements in different areas of performance. For example, long-term strategic buyer-supplier relationships deployed with few suppliers where the parties communicate frequently are found to be important for achieving a higher level of integration in logistics, leading to improved performance of both the buyer and the supplier in terms of supply chain agility (Paulraj & Chen, 2007a). Another study emphasizes the role of long-term relationships as driver

for information integration, through which the companies achieve a higher level of integration in logistics activities, leading to improved buyer performance in terms of speed of delivery and reduced production costs, as examples (Prajogo & Olhager, 2012). Practices that foster problem solving in collaboration with the supplier and frequent communications have been found to contribute most to the buyer's manufacturing performance (Das et al., 2006).

In the SI literature, few studies have addressed the role of relational factors in supplier integration. According to Vijayasathy (2010), higher levels of trust, commitment and mutual dependence between the buyer and supplier lead to higher integration in terms of information and product flows, planning and control systems and in building and maintaining partnership as well as conducting joint actions within the dyad. The conclusion is that companies aiming for a high level of integration with suppliers need to pay attention to establishing trustful relationships with their suppliers and ensure commitment in the prevalence of mutual dependence in their relationships (Vijayasathy, 2010). The importance of establishing trusting relationships with suppliers was also highlighted in the study by Yeung et al. (2009) that labelled trust and power as relational management mechanisms. Their study found that trust is an important antecedent for integrating both internally within the company and externally with suppliers. Contrary to the expectation that supplier integration will diminish through the supplier's use of power, the study found that this had a positive impact on supplier integration, which was further intensified in case of high trusting relationships (Yeung et al. 2009). This suggests that relational factors, such as trust may be intertwined with other enabling factors in a complex manner in the context of supplier integration (Yeung et al. 2009). Petersen, Handfield, Lawson and Cousins (2008) considered the role of socialization (including team building and social events, joint workshops and communication guidelines) as a predecessor for integrating with suppliers and as means to offset power imbalance in a relationship. The study suggested, that when a buyer is in a less powerful position than the supplier this imbalance may be mitigated by increasing the level of social interaction in the relationship, which will lead to improved integration and eventually to the development of a closer buyer-supplier relationship based on mutual trust and respect (Petersen et al., 2008). Finally, from the supplier perspective, deploying co-operative behaviour towards the key buyers, indicated by intentions, attitude and willingness to co-operate were found to enable integration practices including information sharing and implementation of joint improvement actions in manufacturing B2B relationships (van der Vaart et al., 2012).

Thus, from the relational integration perspective, having a high level of supplier integration can be associated with strong, long-term strategic supplier relationships that engender high levels of trust, commitment, mutual dependence and collaboration. The key issue thus becomes how the underlying buyer-supplier relationship can be maintained and developed and what factors may influence on the development of the mutual relationship. However, the studies discussed

above do not address these issues. Moreover, since the SI studies discussed above have been predominantly conducted from the buyer company perspective, there is less insight into establishing and developing the buyer-supplier relationship from the supplier perspective. In particular, the studies neglect to consider why the supplier would be willing to dedicate resources and capabilities to the buyer and develop the underlying relationship. Understanding the supplier view to factors that influence relationship development would thus complement extant research.

Recent research in purchasing and supply management and business relationships has suggested that attractiveness is a potential contributing factor to the willingness and motivation of the buyer and the supplier to engage with each other, devote resources and develop and continue their mutual relationship (Hald et al., 2009; Mortensen, 2012; Tanskanen & Aminoff, 2015). According to Ellegaard and Ritter (2007), there are two sides to attractiveness in all dyads: buyer attractiveness i.e. the attractiveness of the customer (or buyer) as perceived by the supplier and supplier attractiveness i.e. the attractiveness of the supplier as perceived by the buyer. When buyer attractiveness literature views attractiveness as the buyer's strategy in aiming to increase the supplier's dedication to the buyer over other customers that the supplier has (Schiele et al., 2012), recent studies have suggested that attractiveness needs to be nurtured by the buyer as well as the supplier to ensure the other party's dedication and investments into the mutual relationship (Tanskanen & Aminoff, 2015). This adds to our understanding of buyer and supplier attractiveness being interrelated and underlines the importance of understanding and viewing attractiveness from both sides of the dyad.

Previous literature has investigated attraction and attractiveness in three domains: attraction in the development of buyer-supplier relationships; buyer attractiveness to suppliers and attractiveness in portfolio and key account management (Mortensen, 2012). Drawing on extant literature (Mortensen (2012, p. 1214) finds that attraction "contributes to the motivation for a relationship between the parties and its development", suggesting that it may help to explain, why the buyer and the supplier initiate, develop and continue their mutual relationship. Evidence suggests that the supplier's diminished interest in a relationship with a buyer may be linked with the buyer losing attractiveness in the eyes of the supplier (Ellegaard et al., 2003), making attractiveness a potential factor for explaining the dynamics that are prevalent in buyer-supplier relationships (Harris et al., 2003). With regard to the relational integration perspective, that emphasizes long-term buyer-supplier relationships and partnering, understanding how attractiveness influences relationship development from both buyer and supplier perspectives appears warranted. This is where this dissertation aims to contribute.

### **3.2.2 Understanding supplier integration from the process integration perspective**

Integration of processes and activities with suppliers is one of the key elements in supply chain integration and built upon the notion that in order to perform well, the value creating processes across supply chain should be connected in seamless manner (Fabbe-Costes & Jahre, 2008; Pagell, 2004). In fact, the entire concept of supply chain management bases on linking with downstream and upstream supply chain members through business processes, including customer relationship management, demand management, order fulfilment, manufacturing, procurement and product development, in order to achieve efficient materials, financial and information flows from the original suppliers to the end customers (Cooper et al., 1997). It has been claimed that by linking their internal processes with external suppliers and customers, manufacturers have been able to generate competitive advantages (Frohlich & Westbrook, 2001). According to this process approach to integration, the way business processes are connected and managed across companies within the supply chain is critical for the success of the focal company whereby the key issues are, what processes should be linked, with which business partners, and what is the right level of integration and management that should be applied for the inter-organizational process links (Cooper et al., 1997; Lambert & Cooper, 2000).

Process integration refers to managing different activities that aim to link business processes within and across firms whereby the main objective is to build a more efficient supply chain (H. Chen et al., 2009). Through collaboration, the buyer and the supplier integrate processes and align in order to increase productivity (Bowersox et al., 2003). Breaking down organizational barriers and promoting seamless and synchronized processes across the supply chain is however difficult to achieve in practice (Alfalla-Luque et al., 2013) and the focal company needs to reduce barriers that inhibit integration and at the same time promote factors that facilitate it (Richey et al., 2010). According to the authors, the former involves improved sharing of information, risks and rewards, developing guidelines to managing relationships with key business partners and deploying joint operating goals and performance metrics with business partners. The latter involves increased alignment of mission, goals and operating procedures with key partners, improved communications, utilizing a structured approach to managing and selecting partners, adopting consistent performance measures throughout the chain and working in interdependent ways with other companies (Richey et al., 2010). Thus, process integration bases on a collaborative mindset that enables the buyer and the supplier to work closely together, share information and align operations; the most comprehensive level of collaboration entails integration on strategic level where processes span organizational boundaries, risks, rewards and responsibilities are shared, the buyer and the supplier work towards common objectives (Bowersox et al., 2003) and engage in knowledge sharing (Swink et al., 2007). Indeed, many authors emphasize the importance of integrating with suppliers on strategic level and distinguish it

from operational integration (Flynn et al., 2010; Swink et al., 2007). When operational integration comprises the linking of operational interfaces and daily business activities with business partners, strategic integration has longer-term focus whereby the buyer and the supplier align their value creation processes, collaborate in terms of supply chain network and capacity planning, conduct joint new product development and innovate together (Bowersox et al., 2003; Lockström & Lei, 2013).

Extant SI studies conceptualize and scope process integration slightly differently. For example, Wagner (2003) suggests that process integration with suppliers can be viewed with regard to the phase of involvement whereby suppliers can be integrated into the focal company during the development and/or the industrialization phase. According to the author, the development phase activities comprise strategic planning, conceptualization, design and engineering of new products, and the industrialization activities production and customer service. The study found that most companies involved suppliers in the industrialization phase i.e. during volume production, whereas there was less evidence of integrating suppliers during earlier phases (Wagner, 2003). The benefits from integration also differed, as integrating suppliers during manufacturing relates generally to improving quality and logistics and reducing stock levels and costs i.e. operational performance, whereas supplier integration during the development phase can be related to achieving faster time-to-market, improved quality and reduced NPD costs (Rungtusanatham et al., 2003; Sjoerdsma & van Weele, 2015; Wagner, 2003). Another study observed a more dispersed pattern with regard to the phase of integration where the key suppliers were mostly integrated into R&D, procurement and distribution with less supplier engagement in inventory management, manufacturing, supply chain design and implementation of supply chain systems (Bagchi et al., 2005).

Many studies view process integration with regard to logistics function in particular and the importance of integrating activities and sharing information with suppliers in order to create seamless flows of goods and materials to achieve performance benefits has been discussed extensively (Frohlich & Westbrook, 2001; Morash & Clinton, 1998; Paulraj et al., 2006; Paulraj & Chen, 2007a; Prajogo & Olhager, 2012; Romano, 2003). Integrating in terms of logistics has been found to contribute to achieving operational excellence and to the reduction of total costs along the supply chain, thus supporting the cost leadership strategy of the focal company (Morash & Clinton, 1998). Integrating in terms of logistics may be considered as the logical first step towards deeper integration: a study of integration initiatives in six buyer-supplier dyads found that the companies started with improving logistics responsiveness and executed broader integration initiatives such as sharing knowledge and using common resources only during later stages as their relationships progressed (Vanpoucke, Vereecke & Boyer, 2014). The activities contributed to different performance objectives, with logistics responsiveness contributing to cost reductions and knowledge sharing and use of common resources to growth and value creation - that is,

goals other than mere cost reduction (Vanpoucke, Vereecke & Boyer, 2014). This appears to suggest that in order to attain a full set of integration benefits, companies need to integrate not only in terms of logistics, but also within other processes and activities, such as new product development (Cooper et al., 1997).

Process integration has been suggested to comprise the management of activities that aim to link relevant business processes within and across firms (H. Chen et al., 2009) as well as induce the participation and involvement of key suppliers in procurement, production and new product development (Huo et al., 2013). In this dissertation, the process integration theme is observed in two different contexts i.e. complex project delivery and new product development. The related literature is reviewed next.

#### *Involving suppliers in complex project delivery*

In today's business markets, traditional manufacturing companies are increasingly moving towards to becoming systems integrators that provide unique, customized and often complex solutions and product service systems to their customers (Davies et al., 2007). Systems integration can be understood both as a process and a structure for co-ordinating various organizations that are involved in the design, development and delivery of a system (Davies & Mackenzie, 2014). In systems integration, the focal firm relies on the skills and knowledge of various external actors including suppliers, users, government agencies and even competitors (Hobday et al., 2005). The key issue is how the different external inputs – technologies, knowledge, skills and human resources - are brought together to produce the product or solution (Hobday et al., 2005). When outsourcing work outside company boundaries, suppliers form networks where they collaborate in terms of product design, component manufacturing, assembly and sales whereby the focal company leads and co-ordinates their work (Brusoni et al., 2001). Thus, integrating the external skills, components, knowledge, technologies and services into complex solutions has become a core capability and a potential source of value creation for the focal integrator company (Hobday et al., 2005; Jaakkola & Hakanen, 2013). This underlines the importance of understanding how the systems integrator firm co-ordinates activities with its suppliers in integrated systems deliveries.

The systems integrator has many roles: in addition to assembling product components, designing the system design, selecting and coordinating external partners and producing the entire system the focal company needs to develop and keep abreast of technological knowledge (Davies et al. (2007). The production and delivery of complex product and systems are usually organized in projects that function as the platform for linking internal and external knowledge bases, skills, expertise and technical capabilities (Gann & Salter, 2000; Söderlund et al., 2008). The way suppliers are managed, integrated and co-ordinated is critical for the success of the project (Martinsuo & Ahola, 2010). Extant studies (Ahola et al., 2013; Davies & Mackenzie, 2014; Jaakkola & Hakanen 2013) have added understanding of integrative activities that the focal companies conduct with suppliers in order to co-ordinate and manage tasks across organizational

boundaries in complex projects and solution deliveries. Yet, these studies do not consider the supplier's perspective to integration. In addition, there is a need to enhance understanding of the nature of integrative activities and how they relate to the time, cost and scope objectives of the underlying project. This provides the motivation for studying integrative activities and describing their role in integrated systems delivery involving a systems integrator and its multiple suppliers.

#### *Involving suppliers in new product development*

The increasing complexity of products that feature various technologies, rising costs related to new product development, the shortage of personnel and demands for faster time-to-market are driving companies to extend their new product development efforts outside company boundaries (Howells et al., 2003). Studies on supplier involvement in new product development have emphasized suppliers' role in bringing new knowledge and capabilities for product development needs (T.E. Johnsen, 2009). As experts in their own area, suppliers possess critical product and process technologies and have more knowledge in relation to these than the customer (Handfield et al., 1999), suggesting that suppliers constitute a valuable source of innovation (Smals & Smits, 2012). Involving suppliers into the buyer's NPD has been associated with several benefits, such as shorter time-to-market, improved product quality and reduced development and product costs (T.E. Johnsen, 2009). Consequently, companies are increasingly tapping on their supplier's knowledge, expertise and capabilities for new product development purposes (Wagner, 2012).

