



**HAL**  
open science

## Exploring early purchasing involvement in discontinuous innovation: A dynamic capability perspective

Katia Picaud-Bello, Thomas Johnsen, Richard Calvi, Mihalis Giannakis

### ► To cite this version:

Katia Picaud-Bello, Thomas Johnsen, Richard Calvi, Mihalis Giannakis. Exploring early purchasing involvement in discontinuous innovation: A dynamic capability perspective. *European Journal of Purchasing and Supply Management*, 2019, 25 (4), pp.100555. <10.1016/j.pursup.2019.100555>. <hal-02380474>

**HAL Id: hal-02380474**

**<https://hal.science/hal-02380474v1>**

Submitted on 26 Nov 2019

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire HAL, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



HAL Authorization

# Exploring early purchasing involvement in discontinuous innovation: A dynamic capability perspective

Katia Picaud-Bello<sup>a,\*</sup>, Thomas Johnsen<sup>c</sup>, Richard Calvi<sup>b</sup>, Mihalis Giannakis<sup>c</sup>

<sup>a</sup> ESSCA School of Management, Angers, France

<sup>b</sup> IREGE Laboratory, Savoy Mont-Blanc University, France

<sup>c</sup> Audencia Business School, France

---

## ABSTRACT

This paper aims to address the gap concerning our knowledge about early purchasing's involvement (EPI) in new product development (NPD) projects in contexts characterized by discontinuous innovation. We adopt a dynamic capability perspective to explore how existing sourcing and supplier relationship management capabilities are adapted when purchasing agents become involved in discontinuous innovations projects. We use an embedded case-study approach to study four NPD projects in a heating, ventilation, and air conditioning (HVAC) company. The case studies are based on interviews with managers and staff from the research and development, purchasing, and marketing departments, as well as suppliers involved in the projects. Our empirical findings capture emerging purchasing practices including a "reversed" sourcing process, purchasing-marketing interaction, and the coordination of "a learning atmosphere" between the R&D department and suppliers through proactive innovation meetings and creativity workshops. We derive propositions to conduct further research into the role of the purchasing department in times of discontinuous innovation. We also provide a framework of sourcing and supplier-relationship practices that firms can use when embarking on discontinuous innovation.

---

## 1. Introduction

Increasingly, companies find themselves facing pressure to innovate. In the past, the focus of innovation efforts was usually on gradual improvements to a well-functioning recipe. However, the rate of technological and market change now offers unprecedented opportunities to develop innovations that have the potential to alter the competitive landscape. *Discontinuous innovations* are new technologies, products, or business models that represent a dramatic departure from the current state of the art in an industry (Birkinshaw, 2007). Such innovations tend to come about when a new technology is introduced to a market. In many cases, the technology already exists in an adjacent industry but is adapted to fit a new context (Bergek et al., 2013; Magnusson et al., 2003). This implies that discontinuous innovations require that firms find and form inter-organizational relationships with a range of external parties, including suppliers (Birkinshaw, 2007).

Existing research in innovation management shows that to discontinuous innovation requires the development of new capabilities within the firm and outside with other firms such as "non-linear, highly explorative and experimental organizational processes, involving probing and learning rather than targeting and developing" (Bessant et al., 2005; Lynn et al., 1996; Phillips et al., 2006b). Discontinuous innovation creates several new challenges for purchasing in relation to

searching for supplier innovation and to sourcing new technologies that may previously have fallen under the domain of research and development (R&D) management (Cousins et al., 2011; Luzzini et al., 2015; Mikkelsen and Johnsen, 2019; Schiele, 2010; Servajean-Hilst and Calvi, 2018).

If purchasing is to assume a broader role in innovation, early purchasing involvement (EPI) in NPD projects is necessary. However, such involvement requires new capabilities in the management of sourcing and supplier relationships. This premise is based on research that promotes sourcing supplier innovations outside the existing supply base (Bessant et al., 2010; Legenvre and Gualandris, 2018; Subramanian and Soh, 2017) and using short-term and experimental supplier relationships (Mikkelsen and Johnsen, 2019; Phillips et al., 2006a) as an effective response to discontinuous innovation challenge.

In practice, some companies have pioneered new organizational purchasing processes developing dynamic capabilities. For example, BMW has implemented an alternative form of EPI organization with a purchasing innovation department dedicated to the scanning of new supply markets for innovations (Schiele, 2010). Taking the dynamic capability approach, we posit that an effective involvement of purchasing in NPD in contexts characterized by discontinuous innovation may depend on the development of new supplier management capabilities that match the changing environment (Ambrosini et al., 2009;

---

\* Corresponding author.

E-mail addresses: [katia.picaud-bello@essca.fr](mailto:katia.picaud-bello@essca.fr) (K. Picaud-Bello), [tjohnsen@audencia.com](mailto:tjohnsen@audencia.com) (T. Johnsen), [richard.calvi@univ-savoie.fr](mailto:richard.calvi@univ-savoie.fr) (R. Calvi), [mgiannakis@audencia.com](mailto:mgiannakis@audencia.com) (M. Giannakis).

