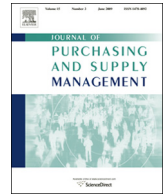




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Purchasing involvement in technologically uncertain new product development projects: Challenges and implications

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ABSTRACT

This paper explores an emerging field of research within purchasing that concerns the changing role of purchasing when companies embark on technologically uncertain NPD projects. Where existing research has examined the role of purchasing in facilitating early supplier involvement in new product development, little research has been done to date on how purchasing's role might change when facing technologically uncertain NPD that require new capabilities and new technology. Based on an in-depth case study of a technologically uncertain NPD project in the passenger ship rescue equipment industry, the paper sheds light on how supplier involvement in NPD projects with a high degree of technological uncertainty impacts on a company's sourcing strategies and the challenges this poses for purchasing.

Based on the case study findings, we propose a) that early purchasing involvement in technologically uncertain NPD projects requires a mature purchasing organization that possesses competences to interact effectively with R&D and b) that involving a new supplier from a different industry in NPD projects characterized by technological uncertainty requires a leap of faith from both innovating firm and supplier. The paper contributes to research in early supplier involvement in new product development, in particular the thin branch within this body of literature that now focuses on early purchasing involvement.

1. Introduction

The literature on Early Supplier Involvement (ESI) in New Product Development (NPD) is now well established. Most of this research argues that early and close collaboration with key suppliers are important factors in achieving reduced development cost, reduced time to market, and improved product quality. However, emerging research suggests that high technological uncertainty or newness (e.g. McDermott and Handfield, 2000; Primo and Amundson, 2002; Ragatz et al., 2002; Song and Di Benedetto, 2008; Cousins et al., 2011) call for a different way of engaging with suppliers. One implication is that technological uncertainty implies application, and therefore often sourcing, of new technology, possibly from a supplier in a different supply market. This has led some authors (e.g. Bessant et al., 2005; Phillips et al., 2006) to suggest that conditions of technological uncertainty render long-term stable supplier partnerships obsolete and instead require new relationships (Beckman et al., 2004) or 'supplier dalliances' (Phillips et al., 2006). However, the empirical basis for this assertion remains limited and research is contradictory on the impact of technological uncertainty on ESI practices (Johnsen, 2009).

ESI is clearly relevant to purchasing and supply management (hereafter just 'purchasing'), as purchasing is a natural liaison to suppliers but it is traditionally Research & Development (R&D) and not purchasing that normally assume control of technology development and sourcing. However, some companies are beginning to realize that purchasing can play an important catalyst role in sourcing of new technology (Luzzini et al., 2015), yet this is not a role that naturally falls within the usual sphere of responsibility and competence of most purchasing departments: it requires a new 'dual' role of purchasing (Schiele, 2010).

Likewise, the ESI literature is by no means the exclusive domain of purchasing. In fact, much of the ESI literature, especially papers focusing on conditions of technological uncertainty, is usually positioned in innovation or operations management journals (e.g. Primo and Amundson, 2002; Song and Di Benedetto, 2008; Cousins et al., 2011). From a purchasing research perspective, a pertinent question concerns if and how the role of purchasing in contributing to the management of ESI – and more widely supplier integration or collaboration in NPD and innovation projects – may need to change. The research by Wynstra and colleagues (Wynstra et al., 1999, 2003) made notable contributions to

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advancing our understanding of the various activities of purchasing involvement in NPD and concurrent research by [Lakemond et al. \(2001\)](#) focused on organizational challenges considering contextual factors such as project complexity, including technological newness. More recently, [Schiele \(2010\)](#) has rejuvenated this stream of research by exploring the notion of early purchasing involvement, or EPI, suggesting a dual role for purchasing depending on sourcing tasks. In sum, there appears to be a gap in current research regarding the nature of supplier involvement in NPD projects that are characterized by a high degree of technological uncertainty. Furthermore, there is a gap concerning how the role of purchasing may need to be adapted under such conditions.

This paper therefore aims to explore how supplier involvement in NPD projects with a high degree of technological uncertainty impacts on a company's sourcing strategies and the challenges this poses for purchasing. By technological uncertainty we refer to "the degree of familiarity with the given technology or degree of change in the technologies relative to products developed or manufactured by the company" ([Chen et al., 2005](#), p. 202). In particular, we explore two questions:

1. *How do companies apply alternative sourcing strategies when implementing supplier involvement in NPD projects with a high degree of technological uncertainty?*
2. *What are the challenges faced by purchasing when the company is implementing supplier involvement in NPD projects with a high degree of technological uncertainty?*

The first research question explores the changes in sourcing strategy that may be necessary when companies seek to involve suppliers early and closely in technologically uncertain NPD projects; sourcing strategy relates to the sourcing and supplier selection process and the type of relationship companies seek to develop with suppliers ([van Weele, 2010](#)). The second question explores the particular challenges of such endeavours, for the purchasing function as perceived not only by purchasing itself but also by other internal functions involved in the NPD process, in trying to manage internal cross-functional relationships with other functions that are involved in the sourcing and supplier involvement process.

We have conducted an in-depth case study exploring these challenges, revealing interesting insights into how a technologically uncertain NPD project in the maritime safety industry required a different approach to existing supplier involvement practices, including a new role for the purchasing function and its relationship with R&D. Our results therefore point to a need for a fresh look at the role of purchasing in innovation projects characterized by high technological uncertainty. The paper contributes firstly to research that focuses specifically on the potential need for changing ESI practices for NPD projects characterized by technological uncertainty. Secondly, the paper contributes to research on ESI in NPD, in particular the thin branch within this body of literature that now focuses on the role of purchasing in the ESI process ([Schiele, 2010](#)).

The paper is structured as follows: the next section provides a brief review of the literature on supplier involvement in NPD under conditions of high technology uncertainty and the role of purchasing with particular attention on sourcing strategy implications. An explanation of the case study methodology is provided before we report on the case study and discuss the implications and conclusions of our study.

2. Literature review

The literature review provides a brief review of the literature on supplier involvement in NPD, focusing on research that has investigated the effects of conditions of high technology uncertainty. We then review the literature that has explored the role of purchasing in facilitating NPD projects with particular attention to sourcing strategy implications.

Supplier involvement in NPD under conditions of technological uncertainty: overview

Definitions of supplier involvement in NPD revolve around the integration of the capabilities that suppliers can contribute to 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](#), p. 182). The acronym ESI adds a particular focus on the timing of supplier involvement ([Bidault et al., 1998](#); [Swink, 1999](#)), which usually refers to involvement of key suppliers, such as black box suppliers ([Clark and Fujimoto, 1991](#)), at the concept stage or during early feasibility studies.

Reviewing the literature on supplier involvement since its inception in the 1980s, [Johnsen \(2009\)](#) found that most but not all research demonstrated performance benefits of both early and close supplier involvement in NPD, especially in terms of reduced development and product cost, shortened time to market, and improvement in product quality. A stream of research within the ESI literature has been dedicated to analyzing the modifying effect of technological uncertainty (using varying terminology such as radical innovation or technical difficulty) on various performance outcomes. This can be traced back to [Eisenhardt and Tabrizi's \(1995\)](#) paper, which focused on rapid adaptive processes including supplier involvement, which cautioned against the assumption of supplier involvement benefits for rapid and unpredictable NPD projects.

Later studies reported varying results: where, for example, [Petersen et al. \(2005\)](#) found that technological uncertainty may further necessitate the need for supplier participation on the customer's NPD team, others (e.g. [Primo and Amundson, 2002](#)) found that existing suppliers may be less important than new suppliers. Extrapolating from [Johnsen \(2009\)](#), [Table 1](#) provides a synthesis of supplier involvement implications specifically under conditions of technological uncertainty.