Integrating suppliers in NPD which is also termed supplier involvement, encompasses the tasks the suppliers carry out on behalf of the buyer, and the responsibilities that the suppliers assume for the development of a part, process or service (Van Echtelt et al., 2008). In supplier involvement, the R&D resources of the buyer and the supplier are combined and joint capabilities formed with the purpose of creating superior products in shorter time (Wagner & Hoegl, 2006). The point of supplier integration can range from idea generation to technical assessment, concept development, engineering and design to prototyping (Petersen et al., 2005). The issue of right timing for supplier integration has been raised recently (Parker et al., 2008); however, it has been claimed that suppliers should be involved already at the early stages i.e. the concept stage or during early feasibility studies in order to reap the potential benefits (Handfield et al., 1999; Wagner, 2012). The term early supplier involvement (ESI) has been coined to point to the early stage of integrating a supplier into NPD. Early involvement of the supplier helps the buyer company to get supplier's input and knowledge incorporated into designs, which improves the manufacturability of the product (Swink, 1999; Wasti & Liker, 1997). The tasks assigned to the suppliers may range from assuming complete responsibility for product engineering, to the development of component parts or entire sub-assemblies (Koufteros et al., 2007). The classification into black-box / white-box / grey-box suppliers is used to describe the level of supplier responsibility and autonomy in NPD,



whereby a black-box supplier has the highest level of autonomy in terms of design, a white-box supplier simply makes to print and a grey-box supplier works in collaboration with the buyer company in order to develop new designs (Petersen et al., 2005).

The literature review by T.E. Johnsen (2009) on supplier involvement pointed out that even if integrating suppliers into NPD may improve NPD performance and outcomes, there are several challenges in achieving and managing supplier integration and realizing the potential benefits. According to the review, there are three factors that drive successful supplier involvement: supplier selection, supplier relationship development and relationship adaptation as well as internal customer / buyer capabilities (T. Johnsen, 2009). Indeed, the importance of selecting a supplier with the right capabilities for joint NPD has been emphasized in extant literature (Croom, 2001; Koufteros et al., 2012; Petersen et al., 2003; Van Echtelt et al., 2008; Wagner & Hoegl, 2006). Supplier selection has been found to be positively linked with enhanced decision-making in the product development team, leading to better designs and financial performance, effectively (Petersen et al., 2005).

In the context of supplier involvement, companies aim to evaluate the supplier's capabilities vis-à-vis the buyer requirements as well as the supplier's ability to collaborate in a joint project (Melander, 2014). Studies have emphasized supplier new product development capabilities (Hartley et al., 1997; Koufteros et al., 2007; Koufteros et al., 2012; Petersen et al., 2005; Song & Benedetto, 2008; Wagner, 2012; Wasti & Liker, 1997) as well as supplier technological capability and technical expertise (Emden et al., 2006; Petersen et al., 2003; Wagner & Hoegl, 2006). In addition, softer criteria, including trust and reliability, degree of openness and mutual support between the buyer and the supplier are regarded as important (Wagner & Hoegl, 2006). Some studies stress the supplier capability to collaborate (Croom, 2001; Feng et al., 2010) and supplier responsiveness and willingness to work with the buyer (McCutcheon et al., 1997) in addition to technical capabilities. With regard to the nature of NPD with supplier involvement, the quality of collaborative working amongst the project members (Hoegl & Wagner, 2005) and the alignment of capabilities on both sides of the dyad to achieve fit in technical, strategic and relational domain (Emden et al., 2006) are also regarded as important for successful NPD outcomes.

The studies above have increased understanding of supplier selection as a success factor for early supplier involvement as well as the capabilities that are desirable for a supplier. Nevertheless, with some rare exceptions (Croom, 2001) the studies tend to take a one-sided view the early supplier involvement (ESI), namely that of the buyer company. Furthermore, the view that extant studies take into the capabilities tends to be rather static as the studies emphasize evaluating – from the buyer perspective - whether a supplier has a certain capability of not with less insight into how a capability develops. Recent study suggests that small suppliers develop capabilities in technical, managerial, cultural and

human domains as they interact with their larger customers and that it is these capabilities that enable the buyer and the supplier to enhance their mutual relationship, innovate and create value together (Ngugi et al., 2010). With the sparse amount of studies on capabilities from the supplier perspective, there is room for further investigation of the phenomenon that deploys the supplier viewpoint. Furthermore, despite the belief that collaborating with suppliers or external actors in general is beneficial for NPD or innovation outcomes, the evidence concerning the actual benefits of supplier integration in NPD is mixed (see Ledwith & Coughlan, 2005). In fact, integrating suppliers into NPD has been related to increased costs and managerial challenges that can offset the desired benefits (Salvador & Martínez, 2011). This implies that conducting NPD with supplier involvement is not straightforward and may be more complex than anticipated, warranting additional insight into conducting ESI and related challenges.

### **3.2.3 Understanding supplier integration from the system and information integration perspective**

System and information integration is identified as one of the key dimensions of supplier integration (Huo et al., 2013; Lockström et al., 2010; Paulraj et al., 2006; Vijayarathy, 2010; Yeung et al., 2009). In supply chain management, information technology and information sharing are regarded as the main mechanisms in achieving co-ordination and managing interdependencies across companies (Kanda & Deshmukh, 2008). A company can engage in different levels of electronic interaction with its trading partners, ranging from exchanging a limited set of documents to integrating complete systems and connecting all supply chain members together (Riggins et al., 1994; Shah et al., 2002). Information technology can be utilized for integrating within the supply chain both upstream and downstream for the purposes of joint inventory planning, demand forecasting, order scheduling and relationship management, as examples (Frohlich & Westbrook, 2002; Lee, 2000; Yeung et al., 2009). Correspondingly, transaction processing, planning and collaboration within supply chain (for example, setting up vendor managed inventory), order tracking and co-ordination of deliveries are regarded as typical uses of information systems in supply chain context (Kärkkäinen et al., 2007). Aligning with supply chain partners in terms of IT has been linked with enhanced responsiveness to the marketplace, customer value creation and firms' competitive advantage (Kim et al., 2013; F. Wu et al., 2006).

Information technology and its various uses have been studied particularly in relation to company and supply chain performance (see Zhang et al., 2011 for a review of survey-based studies on the impact of ICT on supply chain management and supply chain performance). Whilst there are findings that ICT does not have a positive direct impact on performance (Li et al., 2009; Tan et al., 2010), there is evidence suggesting that the impact of ICT on performance takes place through integration of activities across company boundaries (Vanpoucke et al., 2017). In other words, information technology and its various uses may

act as an enabler and facilitator of integration of operations and activities with business partners whereby the importance of both - i.e. the integration of systems and operations is accentuated (Prajogo & Olhager, 2012; Vanpoucke et al., 2017).

In integration literature, Vickery, Jayaram, Droge and Calantone (2003) found that technologies (including the use of EDI, integrated information systems and computer-based production systems) impact positively on upstream and downstream supply chain integration (measured as supplier partnering, closer customer relationships and cross-functional teams), which has a positive impact on customer service which further drives company financial performance. Devaraj, Krajewski and Wei (2007) studied different forms of web-based technologies that a company can deploy to link with its customers and suppliers electronically (web-based ordering and electronic auction, as examples) and to collaborate (including the use of web-based EDI, electronic forecasting, inventory replenishment and scheduling). The study found that technologies and collaboration tools supported integration with suppliers in terms of information sharing and collaborating, which impacted positively on company performance (Devaraj et al., 2007). Alike Vickery et al., (2003), the study could not establish a direct link between information systems and performance, which indicated that systems per se do not bring benefits, but there need to be processes and methods in place to leverage and use these systems in order to capture the potential benefits (see also Vanpoucke et al., 2017). Additionally, the study by Li, Yang, Sun and Sohal (2009) found that information technology implementation facilitated integration with supply chain partners (in terms of optimized systems, improved information flows, increasing accuracy and adaptability of planning, control and tracking of inventory, standardization of processes, visibility) which then had a positive impact on supply chain performance. The authors concluded that IT has become a necessity that enables better integration both upstream and downstream (Li et al. (2009). Studying IT in the context of logistics, Prajogo and Olhager (2012) found support for the fact that both IT systems and sharing of information facilitate better integration with suppliers in terms of co-ordination and coupling of logistics activities, which had a positive impact on performance. The authors emphasized that to achieve desired performance benefits, companies need to consider both the hard side i.e. the technical side of information integration in terms of implementing physical systems and the soft i.e. the social side in terms of ensuring the quality of information that is shared with suppliers and building efficient ways to communicate within the buyer-supplier relationship (Prajogo & Olhager, 2012). D.Q. Chen, Preston and Xia (2013) studied the impact of information technology into supplier integration in healthcare and found that information technology (i.e. transparent data, use of software with suppliers and shared systems) influences both knowledge exchange as well as integration measured e.g. in terms of co-ordinated and shared logistics activities, which in turn impact positively on supply chain performance in terms of quality, speed, cost and flexibility.

Whilst the above studies enhance our understanding of the relationship between ICT integration and performance and portray ICT as a key precursor for integration (albeit measured differently), there are issues that need further investigation. First, whilst the studies suggest that ICT may facilitate integration between and across supply chain partners, manifested through improved coordination, information sharing, collaborating and establishing joint activities, the studies remain silent on how these ICT-enabled processes and practices are built between a buyer and respective supplier(s). Insight into this would be important given the notion that it is not the systems per se that bring benefits, but rather how systems and different technologies are incorporated into more efficient practices and processes between companies in the supply chain (Zhang et al., 2011). Secondly, the buyer perspective dominates the studies on ICT and its utilization, advocating a rather one-sided view into the phenomenon. Given that inter-organizational systems and technologies cannot be implemented without the other party, more attention to the supplier side is needed.

Thirdly, and perhaps most importantly for this dissertation is the notion that extant studies on ICT and integration tend to neglect the underlying buyer-supplier relationship context. As discussed above, the links between implementing ICT, integration and performance have been investigated whereby extant studies concentrate on measuring the extent and contents of information exchange (e.g. exchange of inventory level data or demand forecasts) and the use of particular systems (e.g. quick ordering systems or vendor managed inventory) between the focal company and its suppliers as part of the integration construct (e.g., Flynn et al., 2010; Lii & Kuo, 2016; G. Zhao et al., 2015). The buyer-supplier relationship within which IT is deployed has received less attention. As noted by Lindh (2006), the role of IT in supporting and enabling operational product and information flows between business partners tends to be emphasized in extant literature. However, some scholars suggest that IT should be seen as an inherent part of the buyer-supplier relationship (Lindh, 2006; Lindh & Rovira Nordman, 2017; Salo, 2007). Thus, an investigation into IT and its role in a buyer-supplier relationship is warranted.

## 4. Research design

The research process comprises phases that relate to each other in sequential manner (Denzin & Lincoln, 2011). The process begins with the researcher herself (personal ethics, history, research traditions), followed by the main theoretical paradigm or worldview that reflects the philosophical assumptions of the researcher regarding the nature of reality and ways of understanding it (ontology and epistemology, respectively) (Guba & Lincoln, 1994). The different worldviews guide the researcher towards particular research approaches that include the quantitative, qualitative or the mixed methods approach (Creswell, 2014). Guided by the personal history and her worldview the researcher moves on to devising a strategy of inquiry that begins with the research design, which bridges the theoretical assumptions with a specific type of inquiry and methods in conducting the research i.e. collecting and analyzing the empirical materials (Creswell, 2014; Denzin & Lincoln, 2011). The final phase in the research process concerns the practice of interpretation, and criteria for evaluation (Denzin & Lincoln, 2011). This dissertation builds on a critical realist view, inducing a qualitative research approach executed through in-depth multiple and single case studies, where data has been collected through semi-structured interviews and complemented through secondary materials.

The researcher adopts different positions regarding the nature of reality and what is (i.e. ontology) and his/her relationship to understanding reality through knowledge and what it means to know and how we know what we know (i.e. epistemology) (Crotty, 1998, pp. 8-10). The extremes can be described as representing objectivist and subjectivist approaches (Morgan & Smircich, 1980). Critical realism is situated at somewhere in the middle between the two extremes, adhering to an external reality in the same vain as the objectivist stance yet at the same being aware and critical of the notion that the world could be understood with full certainty (Sekaran & Bougie, 2016). The epistemological assumption is that findings are only probably true, instead of being absolutely true or created as per the positivist / constructionist view, respectively (Sobh & Perry, 2006). Critical realist acknowledges that knowledge is created in social setting of which the researcher is also part of and this is why knowledge can never be complete; according to Miller and Tsang (2011, p. 144):

“A critical realist perspective affirms the possibility of truthful knowing but acknowledges that human limitations undermine claims to indubitable or objective knowledge.”

For a critical realist, the goal is to understand the reality through mechanisms and structures that underlie the investigated phenomenon. Thus, the critical realist focuses on the actors' perceptions, the context, its influence on the investigated phenomena (Sobh & Perry, 2006) as well as contingencies (Miller & Tsang, 2011). Qualitative methods such as in-depth case studies and convergent interviewing are considered as feasible methods; however, drawing to various sources of data i.e. triangulation is advised in order to capture the complexities of reality as investigated actors may hold a variety of differing views (Healy & Perry, 2000; Sobh & Perry, 2006).

As a phenomenon, supplier integration is multidimensional and complex. Yet, the majority of supplier integration research represents the positivist research paradigm and quantitative research approach, executed through survey-based research designs (Vuori & Kaipia, 2017). Consistent with earlier reviews (van der Vaart & van Donk, 2008), a literature review on SI showed that focus of SI related research is predominantly on investigating the impact of supplier integration into buyer company performance or other outcome variables (Vuori & Kaipia, 2017). Whilst these studies may advance our knowledge of the SI phenomenon and its effects, they can be criticized for offering only a snapshot view into SI (Vuori & Kaipia, 2017). Based on the results of survey studies that have been claimed to be ambiguous (van der Vaart & van Donk, 2008), it is difficult to understand how integration can be achieved or how it can be implemented in buyer-supplier relationships, the latter point being of particular importance given that this dissertation is conducted in the industrial engineering and management field. In this sense, quantitative, theory-testing, studies can only give a partial view to on the phenomenon of supplier integration. The critical realist paradigm is deemed feasible for this study firstly; as it allows the researcher to investigate the phenomenon taking into account the underlying context i.e. the buyer-supplier relationship where integration is actually implemented (Sobh & Perry, 2006). Secondly, the criticism towards survey-based studies and their ambiguous results indicates that the SI phenomenon may be more complex than what can be captured through studies on integration-performance relationships which are based on an average of the measures at best (van der Vaart & van Donk, 2008). Realism accepts that investigated phenomenon are bound to the social setting and may be more complex than meets the eye, making it a feasible stance for investigating complex phenomena in social settings where people interact (Sobh & Perry, 2006). Thirdly, the realist accepts that there are different views and perceptions of reality and attempts to learn as much as possible from these different perceptions in order to comprehend the investigated phenomenon (Riege, 2003). Since integration is bi-directional by nature and involves both the buyer and the supplier companies and various people in these organizations, it appears that various views on both sides of the dyad need to be taken into account in order to understand the phenomenon holistically.