Bowen et al., 2001; Eisenhardt and Martin, 2000). Therefore, based on an analysis of four NPD projects under discontinuous innovation conditions, we investigate two research questions:

1. How are existing sourcing capabilities adapted for EPI in NPD projects under discontinuous innovation conditions?
2. How are existing supplier relationship management capabilities adapted for EPI in NPD under discontinuous innovation conditions?

The context of our study is a major heating, ventilation, and air conditioning (HVAC) company in Europe. For reasons of confidentiality, we call it “Anémos.” Since 2010, HVAC companies in the EU have had to comply with the Energy Performance of Buildings Directive, which imposes limitations on the use of electricity in manufacturing processes. This has driven HVAC companies to follow the development of renewable energies closely. In this context of discontinuity, Anémos has sought to approach renewable-energy suppliers to develop its first NPD project. Although the project appeared to be controlled by the Anémos project team, issues related to collaboration with the new suppliers selected emerged. In the period following this NPD project, Anémos decided to improve its purchasing management processes and practices. Some of these improvements focused on involving the purchasing department in the early stages of the NPD process.

Our findings extend prior research on purchasing involvement in NPD literature (Luzzini et al., 2015; Melander and Lakemond, 2014; Mikkelsen and Johnsen, 2019; Schiele, 2010; Servajean-Hilst and Calvi, 2018; Wynstra et al., 2003) by offering empirical evidence on how purchasing managers may adapt existing sourcing and supplier relationship management capabilities to cope with discontinuous innovation challenges. We develop two propositions to guide future research into a dynamic capability perspective of EPI. Managerially, we suggest that renewing and regenerating existing purchasing capabilities is an essential prerequisite for purchasing managers to play an effective role in this type of innovation.

The remainder of this paper is organized as follows. We first review the literature on discontinuous innovation and purchasing's involvement in NPD using a dynamic capability perspective. We then present four case studies to show how Anémos's purchasing department pursued creative and alternative sourcing and supplier-relationship practices in an attempt to actively respond to a discontinuous innovation context. Thereafter, we discuss our analysis and delineate avenues for further research based on two propositions. We also present a framework for sourcing and supplier-relationship managerial practices in the context of discontinuous innovation.

## 2. Literature review

### 2.1. NPD under discontinuous innovation

While product innovation is widely recognized as essential for organizational prosperity (Bessant et al., 2010; Brown and Eisenhardt, 1995; Griffin, 1997), the literature also acknowledges that not all product innovations are the same. Garcia and Calantone (2002) argue that “inconsistencies in labeling innovations have significantly contributed to a lack of academic advancements regarding NPD of different types of innovation” (p. 112). Many studies report that discontinuous innovations require an exploratory approach along technology and market dimensions (Bergek et al., 2013; Bessant et al., 2010; Kishna et al., 2017; Lynn et al., 1996; Phillips et al., 2006a).

In this paper, the term *NPD under discontinuous innovation* refers not only to product technology i.e., its systems and their components but extends also to the exploration of new markets and/or technologies for a company's strategy innovation (Durisin and Todorova, 2012). As illustrated in Fig. 1, discontinuous innovation is marked by high technical and/or market uncertainty, while incremental innovation is

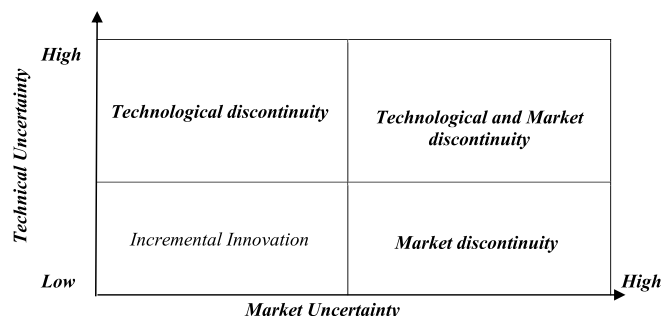


Fig. 1. Discontinuous innovation characteristics, adapted from Rice et al. (2002).

relatively rare in these circumstances (Rice et al., 2002).

The discontinuity of the market dimension implicates that there is no existing market available for such innovations (Herrmann et al., 2007; Lynn et al., 1996). This translates into the need to resolve not only technical uncertainties but also the need to address in some cases, market uncertainties. According to Rice et al. (2002), “new products based on a discontinuous innovation are often different from current products that potential customers need to be conditioned to the potential of the innovation” (p.333). In this case, product innovation requires new marketplaces to evolve, and new marketing capabilities for the firm to ensure effective management (Garcia and Calantone, 2002; Phillips et al., 2006a).

