

# EARLY SUPPLIER INVOLVEMENT IN NEW PRODUCT DEVELOPMENT: A CAPABILITIES PERSPECTIVE

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**Abstract:** ESI research has demonstrated various performance benefits from involving key suppliers earlier and closely in NPD projects. Yet, extant research stresses the ex-ante evaluation of suppliers and takes predominantly the buyer view. The focal study adopts the industrial network approach in defining ESI in terms of inter-organizational interaction between buyer and supplier catalyzed by ESI capabilities. Our in-depth, dyadic case study finds that ESI was a major departure from the supplier's extant contract manufacturing role evident through the misalignment that existed between supplier's extant culture, management and technical systems and the customer requirements for ESI partner. The capability gaps became evident to the buyer as the project was on-going, suggesting that ex-ante capability evaluation only gives a partial picture of supplier capabilities needed for ESI. The study highlights the dyadic and interactive nature of ESI whereby supplier capabilities, their development and related evaluation is inherent to the two-way interaction process between the buyer and the supplier.

**Keywords:** Early supplier involvement, Capabilities, B2B relationship management

## INTRODUCTION

Companies are increasingly extending their new product development (NPD) processes across firm boundaries and involving suppliers in collaborative research and development activities (Wagner and Hoegl, 2006). Research on early supplier involvement (ESI) has highlighted the

role of suppliers in bringing new knowledge and capabilities for NPD needs (van Echtelt, Wynstra, Van Weele and Duyesters, 2008). However, some research (e.g. Hartley, Zirger and Kamath, 1997) has shown that such benefits do not always materialize, suggesting that it takes time for the parties involved to accrue the experience and to develop the capabilities to manage ESI projects and to perform as NPD partners.

Reflecting the significant role that suppliers may play in the customer company NPD, extant literature has emphasized the importance of ex-ante evaluation of supplier capabilities (LeDain, Calvi and Cherati, 2011). Accordingly, innovation capabilities (Wasti and Liker, 1997; Petersen, Handfield and Ragatz, 2005; Song and Benedetto, 2008), R&D capabilities (Oh and Rhee, 2010; Wagner and Hoegl, 2006) and technology knowledge (Rundqvist and Halila, 2010; Petersen, Handfield and Ragatz, 2003) have been identified as important requirements of successful supplier contributions. Despite its merits, this stream of research provides a rather narrow view on the issue of ESI performance in its buyer dominant perspective and ex ante focus. The emphasis on ex ante selection prior the ESI project excludes the elements and dynamics that shape the ESI outcomes during the project.

In extant literature, supplier capabilities in the context of ESI and NPD have been investigated more or less purely from the focal firm i.e. a customer perspective, neglecting the supplier perspective in the ESI process (Chung and Kim, 2003; Johnsen, 2009). Despite the abundance of literature that points to the importance of evaluation of supplier capabilities and conducting a rigorous capability-focused supplier selection process for ESI projects (LeDain et al, 2011), there is limited understanding of how supplier capabilities evolve during ESI implementation. In addition, there is little research on the factors that may constrain the development of both buyer and supplier capabilities and successful ESI outcomes. The focal study adopts the industrial network approach (e.g. Håkansson, Gadde, Snehota, Waluszewski, 2009) in defining ESI in terms of inter-organizational interaction between buyer and supplier catalyzed by ESI capabilities. The purpose of the study is firstly, to further understanding on supplier capabilities that associate with interaction in ESI context, and factors that influence these capabilities. Secondly, the purpose is to advance understanding on how the buyer perceives these capabilities as the interaction between the parties develops during the joint project. For these purposes, an in-depth, dyadic case study was conducted concerning a NPD project, whereby a long-term contract manufacturing supplier became involved in its key customer's new product development project as an early involvement partner without prior experience in being an ESI partner.