In sum, the realist research paradigm represents the philosophical underpinning in this dissertation guiding towards the qualitative research strategy and case study as the dominant research method, which are elaborated next.

#### **4.1 Choice of the research method: Case study**

The four empirical articles (Articles II-V) included in this dissertation follow qualitative case research strategy which is an increasingly relevant scientific method in operations and supply chain management, industrial marketing as well as in management (Eisenhardt & Graebner, 2007; Ketokivi & Choi, 2014; Piekkari et al., 2010). As a research strategy, case study allows the researcher to investigate a phenomenon in its real-life, naturalistic context, whilst seeking for theoretical understanding of an empirical phenomenon (Piekkari et al., 2010). Through case studies, researchers can create new theoretical constructs, or even holistic explanations of the underpinnings of an empirical phenomenon (Piekkari et al., 2009). The use of the case study method has been associated with the realist research paradigm in allowing a researcher to investigate a contemporary phenomenon in inductive, theory-building sense where the purpose is not to generalize to population, but rather to make analytical generalizations (Perry, 1998). It should be noted here that the case study method may also be suited for theory-testing purposes within the critical realism paradigm, (Piekkari et al., 2009); however, theory-testing is not the purpose of the case studies in this dissertation.

According to Ellram (1996), the case study method is feasible not only for exploration (using the case study method to gain deeper knowledge of a phenomenon where little prior knowledge exists) but also for explanation, description and even prediction. The relevance of using the case study method has been associated with gaining deep contextual insight into the investigated phenomenon, whereby the case research strategy is particularly applicable for addressing “how”, “why” and “what” type of research questions (Voss et al., 2002; Yin, 2009). The case study method has been utilized in the empirical articles included in this dissertation to address both “how” and “what” research questions. With regard to the objective of the dissertation - contributing to SI literature by advancing knowledge on supplier integration from different perspectives – the case study method is seen as feasible, as it allows studying the SI phenomenon in its natural setting i.e. within B2B buyer-supplier relationships. The original studies represent interview-based multiple and single case studies, that allow gaining deep contextual insight into the phenomenon from both buyer and supplier perspectives. This is important due to two reasons: first, SI has been investigated mostly through quantitative, survey-based methods, and secondly, these studies address the phenomenon pre-dominantly from the buyer perspective (Vuori & Kaipia, 2017). Thus, it is expected that case studies that address both the buyer and supplier perspectives can provide in-depth understanding of the

SI phenomenon and complement extant knowledge. Even if survey-based research dominates the SI domain, there are recent contributions that utilize the case study method. As examples, Kaipia and Turkulainen (2016) use the case study method for investigating contingencies in managing supplier integration in outsourcing buyer-supplier relationships and Vanpoucke, Vereecke & Boyer (2014) deploy the case study method to scrutinize dynamics in buyer-supplier relationships. In this dissertation, the use of the case study method was also driven by the motivation to capture the complexity in the investigated buyer-supplier relationships with regard to the different perspectives on supplier integration (see Halinen & Törnroos, 2005).

The dyadic approach is implemented across all empirical studies in this dissertation. Acknowledging both buyer and supplier perspectives in research concerning supplier integration and management of buyer-supplier relationships has been called for (Terpend et al., 2008; Wagner, 2003). Including the supplier's view and gathering dyadic data has been noted to be important in order to gain a more holistic picture of the integration phenomenon (Vanpoucke, Vereecke & Wetzels, 2014). These viewpoints have informed the choice of implementing the dyadic perspective. This is however not to undermine the notion that relationships are part of larger business networks which bear an impact into the focal relationship and its development (Anderson et al., 1994). Yet, given the fact that integration is a complex phenomenon characterized by various dimensions (Vijayasathy, 2010) it was not seen feasible to add further complexity by taking the supply network context – deemed to be of messy and complex nature with multiple linkages amongst actors (Harland et al., 2001) into account.

Case studies can aim to motivate, illustrate, give spark to new ideas, or persuade the reader (Siggelkow, 2007). It has also been suggested that cases can serve the purpose of being exemplary accounts of a particular phenomenon (Dubois & Araujo, 2007). In terms of how new knowledge is created, case studies have been associated with theory generation, theory testing and more recently, theory elaboration, where the distinction lies in the differing configurations of general theory, empirical data and the case research context (Ketokivi & Choi, 2014). The articles in this dissertation mainly follow the principles of theory building case research, albeit not in the “purest” inductive form as for example advocated by Eisenhardt (1989), since the researcher's point of departure has not been a clean slate as research initiatives have been informed by existing literature and theory. For a critical realist however, creating a conceptual frame based on existing literature prior to entering the field and starting data collection can be regarded as an appropriate way for investigation (Sobh & Perry, 2006).



## 4.2 Data collection and analysis

### 4.2.1 Structured literature review

The only non-empirical study (Article I) included in the dissertation is a structured literature review<sup>3</sup> that was conducted in order to capture relevant SI research and to understand the phenomenon based on the state and nature of extant research. The principles of systematic literature review (Tranfield et al., 2003) guided the process, and thus the review progressed from initial planning to conducting the review, ending with the compilation and dissemination of key results. In order to capture high-quality peer-reviewed research on supplier integration, six academic journals that publish predominantly in the domain of operations management, purchasing and industrial marketing with an emphasis on B2B buyer-supplier relationship management were selected. These included the Journal of Operations Management (JOM), International Journal of Production Economics (IJPE), International Journal of Operations and Production Management (IJOPM), Journal of Purchasing and Supply Management (JPSM), Journal of Supply Chain Management (JSCM) and Industrial Marketing Management (IMM). All these journals represent high quality publication outlets with high impact factors (2015): 2,252 (IJOPM), 2,562 (JPSM), 2,782 (IJPE), 4,0 (JOM), 4,571 (JSCM) and 1,93 (IMM). Searches were conducted in the journal abstract, title and keywords with the following three phrases: “supplier integration”, “supply integration” and “buyer-supplier integration”. The scope for the review was limited to include publications between 2006-2016. Abstracts from the retrieved articles were studied in order to see if supplier integration was the main topic of the article; based on this, two articles were discarded, resulting in a sample of 46 articles. The sample was manually complemented with two relevant articles that were found missing from the sample, which resulted in 48 articles. All types of studies (conceptual, qualitative, quantitative, and empirical) were included in equal terms. The sample articles were analyzed by following the principles of qualitative content analysis (Seuring & Gold, 2012). After reading each article thoroughly, an entry into an analysis table was made concerning the following variables: research topic, theoretical background, method, sample (if applicable), industrial context of the study, unit of analysis, outcome variable (if applicable), perspective (buyer/supplier/dyadic), integration definition / description and main findings / contribution. Based on the initial mapping, research themes were identified, and articles categorized into themes accordingly. More condensed analysis tables and graphical illustrations were created to enable effective dissemination of the findings

### 4.2.2 Empirical studies

**Article II.** The study applied the multiple case study method where the empirical cases comprised two buyer companies and their attractiveness as perceived by their key suppliers. The level of analysis was the buyer-supplier relationship.

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<sup>3</sup> The terms structured and systematic appear to be used interchangeably to refer to a literature review following a rigorous methodology: see Burgess et al. (2006) and Touboulic & Walker (2015) as examples

The companies were purposefully selected to enhance understanding of buyer attractiveness and relationship development (Eisenhardt & Graebner, 2007; Miles & Huberman, 1994). With regard to the importance of buyer attractiveness in terms of enforcing the relationships, the cases were similar as both buyer companies were highly dependent on their suppliers, and thus being an attractive buyer was crucial for them both. Moreover, the cases allow the researcher to obtain in-depth understanding and insights into this contemporary phenomenon (Dubois & Araujo, 2007). The cases were considered similar in terms of meaning of attractiveness but polarized in terms of geography (local vs global) and business operations (exploration/exploitation). Dyadic data collection with semi-structured interviews took place between 2011-2012 and resulted in 50 interviews in total. In addition, the researchers had access to extensive secondary materials including project database, meeting minutes, teleconference calls, observations, workshop materials and company documentation on relationship practices. The case studies were first analysed separately by categorizing and summarizing interview data. Within-case analyses were performed vis-à-vis the research framework, and the results were arranged into tables and matrices. The analysis allowed making comparisons between the cases, identification of similarities, differences and patterns on buyer-attractiveness and relationship development both within and across the cases. Extensive case accounts were produced that enabled the combining of ex-ante conceptualizations according to the research framework with empirical insights.

**Article III.** In this article, the qualitative single-case study was chosen as the research method, due to the explorative nature of the research, where contemporary and dynamic phenomenon were investigated in multiple organizations (Yin, 2009). The case comprised a complex system delivery project named “Åsgard” that involved the systems integrator company ABB Transformers and six of its suppliers. Given the considerable technological novelty and involvement of multiple supplier companies possessing complementary technological capabilities in the solution development and delivery, the project Åsgard was considered as an ideal case for observing the deployment of integrative activities across organisational boundaries. The empirical data set comprised 17 semi-structured interviews in total, whereby nine were conducted with the buyer company and eight with the supplier companies. The interviews started with free discussion on the project progress; after this, each informant was asked to elaborate on the ways of integrating across organizational boundaries and to provide examples of the activities that were utilized. Sixteen interviews were recorded and fully transcribed for analysis purposes. The analysis was conducted in three phases. First, all materials including the interview data, field notes, and project documentation was coded and a descriptive label for each activity was assigned. The initial phase resulted in 37 first-level codes; after overlapping codes and content were removed, 12 integrative activities were identified for further scrutiny. After this, the accounts of integrative activities and exemplars on their use were compiled for each involved company. The third

analysis phase concentrated on finding similarities and differences on using integrative activities across the companies involved in the study. This led to the categorization of three distinct sources of initiation: the integrative activities implemented by the systems integrator company, integrative activities initiated by the involved suppliers, and the joint integrative activities. As part of the analysis process, researchers also crafted a timeline for the project, allowing a more detailed picture into the progress and chronological order of the multi-year effort featuring major milestones, project events and the first delivery.

**Article IV.** The study applied the in-depth single case study as the research method. The case i.e. early supplier involvement project and two companies that it concerned were selected due to offering a persuasive example (Siggelkow, 2007) of implementing early supplier involvement where the buyer involved one of their key suppliers more systematically and earlier into NPD than previously. In addition, the supplier, a long-term contract manufacturing company had not been involved in their customer's NPD as extensively or as early on as in the investigated project. The level of analysis comprised collaborations between the buyer and the supplier during a NPD project where the supplier was involved as an early involvement partner. As the companies took part in a joint industry-academia research programme, the researchers were able to gain unique access into both companies. The empirical data was collected first by face-to-face interviews, which were complemented with telephone interviews with key informants in the customer and supplier companies during the period ranging from February 2014 to May 2015. Complementary secondary materials were also obtained, including company presentation materials of their new service offering and process descriptions. Data collection resulted in total of 32 semi-structured interviews, with 10 interviews pertaining to supplier and 22 to the buyer. Key customer informants represented the NPD team as well as managers and senior directors in R&D and purchasing. Supplier informants represented the NPD project team, technology management and top management. The interviews were analysed based on the principles of content analysis, where the interviews were transcribed, coded and categorized into themes (Miles et al., 2014) by using Atlas.TI qualitative data analysis software. Similar content was condensed into categories that were further arranged into Word analysis tables with illustrative quotes (Miles et al., 2014). Three researchers engaged in the analysis to improve inter-rater reliability (Voss et al., 2002). To discuss and validate the findings, the researchers arranged workshops and face-to-face meetings with both company representatives.

**Article V.** In this article, the multiple case study method was applied, enabling investigation of two relationships including two buyer and two supplier companies. The level of analysis was the buyer-supplier dyad and the case pertained to utilization of information and communications technologies within the investigated B2B buyer-supplier relationships. Principles of purposeful sampling guided the case selection, according to which each case is considered a particular and unique opportunity to identify new features of the research phenomenon

to facilitate understanding (Eisenhardt & Graebner, 2007). Cases were selected based on a pre-study concerning the utilization of ICT with suppliers in six Finnish companies; two buyer companies were identified as the most advanced users of IT vis-à-vis their suppliers and were thus most suitable for our theorizing purposes. Data sources comprised semi-structured interviews and personal observations, in addition secondary materials such as industry magazines and company presentation materials were obtained and used for gathering additional insight. Dyadic data collection with semi-structured interviews took place during 2012-2013 resulting in 22 interviews in total that were recorded and transcribed. Data analysis was conducted by thorough reading of each transcript to gain meaningful insights and by coding and categorizing interview material according to the elements in the research framework.