Since 2008 we note one study by [Song and Thieme \(2009\)](#) that compared supplier involvement in incremental and radical NPD projects with a specific focus on supplier roles in market intelligence gathering. Again, they found somewhat conflicting results with no significant impact on market share and negative associations with perceived product performance in radical innovations pre-design tasks. In fact, as shown in [Table 1](#), there is a gap in this stream of research between 2009 and 2015 when studies by [Melander and Lakemond \(2015\)](#) and [Luzzini et al. \(2015\)](#) were published. Reporting on four embedded case studies (NPD projects) in one company, [Melander and Lakemond \(2015\)](#) explored the need for simultaneous transactional and relational governance. Based on their results they argue for organizational separation in managing these two types of governance where R&D is mainly responsible for relational governance, including trust development, goal alignment and relational norms, and purchasing together with the project steering board mainly is responsible for transactional governance including Non-Disclosure Agreements (NDAs) and exclusivity agreements (see also [Melander and Lakemond \(2014\)](#) where the role of purchasing is described as a trouble-shooter). [Luzzini et al. \(2015\)](#) use survey findings (from the International Purchasing Survey - IPS) to investigate supplier involvement in NPD, including the enabling characteristics of the purchasing function, where technological uncertainty is considered as one contingent factor. Their results pointed to purchasing knowledge acting as a catalyst of collaborative innovation but also that technological uncertainty put greater emphasis on innovation strategy and strategic sourcing in order to hedge against risk.

2.1. The role of purchasing in facilitating supplier involvement

[Table 1](#) suggests that recent research into supplier involvement in NPD projects characterized by technological uncertainty has moved the focus from supplier involvement to purchasing involvement. This is a relatively recent but growing area of research, which has its roots in the 1980s and early to mid 1990s (e.g. [Burt and Soukup, 1985](#); [Dowlatshahi, 1992](#); [Birou and Fawcett, 1994](#); [Atuahene-Gima, 1995](#)),

Table 1
Research findings on supplier involvement implications of technological uncertainty.

| Authors | Method | Focus | Implications |
|-------------------------------|--|--|---|
| Eisenhardt and Tabrizi (1995) | Survey of 72 NPD projects | Rapid 'adaptive processes'. Distinguishes between 'compression' (predictable) and experiential (unpredictable) strategies. | Less predictable projects showed no significant effect of supplier involvement. |
| Wasti and Liker (1997) | Survey of 122 component suppliers | Factors leading Japanese buyers to involve certain suppliers in design, and performance impact of supplier involvement. | Technology uncertainty & supplier technical capabilities positively influence supplier involvement. |
| Swink (1999) | Survey of 91 NPD projects | Manufacturability and effects of development team integration processes (of which supplier influence is one of several factors). | Supplier influence strongly associated with improved manufacturability, but results diminished in cases of high product newness. |
| Ragatz et al. (2002) | Survey of 103 NPD projects | Benefits of supplier integration into NPD under conditions of technology uncertainty | Negative direct impact of technology uncertainty on ESI performance benefits can be offset through supplier integration. |
| Primo and Amundson (2002) | Analysis of secondary survey data: 38 NPD projects in 5 companies | Supplier quality control impact on NPD performance. Technical difficulty a moderating factor. | Level of technical difficulty (degree of innovation) points to role of existing suppliers being less important than new suppliers. |
| Petersen et al. (2005) | Case studies of 17 Japanese & American firms; Survey of 84 North American and European firms | Supplier integration in NPD model. Wide range of variables; including focus on technology uncertainty. | Supplier representation on NPD teams especially important in situations of technology uncertainty. |
| Song and Di Benedetto (2008) | Survey of 173 radical innovation projects (paired data from customers and suppliers) | Supplier involvement in radical innovation projects/ventures. Role of supplier commitment, power, and qualification of supplier abilities. | Positive impact of supplier involvement on new product performance, strengthened by supplier specific investments (asset specificity). Importance of supplier qualification & evaluation. |
| Song and Thieme (2009) | Survey of 205 incremental and 110 radical NPD projects | Supplier involvement in market intelligence gathering comparing incremental and radical innovations | Supplier involvement in market intelligence gathering has no significant impact on market share and negatively associated with perceived product performance in radical innovation pre-design tasks. |
| Melander and Lakemond (2015) | 4 case studies of technologically uncertain NPD projects within a single company | Transactional and relational governance of supplier collaboration in technologically uncertain NPD projects | Organizational separation beneficial: R&D responsible for relational and purchasing (and project steering board) responsible for transactional governance. |
| Luzzini et al. (2015) | Multi-country survey of 498 companies | Purchasing and supplier involvement in NPD including under conditions of technological uncertainty | Strategic sourcing hedging against risk is critical when faced with high technological uncertainty of supplier inputs; supplier collaboration may then be limited. Purchasing a catalyst of collaborative innovation. |

although it was not until the late 1990s that research into purchasing's involvement in NPD took form. Wynstra et al.'s (1999, 2000, 2003) research led to several frameworks for managing purchasing involvement in NPD, focused around four categories of activities (development management, supplier interface management, project management and product management), later re-organized into two broader 'management arenas' (Van Echtelt et al., 2008). Focusing on purchasing organization issues, Lakemond et al. (2001) identified various configurations for involving purchasing in NPD, based around project complexity (including the number and newness of technologies and size). McGinnis and Vallopra (1999) found that substantial *early* purchasing involvement in NPD, where purchasing plays a cross-functional leadership role, is critical for new product success.

In brief, extant research has investigated the different ways in which purchasing can facilitate supplier involvement in NPD projects and how it can interface with other organizational functions such as engineering (e.g. Burt and Soukup, 1985; Dowlatsahi, 1992). Such interfacing includes, for example, input into design specifications, improvement of parts interchangeability, standardization and exclusions, supplier identification and selection i.e. sourcing, and the use of purchasing (or procurement) engineers. Furthermore, several researchers have identified a facilitation role for purchasing in forging stronger supplier relationships, helping to build supplier motivation and commitment (e.g. Birou and Fawcett, 1994; Wynstra et al., 1999). Early involvement would enable purchasing to fulfil this facilitation role.

Recent research is beginning to focus on the implications for purchasing involvement that stem from technological uncertainty. One theme is the cross-functional role that purchasing can play, as explored by Melander and Lakemond (2015). Their findings contradict earlier studies in suggesting that where R&D is mainly involved in relational governance, purchasing's role is transactional governance. Using the analogy of Brattström and Richtner (2014), R&D and purchasing act as respectively "good cop-bad cop". Where goodwill trust (Sako, 1992)

can be built between the R&D departments of the collaborating firms, purchasing maintains a high level of formal control. This assumes that instead of viewing transactional and relational governance, or formal control and trust, as opposite supplier relationship strategies, these may be able to exist in parallel (Melander and Lakemond, 2015; Brattström and Richtner, 2014). However, although the transaction cost economics (TCE) based literature tends to advise on the need for formal controls (Poppo and Zenger, 2002), other literatures, such as the Industrial Marketing and Purchasing (IMP) Interaction Approach, suggest this might lead to problems of inconsistency and hence the supplier receiving mixed messages (e.g. Ford et al., 1986). Thus, there appears to be conflicting views of the role of purchasing in the management of supplier involvement and the emerging research suggests that challenges of technological uncertainty may require a division of intra-organizational roles.