The discontinuity of the technological dimension implies adopting a completely new technology, which offers completely different functionalities. Technological discontinuity has been described by the S-curve concept, which suggests that the performance of technologies initially increases rapidly; but later drops off. New technologies that enjoy a higher potential capacity lead to discontinuity, as they force the company to move to the new technological basis (Garcia and Calantone, 2002; Herrmann et al., 2007). Under such conditions, one opportunity is the application of a new technology which already exists in an adjacent industry and might be adapted to fit a new context (Bergek et al., 2013; Magnusson et al., 2003).

### 2.2. Purchasing's involvement in NPD and innovation as a dynamic capability

Dynamic capabilities are a set of specific and identifiable processes that allow a firm to create new products and respond to changes in the competitive environment (Eisenhardt and Martin, 2000; Lawson and Samson, 2001; Teece et al., 1997). In addition, the pattern of effective dynamic capabilities depends upon market dynamism (Ambrosini et al., 2009; Eisenhardt and Martin, 2000). Dynamic capability theory suggests that firms which invest in an organizational capability which purposefully adapt or modify their strategic resources to respond to discontinuous innovations, generate a source of competitive advantage (Helfat and Peteraf, 2015; Lavie, 2006; Lawson and Samson, 2001). Thus, competitive advantage rests on firms developing dynamic capabilities as the primary engine of wealth creation, rather than the possession of physical assets (Lawson and Samson, 2001).

Anderson and Tushman (1990, 1991) argue that while technological discontinuities may be unpredictable events, firms must develop the capacity to initiate discontinuities or respond rapidly. By doing that, organizations should be able to combine technological capabilities with the ability to shape inter-organizational relationships as technology unfolds in the course of their daily activities. Bergek et al. (2013) propose the concept of “creative accumulation” defined as the process of generating new knowledge, which builds on, rather than replaces, existing knowledge. They found that incumbent firms are capable of dealing with discontinuities by acquiring new technologies and resources and integrating novel and existing knowledge into superior

products and solutions.

The role of purchasing in NPD and innovation has been identified as an essential enabler in scanning supplier markets, identifying suppliers that can become part of NPD project teams, and managing buyer-supplier relationships to ensure appropriate levels of integration and performance (Lakemond et al., 2001; Cousins et al., 2011; Servajean-Hilst and Calvi, 2018). As supplier involvement is the result of interactions between buying and supplying firms, the positive or negative influence of supplier involvement depends on the role played by the purchasing department, which is responsible for the supplier's contribution to the buying firm's processes (Wynstra et al., 2003). Burt and Soukup (1985), who identified six points in the design process at which purchasing should provide information and advice to engineering, originally made the argument that purchasing should be involved in NPD. They found that purchasing could act as a facilitator between NPD projects and suppliers' resources, especially when the focal product incorporates state-of-the-art technologies or combines technologies that have not been used together in the past. Under these conditions, purchasing can provide information about the costs, performance, availability, quality, and reliability of various components of the supplier market. R&D or engineering teams would not usually have such information, which is necessary to avoid supply problems in the NPD process.

However, empirical research has demonstrated that R&D often does not believe that purchasing could bring much value to NPD (Melander and Lakemond, 2014). The reason is that coordinating internal R&D needs and supplier resources requires dynamic processes (Lewis et al., 2010). Moreover, purchasing may also require new capabilities to adjust processes from exploitative to more exploratory managerial practices for discontinuous innovation (Gualandris et al., 2018). Therefore, it cannot be taken for granted that purchasing has the required capabilities to be involved in NPD under discontinuous innovation, which suggests a need for purchasing to develop dynamic capabilities.

### 2.3. Sourcing new technology for discontinuous innovation

Rothaermel and Alexandre (2009) suggest that, based on the degree of uncertainty, firms can search for new technologies as well as technologies with which it is already familiar. Thus, a firm's overall technology-sourcing strategy might consist of simultaneously pursuing exploration by sourcing new technologies and exploitation by sourcing known technologies. In pursuing exploration, Rohrbeck (2010) argues that sourcing practices for discontinuous innovation require technology scouting—a systematic approach in which companies assign part of their R&D staff to gather information in the fields of science and technology.

The idea of using technology scouting to explore distant sourcing opportunities is consistent with Cousins et al. (2011) argument that firms will be more successful at integrating and disseminating knowledge within NPD if they develop technical and management process capabilities to scan their environment for breakthrough technologies. They emphasize the importance of supplier-facing managers to scan for new technological knowledge from different partners. However, their research does not examine the role of purchasing in this practice, providing an opening for future research opportunities.

According to Lawson and Samson (2001), companies are encouraging, expecting and rewarding innovation from everywhere within the organization—not just R&D. Research has demonstrated that companies are aligning purchasing and marketing teams for NPD to information sharing regarding customers' preferences and suppliers' resources (Gonzalez-Zapatero et al., 2016; Matthyssens et al., 2016). Indeed, the alignment of purchasing and marketing has been seen as a dynamic process that enhances value creation and generates competitive advantage by developing capabilities difficult to imitate (Matthyssens et al., 2016). For example, strategies of “postponement” may be developed if suppliers initially provide certain product specifications, but wait to disclose others until marketing has more data on the actual

demand (Gonzalez-Zapatero et al., 2016, p. 57).