**Table 3.** Case study design, research context, data collection and data analysis deployed in the empirical articles.

|                                  | Article II   | Article III  | Article IV  | Article V   |
|----------------------------------|--|--|---|---|
| <b>Type of case study</b>        | Multiple case study<br>Case I: 1 buyer and 4 suppliers<br>Case II: 1 buyer and 9 suppliers   | Single case study, 1 buyer and 6 suppliers   | Single case study, 1 buyer and 1 supplier   | Multiple case study<br>Case I: 1 buyer and 1 supplier<br>Case II: 1 buyer and 1 supplier                                      |
| <b>Research context</b>          | Case I: smart phone device development<br>Case II: network construction, maintenance and fault repair services in electricity sector | Integrated solution development and delivery in capital goods  | New product development project in capital goods  | Case I: logistics services in hospitality, restaurant and catering industry<br>Case II: engineering services in capital goods |
| <b>Data sources</b>              | Semi-structured interviews, observations, secondary materials  | Semi-structured interviews, secondary materials  | Semi-structured interviews, secondary materials.  | Semi-structured interviews, secondary materials   |
| <b>Nature of data collection</b> | Dyadic   | Dyadic   | Dyadic  | Dyadic, longitudinal  |
| <b>Number of interviews</b>      | 50 interviews<br>Case I: buyer n=17<br>4 suppliers, n=7<br>Case II: buyer n=10<br>9 suppliers, n=16                                  | 17 interviews<br>Buyer n=9<br>6 suppliers, n=8   | 32 interviews<br>Buyer n=22<br>Supplier n=10  | 6+22 interviews (incl. pre-study)<br>Case I: Buyer n=5<br>supplier n=6<br>Case II: Buyer n=7<br>supplier n=4                  |
| <b>Data analysis</b>             | Categorizing empirical data according to research framework, within and cross-case analysis  | Content analysis, coding and categorizing data in Word matrices, compiling company-specific accounts, finding similarities and differences in empirical accounts | Content analysis, coding and categorizing data in Atlas.TI, compiling Word matrix tables with illustrative quotes | Coding and categorizing empirical data according to elements in research framework.   |

### 4.3 Assessing the validity and reliability of the articles

Establishing reliability and validity in the underlying study is the key concern of researchers, reflecting the fact the “research is only as good as the investigator”

(Morse et al., 2002, p.17). Taking appropriate measures to ensure reliability and validity during the research process is extremely relevant given the concerns that have been voiced over rigor, or lack thereof in inductive inquiry within the operations management field (Barratt et al., 2011).

For case studies, construct validity and internal validity are considered as particularly important criteria (Stuart et al., 2002). In quantitative studies, construct validity pertains to ensuring that the constructs really measure what they intend to measure; however, this may as such not be directly applicable to qualitative studies (Golafshani, 2003). Yin (2009) interprets construct validity in the same manner as above, and suggests tactics for tackling construct validity in case studies during data collection as well as the write-up phase. Accordingly, construct validity in case study research can be addressed by drawing to various sources of data to ensure collection of multiple views and ensuring that the interviewees understand the questions in the right way (Yin, 2009). In the critical realist tradition, Sobh and Perry (2006) also emphasize the importance of triangulation of empirical evidence and gathering various perceptions of the investigated phenomenon. Yin (2009) also recommends establishing a chain of evidence that allows moving back from conclusions to the original research questions, thus promoting transparency of the research effort. In the write-up phase, construct validity can be enhanced by providing the report to the informants for review (Riege, 2003; Yin, 2009), and using of verbatim interview transcripts and notes (Riege, 2003). The following table discloses the tactics used for enhancing construct validity across the articles in this dissertation.

**Table 4.** Tactics used for enhancing construct validity across articles.

| Article II   | Article III  | Article IV   | Article V  |
|--|--|--|--|
| Multiple sources of data: interviews and secondary data including project database, meeting minutes, teleconference calls, observations at case NOKIA; workshops, participation in meetings, informal discussions, access to documents in case POWERHOUSE. Multiple informants interviewed. Interviews were transcribed. | Multiple sources of data: interviews with multiple informants in buyer company; one interview in five of the supplier companies and 3 interviews in one supplier company. Complementary materials obtained including project documentation and internal process descriptions. The study report was provided to buyer company and findings were discussed in meeting with buyer company representatives. 16/17 interviews were transcribed. | Multiple informants on both sides of dyad, representing different functions and positions. Meeting and workshops with both companies held to validate the findings. Interviews were transcribed. | Multiple sources of data, interviews and secondary sources including process and job descriptions, organization charts, performance follow-up reports and internal magazines. Multiple informants interviewed in both companies. Final report provided to case companies. Interviews were transcribed. |

Internal validity is another key quality concern for quality in case studies (Stuart et al., 2002). Internal validity concerns especially the data analysis phase (Yin, 2009) and refers to the extent that the researcher can establish a relationship between investigated constructs (i.e. cause-and-effect) (Stuart et al., 2002), which applies to explanatory case research designs that aim to test theories (Yin, 2009, pp. 42). Yet, as noted by Riege (2003), in non-positivist case study research, internal validity refers to credibility of the research in not only detecting

similarities or differences between patterns, but in “seeing below the surface” in capturing the mechanisms that underlie the investigated phenomenon. To enhance internal validity, the case researcher can resort to performing within-case analysis and cross-case pattern matching, explanation-building and relating the concepts and findings in coherent ways (Miles & Huberman, 1994). The critical realism paradigm emphasizes making the research context explicit for example by detailing out the case contexts and writing the case report in ways that reflect the underlying reasons for a phenomenon to take place instead of merely describing it (Healy & Perry, 2000). The following table discloses the tactics used for enhancing internal validity across the articles in this dissertation.

**Table 5.** Tactics used for enhancing internal validity across articles.

| Article II   | Article III   | Article IV  | Article V   |
|--|---|---|---|
| Performing within- and cross-case analysis, detecting patterns within and between the two cases. Details on case companies and research context are provided in the article. | Detailed description of case context containing timeline for the investigated project, explanation of the technology involved and picture of the product being developed. Details of companies provided in the article. | An extensive case account compiled to explicate both sides of the story i.e. buyer and supplier perspectives. | Details on case companies and context for research are provided in the article. |

In terms of external validity, the issue of generalization of findings is considered. Based on case studies, one can only make analytical generalization (that it, in theory-building sense) instead of statistical generalization (Healy & Perry, 2000; Stuart et al., 2002; Yin, 2009). Multiple case studies have higher external validity compared with single cases (Voss et al., 2002). To ensure high external validity, Yin (2009) advises using replication logic. To allow for stronger analytical generalizations, Marshall and Rossman (1989, as paraphrased in Riege, 2003) advise defining clear scope and boundaries for reasonable analytical generalization. Within the realist paradigm, analytical generalization can also be advanced by identifying research issues prior to data collection and by formulating an interview protocol, that enables collection of data from theory confirming or disconfirming sense (Healy & Perry, 2000).

**Table 6.** Tactics used for enhancing external validity across articles.

| Article II  | Article III  | Article IV  | Article V  |
|---|--|---|--|
| Multiple cases (2) selected providing similarity in terms of importance of attractiveness, yet cases differed in terms of geography (global / local) and focus (innovation and R&D / efficient service production). An interview guide including theory-driven themes was used in interviews. | (Single-case study so replication logic is not applicable). Interviews were carried out with pre-planned topics including overview of the project, challenges, and milestones. Informants were then asked to elucidate cross-organizational integration, related activities and situations where used. | (Single-case study so replication logic is not applicable) Interviews were conducted according to interview guide consisting of following themes: inter-firm collaboration during early supplier involvement, related challenges, characteristics and roles of involved parties, expectations and outcomes. | Multiple cases (2) selected representing strategic and long-term buyer-supplier relationships; yet the selected cases are polarized with regard to business logic and industries. An interview guide was used to ensure interviews covered the main elements of the theoretical framework. |

Finally, reliability concerns are raised with regard to how repeatable the research process, related procedures and operations are, and if other researchers drawing on these are able to draw the same results (Yin, 2009). The risk of having poor reliability can be mitigated by using case study protocol, developing case study database (Yin, 2009), and revealing the name of the studied organization (Gibbert et al., 2008). For the investigator doing case study research, this may be a problematic issue, since “data on real-life events, which were collected by different researchers, may not converge into one consistent picture” (Riege, 2003, p. 81). Here, investigators doing case research may enhance reliability of their research (in addition to tactics discussed above) by providing the fullest possible account of their actions and observations, by the use of multiple researchers, by recording data, and by using peer-review and / or examination, as examples (Riege, 2003). The critical realist researcher is also advised to enhance reliability by using quotations and matrices in summing up data, and providing descriptions of case selection and interview procedures (Healy & Perry, 2000).

**Table 7.** Tactics used for enhancing reliability across articles.

| Article II  | Article III  | Article IV   | Article V   |
|---|--|--|---|
| Case study database compiled. Name of other buyer organization revealed. Multiple researchers engaged in data collection and analysis. Interviews were recorded. Case selection and interview procedure described in the article. | Actual name of buyer company used in article. Multiple researchers engaged in data collection and analysis. Interviews were recorded (with the exception of 1 interview). Interview procedure described in article. Rich use of quotations in the final article. | Case study database compiled. Multiple researchers engaged in data collection and analysis. Rich use of quotations in the final article. | Case study database compiled with interim case study reports and illustrations. Two researchers engaged in data collection and analysis. Interviews recorded. Case selection and interview procedure described in article. Rich use of quotations in the final article. |

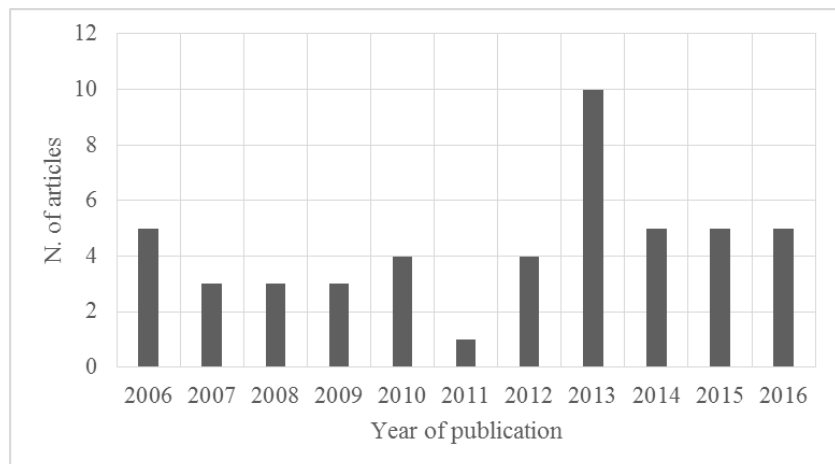
With regard to reliability criteria in Article III it should be stated, that at the time of the study, the oil prices were significantly higher than today and this is potentially reflected in the findings – thus even if the study was repeated with a similar logic, it is possible the findings would not be the same. The actual name of the buyer company was revealed in the article; however, pseudonyms were utilized for the supplier companies.

## 5. Findings of the original articles

### 5.1 The current state of supplier integration research

The current state of supplier integration (SI) research is investigated with regard to the question, what is known about supplier integration based on extant literature (RQ1). Findings below are based on Article I: Review of supplier integration research in operations management and purchasing & supply management literature.

The findings indicate that during 2006-2016, the largest number of articles on supplier integration was published in International Journal of Production Economics (14 articles), followed by Journal of Operations Management (11 articles) and Journal of Supply Chain Management (9 articles). The rest of the journals published 4 to 5 articles each. The number of published articles per annum has grown with a peak year in 2013, after which the rate settled on five publications annually.



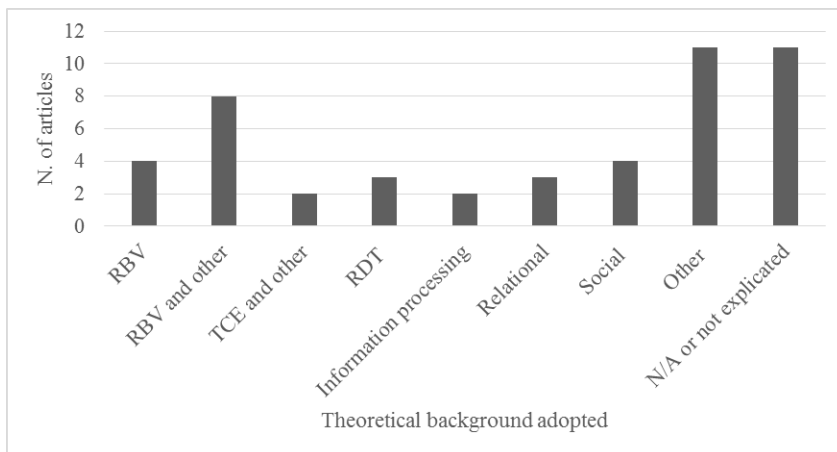
**Figure 3.** Annual breakdown of supplier integration articles.

The analysis on research methods indicates that quantitative, survey-based research designs dominate research on supplier integration, with 36 articles out



of the total of 48 being survey studies. Case study research design, notably multiple case study design was used in eight articles. Mixed methods approach and conceptual studies were in the minority and adopted by four studies.

Analysis of theoretical stances shows that researchers have adopted different theoretical lenses to study supplier integration and no single theory dominates SI research. In the observed mix of theoretical approaches, the resource-based-view (RBV) was used in four studies, and RBV was also used in combination with other theories and approaches (transaction cost economics, dynamic capability theory, relational view, absorptive capacity, social exchange theory and institutional theory) in altogether eight articles. Social capital, social exchange theory and social network approaches were used in four studies, and transaction cost economics in 2 articles), resource dependency theory in three articles, information processing view in 2 articles and relational view in three articles. The most striking finding here is that in the sample articles, a fairly large number of studies (11 articles) on SI resorted to other theoretical stances than the ones mentioned above, indicating that studies draw on a wide and diverse set of theories. Additionally, an equally high number (11 studies) did not explicate their theoretical approach.



**Figure 4.** Theories utilized in supplier integration articles.

In terms of definitions and descriptions of SI in the sample articles it was observed that SI had been conceptualized through five dimensions: 1) SI as the unification of processes between the buyer and the supplier 2) SI as a collaborative effort between the buyer and the supplier 3) SI as a capability 4) SI as partnership 5) SI as supplier involvement.