## **THEORETICAL BACKGROUND**

### *Early Supplier Involvement in New Product Development*

The concept of ESI in NPD concerns the integration of supplier capabilities into NPD projects (Dowlatshahi, 1998), the tasks they are able to carry out on behalf of the customer, and the responsibilities they assume for the development of a part, process or service (Van Echtelt et al, 2008). Johnsen's (2009) systematic review of the literature concluded that there is much evidence to suggest that involving suppliers extensively and early in NPD can improve NPD performance in terms of reduced costs and time to market and improved quality. However, research into ESI practices shows that performance benefits should not be taken for granted and that ESI projects need to be managed very carefully in order for the benefits to materialize. Yet,

the majority of extant studies remain focused on the manufacturer i.e. the customer perspective, in effect ignoring supplier perspectives. This is in part a consequence of the fact that most existing studies are based on large-scale surveys, and even relies on single respondents within the customer company (see also van Weele and van Raij, 2014). Customer-focused studies naturally report on customer views of the required supplier capabilities and do not consider supplier views or experiences of being involved in ESI projects. The most recent research, both within the ESI literature (Smals and Smits, 2012; Melander and Lakemond, 2015) and more widely in, for example, strategic management has shifted the focus from internal firm or core capability to a relational view of capabilities, focusing on *relationship* rather than *supplier* management.

### *Core and relational capabilities*

The emphasis in much of the strategic management literature traditionally lay in tangible technological capabilities, meaning that intangible capabilities, such as those areas of knowledge that may enable a firm to create the values and standards (Leonard-Barton, 1992) associated with the development of ‘softer’ skills were somewhat overlooked. Leonard-Barton’s (1992) work identified that a discrete knowledge set distinguishes the firm and may be grown and deployed by it to achieve competitive advantage. Therefore, a ‘core’ capability may be understood as the knowledge set that distinguishes and provides a competitive advantage (*ibid.*). According to Leonard-Barton’s (1992) framework, this ‘knowledge set’ is embodied by employee knowledge and skills and embedded in technical systems. Knowledge development, and thus capability development, is guided by managerial systems and the values and standards associated with the development of the knowledge and the processes under which it is created and controlled.

To capitalize on interaction between firms, a relational perspective has been emphasized in industrial marketing research to create and develop capabilities through the long-term intermingling of resources and activities, and the fusion of the direction of two firms’ capability development towards each other (Håkansson and Snehota, 1995). According to an interaction perspective, capability encompasses what the firms in a relationship may do for each other, the functions they will conduct and the width and importance of these functions (Ford et al., 1986). The application of valuable and valued capabilities in the most appropriate relationship settings is therefore essential to make an effective contribution to a project (O’Cass and Ngo, 2012). For NPD projects to succeed, evidence of strong capabilities enabling a supplier to have the potential to be a strong contributor to knowledge development, creativity and innovation may be critical (Weerawardena and Mavondo, 2011). Recently Marcos-Cuervas, Julkunen and Gabrielsson (2015) highlight that there is still a paucity of knowledge on capabilities for collaborative value co-creation, especially in the context of increasingly boundary-less inter-organizational relationships. These authors found that ‘sustained purposeful engagement’ enables the effective co-creation of valuable capabilities and they call for a better understanding of practices that organizations in business markets adopt to co-create value. In sum, the interaction view of the role of capabilities in managing ESI in NPD highlights not so much the importance of selecting and involving capable suppliers in their NPD projects, but instead points to the importance of relationship management capabilities and of creating alignment of capabilities on both sides of the dyad (see e.g. Emden et al., 2006; van Echtelt et al., 2008; Ylimäki, 2014).

## **RESEARCH METHOD**

### ***Research strategy and approach***

In contrast with the majority of the extant ESI literature that relies on large-scale survey data, we deemed it important to explore a NPD project with early supplier involvement through a qualitative in-depth case study strategy. Case studies are deemed feasible for researchers to gain deep understanding of actors, interactions, sentiments and behaviours that occur for a specific process over time (Woodside and Baxter, 2013), which was particularly pertinent for our study. Our decision to adopt a case study approach was driven by the ambition to develop a rich and critical understanding of inter-organizational dynamics (Halinen and Törnroos, 2005; Barratt, Choi and Li, 2011) during ESI implementation. An in-depth single case study approach was adopted: as suggested by Järvensivu and Törnroos, (2010), single cases allow researchers to capture deep contextual insights and understand the underlying dynamics, making single cases feasible for studying complex real-life phenomena and interactions in industrial B2B settings. The research approach can be described as abductive which is based on systematic combining whereby the researcher continuously moves between empirical data and theory (Dubois and Gadde, 2002).