Schiele (2010) explores the question of how to organize a purchasing department to enable it to take a leading role in the sourcing of new technologies. He finds that most firms separated advanced sourcing from life-cycle sourcing. While advanced sourcing took the lead during the NPD process, life-cycle sourcing took over after a product entered production. Based on this perspective, Calvi et al. (2000) demonstrate that companies opt for a structural distinction of the purchasing department into “advanced sourcing” and “strategic sourcing”. The advanced sourcing team is integrated into all NPD projects, while the strategic sourcing team has a stronger commercial focus and is connected to internal customers. Therefore, researchers lean towards the creation of a dual role for purchasing in technology sourcing.

Investigating the dual challenges of exploration and exploitation from a wider organizational perspective, Bessant et al. (2010), Gibson and Birkinshaw (2004) and Hill and Birkinshaw (2014) suggest that innovation practices for incremental and discontinuous innovation should not be incorporated into the organizational structure, as the deployment of these practices is likely to create tension and conflict inside the organization. Instead, organizations should develop parallel organizational structures. Recently, Gualandris et al. (2018) argued that purchasing also needs to establish such “parallel structures”. Their analysis suggests that “purchasing managers may need to adjust their exploration-exploitation capabilities balance over time in order to match the dynamism of their external environment” (p. 22). However, little is known about how purchasing managers adapt existing sourcing capabilities to exploration capabilities to address the challenges of discontinuous innovation.

### 2.4. Supplier relationship management for discontinuous innovation

According to Chen et al. (2004), “purchasing can play a vital role in engendering long-term, strategic and collaborative supplier relationships by maintaining open communication and knowledge exchange between the firm and its suppliers” (p. 517). The simple acquisition of new technology from suppliers is insufficient—supplier's technological knowledge and product ideas must also be assimilated into the organization through open communication (Melander and Lakemond, 2014).

Bessant et al. (2010) argue that the rules of the game change when managing supplier relationships in NPD under discontinuous innovation, as there is a need to look in strange, “dark” areas and develop relationships with organizations from unfamiliar zones. For doing this, Birkinshaw (2007) argue that finding and forming new and effective relationships with partners, e.g., suppliers beyond the firm's industry are “best practices” to deal successfully with discontinuous innovations. Similarly, Phillips et al. (2006a) and Noke et al. (2008) propose that innovating firms should seek to develop short-term “dalliances” with suppliers located on the periphery or even outside the firm's usual supply-chain boundary. Recently, Mikkelsen and Johnsen (2019) proposed that EPI in technologically uncertain NPD necessitates a mature purchasing organization able to interact with R&D and that involving new suppliers from a different industry requires a leap of faith by both the innovating firm and suppliers. Subramanian and Soh (2017) suggest that a firm can benefit from explorative alliance experiences with both familiar and unfamiliar partners, adding that familiarity with suppliers makes it easier to involve suppliers in NPD teams, thus contradicting the idea of strategic “dalliances.” Despite these valuable insights, research on how purchasing agents manage supplier relationships with both familiar and unfamiliar suppliers in the context of discontinuous innovation remains rare.

In summary, EPI in NPD under discontinuous innovation may require new dynamic capabilities or at least significantly adapted approaches in the management of sourcing and supplier relationships. This premise is based on recent research that demonstrates that firms search for new technologies, products or ideas outside the firm's

existing industry for sources of discontinuous innovation. Although studies of sourcing and supplier relationships in the context of discontinuous innovation have progressed, little empirical research focuses on EPI in NPD characterized by discontinuous innovation. Similar to Wagner (2012), we contend that there is a need for more research that derives practical advice on how purchasing can adapt existing practices when companies embark on discontinuous innovation projects. Arguably, there are numerous implications for purchasing departments, as the role of purchasing agents in managing sourcing and supplier relationship is becoming more common and visible in firms' innovation strategies (Luzzini et al., 2015; Pihlajamaa et al., 2017).

### 3. Research design

While most research focuses on purchasing involvement in NPD, little research focuses on EPI in NPD characterized by market and technical uncertainty. Our literature review suggests new emerging managerial practices for purchasing in relation to searching for supplier innovation and to sourcing new technologies at the early stages of the NPD that may previously have fallen under the domain of R&D management (Cousins et al., 2011; Luzzini et al., 2015; Mikkelsen and Johnsen, 2019; Servejean-Hilst and Calvi, 2018). Focusing on EPI and discontinuous innovation, we, therefore, seek to elaborate on existing knowledge and theory in the field through exploring four NPD projects under technical and market uncertainty i.e., discontinuous innovation.