In the sample, most articles defined SI as the unification of processes by stressing that forming process-level links between buyer and supplier companies is as a key constituent of SI. For example, D.Q. Chen et al (2013) describe SI as strategic coupling of business processes between buyer and its suppliers. Various articles also emphasize the role of buyer-supplier collaboration as an essential

element, and building block of SI. As examples, Flynn et al (2010) relate supplier integration to a manufacturer that collaborates strategically with its upstream supply chain partners and manages intra- and inter-organizational processes in a collaborative way. Vijayasarathy (2010, p.493) defines SI as the “*extent to which a focal firm and a supplier use collaborative and coordinating structures, processes, technologies, and practices for supporting and managing the flow of information and materials/goods*” (italics in original). SI has been approached as a capability only recently (D.Q. Chen et al., 2013; Vanpoucke, Vereecke & Wetzels, 2014); the latter study considers SI in the dynamic capability sense comprising exchanging information, analysing the situation and making adjustments. Finally, some authors relate SI with building partnerships with suppliers and studies on SI in new product development context appear to define SI simply as involving suppliers in new product development projects and processes. An interesting observation here is that only few articles mention explicitly that SI concerns key, critical or core suppliers (D.Q. Chen et al., 2013; Flynn et al., 2010; Huo et al., 2016; Lawson et al., 2008) despite the notion that integrating with suppliers has been associated to most important suppliers instead of all suppliers in general (Swink et al., 2007).

Finally, based on the analysis of the sample articles, a classification of SI research themes is presented. According to the analysis, the studies represent two main themes: SI in the context of innovation and new product development (NPD) and operational SI.

In the sample, 13 articles focused primarily on SI in innovation and NPD. These were further divided into three sub-themes depending on specific focus: 1) coordinating supplier integration in product and service development 2) drivers and antecedents to SI in NPD context and 3) SI impact on innovation and NPD outcomes. All studies were conducted from the buyer perspective, and the manufacturing context dominated the research setting (as an exception, Perols et al., 2013 who included healthcare and IT industries in the scope). As general observations, it was found that concerning sub-theme 3, defining “performance” was ambiguous resulting in different outcome variables depending on the study. A striking finding was the absence of studies regarding the impact of SI on supplier innovation and/or NPD-related outcomes as well as the studies’ extensive reliance on buyer-side data.

The majority of SI articles in the sample had a focus on operational SI. The following sub-themes were identified: 1) antecedents, enablers and constraints to SI 2) forms and practices of SI 3) outcomes of SI 4) mediating and moderating effects of SI.

Studies on integration antecedents, enablers and constraints (sub-theme 1) concentrated on identifying factors that support or impede integration with suppliers. Relational enablers such as trust and commitment were studied as antecedents (Vijayasarathy, 2010; Yeung et al., 2009), and supplier capabilities were

suggested to be an important predecessor to successful SI (Lockström & Lei, 2013). Studies on forms and practices of SI (sub-theme 2) focused on the ways and forms of integrating with suppliers. Here, two recent studies linked integration practices with buyer-supplier relationship management and development (Kaipia & Turkulainen, 2016; Vanpoucke, Vereecke & Boyer, 2014).

In the sample articles, the impact of SI on buyer performance focusing on direct or mediating effect was found the dominating research theme. Studies on the outcomes of SI (sub-theme 3) concentrated on analysing the effects of SI on various buyer and / or supplier outcomes, whereby the buyer-related performance outcomes dominated as the most common dependent variable. Studies on the impact of SI on supplier side received only minor interest. In studies on the mediating and moderating effects of SI (sub-theme 4), most studies were focused on the mediating effect of SI on buyer performance, which had been defined differently across the studies and interpreted as supply management performance, service performance, supply chain performance and competitive performance of the manufacturing plant or the company as a whole. Only one study considered the mediating effect of SI on supplier performance (Paulraj & Chen, 2007b) and this study was one also the only one deploying the dyadic perspective.

The review of SI research indicates that the topic of SI has received ample interest in the OM and PSM fields and that the interest is on the increase. SI has been primarily studied through survey-based research designs whilst case studies are a minority. No single theoretical approach dominates but the authors draw on a diverse set of theories in their SI related research. Most studies regard SI as unification of processes, collaborative managerial effort in buyer-supplier relationship and as a capability; also partnership building and involving suppliers in new product development are seen as key constituents of SI.

The review identifies and classifies SI research into two themes: SI in the context of new product development and innovation and operational SI. Most studies on SI in the sample are focused on studying the impact of SI on the performance of a single company, in particular the buyer company. Impact on the supplier side or the suppliers' view of the impact of SI have gained sparse interest. Additionally, impact of SI on the buyer-supplier relationship performance or on other outcome variables within the dyad are rarely addressed, confirming the view of van der Vaart and van Donk (2008). Most of the articles deploy a static view into SI by capturing a snapshot of the underlying buyer-supplier relationship. These predominantly survey-based studies focus on if SI is beneficial or not, usually based on the buyer's view of the effect of SI on company-specific outcomes. Yet, these studies fall short of explaining how SI can be conducted successfully, which is a topic that has received recent interest (Lockström et al., 2010). Based on the findings of the review it appears, that SI research would

benefit from taking into account the contextual nature of buyer-supplier relationships and from approaching SI as a dynamic phenomenon. Additionally, more empirical studies that take a dyadic perspective are called for.

## **5.2 The influence of attractiveness on buyer-supplier relationship development**

From the relational integration perspective, supplier integration is investigated with regard to how attractiveness influences the development of the mutual relationship (RQ2). The findings below are based on Article II “Buyer attractiveness as a catalyst of buyer-supplier relationship development”.

In Article II, a research framework for studying buyer attractiveness is first developed. The framework describes the different dimensions of buyer attractiveness and organizes them into four quadrants. Consequently, buyer attractiveness (as perceived by the supplier) associates with the experienced and expected business outcomes from the focal relationship and with the experienced and expected leverage impact of the focal relationship onto the other relationships that the supplier possesses. In other words, buyer attractiveness may be experience-based, reflecting the past and the present or based on expectations and thus reflect the future potential. Relationship development is set in the middle of the framework. The focal relationship with technical (mutual goals, structures and processes) and social elements (trust, commitment, relationship atmosphere) reflect the past and present relationship state and form the basis for the expectations that the supplier has. In addition, the focal relationship can provide the supplier with learnings and knowledge that help the supplier to improve its position on the market or form new customer relationships.

According to the research framework, buyer attractiveness (basing on both supplier’s experiences and expectations) interplays with relationship development. Experienced outcomes shape and feed into the development of the underlying relationship, whereby the relationship and its anticipated development shape and are being shaped by the expected outcomes. However, through relationship development, the activities of the supplier and the buyer’s perception of supplier attractiveness also become essential in the consideration of attractiveness and its influence on the underlying relationship. Thus the research framework allows scrutinizing attractiveness and its influence on the underlying relationship from both sides of the dyad. It also allows taking into consideration the activities and perceptions of both the supplier and buyer.

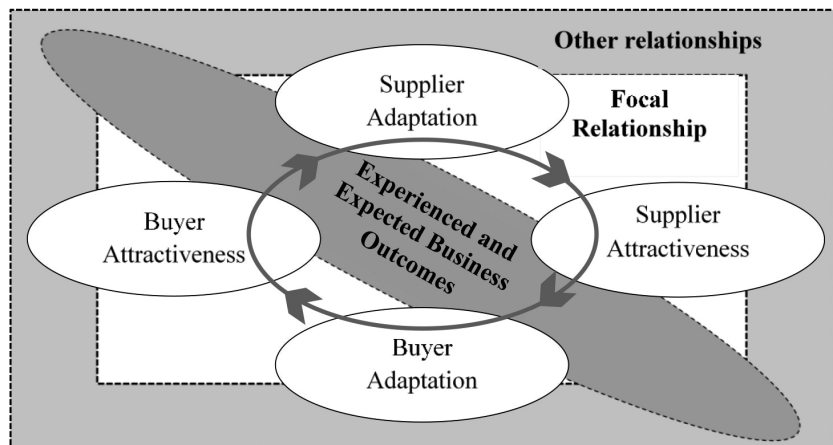
The empirical findings indicate that attractiveness (both buyer and supplier attractiveness) and adaptations (made by the buyer and supplier, respectively) are interconnected whereby each has an effect upon the other. Together, they influence the underlying relationship by making it stronger or weaker, respectively. At best, attractiveness and adaptations reinforce each other, making the underlying relationship stronger and promoting trust and commitment between the

buyer and the supplier. The reinforcing connection between buyer attractiveness - supplier adaptations – supplier attractiveness – buyer adaptations forms a virtuous circle, through which the relationships develop. This was particularly observed with respect to NOKIA and its four suppliers included in the study. The results indicate that the perceived attractiveness of NOKIA motivated the suppliers to adapt in active manner by implementing certain manufacturing processes, by making investments in new machines and by allocating their most capable personnel to work in projects that involved NOKIA. These actions made the suppliers highly attractive from NOKIA's perspective. In consequence, this led NOKIA to make investments and adapt towards the suppliers, shown as exchanging know-how, developing methods for testing and organizing trainings. The reciprocal adaptations facilitated the integration of supplier's knowledge and expertise into NOKIA's products, processes and organization. The positive attractiveness-adaptations circle reinforced the technical and social elements in the relationship, shown through mutual trust and commitment. This enhanced the expectations of business outcomes in the future, adding attractiveness of both parties.

Yet, the results show that the attractiveness-adaptations circle can also become vicious and have a deteriorating influence on the underlying relationships. The results concerning POWERHOUSE and its key suppliers show that some suppliers considered the buyer's attractiveness to be low, due to the poor experienced and expected outcomes from their relationships. This led the suppliers to make modest adaptations towards the buyer, weakening perceived supplier attractiveness and leading to dissatisfaction of the buyer. On the relationship level, this was shown as scant relationship-specific processes and practices, undeveloped technical and social settings, lack of joint goals as well as the propensity to preserve a transaction-oriented operation mode instead of becoming more collaborative. In contrast, suppliers that were more positive in their expectations of business outcomes within the focal relationship were more inclined to make adaptations towards POWERHOUSE. This contributed to supplier attractiveness as perceived by POWERHOUSE i.e. the buyer, leading to more reciprocal adaptations and contributing to improvement of the mutual relationships. Based on the results, an empirically grounded framework is formed that illustrates the inter-connected nature of buyer and supplier attractiveness and adaptations that the buyer and supplier perform as well as the development of the underlying relationship (see Figure 5). The framework allows scrutinizing and understanding dynamics that relate to attractiveness, adaptations and relationship development.

The results also suggest that balancing of perceived attractiveness takes place through adaptations. In order to build its attractiveness, Supplier 3 was highly adaptive towards NOKIA, yet when the companies became more equal in terms of perceived attractiveness, the willingness of the supplier to adapt towards NOKIA diminished. In a similar way, NOKIA perceived Supplier 2 to be highly

attractive, yet when NOKIA's market share dropped, perceived buyer attractiveness weakened. In this situation, NOKIA became more inclined to make adaptations than the supplier. The results thus suggest that the reinforcing mechanism of attractiveness and adaptations works until there the perceived attractiveness of the buyer and the supplier are in balance.



**Figure 5.** An empirically grounded framework of buyer attractiveness as a catalyst for relationship development. (This figure has been published as Figure 2 in Article II on page 165. Reprinted with the permission of Elsevier).

### 5.3 Integrating suppliers into complex solution provision: the use and nature of integrative activities

From the process integration perspective, supplier integration is investigated with regard to how activities are coordinated across organizational boundaries (RQ3). The research context is a project where a systems integrator involved six of its material and service suppliers in developing and delivering a complex solution to its customer. The findings below are based on Article III: “Sharing the burden of integration: an activity-based view to integrated solutions provisioning”.

Firstly, the analysis indicates that integration in the complex system delivery project between the systems integrator company, ABB and its six suppliers was achieved through 12 distinct integrative activities, which were found to be 1) implemented by the systems integrator, 2) supplier-led and 3) implemented jointly. The analysis also points to the nature of the activity being either planned or emergent, the orientation of the activity in relation to time, cost and quality objectives of the project and the contribution of the activity to long-term collaboration between the buyer and the suppliers.

Out of the twelve integrative activities used, six were implemented by the systems integrator company. All these activities contributed to the extremely high quality objectives in the project instead of cost-efficiency targets; it was found that some of the activities actually increased rather than decreased costs during the project. Three activities were planned ex-ante, including frequent co-ordination meetings, using a heavyweight project leader and involving suppliers early in the project, whereas three were found to be emergent (including motivating suppliers to innovate, providing suppliers with additional trainings and physical assets such as machinery and raw materials). All planned activities were implemented across all suppliers alike with one exception, whereas emergent activities did not follow a consistent pattern vis-à-vis the involved suppliers but were executed more selectively. Early supplier involvement, supplier trainings and providing suppliers with physical assets were found to contribute to strengthening long-term collaboration with the selected suppliers.

The findings indicate that suppliers played an active role in integration by initiating four distinct integrative activities during the project. The supplier-led activities included relation-specific investments, engaging in future-oriented support and solution-oriented services towards the buyer, dedicating resources and accelerating project-related processes. All these activities were found to be emergent rather than planned beforehand and all of them stemmed from the suppliers' voluntary efforts instead of contracts. A common pattern across the supplier-led activities was the evident purpose to build long-term collaboration with the buyer. As with the activities implemented by the systems integrator, also the activities initiated by the suppliers reflected primarily the quality and scope objectives of the project, with cost-efficiency being less emphasized. Dedicating resources to the project and accelerating project-related processes contributed particularly to the time efficiency goal in the project.

The analysis also point to three integrative activities that were implemented jointly by the buyer company and the suppliers, including co-locating, joint problem solving and seeking efficiencies. The joint activities were found to be emergent in nature, reflecting the quality and time objectives of the project with less emphasis on the cost objective. All the observed joint activities were found to support mutual collaboration with long-term focus.