### ***The case study and the involved companies***

Our paper reports on a dyadic single case study of an NPD project between a global manufacturing company and one of its key suppliers. The specific case (and the two companies it revolves around) was selected because it offered a persuasive example (Siggelkow, 2007) of related buyer and supplier capabilities and factors that influence the development of these capabilities. The supplier, a contract manufacturing company, was looking to develop their service offering whereby manufacturability feedback and operating as quick prototyping partner comprised ideas for new services. The key unit of analysis comprised customer-supplier collaborations during an NPD project that sought to implement ESI for the first time.

The buyer (OEM) represents a global manufacturer of capital goods for built environments, employing over 40,000 people worldwide. The supplier (EMS) is a medium-sized “build-to-print” contract manufacturer employing around 1,700 persons, with clientele in telecommunications and industrial electronics industries. The companies have a long-standing business relationship spanning nearly 40 years with business exchange ranging from simple sheet metal parts and mechanics assemblies to integrated electrification and signalization assemblies, printed circuit board assemblies and later on, global manufacturing and complex drive assemblies. The NPD project in this case study comprised the development of a control device with an updated user interface, and extremely high demands for visual appearance, functionality and pressure for fast time-to-market. In this paper, the project will be referred to as the “CD project”. The device involved glass, plastics, mechanics and electro-mechanic parts, printed circuit boards and software and was thus deemed a complex product. The most intense period of NPD with ESI took place between late 2012 and late 2013.

### ***Data collection and analysis***

The empirical data was collected by face-to-face by telephone interviews with key informants representing the customer and supplier companies. The data collection period ranged from February 2014 to May 2015 with four researchers engaging with the data collection. In total, we conducted 32 semi-structured interviews, of which 10 interviews were with the supplier and 22 interviews with the customer. In addition to interview data, researchers were granted extensive access to secondary material, consisting of company presentation materials and project

documentation. The data was analyzed first based on content analysis, where the interviews were transcribed, coded and categorized into themes (Miles, Huberman and Saldaña, 2014) by using the Atlas.TI qualitative data analysis software. In addition, the researchers produced an extensive and detailed case write-up comprising both customer and supplier company perceptions of the NPD project. Researchers made summarized presentations of the findings and validated them with company representatives from both companies in various face-to-face workshops and discussions that took place during the research project.

## FINDINGS

### ***Supplier capabilities that associate with ESI outcomes and factors that influence these capabilities***

The most active period of ESI took place between late 2012 to late 2013. However, during the first months of working in the project, it became evident that EMS was unable to meet the agreed iteration schedule of two weeks for prototype deliveries. The findings show that development of ESI capabilities hinged on several factors related to the supplier's existing values and culture, technical and managerial systems as well as individual knowledge and expertise.

In terms of *values and culture*, it was observed that developing a new product from scratch was a major departure from the supplier's existing role as a contract manufacturer. Being involved in early stages of R&D, collaboration with OEM was different from contract manufacturing in that EMS became much more involved also on personal level, as the supplier's project engineer spent time at the buyer's premises. The supplier also allocated their time to very different issues in comparison with normal contract manufacturing. The supplier observed that in the ESI project, majority of design-related issues were non-standardized, and product documentation had to be developed as the project progressed. These constituted a major difference compared with normal way of working for EMS. The supplier also struggled with the tasks that OEM gave related to research and studies concerning potential alternative materials or technologies, as EMS did not have in-house concepts in place for conducting these types of studies. Early supplier involvement also required capability to work in project-based mode; yet project-based thinking or capabilities to work in projects was not widespread in the supplier company.

In terms of *technical systems*, the supplier struggled with the fact that design of the CD played a substantial role. The visual appearance of the product had to fulfill OEM's strict criteria, which had not been a priority for the supplier before. The EMS project manager found that he did not have adequate knowledge of customer requirements and needed to verify these constantly with OEM. In addition, some OEM requirements were somewhat unexpected. The EMS project manager believed that this was a major cause of prototyping delays. Due to the compressed timetable, EMS tried to fulfill OEM's prototype requirements with parts and components from their existing inventories. However, these did not meet the expectations of OEM due to special requirements concerning fire safety or durability. Thus, EMS was compelled to order new parts and components from their supply network, causing further delays.

