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

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\begin{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.

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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\section{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).
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 these 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 Echelt et al., 2006, 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, shorted 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 predesign 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),
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