The findings highlight the essential role of the buyer company in implementing distinct integrative activities towards the suppliers in order to get their expertise and technological knowledge into the project. The results also accentuate the active role of suppliers in coordinating tasks across organizational boundaries by initiating and executing specific integrative activities. In particular, when suppliers were motivated by opportunities for future collaboration, they became active participants. Moreover, the suppliers' activities were voluntary in nature. The study also points to distinct integrative activities that were conducted by the buyer and the supplier in collaboration, which underlines that integration can be achieved through joint activities where both the buyer and the suppliers

make an effort. Based on these observations, the first proposition is presented as follows: *While the systems integrator holds the primary responsibility for integration in integrated solution deliveries, suppliers actively participate in integration when motivated by prospects of long-term collaboration with the systems integrator.*

Given that the context of the study is a complex system delivery project, a key finding is that the integrative activities reflect the objectives of the underlying project i.e. cost, time and quality. In this particular case, it was interesting to observe that none of the integrative activities supported cost efficiency objectives but were focused on enhancing the quality in terms of performance and functionality of the solution and keeping the schedule of the project. The observed de-prioritization of the cost objective was found to encourage the solution and quality-oriented behavior of the suppliers, suggesting that the emphasis in objectives is reflected in the selected integrative activities. This leads to the second proposition: *The use of integrative activities in integrated solution deliveries reflects the priorities between project objectives in terms of cost, time, and scope.*

Finally, concerning the observed nature of integrative activities in terms of being planned vs. emergent, the findings indicate that whilst activities used by systems integrator were mostly planned, or pro-active and emergent in nature, all the supplier-led as well as joint activities were emergent i.e. reactive. This supports the notion of responding to challenges that arise during the project by selecting appropriate mechanisms to solve issues at hand. Based on this, the third proposition is formulated as follows: *While the integrative activities used by systems integrators include activities of both planned and emergent nature, all integrative activities used by suppliers are emergent.*

#### **5.4 Integrating suppliers into new product development: supplier challenges**

From the process integration perspective, supplier integration is investigated with regard to what challenges early supplier involvement poses for the supplier (RQ4). The context for the study is a new product development project, where a global manufacturer involved their contract manufacturing supplier as an early involvement partner for the first time. The findings below are based on Article IV: “Supplier challenges in early supplier involvement projects: in-depth case study findings”.

The findings indicate that the challenges faced by the supplier during the joint NPD project related particularly to developing technical and managerial interaction capabilities that would have enabled the supplier to meet the expectations that the buyer had for an early involvement partner. Interaction capabilities (R.E. Johnsen & Ford, 2006) can be viewed as capabilities that are developed by suppliers in relationships with their buyers that enhance the mutual



relationship. It is through interaction with the other party that defines how the capabilities develop and how useful they are (R.E. Johnsen & Ford, 2006). According to the findings, the lack of technical and managerial interaction capabilities caused delays during the intense prototyping phase and resulted in collaboration difficulties and friction between the parties. The findings also point to the challenges that the supplier had in transitioning towards an ESI partner, since their extant capabilities and knowledge based on contract manufacturing,

Developing technical interaction capability was observed to hinge on several issues, building on fact that the supplier was a long-term contract manufacturer with strong knowledge in certain materials and technologies. The product being developed was technologically more complex than products that were manufactured normally and featured materials that were not familiar to the supplier. From the buyer's perspective, it appeared that the supplier's ability to provide input in terms of material expertise was limited to their extant capability and knowledge base that nevertheless did not match with the expectations that the buyer had for knowledge from an ESI partner. The supplier struggled with the fact that the design of the product had a very important role and influenced the feasibility of manufacturing alternatives, yet the supplier felt compelled to take the design as a given. The buyer's stringent requirements concerning the look and feel of the product proved also challenging since the supplier was not accustomed to manufacturing products that were visible to the eye.

Developing managerial interaction capability and related challenges became evident during quick prototyping, which was the supplier's main task during the NPD project. The supplier's existing production line, machinery and resources were aligned with contract manufacturing orders, yet the supplier's management decided to run quick prototyping on the same production line as used for volume production. However, quick prototyping orders conflicted with normal production flow causing internal friction between production and project management. Supplier's extant supply network and inventories were based on contract manufacturing operations and the understanding of the requirements of early supplier involvement and quick prototyping with regard to speed and available components was only beginning to emerge. On the buyer side, this reflected as the supplier's incapability to assemble and deliver prototypes according to the agreed timetable. According to the buyer's perception, there was inadequate shared understanding of the meaning of quick prototyping between the parties.

Additionally, being an early involvement partner required new ways of collaborating with the buyer including more frequent communications as well as co-locating. However, since the supplier acted as an ESI partner for the first time there were no ready-made processes or concepts to facilitate collaboration with a buyer in NPD context and after the initial period, the supplier's presence at

the buyer became more seldom. The supplier also struggled with adequate re-sourcing of the ESI project, thus noting that resource planning would require more attention the next time around.

Finally, in terms of transitioning from contract manufacturer to ESI partner, the supplier struggled with the requirements that the buyer had with regard to the supplier's new role as a pro-active NPD project member that provides manufacturability feedback and finds alternative solutions. For the supplier, being an ESI partner was a major departure from the traditional build-to-print contract manufacturer role whereby products were manufactured according to given specifications. ESI was not part of the supplier's usual service offering and the supplier lacked related experience, inherent through the supplier's view that ESI required them to do things differently compared to the normal way of doing business. Even if expectations for ESI were shared between the companies at the beginning of the project, the roles of the parties were not explicitly discussed. The buyer experienced that the supplier was inclined to suggest manufacturing solutions and materials that were limited to the supplier's existing manufacturing facilities and capabilities, instead of providing novel input. This raised doubts about the supplier's capabilities to think outside the box and look at the product with product development mindset.

## **5.5 The role of information technology in buyer-supplier relationships**

From the system and information integration perspective, the role of information technology is investigated in the context of two buyer-supplier relationships of strategic nature (RQ5). The findings below are based on Article V: "The role and position of information technology in strategic buyer-supplier relationships".

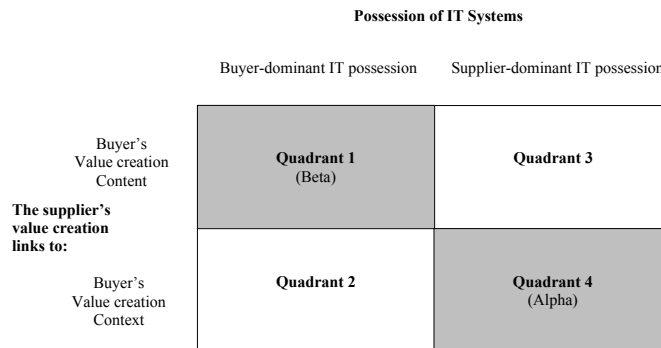
In Article V, a theoretical framework for studying the role of IT in buyer-supplier relationships is built basing on the interaction and network approach of the IMP Group (Håkansson et al., 2009; Håkansson & Snehota, 1995) as well as on insights from service marketing and the service-dominant logic (Chandler & Vargo, 2011; Grönroos et al., 2011). Accordingly, a buyer-supplier relationship composes of three layers, including action, structural and management layers. The action layer refers to the dyadic business exchange, through which the value creation processes of the buyer and the supplier are activated and linked. The structural layer refers to the relationship infrastructure, composed of social and technical links that structure and steer the business exchange between the parties. Relationship management, related to adaptations and co-ordination, are conducted to enhance fit between relationship infrastructure and business exchange for improved outcomes. The framework enables studying how IT links to the buyer and supplier and their mutual relationship in order to define the role and position of IT in strategic buyer-supplier relationships.

In case Alpha, the operational efficiency of the supply chain is of utmost importance. The relationship is geared towards achieving this goal thus, the buyer and the supplier i.e. provider of logistics services have purposefully developed joint supply chain capability relying on integrated systems and processes. From early on, the companies have undertaken continuous management activities to improve the co-ordination of their mutual activities and to divide tasks and responsibilities in efficient way. The development of shared systems that integrate the companies has had a key role in development of the underlying relationship. Companies have built new functionalities and features into the shared systems and extended them upstream. Through continuous adaptations and co-ordination at relationship level, the companies have induced better alignment between the structural and action layer. The shared systems, social connections between the companies and attained efficiencies in joint supply chain operations have reinforced each other, resulting in a relationship of interdependent and tight nature.

In case Beta, shared systems and related work processes have evolved over the course of the relationship to enable business exchange and joint operations between the buyer and the service provider; in this sense, the development of systems in the relationship has not been as intentional as in case Alpha. For delivering the services, the service provider relies on the buyer's planning systems and database, which require in-depth knowledge from the service provider. The sharing of planning systems and databases enables smooth delivery of services and the codification of supplier's expertise. In addition, an ordering system deployed between the companies allows effective ordering of subcontracted services. Yet, even if the ordering process is automated, the buyer has had a tendency to place orders for specific resources of the service provider, reflecting an emphasis on personal relations and routines over the most effective use of resources. The companies are integrated to a point where boundaries are blurred, yet this is somewhat controversial from relationship management point of view. The relationship is regarded as asymmetrical, whereby the buyer has mainly defined the process for service delivery and service provider capabilities. Yet, the service provider has performed most adaptations in terms of learning the buyer's systems.

The findings point to differences in the studied dyads concerning the role and position of IT. With regard to the structural layer, in Alpha, the service provider dominated the information systems whereas in Beta, the buyer dominated the systems. With regard to the action layer, IT in Alpha facilitated highly efficient flows of goods and information and thus, allowed the service provider to contribute to the context of the buyer's value creation. In Beta, IT enabled the service provider's value creation to merge with that of the buyer in terms of planning and design activities, and thus enabling the supplier to contribute to the content of the buyer's value creation. Based on the consideration of system possession and how IT enables linking of activities between the buyer and the supplier, a matrix that contextualizes the role of IT in a buyer-supplier relationship

is formed (see Figure 6 below). Management actions affect the fit between structural and action layers in order to enhance performance of the underlying relationship, and thus form the dynamic element in the matrix.



**Figure 6.** Four situations contextualizing the role of IT in a buyer–supplier relationship. (This figure has been published as Figure 2 in Article V on page 1060. Reprinted with the permission of Elsevier).

Alpha is situated in Quadrant 4 and is described as an IT-enabled relationship. The role and position of systems are aligned with the roles of the parties and enable the parties to divide work efficiently. The buyer can focus on its core business whilst the service provider assumes responsibility for the context. Even if the service provider possesses the systems, the role of IT has developed whereby the buyer is also involved and actively contributes to the joint goal of improving efficiency in joint supply chain operations. From the relationship management point of view, IT forms a comprehensive operating framework. The findings point to consistency within the mutual activities and supporting systems that integrates the companies in tight manner, and the relationship is stable and high-performing. In this sense, the development of systems is reflected on the development of the relationship.

Beta is situated in Quadrant 1 and described as on the path towards IT-enabled consistency. The systems are possessed by the buyer, and enable the service provider to link with the buyer's value creation content whereby the input of the supplier characterizes the products of the buyer. By possessing the systems, the buyer is able to achieve economies of scale, yet for the service provider, the buyer's dominance means that the supplier is not able to develop the systems, or value creation on its own. The buyer's possession of IT systems induced buyer's control on the elements that steer the supplier's value creation. In this way, the service provider's engineering expertise and related value creation potential may be more limited compared with a situation where the service provider was able to develop the systems. The findings point to inconsistency between the mutual activities and supporting structures that appeared to contribute to asymmetry in the Beta relationship. However, a discussion between the

buyer and the service provider is evolving concerning their respective roles, the development of joint processes and supporting systems.

## 6. Discussion and conclusions

External resources have become increasingly important for companies owing to the acknowledgement that it is impossible for a company to possess all the needed resources in-house (Ireland et al., 2002). According to the extended resource-based view, the competitive advantages of a company can be built on both internal as well as external resources residing outside company boundaries (Lavie, 2006; Lewis et al., 2010; Squire et al., 2009). From purchasing and supply management perspective, this accentuates the importance of buyer-supplier relationships, and the suppliers' resources and capabilities in the quest for enhanced competitiveness, operational efficiencies, improved new product development and innovation. In addition to products, materials and services, suppliers may provide ideas, innovations, specialized knowledge and technology expertise (Gadde et al., 2010; Gottfredson et al. 2005; Koufteros et al., 2012; Luzzini et al., 2015; Schoenherr et al., 2012). Key questions in this regard are how to access, leverage and utilize external resources (Tanskanen et al., 2017). Supplier integration can be seen as key means in tapping external resources and capabilities that become available to companies through buyer-supplier relationships, thus representing a strategically relevant topic.

The objective of this dissertation is to contribute to supplier integration literature by advancing knowledge on supplier integration from process, relational and system integration perspectives, which represent the various forms and domains of integration addressed in literature. The empirical articles provide answers to the identified research gaps regarding each integration perspective. Article I reviews extant supplier integration research in six journals in the purchasing and supply management and operations management domains, providing background for the dissertation and the research questions. Article II focuses on relational integration, particularly on buyer-supplier relationship development and the influence of attractiveness. Articles III and IV focus on process integration, in particular activities that are used by the buyer and the suppliers in order to co-ordinate tasks in a complex solution delivery project (Article III) as well as challenges that are faced by the supplier in the context of a new product development project (Article IV). Article V focuses on system and information integration and the role of information technology in strategic buyer-supplier relationships. Next, the theoretical and managerial contributions are elucidated, followed by consideration of limitations and avenues for further research.

## 6.1 Theoretical contributions

The literature review of supplier integration in six leading purchasing and supply management as well as in operations management journals shows that whilst there is plenty of research on SI, most studies are concerned with the impact of integration onto buyer company performance. Focusing on the dyad or taking the supplier perspective is a rare approach. Moreover, most of the articles take a static view into SI and capture a snapshot of the underlying buyer-supplier relationship. Based on the review it appears that extant knowledge can be complemented with empirical case studies that unveil the complexities of integration and focus on how integration can be conducted, supporting the observation of Lockström et al. (2010) in that more knowledge is needed concerning how integration can be implemented. Given the dominance of the buyer company perspective in extant studies, the current literature can also benefit from studies on supplier integration that take both the buyer and supplier views into account. These findings and identified gaps in the extant SI literature form the backdrop to the contributions of the empirical studies in this dissertation that are reviewed next.