In practice, companies struggle to define EPI in NPD projects and the overall capabilities required to involve purchasing managers in NPD in this context remains unclear. Therefore, we adopt a dynamic capability perspective to examine empirical realities (Fisher and Aguinis, 2017) by simultaneously extending or elaborating a theory argument of the need for purchasing to adapt existing capabilities to play an effective role in NPD under discontinuous innovation (Ketokivi and Choi, 2014).

A case study is seen as appropriate for research into complex phenomena involving intra- and inter-organizational dynamics. Such a research strategy accomplishes our goal of studying EPI in NPD characterized by a complex and processual nature, and in which the unfolding discontinuous events play an important role in building explanations (Pettigrew, 1992; Van Echtelet et al., 2007). Given that the objective of the study is not to provide an empirically generalizable result, but to generate theoretical insights and propositions on EPI in discontinuous innovation, we therefore decided that the embedded case study strategy was appropriate.

We adopted an embedded case-study design based on multiple NPD projects as units of analysis within a single company. The strength of an embedded case design is that it offers the possibility to study EPI practices in-depth, on a retrospective as well as a real-time basis and to compare them within and across projects whilst focusing on a single company (Dubois and Araujo, 2007; Leonard-Barton, 1990 Silverman, 2014).

#### 3.1. Selection of embedded case studies: NPD projects in discontinuous innovation

We identified Anémos as a suitable company because it is facing NPD characterized by new market environmental pressures and new renewable-energy technology i.e., green technologies. After identifying the company, we collaborated with the company's R&D and purchasing managers to uncover appropriate cases of NPD projects. We sought to keep variables constant to permit transferability (Lincoln and Guba, 2002). Initially, discussions regarding suitable cases were based on indicators that have been used in a variety of empirical studies focused on discontinuous innovation (Bergek et al., 2013; Kishna et al., 2017; Magnusson et al., 2003; Noke et al., 2008; Phillips et al., 2006a; Rice et al., 2002). Table 1 shows how these indicators were integrated into a set of specific questions to screen NPD projects for areas of

discontinuity.

The identified NPD projects were all considered: highly innovative, new to the industry technical applications and involved potential customer demand for green technologies. A list of the NPD projects selected and their descriptions are provided in Table 2. The four NPD projects involved technologies that were not part of the firm's core competences and posed significant challenges, such as the need to access new technical knowledge from unfamiliar suppliers (Phillips et al., 2006a).

#### 3.2. Data collection

Before conducting the main case studies, we conducted eight face-to-face interviews in an automotive company. In this pilot study, we observed, for example, a structural distinction of the purchasing department into an advanced sourcing team integrated early on into NPD projects and a life-cycle sourcing team integrated into later parts of the NPD process. This pilot study helped to refine the research questions, our general understanding of the early involvement of purchasing in NPD projects, and the need for more research on this topic from other sectors.

In our main case studies, the purchasing department managed both the advanced sourcing and the life cycle sourcing at the same time. Thus, our sampling fits with our objectives of understanding how purchasing managers adapt existing practices to exploration practices given prior theorizing that purchasing may need to adjust the exploration-exploitation capabilities balance to match the dynamics of the external environment (Bessant et al., 2010; Gibson and Birkinshaw, 2004; Gualandris et al., 2018). We collected data from multiple sources. Primary sources of information included interview transcripts, factory visits, observations of business meetings, while secondary sources included companies' websites and reports and presentation materials provided by suppliers. Moreover, the validity and reliability of the research were enhanced by the use of multiple respondents in different projects, which facilitated the identification, classification, and comparison of purchasing practices and innovation results, although the focus was on a single company's strategy and organization (Dubois and Araujo, 2007).

In total, we conducted 29 face-to-face in-depth interviews across purchasing R&D and marketing departments and with suppliers involved in the four projects (see Table 2). Each interview typically lasted two to 3 h. The interviewees were identified in consultation with purchasing and R&D managers following a "snowball" approach based on their project involvement. The interviews were semi-structured and aimed at capturing the different experiences with sourcing, supplier relationships, and EPI in the four projects. An overview of the interview protocol is available in Appendix A.

All interviews were recorded and transcribed, and the transcripts were sent to the informants for verification, thereby increasing the validity of the information (Lincoln and Guba, 2002). We began the data-analysis process by labeling the main themes in the interview passages. Table 3 contains the initial list of the main themes for coding. Emerging themes were identified and a new code was created (Corbin and Strauss, 2014). The codebook used for this study was the result of two procedures: essential thematic codes and emerging codes (Fereday and Muir-Cochrane, 2006; Hsieh and Shannon, 2005). We used the NVivo 10 software to store, encode, and organize data, which allowed for effective exploration of the data.