Schiele (2010) has suggested a different type of organizational division: he found that most of firms had separated purchasing into advanced sourcing and life-cycle (or strategic) sourcing: advanced sourcing took the lead during the NPD process and life-cycle sourcing took over once a product had entered production. Advanced sourcing would typically consist of engineers or purchasers with a strong technical background while life-cycle or strategic sourcing staff would have a more commercial background. Although not focusing on technologically uncertain NPD, Schiele (2010) suggests that methods such as purchasing scouts dedicated to scanning the supply market for new and unknown components appear to be particularly relevant for technologically uncertain NPD.

2.2. Changing sourcing strategies for managing technologically uncertain NPD

The term *sourcing* is usually seen as the part of the wider purchasing process that focuses on the searching of supply markets for sources of

goods and services, including the activities of finding, selecting and contracting with suppliers (Van Weele, 2010). The term *sourcing strategy* is used in different ways but here refers to the decisions regarding the number of suppliers used for buying a particular purchase item or category, the type of supplier relationship to pursue, contract duration and type and locational sourcing decisions (Van Weele, 2010). In this paper, we are mostly concerned with decisions that concern the type of supplier relationship to pursue, as this is a key question that has been raised in connection with purchasing's role in managing supplier involvement in NPD projects with a high degree of technological uncertainty.

The ESI literature generally advocates collaboration and closeness with existing supply partners (Bonaccorsi and Lipparini, 1994; Dröge et al., 2000; Schiele, 2006) with whom they have accrued experience and trust (Cousins et al., 2006), aligned and adapted to each other's capabilities (Van Echtelt et al., 2008) and made supplier-specific investments (Song and Di Benedetto, 2008). The ESI literature also emphasizes the importance of a careful supplier selection process that pays particular attention to qualification and evaluation of supplier technical capabilities (Petersen et al., 2005; Song and Di Benedetto, 2008). In fact, Wasti and Liker (1997) and Song and Di Benedetto (2008) argue that technological uncertainty implies that even more careful supplier qualification with more emphasis on the supplier's technical capabilities is required.

However, during the last 15 years or so several studies have indicated that existing suppliers may be less important than new suppliers in conditions of technology uncertainty (Primo and Amundson, 2002; Phillips et al., 2006). Recent research on the role of suppliers in *discontinuous* innovation (i.e. discontinuing an existing technological trajectory) supports the idea that existing suppliers may be less important than new suppliers, because new complementary capabilities and technologies from outside the existing supply chain are required (Phillips et al., 2006). Whether we frame innovations involving high technological uncertainty and newness as discontinuous, radical or disruptive, a key characteristic is that these types of innovation involve a paradigm shift (Kasscieh et al., 2002) and tend to be competence-destroying (Tushman and Anderson, 1986). Logically, in order to access such new technology and knowledge new suppliers from outside the firm's usual search space (Nicholas et al., 2013), may be required as existing suppliers would be more unlikely to provide new technology or knowledge of sufficient competence-destroying newness. Research in innovation and strategy, not surprisingly, has a more established record of research into technology searching from outside the firm's usual search space, for example, focusing on breakthrough scanning (Cousins et al., 2011), exterior sourcing (Datta and Jessup, 2013), boundary-spanning and exploration (Rosenkopf and Nerkar, 2001). However, although this has, potentially, important implications for purchasing and sourcing, far less research has examined these issues from a purchasing perspective.

The need for different ways of managing innovations that involve a high degree of technological uncertainty from those that involve a low degree of technological uncertainty resembles the classic *exploration - exploitation* paradox (March, 1991). Logically, technologically uncertain NPD calls for exploration of new ideas, technologies and relationships, whereas incremental innovation requires exploitation, or reliance and reinforcement of existing technologies and relationships. This duality is often viewed as a challenge of ambidexterity, which may require a structural separation of exploration and exploitation activities that clearly divides the different tasks (Benner and Tushman, 2003; O'Reilly and Tushman, 2011). We should note here that some innovation researchers (Gibson and Birkinshaw, 2004) have argued that structural separation is not the best way forward and as it may lead to harmful isolation; instead ambidexterity should be present in the mind of each employee.

The idea of gradually developing relationships in which the most stable and mature relationships form the backbone of joint innovation

activity is consistent with most of the literature on supplier involvement in NPD and innovation (Johnsen, 2009). However, the strength of weak ties (Granovetter, 1973) and the need for 'dancing' with new potential business partners (Wilkinson and Young, 1994) are not completely novel ideas and suggest a need for exploring new potential supplier relationships instead of relying solely on exploiting existing partnerships. The importance of weak ties has also been researched in the strategy and technology transfer literature (e.g. Hansen, 1999). Likewise, studies in organizational science have explored inter-firm partnerships under conditions of different types of uncertainty. For example, Beckman et al. (2004) proposed that depending on the nature of uncertainty, firms may turn to either existing or new network partners: when facing market-level uncertainty firms tend to turn to existing partners to create additional relationships but when firms are facing firm-specific uncertainty they are likely to turn to new relationships with new partners. Nevertheless, this is rarely considered in the context of purchasing and sourcing.

3. Methodology

3.1. In-depth case study approach

This research project adopts an in-depth single case study strategy, which is motivated by the focus of the research topic on complex intra- and inter-organizational issues and an ambition to gain deep and rich explanations. Put differently, our decision to adopt a single case approach was motivated not only by the relative lack of existing theory necessitating an exploratory inductive approach but also by the ambition to gain rich and critical insights into the context and real-life challenges of how a company manages NPD projects and the involvement of the different functions and individuals involved in the process. Where multiple case studies are often advocated in some parts of the case study methods literature (e.g. Eisenhardt, 1989), we follow the alternative single case study approach advocated by Dyer and Wilkins (1991) and Dubois and Araujo (2007) that pays more attention to the context and the story than to construct development and empirical generalization.

Relying on an abductive approach (Dubois and Gadde, 2002) we seek to use a single in-depth case study approach to *elaborate* on theory (Ketokivi and Choi, 2014) within the two principal domains of purchasing and innovation. Following this approach, our case study is not guided by tightly formulated propositions but by relatively open research questions. We have no ambition to generalize from the empirical findings from a single case study but instead we aim to provide initial analytical generalization (Dubois and Araujo, 2007). Applying a moderate constructionist perspective (Järvensivu and Törnroos, 2010), we have sought to capture the perceptions of different respondents from across several company functions as well as supplier perceptions in order to uncover both local and more widely shared perceptions of reality. Therefore, although we focus on a single case study our data builds on primary data through interviews with multiple respondents both within the focal company of our study and with a supplier of new technology and secondary data in the form of company and project documentation.

3.2. Case selection

In selecting the right case study, we aimed for what Patton (1990) describes as purposeful sampling: identifying a case from which in-depth understanding and insights into purchasing's role in NPD could be gleaned. Our primary criteria were to find a company, which was a) currently working on or had very recently launched a NPD project representing a high degree of technological uncertainty and b) involving purchasing in the NPD project. Although the case study would centre on a focal company, the unit of analysis would be a specific NPD project involving the focal company and any relevant suppliers. We based our

case study selection on the results of an online survey conducted in collaboration with the Danish Purchasing & Logistics Forum (DILF), targeting 100 Danish manufacturing companies. The short questionnaire sought to explore how Danish companies involve suppliers in NPD, the role of purchasing in NPD projects including in sourcing new technology. We received 69 responses to the survey of which eight respondents indicated that their companies focused on innovation through their supplier relationships and that their purchasing functions were involved in sourcing of new technology. We contacted each of these companies, interviewing four of these face-to-face to identify which could become a potential case study. In particular, we sought to establish whether the innovations these companies were currently working on were characterized by a high degree of technological uncertainty and the nature of the purchasing function's involvement in the innovation process. A set of questions sought to critically evaluate the level of technological and market uncertainty; although the respondents had initially stated that they were working on innovations, this screening process resulted in just one company that met our criteria and was willing to give us the access we required. This access included the possibility to interview purchasing, R&D or engineering, top management and any relevant suppliers.