As the supplier's existing order fulfillment process was aligned with contract manufacturing based on receiving detailed specifications from the customer, the supplier soon noted that the underlying processes were not optimally supporting quick prototyping. In fact, receiving the prototyping orders as task assignments from the buyer was in constant contradiction with the

supplier's legacy systems, and thus prototyping assignments coming from OEM needed to be checked and complemented manually. Thus, the prototyping orders caused internal confusion at the supplier and caused additional strain in terms of keeping the agreed timetable. The situation was complicated by the fact that the supplier's existing production and operating processes were geared towards fulfilling contract manufacturing orders and EMS did not possess separate facilities, dedicated production machinery nor allocated resources for prototyping. From production viewpoint, the fact that prototypes were produced in the normal production line conflicted with normal standard processes, which caused internal friction. To this end, it was acknowledged that for prototyping, a separate production line would need to be set up for next ESI project and that the supplier would have to learn how to become a prototyping partner for the customers.

Finally, EMS experienced challenges in managing their own supply network and internal inventories vis-à-vis EMS tight timetables regarding prototype revision rounds. Inventories for purchased materials were predominantly situated in China, and thus delivery times were long, leading to decrease in EMS capability to react to OEM's requirements in terms of quick iterations. In addition, it was challenging to co-ordinate inventory management at China from Finland, and the hands-on process in China i.e. checking inbound materials and availability of existing components as well as preparing documents was lengthy. Thus, coordinating efforts and tasks related to fulfilling prototype orders and managing the related material flows and inventories situated in China was recognized by EMS as a capability that needed development.

In terms of *managerial systems*, the findings point to lack a proper project organization and dedicated resources at the supplier. During the project, EMS did not organize an internal steering group that would have followed up the project which lead to the fact that the supplier's project manager was compelled to work mostly on his own, without much support from his peers or supervisors. Additional strain was caused by the fact that the traditional and familiar ways of communicating with the customer's organization were not feasible during the ESI project, yet new processes and collaboration practices between production and the customer's project team were not developed yet. This added to the workload of the supplier's project manager who was in charge of communications towards the buyer.

### ***The buyer's perception of supplier capabilities during ESI***

From OEM perspective, issues in the CD project related to gaps in supplier capabilities, which led to the fact that the supplier was unable to meet the buyer's expectations for an ESI partner. The buyer observed that to a great part, the supplier's lack of capabilities related to their existing strengths in contract manufacturing and the related culture and values that had been established with respect to their long-term role as contract manufacturing partner. OEM's expectation was that EMS's strong knowledge in manufacturing and assembly would bring essential input into the early phases of development of CD and help speed up the development phase. However, integrating EMS's manufacturing knowledge into new product development proved highly challenging and time-consuming. EMS's strongest expertise was in sheet metal manufacturing, whereas the product being developed involved glass, plastics and new user display technology, which were unfamiliar to EMS. The EMS Project Manager was an expert in mechanics, which nevertheless represented only a minor part of the Bill of Materials in the CD, resulting in less input from the EMS project manager than OEM expected.

A major issue observed by OEM concerning EMS's input was the fact that EMS only had limited experience in doing actual NPD, which caused frustration for OEM's project team. An interesting observation is that even if the strong relationship and EMS's experience in contract manufacturing were the factors driving the supplier selection for the CD project, the strong manufacturing capabilities that the supplier possessed became a burden for OEM as the project progressed. In terms of technical systems of the supplier, the buyer experienced that there were long delays in prototype deliveries. OEM was concerned that EMS had been unable to make necessary adaptations in their production line and internal processes to support quick prototyping. The buyer also observed that it appeared to the buyer that the supplier lacked capabilities to control the supply chain and the material flows for prototyping. This resulted in OEM taking on more responsibility for keeping track of planning and ordering of components than originally intended. In terms of the management systems at the supplier, supplier collaboration experience raised doubts at the buyer end. To follow up the collaboration during the project, a steering group with OEM and EMS participants was set up. However, supplier performance issues and performance measurement were not a standard part of the agenda. OEM believed that their own internal resourcing was adequate and well planned and effectively blamed EMS for not fully understanding resource requirements related to critical phases in prototyping, such as testing. OEM also doubted if the EMS project manager was receiving sufficient internal support at EMS and, more importantly, if this support differed from regular contract manufacturing tasks.