### 4. Within and cross-case analysis

#### 4.1. Anémos, an HVAC company in Europe –a discontinuous innovation context

The European Union's Energy Performance of Buildings Directive, which was introduced in 2010, had a significant impact on the HVAC

**Table 1**  
Indicators for identifying discontinuity in NPD cases.

Dimensions	Questions/Indicators
Market discontinuity	<p>Is it an NPD project that looks for a new to the world performance features?</p> <p>Is it an NPD project that acts as a catalyst for the emergence of a new market?</p> <p>Is it an NPD project triggered by the political and economic regulatory shifts?</p> <p>Is it an NPD project that creates a whole new competitive arena?</p> <p>Does the demand exist, or it is only a potential demand –needs to be created?</p> <p>Does the product innovation create potential new product lines?</p>
Technical discontinuity	<p>Does an NPD project require to be developed on completely novel solutions? Or,</p> <p>Does an NPD project require the intersection of two technological domains?</p> <p>Is it an innovation project that looks for a new performance trajectory by defining new dimensions of performance?</p> <p>Is it a new performance curve created by redefining the existing performance parameters?</p> <p>Is it an improvement or modification of technology already in use elsewhere in your industry?</p> <p>Does the innovation contain a significantly different core technology compared to the previous product generation?</p>

**Table 2**  
Summary of project descriptions.

Project	Discontinuous project characteristics	Gate stage of project	Number of interviews/Job titles
Alpha	The development of a new hybrid-heating system by the application of an alternative technology. The ambition is to develop an HVAC product with high-energy efficiency required with the objective of new regulations. Compared to a traditional heating system, this hybrid heating system can reduce CO2 emissions by more than 70%.	Commercialized (2009)	<b>Anémos:</b> 6 interviews (R&D, Purchasing and Marketing managers; R&D and Purchasing directors)
Beta	The development of a new system through the application of a technology sensor connected to an electronic card that manages the maximum temperature in a regulating circuit that provides a constant temperature between 24 and 25°. Traditional heating of towels operates with a mechanical system, which controls the safety temperature of the device by a circuit breaker that works when the temperature reaches 50°.	Commercialized (2013)	<b>Anémos:</b> 6 interviews (R&D, Purchasing and Marketing managers; R&D and Purchasing directors) <b>Supplier Thermo:</b> 1 interview (Vice president)
Gamma	The development of an eco-design heater that is more aesthetically pleasing and slimmer than existing models. The idea was fostered in collaboration with the purchasing department and new suppliers.	Product development (2015)	<b>Anémos:</b> 7 interviews (R&D, Purchasing and Marketing managers; R&D and Purchasing directors) <b>Supplier Sierra:</b> 1 interview (Sales director)
Omega	The development of compact radiators with the objective of reducing energy consumption. The idea was a fostered for the first time in collaboration with the R&D and one supplier during workshop meetings that were organized by the purchasing department.	Concept planning (2015)	<b>Anémos:</b> 6 interviews (R&D, Purchasing and Marketing managers; R&D and Purchasing directors) <b>Supplier Ocean:</b> 2 interviews (Sales and R&D managers)

industry, as it limited the electricity that could be consumed by the heating systems commonly used by European HVAC companies. Our focal company, Anémos, has a strong manufacturing culture focused on HVAC designs and systems. Given the ambitions of various companies to develop HVAC equipment that used less energy and to develop sophisticated use of this equipment through appliances and electronics, Anémos searched for supplier innovation in the renewable-energy market.

#### 4.2. Four embedded NPD projects in Anémos

The objective of using theoretical sampling for this study was to delimit the cases by focusing on NPD projects along two dimensions: technical and market discontinuities. However, as can be seen in

Table 4, different interviewees' perceptions along discontinuities were found (Dubois and Salmi, 2016). In Fig. 2, we map the cases according to the degree of technical and market uncertainty based on interviewee perceptions (Table 4) and internal and external documents. These differences are briefly explained in the following.

**Market uncertainty** - Our findings indicate that market uncertainty in the four projects was driven by the political and economic regulatory shifts in the European HVAC industry, which imposes limitations on the use of electricity in manufacturing processes and reduces CO2 emissions. This acted as a catalyst for the emergence of a new market – renewable energy products. We considered Alpha as an NPD project with a moderate market uncertainty because it did not aim to create a new market but was the first project that aimed to respond to increasing market demand for sustainability. In contrast to the Alpha project, the

**Table 3**  
Initial list of themes for coding.

Themes	Description
Early Purchasing Involvement	Describes the involvement of the purchasing department at the ideation and/or product planning stages of the NPD process.
Purchasing cross-functional collaboration	Describes collaboration between purchasing, R&D and marketing departments at the early stages of the NPD process, e.g. sharing technical/market information, or formal/informal exchanges at the early stages of the NPD process.
Sourcing new technology	Describes how product specifications are communicated and which supplier selection (familiar/unfamiliar) is used at the early stages of the NPD process.
Supplier relationship management	Describes managerial practices used for managing supplier relationships at the early stages of the NPD process, e.g., alliances/dalliances, long-term/short-term relationships.
Technology scouting	Describes managerial practices used for searching for and assessing supplier innovations.
Purchasing communication with suppliers	Describes communication processes or managerial practices used to share technical/market uncertainty with suppliers.
Purchasing internal communication	Describes communication processes/practices used to share information between R&D and marketing departments from buyer and supplier organizations.