The in-depth case study focuses on a Scandinavian company, here called 'Alpha', which has recently developed a completely new product for its customers in the ship construction industry: an NPD project with a high degree of technological uncertainty. Forming our unit of analysis, the Alpha raft project involved the application of technology and competencies, which were completely new to the company, and the purchasing function had been involved in this process. The Alpha raft project created a sense in the company of a need to involve its purchasing function from an early stage in the development process and to collaborate internally with R&D in managing the ESI process. This forced the company to reconsider its internal processes for managing NPD projects and the traditional organizational responsibilities and roles. The project was undergoing final testing and nearing launch at the time of data collection. In sum, these project and company characteristics were an ideal fit for our research project.

3.3. Data collection and analysis

11 formal semi-structured interviews were conducted with representatives of three departments within Alpha; Strategic Purchasing & Engineering (management and strategic purchasers), R&D (management and project manager) and Marketing (management). Interviews were also carried out with Alpha top management and the supplier responsible for the technology in question (supplier key account/project responsible). Interviews took place at the company premises and we had the opportunity to visit the company on several occasions. In addition to the formal interviews we had several 'in between' meetings with our key contacts to discuss and follow up on particular themes. The list of interviews and length are depicted in Table 2.

A semi-structured interview guide was used, adapted for different

types of interviewee. We sought to understand the company context so asked questions around NPD and innovation management processes, strategy, organization, role and characteristics of the purchasing function. The main body of our questions then concerned purchasing involvement in innovation and collaboration with other functions especially R&D, sourcing strategy, supplier relationship management and supply market characteristics. We interviewed the supplier to gain its perceptions of the interaction and relationship with Alpha. We also asked a set of structured questions to evaluate the level of innovation of the Alpha Raft project, based on Garcia and Calantone (2002), and the level of purchasing maturity following Johnsen et al. (2014).

All interviews were fully transcribed, coded and categorized into themes (Miles et al., 2014). The manual open coding process (Corbin and Strauss, 2008) was initially data-driven (Ryan and Bernard, 2003) with some codes defined *a priori* and others as they emerged from the raw data (data-driven) (DeCuir-Gunby et al., 2011). The second step was to import the raw interview text into a scheme or matrix linked to each code and functional department. This part of the analysis was conducted by one of the authors singlehandedly. Hereafter the codes were categorized and consolidated into meaningful themes through a dialog between the authors. Meaningful emerging themes were e.g. "strategic sourcing and innovation", "challenges in NPD", "initial contact", "risk, trust and relationship management", and "innovation challenges in Alpha Raft project". A further step was to synthesize the clustered raw text from the interviews into shorter statements and text within each theme to gain a comprehensive overview of interviewee perceptions and the discrepancies identified. Finally, we checked for errors and aligned the authors' understanding and interpretations of the content of the themes (DeCuir-Gunby et al., 2011). Consistent with the moderate constructionist approach (Järvensivu and Törnroos, 2010), we used role-ordered matrices (Miles et al., 2014) as tools to emphasize the different constructions (or perceptions) of the different groups of respondents i.e. the main communities involved.

The results were presented at a meeting with Alpha senior management and the heads of strategic purchasing and R&D. This served as an opportunity to validate the interpretations of the findings and discuss the emerging themes and conclusions (Eisenhardt, 1989). Thus, as recommended by Järvensivu and Törnroos (2010, p. 107), we exposed our interpretations and the ideas we were generating from the case analysis for scrutiny of the communities to which the ideas were brought (i.e. in particular the R&D, purchasing and top management respondents). The fact that these supported our interpretations but also added important nuances, enhanced our confidence in the results.

4. Case study findings: the Alpha Raft project

In this section, we first introduce the background of the company to gain an understanding of the context of the case. This includes a brief introduction to how the company traditionally manages NPD projects and its purchasing organization. The contextual introduction is followed by an outline of the Alpha Raft project including what makes it

Table 2
List of formal interviews.

| Date | Title of interviewee | Length of interview |
|-----------------|---|---------------------|
| Dec. 12th 2013 | Head Strategic Purchasing | 90 min |
| Dec. 12th 2013 | Manager R&D | 90 min |
| Jan. 23rd 2014 | Head Strategic Purchasing | 30 min |
| Jan. 23rd 2014 | Research Engineer/project manager | 75 min |
| Jan. 23rd 2014 | Strategic Purchaser | 75 min |
| Jan. 23rd 2014 | Strategic Purchaser | 75 min |
| April 2nd, 2014 | Head of Marketing | 60 min |
| April 2nd, 2014 | Research Engineer/project manager | 60 min |
| April 2nd, 2014 | COO | 90 min |
| April 2nd, 2014 | International Sales Manager/supplier key account/project responsible (supplier Tango) | 75 min |
| Dec. 2nd 2014 | COO, Head of strategic Purchasing, Head of R&D follow up meeting | 90 min |

Table 3
Comparing traditional and alternative (Alpha raft) sourcing strategies.

| | Traditional sourcing strategy | Alpha Raft sourcing strategy |
|--|---|--|
| <i>Strategic purchasing involvement in NPD</i> | <ul style="list-style-type: none"> - Strategic purchasing department responsible for Engineering projects - Strategic purchasing only limited involvement in NPD after suppliers and components determined - Limited cooperation between R&D and strategic purchasing: strategic purchasing seen as a constraint | <ul style="list-style-type: none"> - R&D department responsible for NPD and Alpha Raft project - Strategic purchasing involved early in Alpha Raft project - Close cooperation between R&D and strategic purchasing: strategic purchasing seen as NPD contributor by R&D |
| <i>Sourcing process and supplier selection</i> | <ul style="list-style-type: none"> - Standardized approach based on cost/price, quality, delivery - Looking for competences inside traditional supply base | <ul style="list-style-type: none"> - Standard processes circumvented/ad hoc: technical capability, product and reliability; less cost focused - Looking for new technologies, products and competences outside traditional supply base |
| <i>Alpha-supplier relationship</i> | <ul style="list-style-type: none"> - Trust develops incrementally creating the basis for collaboration - Few functions from each side involved: narrow interface - Long-term contracts with close suppliers - Limited/unstructured ESI | <ul style="list-style-type: none"> - Basic degree of trust developed up front: collaborating despite lack of initial trust - Multiple functions involved on both sides: broad interface - No contract except non-disclosure agreement - Supplier involved much earlier than normally |

innovative. Addressing research question 1, we then compare the traditional sourcing strategy with the new sourcing strategy developed for the Alpha Raft project. Addressing research question 2, we discuss the various challenges faced by purchasing and how the company coped with these challenges. The major findings from the case study on these themes are summarized in Tables 3 and 4.

4.1. Company and market background

Founded in 1960, company Alpha is today a market leader in maritime and fire safety. Privately held and headquartered in Denmark, Alpha employs approximately 2000 employees worldwide. An important customer segment for the company is maritime safety for passenger and cargo ships. A significant product within the passenger safety market consists of self-inflatable rescue life rafts. All passenger ships are required by law to carry lifesaving rescue equipment on board in case of an emergency. Regulations demands that 75% of rescue capacity must be in the form of self-propelled lifesaving boats and 25% can be floating life rafts. In addition, regulations demand 25% rescue overcapacity, which may include life rafts. With its current product portfolio, Alpha targets 40% (50% of 125%) of passenger ship lifesaving rescue capacity.

