

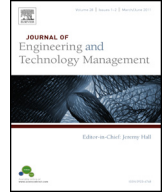


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# Uncertainty in collaborative NPD: Effects on the selection of technology and supplier



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### ABSTRACT

To gain competitive advantage, firms involve suppliers in New Product Development (NPD). However, uncertainty affects selection of suppliers and associated technologies, and selection outcomes in terms of commitment to one supplier or maintaining flexibility. We report on a case study of collaborative NPD with the aim to develop an energy storage unit. The case involved selection of both technology and supplier, where both were changed during the NPD. Drawing upon Hall et al. (2011), we analyze technological, organizational and commercial uncertainties. We demonstrate how technological, commercial and organizational uncertainties cause firms to seek flexibility rather than commitment to one supplier.

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## Introduction

As many firms choose to specialize in order to gain competitive advantages, they increasingly rely on other firms for the knowledge they need to develop, manufacture and market their products. Such complementary and specialized knowledge needs to be integrated with the knowledge of the focal firm (Grant and Baden Fuller, 2004; Johansson et al., 2011; Teece, 1986). One case in point is the increasing importance of the involvement of suppliers in New Product Development (NPD) projects. Firms strive to involve suppliers in their development projects and require that suppliers contribute their knowledge to the development process in order for the firm to get access to, and exploit, new technology. Extant literature has pointed to the advantages of involving suppliers in the development

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process (Bonaccorsi and Lipparini, 1994; Clark, 1989; Handfield et al., 1999; Petersen et al., 2003; Ragatz et al., 2002, 1997; Song and Di Benedetto, 2008; Walter, 2003) and highlights reductions in cost and time, improvement in quality and performance as some of the advantages of this involvement. In addition, having a close relationship with key suppliers has proved to be an effective way for firms to draw upon, and benefit from the capabilities of technologically advanced suppliers in developing new products (Kamath and Liker, 1994).

Studies also show mixed results on projects' speed when involving suppliers in product development (Eisenhardt and Tabrizi, 1995), where supplier involvement in predictable projects showed positive effects while no effect was shown in more uncertain projects. One explanation may be that the success of supplier involvement is contingent upon the process of evaluating and selecting the supplier for collaboration (Petersen et al., 2003). For instance, selecting a suitable supplier involves finding one with complementary knowledge, and that at the same time is easy to collaborate with, is committed and keeps promises. A challenging feature of supplier selection in NPD contexts in comparison to, for instance, manufacturing, is that the rate and direction of technological change arguably is an even more important factor. Oftentimes there are different technological designs and architectures evolving concomitantly, where suppliers may probe diverse technological trajectories. The selection of suppliers for NPD collaboration thus involves uncertainties pertaining both to the supplier as well as the technological frontier. Accordingly, we pose the following research questions: how do different types of uncertainty affect technology selection and supplier selection, respectively? How do such uncertainties influence selection outcomes, in terms of flexibility or commitment to suppliers? There is a shortage of studies focusing on how suppliers are selected for collaboration in NPD projects. In particular, previous research has not focused on different types of uncertainty in the selection phase of collaborative NPD and how such uncertainties influence the selection process and its outcomes. Therefore, the purpose of the study reported here is to analyze uncertainties in technology selection and supplier selection in collaborative NPD, more specifically aiming (a) to present a classification of different types of uncertainty, and (b) to discuss how these different types of uncertainties affect supplier selection.

In this paper, we describe and analyze the selection of both the technology and the supplier in a complex and novel NPD project in the energy sector. We present an empirical study of a collaborative NPD project that was conducted to develop an energy storage unit for integration in advanced power grid applications. In this project, the buyer faced uncertainties both when selecting the technology and the supplier. First, the buyer selected one technology and one supplier in order to establish a joint development. This collaboration was discontinued and another technology and supplier was selected, with the buying firm seeking more flexible terms. Using a classification of uncertainties developed by Hall et al. (2011), our analysis suggests that buying firms may need to seek flexibility in supplier selection in situations where technological, organizational and commercial uncertainty prevail. We discuss specific problems associated with each type of uncertainty. Technological uncertainty primarily revolves around techno-paradigmatic and complexity-related problems, in which discontinuous change and high complexity may call for flexibility. Organizational uncertainty primarily concerns problems of inter- and intra-organizational fit, where low fit may necessitate openness to flexibility rather than strong commitment to one supplier. Commercial uncertainty involves problems regarding cost, supplier appropriation, supplier migration in the value chain, and leakage conditions. Flexibility decisions may be based on: non-predictable cost developments, non-proprietary technology, a high threat of supplier migration in the value chain, and a high risk of leakage from suppliers to competitors.

The paper is structured as follows. Section 'Innovation, uncertainty, and supplier selection' reviews some of the literature on innovation, uncertainty and supplier selection. In section 'Research methodology' we describe the research methodology and design of the empirical case study. Section 'Energy storage: a case of technology and supplier selection' presents the case study of supplier selection in the development of a new battery storage unit for electrical power transmission systems. In section 'Uncertainty, supplier selection and effects on selection outcomes', we analyze the case with regard to technological, organizational and commercial uncertainty. Section 'Discussion and implications' provides conclusions and implications for management and research.

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