**Table 4**  
Overview of different interviewees' perceptions on project uncertainties.

Cases	R&D director	R&D manager	Purchasing director	Purchasing manager	Marketing manager	Supplier
Gamma	"A highly innovative project involving a paradigmatic shift and revolutionary product. It required transferring a new material which was unfamiliar to the company."	"Even before saying at what price, is there going to be material between our markets, our customers and our technologies? We know nothing about it"	"A radical innovation with different technical solutions, adaptations, and architectures. It is a possibility that there would not be a final product at the end of this project, but it was a learning process for the purchasing department to bring new solutions"	"Traditional water-heater products are placed in the garages; these new products can be placed in the living home which is a revolution in the world of water-heaters"	"The idea of this NPD project exists in the market, but it has never been commercialized before"	"Sierra engineers provided our extrusion process which is a different material transformation; so, it was already an innovation for Anémos, not for us, this is our business"
Alpha	"New technological solution and new supplier collaboration" "The new supplier had a great expertise in heat pump, but in another sector"	"Major technology because market change has brought about a complete change in product and the dimensioning of components"	"There was an uncertainty in the R&D department because for R&D managers and technologists the new renewable-energy market required completely new technological solutions and a more active collaboration with unfamiliar suppliers"	"Heat pump was a new trade; no one in the company knew how to work on it"	"Sustainable comfort is now a strategic line of development for Anémos to make the new European directive comprehensible for our partners and end-users"	According to the purchasing director: "The supplier had limited experience in the water-heating industry"
Beta	"This project was very different from traditional projects because it concerned a new product range and the triple heating system application was new to the industry"	"Thermo provided us the new system application, we only adapt this system into the tower dryers"	"The triple heating system was unfamiliar to Anémos, therefore it required supplier's expertise in the application of this new system into the product configuration"	"The technical process operates by the supplier was close enough to our products"	"It is a product that did not exist before. Today we are the only one still doing it. But, Anémos face a challenge to communicate this product to customers"	"For us, it was not a discontinuous innovation, Thermo just transferred the technology and its application knowledge, but I think for Anémos it was a kind of different marketing approach"
Omega	"Potential radical innovation, the project may improve the performance of a heating element to 15%, to save energy by providing homogeneous electric power"	"The difficulty of this project is that we work with a supplier who provides its expertise on a heating element. So, the idea is to work together on the characteristics of this element. But the interest of this project is visible on another component that does not exist."	"We had selected two suppliers to participate in this project, but one supplier refused to work in an innovation project with high technical uncertainty" "Moreover, the idea to work in a product idea that can come from its resources was not favorable for the supplier"	"There was an uncertainty for Ocean because it was the first time that both companies Ocean and Anémos work together at the ideation process for an NPD project"	"New product lines for the renewable energy market"	"The uncertainty of this project is for Ocean to have a general vision of the concept design of radiators"

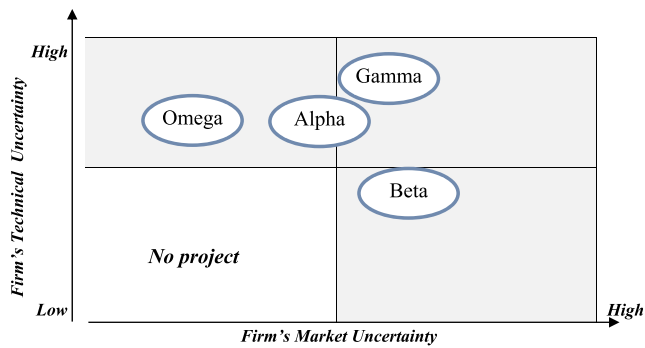


Fig. 2. Four NPD under discontinuous innovation conditions at Anémos.

market uncertainty in Beta was considered high because this project aimed to create market demand. The idea for Beta came from top management who were confident in the business potential to develop a product that replaces the traditional heating of towels for a premium product range. However, Beta was based simply on a potential demand – so needs have to be created. According to the marketing department. *“Anémos needs to improve the identification of the customers’ needs and how these new products create new value to customers in terms of product features, not only technology.”*

Similar to Beta, Gamma was placed in Fig. 2 as an NPD project characterized by high market uncertainty because both the R&D and purchasing departments described Gamma as a revolution in the world of water-heaters. Although marketing managers do not describe the project as a revolutionary NPD, they confirm that there was a market uncertainty at the company level because the product had never been commercialized in the HVAC industry. The Omega project was triggered by the same objectives of the Alpha project but started five years later than the Alpha project. This means that the project was based on current demands and an extension of the new product lines already defined – renewable energy products. Hence, market uncertainty in the Omega project was lower than the other three projects.