### *Contributions to the relational integration perspective*

First, this dissertation contributes to advancing knowledge on supplier integration from relational integration perspective by elucidating *how attractiveness influences the development of buyer-supplier relationships (RQ2)*. The empirical study on two buyers and their key suppliers shows that attractiveness and adaptations are connected, forming a mechanism through which the relationship develops. In other words, relationship development is a function of buyer and supplier attractiveness and respective adaptations whereby each has an effect upon the other. This effect can be reinforcing as in the case of a virtuous circle, where buyer attractiveness stimulates supplier adaptations, leading to increased supplier attractiveness, which stimulates the buyer to make adaptations, leading to improved buyer attractiveness. Through this virtuous circle, the underlying relationship becomes stronger, shown as reinforcement of technical setting and social relations, mutual business processes and shared goals as well as establishment of inter-organizational trust and commitment. This kind of relationship increases expectations of future outcomes, feeding also into perceived attractiveness of both parties. However, attractiveness and adaptations can also have a deteriorating effect on each other, whereby they form a vicious circle. In some dyads, it was observed that poor experienced and expected outcomes within the focal relationships led to low buyer attractiveness, resulting in only modest adaptations made by the suppliers and dissatisfaction of the buyer. On the relationship level, this showed as scant relationship-specific processes and practices, undeveloped technical and social settings, lack of joint goals as well as the propensity to preserve a transaction-oriented operation mode instead of becoming more collaborative. In sum, these findings underline the connections between adaptations and attractiveness driven by experiences and expectations from the underlying relationship.

Earlier studies (Hald et al., 2009; Mortensen et al., 2008; Tanskanen & Amionoff, 2015) have suggested that attractiveness contributes to the willingness and motivation of the buyer and supplier to engage with each other, devote resources, and develop and continue the mutual relationship. This study contributes to this discussion by empirically linking attractiveness (based on expected and experienced business outcomes, or / and in addition to the leverage impact of the focal relationship) with adaptations that are performed by the supplier and buyer and suggesting that this interplay is affected by and affects the underlying relationship. Earlier conceptual research has suggested that adaptations influence the elements of attractiveness (Hald et al., 2009). This dissertation supports this notion. However, as the results show, attractiveness and adaptations can reinforce each other, as in the case of the virtuous circle or alternatively weaken each other, as in the case of the vicious circle. Furthermore, extant studies have established that buyer attractiveness can induce the supplier to perform well and to commit to the buyer (Ellegaard et al., 2003), and buyer attractiveness drives and motivates suppliers to take voluntary actions or make an effort in the relationship (Mortensen, 2012; Nieminen, 2011). This dissertation, whilst supporting these findings, extends the discussion by making the link between buyer and supplier attractiveness explicit and by showing that supplier activities and buyer perception of supplier attractiveness bear an influence on the buyer's actions and adaptations with regard to the mutual relationship. This underlines the interconnected nature of buyer and supplier attractiveness and the notion that both should be considered in business relationship context (Mortensen, 2012). Finally, extant studies have noted that the quality of buyer-relationship encourages the supplier to make voluntary effort, which then enhances the relationship (Nieminen, 2011). The observation of the virtuous attractiveness-adaptations circle and its reinforcing effect on the underlying relationship is consistent with the findings of Nieminen (2011). A good working relationship leads to positive expectations on future outcomes, which is likely to trigger adaptations and feed into attractiveness on both sides of the dyad. In contrast, a relationship with poor experiences or modest expectations of future outcomes is observed to offer very little incentives for the parties to adapt and dedicate resources towards the other party in the relationship.

Despite the notion that mutual attraction is essential for developing buyer-supplier relationships (Hald et al., 2009; Harris et al., 2003; Mortensen et al., 2008), attractiveness has received limited attention in integration studies. Yet, building partnerships and developing long-term, deep relationships with key suppliers is a key dimension of integration (Alfalla-Luque et al., 2013; Paulraj et al., 2006). In quantitative studies, relational integration is operationalized as the degree or level of strategic partnership with suppliers, which is measured from the buyer's perspective (Lii & Kuo, 2016; Wong et al., 2017; G. Zhao et al., 2015). Nevertheless, this provides a one-sided, static snapshot view of relational integration. The results of this dissertation indicate, that both the buyer and the supplier contribute to relationship development through the perceptions of attractiveness of the other party, as well as the actions that they do– or do not do



– for each other. In this sense, it is argued that relationship development is not one-sided and influenced solely by the buyer, but the supplier's perception of buyer attractiveness and the supplier's actions in adapting to the buyer's needs play an equally important part. According to a recent study, a buyer-supplier relationship develops through initiatives and efforts made continuously by both the buyer and the supplier and these efforts help to engender trust and interdependence which are essential for the relationship to progress (Vanpoucke, Vereecke & Boyer, 2014). The finding that both the buyer and the supplier contribute to relationship development through the actions that they do for each other is consistent with this.

With regard to integration and relationship development, relational factors such as trust, commitment and mutual dependence have been found to enable the buyer and the supplier to engage in close collaboration, make joint investments as well as share information (Vijayasathy, 2010), and trust is acknowledged as a pre-requisite for establishing partnerships (Yeung et al., 2009). In addition, Vanpoucke, Vereecke and Boyer (2014) emphasize that building trust first is required for the buyer and supplier to be able to implement broader and more complex integration initiatives, establish commitment and develop their mutual relationship. Extant attractiveness literature has noted that attractiveness engenders trust and commitment between parties in a relationship (Harris et al., 2003; Mortensen et al., 2008). This dissertation supports and complements these views by observing that the mutual relationship, trust and commitment develop through the reinforcing circle of mutual attraction and reciprocal adaptations. This suggests that attractiveness should be considered in conjunction with other relational factors that affect integration in order to obtain more comprehensive understanding of how to achieve higher level of integration. Managing relationships through attractiveness can complement the extant notion of trust and power as important relationship management mechanisms in integrating with suppliers (Yeung et al., 2009).

The extended RBV suggests that internal as well as external resources and capabilities can be a source for creating competitive advantages (Lavie, 2006). An interesting question in this regard is why the supplier would be willing to dedicate resources to a particular buyer and how the buyer company can influence this (Tanskanen et al., 2017). Indeed, the behaviours and activities of the buyer company's bear an influence on the way how the supplier deploys and activates its resources to serve a particular buyer (termed as supplier resource mobilization) (Ellegaard & Koch, 2012). Yet, these findings pertain to a situation where the supplier is from the outset willing to dedicate resources to a particular buyer since the supplier believes in the potential of the buyer (Ellegaard & Koch, 2012). In other words, though not explicitly stated in the aforementioned study, the authors imply a situation where the supplier perceives the buyer to be readily attractive. However, the notion of supplier attractiveness may bring an additional perspective to the discussion on supplier resource mobilization. The find-

ings of this dissertation (pertaining to one particular dyad) show, that the supplier's motivation to adapt – i.e. activating and deploying resources to serve the buyer – was associated with the supplier's willingness to improve and build its attractiveness in the eyes of the buyer. Yet it was observed that when the companies' perceived attractiveness became more balanced, the supplier reduced its adaptations. Observations from another dyad suggest that when the buyer's attractiveness diminished in the eyes of the supplier, the buyer was more adaptive than the supplier. As Tanskanen and Aminoff (2015) state, relationships can be asymmetrical in the sense that buyer and supplier attractiveness may differ from each other. In this type of a situation, this dissertation suggests that the gap between the two stimulates the party that is perceived as less attractive to make adaptations and dedicate resources in order to secure outcomes and maintain the relationship. The reinforcing mechanism between attractiveness and adaptations is proposed to work until buyer and supplier attractiveness are in balance. This implies that the supplier's propensity to make investments in relationship may be inasmuch affected by the buyer's behaviour and actions (Ellegaard & Koch, 2012; Pulles et al., 2016) as by the balance of attractiveness between the parties in the buyer-supplier relationship and the related willingness of the supplier to build up or conversely, reduce its attractiveness. With these insights, this dissertation contributes to the evolving discussion on supplier resource activation and deployment in a buyer-supplier relationship.

#### *Contributions to the process integration perspective*

This dissertation advances knowledge on supplier integration from process integration perspective by elucidating *how activities are co-ordinated across organizational boundaries (RQ3)*. Through investigating this question in a project aiming at the delivery of a complex and integrated solution and involving multiple suppliers, the dissertation finds that co-ordination took place by integrative activities that were implemented purposefully 1) by the focal company i.e. the systems integrator; 2) by the suppliers and 3) jointly by the involved companies. The focal company i.e. the systems integrator co-ordinated the work of the suppliers by having meetings and a heavyweight project leader, involving suppliers early into the process, motivating suppliers to innovate and providing suppliers with training and physical assets. The activities initiated by the suppliers comprised relation-specific investments, providing the buyer with special support, dedicating resources to the project as well as accelerating the project. The joint activities comprised co-locating, problem solving and seeking efficiencies together. Overall, the findings contribute to the discourse on how integration is achieved in integrated solutions provisioning.

The empirical findings show that all involved companies participated in the co-ordination of activities across organizational boundaries. Extant literature emphasizes the key role of the systems integrator i.e. the focal company in a leading the supplier network and coordinating suppliers' work (Brusoni et al., 2001; Da-

vies et al., 2007) whereby the latter is regarded as the core capability of the systems integrator firm (Hobday et al., 2005; Jaakkola & Hakanen, 2013). To this end, studies (Ahola et al., 2013; Davies & Mackenzie, 2014; Jaakkola & Hakanen 2013) have identified various activities that facilitate supplier integration in integrated solutions provisioning and in complex projects, including for example informal interaction, joint problem solving and idea generation sessions, co-locating, review meetings, joint team events and encouraging suppliers to come up with innovative solutions. Consistent with these earlier studies, this dissertation underlines the role of the systems integrator as the main integrative actor that co-ordinates the work of involved suppliers by implementing various integrative activities in pre-planned manner.

However, in earlier studies on supplier integration in project-based business and in integrated solutions context, the systems integrator perspective dominates (e.g., Ahola et al., 2013; Davies & Mackenzie, 2014; Jaakkola & Hakanen 2013) whereby the supplier perspective to integration has been largely ignored (for an exception, see Martinsuo & Ahola, 2010). This dissertation broadens extant literature by incorporating the supplier's perspective to integration in complex project delivery. According to the findings, the suppliers - both manufacturing and service suppliers alike -took an active role in coordinating tasks across organizational boundaries by initiating specific integrative activities as well as by participating in joint activities with the systems integrator. The suppliers' activities were motivated particularly by the prospects of future collaborations with the buyer and they were voluntary and emergent in nature. Based on this it is argued that suppliers are and should be seen as active participants in achieving integration across organizational boundaries. This contrasts with the overall tendency to view supplier integration as the outcome of activities that are implemented by the systems integrator (or the buyer, respectively) solely and where the suppliers are described more or less as passive. In supply chain integration literature, the notion that integration needs input from both the buyer and supplier is long acknowledged (Cousins & Menguc, 2006); yet integrative activities and practices have been investigated from the buyer company perspective (Das et al., 2006; Swink et al., 2007). The categorization of integrative activities into those implemented by the buyer, supplier-led and joint activities may offer useful insights to supplier integration discourse concerning also other than project-based environments, and thus contribute to unveiling complexity that has been associated with process integration (H. Chen et al., 2009).

This dissertation also contributes to advancing knowledge on process integration by shedding light on the selection and use of integrative activities in project-based environment. According to the findings, integration activities of the systems integrator reflected primarily the quality and time objectives of the overall project, whilst none of the activities drove cost reduction. This can be explained by the unique nature of the underlying project, where extremely high quality and innovativeness were prioritized over cost reduction. This finding is consistent with Peng, Verghese, Shah and Schroeder (2013) who emphasize that

integration should be viewed as a context-dependent phenomenon, instead of a “bundle of universally applicable practices” (Peng et al., 2013, p.4). The contextual nature of integration has received recent empirical support in operations and purchasing management literature. Kaipia and Turkulainen (2016) found that the use of integration modes in outsourcing buyer-supplier relationships is contingent on the strategic priorities of cost reduction and quality improvement. Vanpoucke, Vereecke and Boyer (2014) observed that the nature of integration initiatives reflects the parties’ motivation for cost reduction as well as service improvement and growth. This dissertation contributes to the discussion on the contextual nature of integration by arguing that in integrated solution deliveries, the objectives of the underlying project and their prioritization bear an influence on the use of integrative activities.

This dissertation also advances knowledge on supplier integration from process integration perspective by elucidating *what challenges early supplier involvement poses for the supplier (RQ4)*. This was investigated in a new product development project where a global manufacturer involved their contract manufacturing supplier as an ESI partner for the first time. Firstly, the findings show that the supplier’s challenges related in particular to developing interaction capabilities in technical and managerial domains. The challenges in the technical domain pertained to coping with a technologically complex product, various new materials and buyer’s strict design requirements. Management system challenges related to executing quick prototyping, providing the buyer with adequate resources and collaborating with the buyer in new ways. The lack of the aforementioned capabilities resulted in mismatches between buyer expectations and supplier’s input, caused delays in prototyping and friction in collaboration. Based on the study, it is concluded that capabilities stemming from contract manufacturing history may not optimally support the early involvement of the supplier in the buyer’s new product development. The results indicate that it was challenging for the supplier to transition from a contract manufacturer to ESI partner. The results overall point to challenges in successfully managing projects with supplier involvement, supporting earlier findings by Hartley et al., (1997) that it takes time for the parties to develop new capabilities.

Based on the empirical findings it is argued that the development of technical and managerial interaction capabilities contributes to early supplier involvement. Basing on the interaction capability framework (R.E. Johnsen & Ford, 2006), the finding contributes to the ESI discourse firstly, by bringing the supplier view into capabilities that are needed for ESI and secondly by accentuating capabilities as being specific to the mutual relationship as they are developed through interaction between the buyer and the supplier in NPD context. From the buyer’s perspective, selecting the right kind of supplier through a careful assessment of supplier capabilities is regarded as particularly important for the success of joint NPD (Petersen et al., 2005). Earlier research has added understanding of supplier capabilities that are important in this context, including supplier’s technological capabilities, technical skills (Hartley et al., 1997; Song

& Benedetto, 2008; Wagner & Hoegl, 2006) and collaboration skills (McCutcheon et al., 1997; Feng et al., 2010). Supplier capability assessment however takes place “ex-ante” and implies an inherently static view to supplier capabilities, in that they either exist or not. Results of this dissertation emphasize that it is during the ESI project, as the buyer and the supplier interact, when the usefulness of capabilities becomes apparent and capabilities develop (see R.E. Johnsen & Ford, 2006). This implies that in addition to assessing supplier individual capabilities, attention should be paid to understanding and assessing how the buyer and the supplier interact and collaborate during the joint NPD project, as also emphasized earlier (Feng et al., 2010). The finding also points to the importance of supplier’s skills to manage the relationship and interact with the buyer in order to fulfil the requirements of the buyer in terms of NPD, as stressed by Le-Dain et al. (2011) and Ngugi et al. (2010).