## **DISCUSSION**

The focal study is motivated by the fact that the great majority of research in ESI has been conducted from the customer's perspective, effectively ignoring the supplier's view. The focal study adopts the interaction and network approach on early supplier involvement (ESI) and thus defines the ESI capabilities as entities embedded in buyer-supplier interaction. Respectively, instead of the purely technological focus, the focal study aims at understanding capabilities on the level of relationship and dyadic interaction.

Extant research suggests that when a customer company desires to improve its performance in terms of product innovation, it is paramount that the supplier is selected based on their NPD capabilities (Koufteros, Vickery and Dröge, 2012). By selecting an existing long-term contract manufacturing supplier with no significant NPD collaboration experience, OEM evidently did not pay due attention to the importance of NPD capabilities and assumed that the supplier would be able to develop these as the project progressed. Despite a decade-long relationship, ESI represented a new arena for collaboration for the companies, requiring new capabilities on both sides of the relationship. The case study revealed that EMS struggled to perform as an ESI partner because of their obvious lack of joint NPD project experience, and experience in R&D in general. Moreover, the learning process of becoming an NPD partner that pro-actively responds to customer requirements was slow and sometimes painful for both parties. The case study suggests that choosing a contract manufacturer as an ESI partner may in fact be an overly difficult point of departure and would require extensive upfront planning and management from both parties. Although our interviewees generally refrained from blaming each other, it was clear that there were many latent conflicts and frictions both between the two companies and between individuals within the project teams. Nevertheless, even if many of the observed challenges seem to relate to capability shortages of the supplier, it is important to note that this resulted, to a high

extent, from deficient interaction and communication between the two parties. This points to the buyers' difficulties in clearly conveying their requirements to, and in aligning the goals and communication interfaces with the supplier (see also van Echtelt et al., 2008). Our results suggest that implementing and managing ESI is a complex two-way interaction process, where managing the relationship plays an important part. This study thus highlights the inherently dyadic and interactive nature of ESI and emphasizes the active role of both the buyer and the supplier in developing higher-order capabilities that contextualize the primary activities and operational capabilities related to new product development.

The supplier's challenges with regard to performing as an optimal ESI partner hinged on several factors that maybe were not so visible to the buyer and showed simply as the supplier's inability to perform against expectations. The empirical data suggests that ESI required the supplier to adopt an entirely different supplier role than previously. The data shows that there were several challenges during the project that mostly related to the supplier's existing ways of doing things, systems and processes that were aligned with the extant role of contract manufacturer. Adopting an ESI partner role however meant a major departure from the culture, organizational values, technical and managerial systems that had been established to support contract manufacturing. Given the fact that suppliers are not readily capable of performing as ESI partners, these findings thus enhance knowledge on the factors that may slow down ESI implementation and highlight that supplier culture, values as well as technical and managerial systems need attention when planning and implementing an ESI project with the customer.

From the buyer perspective, most issues within the project related to lack of supplier capabilities and supplier not meeting the expectations set for an ESI partner. As the buyer observed, this was due to the fact that the supplier's core competences in contract manufacturing did not optimally support being an ESI partner. These findings enhance understanding on the buyer's perception of what makes a well-performing ESI partner. Instead of highlighting the ex-ante evaluation of supplier capabilities our findings point to perceiving supplier capabilities – or lack of them – during the on-going project. The findings suggest that the supplier capabilities to offer ESI services and to function as an ESI partner associate with the supplier's ability to organize their production and underlying support systems, to structure of their supply network, to co-ordinate their sub-suppliers pro-actively, to “think outside the box” and to install an internal mindset geared towards R&D and project-based work.

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