Alpha is leader in the passenger safety market, which is undergoing a process of consolidation and becoming more competitive so creating a need for innovation. However, the market is governed by strict rules and regulation as:

“... it is the life or death of people we deal with every day” (purchasing manager)

Hence, safety is the primary market driver followed by cost and with the focus on safety and regulations the market is traditionally neither innovation nor technology driven.

4.2. Alpha purchasing and its traditional role in the NPD process

The supply market is characterized by relatively few suppliers: Alpha has approximately 300 suppliers and what it defines as partnerships, or close collaboration, with approximately 10% of these. Referring to the COO, the strategic purchasing department (internally called ‘strategic sourcing’) employs 10 people, with six in Denmark, two in Thailand and two in China. The employees in Asia are mostly tasked with finding and developing new low-cost suppliers, underlining the strong cost focus of the function. Operational purchasing and inventory management are the responsibility of the logistics department. When searching for new suppliers, Alpha imposes a traditional sourcing and supplier selection process based on price/cost, quality, delivery reliability/flexibility, and technical capability.

Alpha divides R&D and engineering into two departments. First, the engineering department is responsible for incremental cost-oriented development projects on rafts, which have already been launched, and reports to the head of strategic purchasing. Hence, the strategic purchasing department resembles what is connoted as ‘life-cycle sourcing’ by Schiele (2010). Second, NPD and innovation are traditionally the sole responsibility of R&D, which is responsible for sourcing of new technology (‘advanced sourcing’ in the terms of Schiele (2010)). Countless rules and regulations govern the NPD process, which is therefore heavily driven by frequent and stringent tests; every new development must be fully documented to persuade customers and official authorities. The current NPD process is mainly closed and surrounded by much secrecy as the company is concerned about the risk of knowledge dissipation to competitors e.g. through mutual suppliers.

Although the head of strategic purchasing is responsible for incremental cost-oriented NPD, the strategic purchasing department only becomes involved in NPD after components and suppliers have been determined by R&D. Likewise, it is still R&D that takes the major decisions on innovations and is responsible for scouting for new technologies. The purchasing department would like to be more involved, but daily operational tasks leave limited time for taking part in the NPD process. There have been attempts to develop ESI in NPD projects yet so far this has only been explored with a few suppliers and Alpha’s ESI capability is not yet very advanced.

4.3. The innovative NPD project “Alpha Raft”

In 2009 the company came up with an idea that it believed had the potential to change the rules and competitive dynamics of the market. The project was the largest innovation project in the history of Alpha and would challenge the company’s NPD project management and sourcing strategies. “The Alpha Raft” combined the best features from lifeboats and life rafts into one, doubling rescue capacity compared to traditional solutions and better able to accommodate children and disabled passengers. By increasing rescue capacity, combined with less demand for space, the Alpha Raft enabled ship-owners to better utilize space and offer a larger number of cabins with sea view: the key to charging premium prices from passengers. The Alpha Raft also increased the safety level on board, building on the core value of Alpha as “... a reliable supplier”. The product might not in itself create a new market, but had the potential for the company not only to capture market shares from current life raft competitors, but also to substitute other maritime lifesaving passenger products on board, such as traditional lifeboats. In other words, with Alpha Raft the company could potentially enter into the 60% of the market consisting of rescue boats.

The technological innovation was the ability for the Alpha Raft to self-propel and steer away from the ship through the application of

Table 4
Perceptions of purchasing challenges across different functions.

| Themes | Management | Strategic Purchasing & Engineering | R&D | Supplier Tango |
|--|---|--|---|---|
| <i>Strategic Purchasing role: lack of maturity/new competences</i> | <ul style="list-style-type: none"> - No formal purchasing role in new technology sourcing - Technical decisions still led by R&D - Purchasing responsible for cost optimizing after launch - Lack of competences for new role - Need for purchasing to integrate with/challenge R&D - Potential to increase internal collaboration - Tango identified by R&D, purchasing involved later - Same process used for sourcing innovations - No formal qualification process for Alpha raft - Tango technology far from current supply base: presenting a problem | <ul style="list-style-type: none"> - Purchasing traditionally a reactive function - New technology sourcing mainly R&D responsibility - Purchasing follows R&D's lead - Conflicts "sharpen the edge" - Internal collaboration increasing: purchasing now involved earlier | <ul style="list-style-type: none"> - Purchasing normally involved after specifications and suppliers decided - Purchasing involved earlier in Alpha Raft - Ideas for new technology mostly originate in R&D - Projects begin in R&D, but purchasing involved earlier - Purchasing and R&D jointly resolve problems with supplier - Collaboration developed bottom up and top down - Different sourcing market & process - Tango a mutual choice between purchasing & R&D - No codified procedure for new technology sourcing | <ul style="list-style-type: none"> - N/A |
| <i>Gross-functional collaboration</i> | <ul style="list-style-type: none"> - Tango identified by R&D, purchasing involved later - Same process used for sourcing innovations - No formal qualification process for Alpha raft - Tango technology far from current supply base: presenting a problem | <ul style="list-style-type: none"> - Conflicts "sharpen the edge" - Internal collaboration increasing: purchasing now involved earlier | <ul style="list-style-type: none"> - Projects begin in R&D, but purchasing involved earlier - Purchasing and R&D jointly resolve problems with supplier - Collaboration developed bottom up and top down | <ul style="list-style-type: none"> - N/A |
| <i>Accelerated sourcing: circumventing normal process</i> | <ul style="list-style-type: none"> - Same process used for sourcing innovations - No formal qualification process for Alpha raft - Tango technology far from current supply base: presenting a problem | <ul style="list-style-type: none"> - Tango process short cut of standard process - Purchasing involved from start in Alpha project but Tango was R&D's decision - Purchasing responsible for risk assessment, agreements, contracts & supplier relations | <ul style="list-style-type: none"> - Different sourcing market & process - Tango a mutual choice between purchasing & R&D - No codified procedure for new technology sourcing | <ul style="list-style-type: none"> - Initial approach by Alpha at boat show - no prior contact - Alpha very different customer from different market - Potential business with OEM seen as valuable - Tango funded 50% of first order |
| <i>Alpha-Tango relationship development leap</i> | <ul style="list-style-type: none"> - Up front trust in Tango created through Tango network references - Tango from another/adjacent supply market | <ul style="list-style-type: none"> - Tango initially sceptical - Close cooperation, but not partnership - no long-term contract - Tango seen as innovation supplier | <ul style="list-style-type: none"> - Tango traditionally operates in consumer leisure boat market: initially sceptical as no prior history | <ul style="list-style-type: none"> - Initially sceptical, double-checking market potential - Initial uncertainty, then a close cross-functional collaboration evolved (continued on next page) |
| Themes | Management | Strategic Purchasing & Engineering | R&D | Supplier Tango |
| | <ul style="list-style-type: none"> - Coordination with other new NPD suppliers | | | |

Table 4 (continued)

small electric motors adapted from an adjacent industry: leisure boats. Adapting a known technology into a new context, Alpha Raft offered a new solution: the raft could steer away from the ship and sail by own means, which was normally a traditional lifeboat capability, as traditional rafts had neither self-propelling nor steering equipment, but were designed simply to float.