The findings also indicate that being an ESI partner differed considerably from the traditional build-to-print contract manufacturer role of the supplier, and the supplier had difficulties in transferring knowledge and capabilities based on contract manufacturing into product development. Based on it is argued that a contract manufacturing supplier does not automatically make a well-performing ESI partner. This corroborates with the notion that capabilities that underpin supplier’s industrial performance in terms of delivering quality products cost-efficiently and timely are not adequate for successful supplier integration in NPD context (Petersen et al., 2003). Overall, the findings emphasize that implementing ESI is a challenging and complex task not just for the buyer, but also for the supplier.

#### *Contributions to the system and information integration perspective*

This dissertation advances knowledge on supplier integration from system and information integration perspective by elucidating *what is the role of information technology in strategic buyer-supplier relationships (RQ5)*. This was investigated in two long-term buyer-supplier relationships in the context of logistics and engineering services. The findings show that IT forms a key element in the relationship infrastructure (i.e. structural layer) that supports and facilitates business exchange between the buyer and the supplier (i.e. action layer). Yet it was found that the dyads differed in terms of the structural layer whereby in Alpha, the systems were predominantly situated in the supplier organization and in Beta, in the buyer organization. In terms of action layer the dyads also differed as in Alpha, the value creation process of the supplier facilitated the buyer’s value creation process by enabling efficient flow of information and goods. In Beta, the supplier’s value creation process merged with that of the buyer. In this way, the supplier’s value creation process became an inherent part of the planning and design activities of the buyer’s end products. Based on the consideration of IT position in the structural layer of the relationship (i.e. are the systems possessed by the buyer or the supplier) and role of IT in the action

layer of the relationship (i.e. whether IT systems enable the supplier to contribute to the buyer's value creation content or context), a matrix is formed that contextualizes four situations concerning the role of IT in buyer-supplier relationship. Here, the relationship management activities conducted by the buyer and the supplier –such as joint development of systems i.e. building new features and adding functionality and reach, introducing shared performance measures based on the shared systems and co-ordinating the division of work between the parties - were found essential in inducing alignment within the structural and action layers within the relationship. It is argued that consistency between IT and mutual business exchange contributes to enhancing the total performance of the relationship. Conversely, inconsistency may show as an asymmetric relationship and inhibit its development. Overall, the findings point to IT as being intertwined with the intra- as well as inter-organizational structures, processes and managerial actions, leading to the conclusion that managing IT in a buyer-supplier relationship requires a holistic approach.

The findings of this dissertation enhance relationship-level understanding of the deployment of inter-organizational IT. The findings indicate that IT is a key part of the relationship infrastructure, located in the buyer or supplier organization from where it is brought to the technical setting of the underlying relationship. Furthermore, it was found that IT facilitates the linking of value creation activities between the buyer and the supplier, enabling the supplier to contribute to the buyer's process or product, respectively. In some quantitative studies, IT has been found to be a key enabler for process and activity integration between supply chain parties (e.g., Li et al., 2009; Prajogo & Olhager, 2012; Vanpoucke et al., 2017). The results of the case study enhance understanding of what this entails on relationship-level by highlighting the contextual considerations regarding the possession of the systems and how systems enable linking of activities between the buyer and the supplier. Accordingly, the shared systems can be possessed by the buyer as well as the supplier. In the latter case, the systems were observed to form a key part of the suppliers offering. In this case, the supplier had a strong interest to develop the joint systems actively and make related investments to serve its customer i.e. the buyer. In this sense, the supplier can also pursue system integration towards the buyer, a point that is perhaps less considered in the SI discourse that emphasizes the buyer's perspective. With regard to linking of supplier and buyer activities, it is observed that in the IT-enabled relationship, IT enabled the supplier to contribute to the buyer's production by facilitating efficient flow of products and information between the parties. This role and position of IT were in line with the division of work between the buyer and the supplier and it had involved both parties in continuous and active development work concerning joint systems and processes. In the other relationship, IT was observed to support the supplier's contribution to the end product of the buyer, yet when this was considered vis-à-vis the buyer's possession of the systems it was observed that the setting somewhat complicated the supplier to fulfill its value creation potential to the fullest. Earlier stud-

ies have highlighted the importance of integrating both systems as well as business activities with important suppliers in order to secure benefits (Kim et al., 2013). The findings above shed light on the structural and action –related configurations that this entails on the buyer-supplier relationship level, contributing to the discussion on the deployment of IT in the context of buyer-supplier relationships (Ekman et al., 2014; Lindh, 2006; Salo, 2007).

As discussed above, studies on IT integration highlight the importance of both system and activity integration between the buyer and its suppliers, finding that in order for IT integration to influence the performance of the company, both system integration and operational integration are needed (Prajogo & Olhager, 2012; Vanpoucke et al., 2017). This study brings new perspectives to this discussion. Firstly, the study highlights the importance of consistency between inter-organizational systems and the inter-organizational activities facilitated by the systems. Secondly, the study suggests, that relationship management activities play a key role in improving the mutual fit between the structures and activities in a relationship. Thirdly, creating alignment between IT and mutual business processes is suggested to contribute to the performance of the underlying relationship whereby misalignment may show as poorer relationship outcomes. The dyad Alpha was found to be an IT-enabled relationship with highly consistent systems and processes that integrated the companies tightly. The relationship was observed to be stable and high performing. The dyad Beta was observed to be more asymmetrical and with the buyer's possession of the systems, the supplier's value creation was observed to be somewhat limited, manifested as inconsistency between the structures and activities on relationship level. The results indicate, that instead of considering the impact of IT on the company or supply chain performance, it may more sense to consider the influence of inter-organizational IT on the performance of the underlying relationship, which is a stream of research that has been recently advanced (Lindh & Rovira Nordman, 2017; van der Vaart & van Donk, 2008).

Finally, the case Alpha shows that the intentional development of shared systems, involving both the buyer and the supplier played an essential role in the development of the mutual buyer-supplier relationship. Prajogo and Olhager (2012) have found that deep, long-term buyer-supplier relationships are a predecessor for information integration and information sharing. In another study, it is found that trust between the business partners is needed to share information and induce collaboration between the focal company and its suppliers (L. Wu et al., 2014). The findings of this dissertation enrich these views by suggesting that development of the underlying relationship and development of shared systems can also occur in a concurrent way. In other words, based on the case study it appears that the buyer-supplier relationship and shared systems develop simultaneously (see also Salo, 2007). This may provide an interesting avenue for further studies.

## *Conclusions*

This dissertation contributes to supplier integration discourse by advancing knowledge on SI from relational, process as well as system and information integration perspectives. These perspectives were synthesized from extant literature and utilized to distinguish between the various forms of integration as well as to position the findings and related contributions. By adopting the dyadic approach throughout the empirical studies, this dissertation sheds light to the less investigated supplier side vis-à-vis integration, enriching SI literature that focuses predominantly on the buyer. With regard to relational integration, the findings show that relationship development is a function of buyer and supplier attractiveness and respective adaptations whereby each has an effect upon the other. With regard to process integration, co-ordination in complex solution delivery is shown to result from activities that are implemented by the systems integrator and also by the involved suppliers, emphasizing the active role of suppliers during the project when motivated by future collaboration opportunities with the buyer. In the context of involving a contract manufacturer in the buyer's new product development, the findings indicate that development of technical and managerial interaction capabilities contributes to early supplier involvement and that implementing ESI is complex and challenging for both the buyer as well as the supplier. Finally, with regard to system and information integration, the findings emphasize that IT is intertwined with the buyer-supplier relationship structures, joint processes and activities as well as managerial actions, leading to the conclusion that in a buyer-supplier relationship, IT needs to be managed in a holistic way. Taken together, the findings on the influence of attractiveness on relationship development, activities that facilitate task co-ordination in complex solution delivery, supplier challenges that relate to early supplier involvement and the role of IT in buyer-supplier relationships provide a more balanced and comprehensive view of supplier integration with regard to relational, process and system perspectives.

### **6.2 Managerial contributions**

This dissertation offers insights for both the buyers as well as the supplying companies that aim to make integration work in practice.

The study on the role of attractiveness in buyer-supplier relationships showed that the perceptions of both parties and the adaptations are interlinked in mutually reinforcing or deteriorating way which influences on relationship development. Based on this, it is suggested that managers on both sides of the dyad can benefit from explicit attention to attractiveness and consider conscious efforts that increase their attractiveness in the eyes of the other party. Managers should also pay attention to whether the relationship is balanced in terms of attractiveness and adaptations in order to foresee potential changes in the other party's willingness to continue the relationship. This viewpoint may be a useful addition to the relationship management agenda.



The dissertation suggests that integration in a complex solution project is facilitated by activities that contribute to the goals of the underlying project. The finding that suppliers are active players in integration vis-à-vis the buyer shows that the burden of integration can be shared between the buyer and the supplier(s). This is an important to managers on both sides of the dyad, since integration is costly and takes up resources. However, sharing the burden of integration may require that managers especially at the buyer company adopt a new mindset towards suppliers and allow them to be pro-active. This may be challenging especially if the buyer company is used to being the orchestrator. Managers on the supplier side need to understand that they can also be active players and take the initiative, instead of passively waiting to be integrated.

With regard to integration for new product development purposes, the dissertation highlights the importance of buyer and supplier interaction capabilities, and points out that lack thereof may cause delays and friction. The awareness of interaction capabilities may help both parties to recognize managerial and technical issues that need to be addressed during ESI. Yet, the challenges may be difficult to foresee beforehand as they may only arise during the joint project. Hence, companies that work together in terms of NPD may need to review challenges during the project and be prepared to tackle them as the project progresses. Finally, with regard to the implementation of IT, the study emphasizes the importance of managing IT as part of the relationship management agenda.

### **6.3 Limitations and opportunities for further research**

With regard to Article I, the analysis is limited to a sample of articles based on keyword search in six selected purchasing and supply management as well as operations management journals during 2006-2016. Even if the selected journals represent the top in their respective fields, there are undoubtedly studies on supplier integration in other relevant outlets that have not been included in the sample. Extending the timeframe beyond 2006 could also have provided a larger sample. Also, the use of additional and / or associated keywords (such as supply chain integration, supplier development or supplier relationship management) could have resulted in a more diverse sample of relevant articles.

The empirical studies (Articles II-V) in this dissertation have adopted the case study research design. A criticized issue with case studies relates to the generalizability of the results, even if the relevance of this requirement for case studies can be questioned (Ruddin, 2006). According to Yin (2009), case studies allow analytical but not statistical generalization; in other words, the findings from case studies can be generalized to theories but not to populations. The studies in this dissertation are limited to dyads where the suppliers can be considered as key suppliers, they represent the buyer's major or main suppliers, or have technologies or expertise that are essential for the buyer. Thus, the findings can

be generalized to these investigated cases in this empirical context and not beyond. As a limitation, Article III findings cannot be directly generalized outside the context of oil and gas industry, and in terms of Article IV, a word of caution must be given in terms of generalizing the results outside the context of early supplier involvement between a buyer and a contract manufacturer. Yet, the studies have allowed for creating broader and theoretically expressed understanding of the investigated issue (Ketokivi & Choi, 2014) and the findings of the qualitative studies as for example the propositions in Article III and the empirically grounded frameworks in Article II and V may be elaborated or tested further as part of future research efforts.

The fact that the study is conducted as a single-case study can be seen to lead to lower external validity compared with multiple case studies (Voss et al., 2002). In this dissertation, Articles III and IV are based on single-case design and are thus subject to the concerns and limitations concerning single cases. Yet, both single cases in this dissertation can be regarded as providing an ideal and unique setting to study supplier integration in the particular context of a project, whereby interviews were conducted with informants on both sides of the dyad. As a limitation to Article III is however the relatively small number of interviews that were conducted in the supplier companies. Articles II and V deployed the multiple case study design and in both articles, cases were selected purposefully. Multiple cases can improve external validity, help to avoid over-reliance on or making biased interpretations (Barratt et al., 2011). Yet, the number of investigated cases is relatively low (i.e. two) in both articles, and it is acknowledged that increasing the number of investigated cases could have improved the external validity of the studies. The decision to keep the number of cases small is due to the adopted dyadic approach, which resulted in a substantial number of interviews and challenges in data, time and resource management during the research process.

This research has provided ideas for further studies. Firstly, the relationships between attractiveness, relationship development and supplier integration would be an interesting research topic, that would contribute to the discussion on relational enablers and drivers of integration in buyer-supplier dyads. Conducting a quantitative study on the impact of attractiveness on supplier integration including relationship development as the mediating construct could be a way to advance understanding related to this topic. This research has focused on dyads: an interesting research opportunity would be to study integration between one buyer company and multiple suppliers. This could be conducted in the solution delivery environment to advance understanding of the complexities on managing a portfolio of suppliers in terms of integrating with several upstream partners at the same time. Going further upstream and beyond the dyad would also provide interesting research opportunities. As an example, the early supplier involvement –study sparked an interest into investigating from the supplier perspective, how becoming an early supplier involvement partner and integrating more firmly into the buyer's new product development is reflected

in the ways how the ESI supplier manages their own supplier network. With regard to recent developments in the information and communication technologies, how increasing digitalization influences integration between buyers and suppliers would also be an interesting research topic. Finally, this dissertation omitted internal integration from the scope. Further studies could investigate internal integration and external integration with suppliers simultaneously to capture the internal dynamics between for example, purchasing, manufacturing and business owners and how the interplay between the internal functions is reflected on managing the external interface.

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