Despite the overall agreement within Alpha that this project was a breakthrough for the company, there were widely diverging perceptions of its level of innovativeness. Acknowledging the market potential, R&D described it as known technology and “*still just a raft with an engine...*”. In comparison, marketing highlighted the potential to change the way that the company positioned itself in the market and indeed both top management and marketing perceived the innovation as a paradigmatic shift:

“...Alpha has not traditionally been positioned as very innovative in any way ... but this is different ... suddenly this [Alpha raft] gets a bigger life and Alpha is hooked to it ... it is a very very big thing ... and a risky business for the company” (marketing manager)

From a sourcing perspective, the most important implication of the innovativeness of the Alpha Raft project was that the project required new technology, which was unfamiliar to the company and which did not exist within its existing supply base. The company was forced to look outside the known supply base, opening up the traditional rather closed innovation process. The application of new technology also required Alpha to source for knowledge about the steering and control system of the self-propelling equipment. In other words, Alpha needed to build up internal knowledge and competences about a new technology.

4.4. Sourcing strategy for the innovative Alpha Raft project: an alternative approach required

The sourcing process for the Alpha Raft was very different from the traditional process, both when it came to identifying and engaging with potential suppliers and the role of the strategic purchasing department. In the Alpha Raft Project, the traditional sourcing process was not followed as illustrated in the following two quotes:

“The process was ad-hoc.... it didn't go through a formalized process...” (COO)

“I will characterize [the sourcing process] as a different process, as it is a very new component. It is not in the same as with hydraulic cylinders, where we have much more history and competence” (R&D engineer)

Furthermore, although the process was initially R&D controlled, R&D and strategic purchasing worked much more closely than in traditional NPD projects. As explained by the COO:

“... of course, purchasing made sure that [the supplier] wasn't a bunch of robbers and bandits, so there were many meetings with (Tango) and if purchasing didn't trust them they would undoubtedly have also raised it.

The purchasing department was involved earlier than normally but still following R&D's lead. At the beginning of the project the R&D department produced a short list of suppliers for the self-propelling part. Hereafter, strategic purchasing became involved and, together with the steering committee, they decided on a supplier: here referred to as “Tango”. The most important considerations in this decision were the product and its technical capability, the experience and reliability of the supplier, and to a lesser extent product cost. As Tango traditionally operated in the commercial small boat market and not in the B2B large ship market, there were several concerns about going ahead with Tango. Alpha needed to persuade this supplier of the market potential and quickly establish a basic level of mutual trust as the two companies had no prior knowledge of each other and their respective markets. The initial contact was very informal with Alpha contacting

the sales manager from Tango on a boat show. With no prior history with Alpha, Tango was also initially sceptical, as it needed to invest R&D resources into the potential business with Alpha, and the mismatch between Tango's high-volume consumer business and Alpha's low volume project business was a further concern for Tango.

When Alpha first introduced the idea of using the Tango technology, much secrecy surrounded the interaction. Trust from both sides needed to be developed up-front in order to proceed from the initial interactions. Tango demonstrated its initial willingness and trust by sponsoring the first order with a 50% discount and Alpha gained trust in Tango through references from other Tango customers. However, after the initial order, Tango did not hear anything from Alpha for approximately four months until suddenly Alpha resumed contact, expecting everything to speed up as Alpha was now under pressure. This was challenging for Tango as resources had by now been allocated elsewhere due to the long silence. We return to this issue in the next section.

The CEO of Tango had sufficient confidence in the business potential and decided to invest in the project. Tango's management acknowledged that engaging with an OEM required a totally different interaction pattern, which could not be achieved with their traditional one-to-one customer interaction business model. Over time Tango sales, R&D and top management began to interact with Alpha creating a much wider interface; Tango described the relationship as a partnership. In comparison, although Alpha described the relationship with Tango as good and based on mutual trust, it did not classify Tango as a partnership, as no long-term agreement has been signed; due to the relatively low volume, Alpha classified Tango classified as a ‘B supplier’.

Table 3 compares the traditional approach to sourcing in Alpha with the new emerging approach applied in the Alpha Raft project.

4.5. Purchasing challenges when implementing supplier involvement in Alpha Raft project

In seeking to become involved in the Alpha Raft project, strategic purchasing faced a number of challenges. This section therefore addresses the question of purchasing challenges, following up on themes emerging from the previous section. Table 4 illustrates the different perceptions of these challenges: although interviewees from each department did not necessarily express identical views, we did find enough consistency to group the patterns of the responses according to departments. However, we separated top management and supplier perceptions as these in many cases offered different perceptions to the functional levels of strategic purchasing and R&D.

Strategic purchasing's closer and earlier involvement in the Alpha Raft project was generally seen as positive, especially by the strategic purchasing function itself. However, R&D believed that there were not only advantages but also disadvantages of inviting strategic purchasing – and suppliers – into the NPD process at an earlier stage. R&D believed that the strategic purchasing department constrained the NPD process by increasing the time required for coordination and their frequent questioning of what R&D believed to be technically sound solutions. As stated by an R&D engineer:

“... we are now in a position where purchasing is involved much earlier than before. By involving [purchasing] earlier in NPD we have a potential for better cost optimization. However, I think that some [colleagues] find that it takes away time from projects and slows them down” (R&D engineer).

Despite the risk of delays and potential frustrations, R&D therefore recognized that involving strategic purchasing and suppliers at an earlier stage also provided an opportunity to cost-optimize the product up front. Still, technical decisions remained an R&D decision, with the purchasing department being more cost-optimization focused. One challenge for the purchasing department was the heritage of being a cost-oriented department that had to transform to a more mature innovation and value-oriented department, as described by the COO:

“Purchasing has a traditional approach, and [is] not innovation focused”.

Strategic purchasing's role in NPD remained informal which posed a challenge as there was a lack of clarity as to purchasing's specific responsibilities. However, in order to increase and formalize purchasing's role in NPD, Alpha top management believed that the new and more complex strategic purchasing responsibilities required a change in employee competence profiles: purchasing was not sufficiently mature to challenge R&D and be a competent sparring partner. Addressing this gap, the company had begun a process of employing purchasing professionals with a higher level of education, such as engineers and MBA graduates.

Scouting for new technology was the responsibility of the R&D department and, symptomatically, Tango was identified by R&D, while purchasing became involved further “down the road”. According to the strategic purchasing manager, purchasing was often seen as “*a pebble in the shoe*” from the R&D point of view. This began to change with the Alpha Raft project, as other functions (including R&D) acknowledged the positive contributions by purchasing with conflicts being perceived as “*sharpening the edge*” (strategic purchasing interviewee) instead of creating inter-organizational departmental distance. The rapprochement between the departments was both directed top down and bottom up. However, from a top management perspective purchasing was still not involved early enough, as Alpha's COO believed that a large untapped potential existed through closer internal collaboration and in breaking down functional silos and not least in challenging R&D.

Rooted in a traditional reactive sourcing and supplier selection approach, based on parameters such as cost, quality, delivery time and flexibility, purchasing was furthermore, challenged by the lack of a formalized procedure for supplier selection when engaging with suppliers of innovations characterized by technological uncertainty. Normally, Alpha would source from within the current approved supply base and potentially develop a new supplier to fulfil required needs. However, the technology required for the Alpha Raft project was completely novel to Alpha and outside the current supply base. Hence, the traditional supplier selection process including the selection metrics, which were normally used for sourcing in NPD, were circumvented due to the need for rapid decision-making. Untraditionally, Alpha top management became involved in the sourcing process of Tango, signalling the strategic significance of this sourcing decision. Cost was less prioritized than technical capability, product and reliability and, in fact, there was no formal qualification process governing the process. Purchasing believed that R&D decided unilaterally on the supplier without involving strategic purchasing, preventing it from focusing on commercial issues, risk assessment and contracting.

With only a few supply market actors Alpha categorized approximately 10% of its suppliers as partnerships based on trust and mutual dependency: these would typically constitute the relevant candidates for supplier involvement projects and Alpha would seek to nurture long-term relationships with these. Nevertheless, interviewees described the process for involving suppliers in Alpha Raft as “*ad hoc*” rather than following the standard structured supplier qualification process. In the Alpha Raft project, the process was “*on/off*”; as described earlier, Tango experienced complete silence for four to five months following the initial order, and then a sudden communication from Alpha that Tango had indeed been selected as the supplier. At this point a rush of activity ensued, leaving Tango feeling frustrated despite winning the contract. This meant that up front trust in Tango had to be created through references and a basic level of trust had to be quickly established between the two parties. There was no contract apart from an NDA so both parties had to take a leap of faith, accepting the risk involved in working with a completely new supplier:

“The decision was that it was Tango that we dared to trust in this project ... either we went with them or some smaller suppliers, and this we did

not dare” (strategic purchaser).

“... [Alpha] wanted to meet me before they would even tell me what they wanted to talk to me about ... then we had a kind of NDA. We looked into each other's' eyes and said: okay I can trust that guy, tell me what you want and I give you my opinion on that. At that moment, they introduced their idea - I thought they are crazy but I love the idea” (Tango).

The relationship was of different importance to the two parties. Where Alpha was potentially a strategic customer to Tango, which therefore invested heavily in the project, Alpha was more cautious and kept Tango at arms-length during the very early stages, unsure of the direction of the relationship. However, after the initial uncertainty Alpha decided to proceed with Tango.

5. Conclusions and implications

This paper sought to address a gap in existing research on the role and challenges of purchasing in technologically uncertain NPD. We have investigated firstly how companies may apply alternative sourcing strategies when implementing supplier involvement in NPD projects with a high degree of technological uncertainty and secondly what challenges this may impose for the purchasing function when implementing supplier involvement in NPD projects under high technological uncertainty.

We have used a single in-depth case study of a technologically uncertain NPD project within a company in the maritime safety industry based on multiple internal interviews with managers and operational personnel representing different organizational functions; these include purchasing, internally called ‘strategic sourcing’, R&D, marketing and top management. In addition, we interviewed a supplier of a new technology, which was key to the innovation in Project Alpha Raft. The case study explored how the purchasing function dealt with the challenges posed by a technologically uncertain NPD project and the implications for sourcing and supplier relationship development; interviewing people from different functions and the supplier involved enabled us to gain the different perceptions or ‘local truths’ (Järvensivu and Törnroos, 2010) that indeed turned out to differ significantly in some respects, for example, around the extent of innovation represented by the Alpha Raft project.

5.1. Propositions

The findings showed that project Alpha Raft presented a number of challenges for Alpha purchasing. One critical challenge was the need for purchasing to become involved in the NPD process much earlier than in previous projects and to collaborate more closely with the R&D function, which was usually in charge of such projects. Alpha decided to involve its strategic purchasing function much earlier than usual in this project because it realized that technology decisions, in particular technology sourcing, should not be left largely to R&D as per normal practice. But, this presented a challenge for the Alpha purchasing function as this was outside its usual comfort zone. Alpha recognized the need for it to develop competences within sourcing to enable it to better collaborate with, and understand the technical demands of, R&D.

Much purchasing literature has examined the progression of purchasing from a passive administrative function, whose primary goal is cost savings, to an integrative strategic function that aims to contribute overall competitive strategy (Reck and Long, 1988). Strategic purchasing implies that companies create value and such value is likely to stem from contributions to innovation (Lamming, 1993; Narasimhan and Das, 2001). Early purchasing involvement is one way in which purchasing can contribute to innovation but purchasing needs to have the maturity and the skills and competences to contribute effectively and perform as innovation sparring partner with R&D (Wynstra et al., 2001; Luzzini et al., 2015). Based on their survey findings, Luzzini et al.

(2015) argued that purchasing knowledge is a prerequisite for success in both supplier collaboration and strategic sourcing. Furthermore, they argue that “knowledgeable and mature purchasing professionals are likely to invest a greater portion of their time in strategic activities (such as market scouting and contracting) rather than operational and administrative ones” (p. 112). Melander and Lakemond (2015) point out that especially under conditions of technological uncertainty purchasing’s influence may be limited as highly innovative projects are likely to be enabled by R&D. In such circumstances, our case suggests that purchasing can be an effective sparring partner with R&D but requires a mature and competent purchasing function. Therefore, comparing our case study findings with the extant literature, we suggest the following proposition:

Proposition 1: *early purchasing involvement in technologically uncertain NPD projects requires a mature purchasing organization that possesses competences to interact effectively with R&D*

Related to the challenge of purchasing becoming involved early in a technologically uncertain NPD project is the need to manage what Schiele (2010) refers to as the dual challenges of advanced and lifecycle sourcing tasks. Our case provides an example of exactly such a structural division, although the advanced sourcing function in Alpha was traditionally controlled by the R&D department with little involvement of the purchasing department. Our case further illustrates how a technologically uncertain NPD project, which clearly requires advanced sourcing, made one company reflect on its advanced sourcing organization, seeking to involve its sourcing department more closely in this process if not quite allowing it to control this process. We found no evidence of a “good cop-bad-cop” role division between R&D and purchasing (Brattström and Richtnér, 2014) but our case suggests a more constructive role for purchasing (Wynstra et al., 1999) than simply policing the supplier collaboration process, although the specific role of purchasing in our case was not yet well-defined. Our case therefore provides limited guidance for formulating propositions around this challenge.

The sourcing criteria differed for the Alpha Raft project, being far less concerned with cost, and the usual supplier qualification process was circumvented due to the need for a rapid process. This appears to echo the recommendations of Wasti and Liker (1997) and Schiele (2006) that technical capabilities should dominate supplier selection criteria but in fact contradicts Song and Di Benedetto (2008) advice to ensure a more careful supplier qualification process under conditions of high technological newness. The need to prioritize technical capabilities rather than cost is well-established so in this way our case study findings confirm our expectations.

Furthermore, the case study demonstrated how a company (Alpha) decided to source from a new and unknown supplier, Tango, which belongs to a related yet very different industry, thus in line with Phillips et al. (2006) and Primo and Amundson (2002). We observed the concerns this raised within Alpha not least due to the fact that the industry is heavily driven by safety regulations, which means that any new unproven technology supplied by a new supplier presents a high level of risk. Indeed, Alpha saw a need to speed up the relationship development process it usually required before engaging in supplier collaboration. The supplier of the new technology in turn also saw this opportunity as more than simply a short-term relationship, realizing the need to adapt its practices, resources and expectations, as it was facing significant change in its business model as an outcome of the Alpha Raft project. This bears some resemblance to what Phillips et al. (2006) refer to as ‘strategic dalliance’ and Wilkinson and Young (1994) as ‘business dancing’, although in this case the ambition on both sides seemed to be to develop the relationship into a long-term collaboration rather than a short-term dalliance. But, the willingness of the two actors to circumvent the usual supplier qualification and relationship development process, taking a leap of faith, suggests a mutual willingness to accept the risk of getting together with a new potentially critical innovation

partner. This contradicts most of the extant ESI research and the idea that innovative suppliers are both close in terms of a high level of trust and physical proximity (Schiele, 2006). We therefore propose:

Proposition 2: *Involving a new supplier from a different industry in NPD projects characterized by technological uncertainty requires a leap of faith from both innovating firm and supplier*

5.2. Conceptual implications

This paper has sought to contribute to research in early supplier involvement (ESI) in NPD, in particular the thin branch within this body of literature that now focuses on early purchasing involvement (EPI) (Schiele, 2010). Existing research on ESI has largely ignored the role of purchasing yet potentially purchasing can play an important facilitating role in this process. However, as discussed earlier, there is little consensus on what this role might entail with some research suggesting a policing role (Brattström and Richtnér, 2014) whilst other research suggests a more constructive collaborative role (Wynstra et al., 1999, 2003; Schiele, 2010; Luzzini et al., 2015).

The case study of the Alpha Raft project is a case study of EPI but a project specifically characterized by technologically uncertain NPD. Although some ESI research has investigated NPD under conditions of radical technological change (e.g. Primo and Amundson, 2002; Song and Di Benedetto, 2008) little research to date has empirically investigated EPI especially under conditions of technologically uncertain NPD (e.g. Melander and Lakemond, 2014, 2015; Luzzini et al., 2015). This paper has contributed a single in-depth case study on the phenomena, gaining insights from several internal functions as well as the supplier’s perceptions.

In particular, we have focused on the sourcing process in a technologically uncertain NPD project and the challenges of interacting with a new unknown supplier. Resembling a strategic dalliance (Phillips et al., 2006), but with the potential to evolve into a long-term relationship, the case study indicated a need to circumvent the normal supplier qualification process and for the two actors to take a leap of faith rather than wait for the relationship to mature and for trust to develop slowly. We highlight here that the idea of circumventing the normal supplier qualification process contradicts the advice of other research, notably Song and Di Benedetto (2008), to ensure a more careful supplier qualification process under conditions of high technological newness. In our view, a plausible explanation for this is the need for technologically uncertain NPD projects a) to accelerate the innovation process and therefore also the mobilization of actors and b) to source new complementary technology from outside the firm’s existing supply base, developing a tactical rather than, at least initially, a strategic collaboration with a trusted existing partner. Using Sako’s (1992) trust typology, we suggest that this ties in with our observation that such collaboration requires a certain amount of initial competence and goodwill trust without first establishing the contractual trust that is normally assumed as the starting point for collaboration.

Although the exploit-explore dilemma in innovation is well-known (March, 1991) and the need to develop different routines for different types of innovation (e.g. O’Reilly and Tushman, 2011; Bessant et al., 2014), very little research to date has investigated this challenge from a purchasing perspective. Where some existing research has considered challenges related to search and selection (Rosenkopf and Nerkar, 2001), little research to date has examined what this means for the purchasing function and structure although Phillips et al. (2006) is a rare contribution that explores implications for buyer-supplier relationships yet not for the purchasing function. In fact, it seems to be the assumption in existing research that search and selection of new technology is predominantly an R&D responsibility (e.g. Rosenkopf and Nerkar, 2001). Our paper indicates that this may no longer be the case and that there are considerable benefits but also challenges of involving purchasing in the NPD process. Therefore, our paper makes a

Table 5
Contrasting Sourcing for Innovation.

| | Low Technological Uncertainty | High Technological Uncertainty |
|---|---|---|
| <i>Purchasing function</i> | Lifecycle sourcing: for products/services already in operation and/or representing low innovation | Advanced sourcing: for future products/services |
| <i>Sourcing market</i> | Purchasing responsibility Search within existing supply network: Reinforce relationships in which parties have adapted to each other and trust has been created over a long period of time Strong ties | Joint R&D and purchasing responsibility Search/scout outside existing supply network: Explore new potential relationships Explore suppliers from other industries with complementary technology Weak ties |
| <i>Supplier relationships</i> | Reinforce and develop existing suppliers e.g. through adaptation: strategic collaboration | Explore or “dance” with new partners: tactical collaboration |
| <i>Trust and commitment</i> | Long-term supplier relationships with trust, demonstrated by sharing of sensitive information | Short-term supplier relationships, limited to duration of project Limited sensitive information shared Easy to break off relationships |
| <i>Key sourcing criteria</i> | Cost, quality and delivery always critical supplier capabilities | Innovative capabilities of suppliers are particularly important; challenge of attracting suppliers with innovative capabilities |
| <i>Supplier approval as part of NPD process</i> | Existing preferred suppliers should continuously be evaluated and approved on efficiency and ESI contributions | New suppliers should circumvent the standard supplier approval process in order to fast track their involvement |

conceptual contribution to advance this agenda and we hope that our research can help to elucidate the role and challenges of purchasing in technologically uncertain NPD.

5.3. Managerial implications

From a single in-depth case study, we are not in a position to generalize major managerial implications. However, taking our findings together with the consensus from existing literature, we are confident that companies would be wise to ensure close and early involvement of purchasing (EPI) in NPD projects, working closely with R&D, especially in new technology sourcing or breakthrough scanning. In turn, this may require competence development, for example to boost the technical skills of purchasing or sourcing people.

Furthermore, we suggest organizational restructuring of the purchasing function, (Schiele, 2010) to divide purchasing into two sourcing groups: a) an advanced sourcing group, whose responsibility is primarily future technology sourcing and interaction with R&D and b) a lifecycle sourcing group, whose main responsibility is sourcing during the product lifecycle. In order to successfully capitalize from EPI projects, we firmly believe that purchasing maturation is required to ensure a purchasing function that is truly in strategic alignment with overall corporate strategy.

Inspired by Phillips et al. (2006), Schiele (2010), and Bessant et al. (2014), and our findings we propose a set of contrasting sourcing practices for different innovation contexts i.e. low technological uncertainty and high technological uncertainty (see Table 5). The need to manage these two types of innovation challenges in a different way but at the same time is also emphasized by Tidd and Bessant (2009) and suggest an ambidextrous organization that incorporates both exploration and exploitation activities (O’Reilly and Tushman, 2011) although they do not focus on purchasing or sourcing. In other words, we do not suggest that companies switch from one practice or routine to another but that they seek to develop both ways of working – as parallel routines – at the same time, as indicated in Table 5.

5.4. Limitations and future research avenues

This study has relied on a single in-depth case study to explore the involvement of purchasing in technologically uncertain NPD projects. We tried to ensure a high level of rigour and richness in our single case but we should nevertheless caution against any empirical generalization from our research (Dubois and Araujo, 2007). In addition, we were unable to achieve a balance between the amount of data from the two parties in the dyad we investigated so have relied mostly on insights from buyer (Alpha) interviews. We believe this is justified given

our focus on purchasing but recognize that more supplier interviews, for example, with supplier top management and R&D would have been beneficial.

There are several potential avenues of research that follow from this study. Our two propositions are intended to provide guidance for future research; as our research is based on a single case study we advocate further case studies and surveys to investigate these issues. Other avenues of future research concern the challenge of attracting suppliers from another industry (Song and Di Benedetto, 2008). Our case study suggested that this might not be straight-forward but future research could explore this in much more depth, ideally also by collected dyadic data from both innovating firms and suppliers. A further related avenue concerns the challenges of collaborating with an unknown supplier and the problems of applying unknown technology especially within industries in which safety regulations, like in our case, are critical e.g. aerospace. Finally, more research needs to investigate the required ambidextrous capability (O’Reilly and Tushman, 2011) to simultaneously explore and exploit in the context of purchasing and how this is related to company performance.

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