**Technical uncertainty-** Our findings show that the four NPD projects were developed in completely novel solutions. We considered Alpha as an NPD project with high technical uncertainties because of the lack of clear product specifications, the ambitious targets for new product design, and a desire for completely new technological solutions or previously unproven technological solutions. In contrast, we identified that most interviewees described Beta as an NPD project with lower technical uncertainty than Alpha. Although Beta required developing new technical solutions, this novelty affected only one part of the product system. This was not a case of improvement or modification of a technology already in use elsewhere in the HVAC industry; a technology already in use from a familiar supplier was transferred. Therefore, the R&D and purchasing departments perceived the technical uncertainty as low.

Our data indicate that the Gamma project was perceived as an NPD project with the highest level of technical uncertainty. Involving new technological solutions, the project was initially fostered by an unfamiliar supplier who provided the prototype and transferred its technical process knowledge. This also required transferring of a new material processing capability which was unfamiliar to the Anémos R&D managers and meant that Anémos might switch from 40 years of manufacturing heaters using aluminum to now using plastic. Similar to Alpha, Omega was developed with the ambition to develop HVAC equipment that used less energy – triggered by environmental challenges. Both projects developed completely novel solutions and involved suppliers from other sectors, having limited knowledge about Anémos’s product configuration.

Based on these characteristics and differences between the four

projects, the cross-case analysis is summarized in Appendix B. In the following, we report the findings concerning the two research questions.

#### 4.3. Sourcing new technology for discontinuous innovation

During the interviews, we collected data about sourcing practices for each of the four projects. Based on Table 3, two initial sourcing practices were coded: “sourcing new technology” and “technology scouting”. These initial codes generated emerging codes, such as “scanning supplier market”, “scanning supplier base”, “supplier day”, “unfamiliar suppliers” and so on. Then, we categorized these into two managerial processes: a “traditional sourcing process” and a new sourcing process characterized internally in Anémos as a “reversed sourcing process”. The purchasing director of Anémos broadly described the two processes:

*“I think about the sourcing of new technologies, there are two different approaches; there is a first sourcing approach that focus on the new specifications provided by R&D and the other sourcing .... is a simple informal exchange with the supplier initially”*

**Traditional sourcing process.** In the Alpha project, the decision to search for suppliers outside the supply base was fostered by the R&D department. As Anémos’s R&D department did not have a significant amount of knowledge about renewable energy at the time of the Alpha project’s development, it was forced to search for new technologies not only outside the company but also outside its own industry and supply base. The purchasing department was asked to support the R&D department in the search for suppliers and in the supplier selection process. Therefore, the sourcing process started with the provision of technical specifications to suppliers driven by the R&D department. According to the purchasing manager, the R&D department found it challenging to communicate the specifications to suppliers due to the internal technical uncertainty and external confidentiality issues:

*“The project involved a new technological solution for Anémos’s R&D, and the way of handling the communication with suppliers in this context was also new.”*

The decision to select a supplier outside the existing supply base in the Alpha project was due to the lack of suppliers within the existing supply base with access to the technology the R&D department required. Our interviews with representatives from the purchasing department revealed that they realized that the traditional sourcing process was wrong for the Alpha project. In particular, the contract signed with the unfamiliar supplier focused on a specific technology component and knowledge but did not cover collaboration or support for the NPD’s product specifications. According to the purchasing manager and the R&D manager:

*“The wrong choices or the bad decisions we made in the Alpha project were related to sourcing and supplier collaboration, [which meant] that we could not continue working with the supplier on other innovations. If we had focused on EPI, perhaps we would not be in a failure situation with this supplier.”* (Purchasing manager)

*“Absolutely, and we might have been able to start up on complementary innovations with this supplier.”* (R&D manager)

The sourcing in the Beta project was similar to the Alpha project. However, in this case, the presence of a competent supplier—Thermo—in the supply base was particularly helpful for the purchasing department. More specifically, the purchasing and R&D departments attended trade exhibitions to identify suppliers outside the supply base. After scanning the supplier market, Anémos had located two suppliers that could support the project. One was an unfamiliar

supplier with which Anémos had no previous experience. This supplier was well versed in the application of the new technology. However, Anémos selected Thermo, with which it was already familiar. Given this familiarity, the purchasing department did not need to ask Thermo to participate in the supplier-approval process. According to the purchasing manager involved in Beta:

“Anémos has not yet developed a strategy for unfamiliar suppliers. Therefore, it is difficult to take the risk—we do not trust suppliers before the supplier-approval process. We are afraid that new suppliers will take our know-how or technical expertise”.

In the period after the Alpha and Beta projects were introduced to the market, attempts were made to improve supplier collaboration in Anémos's NPD projects. A key part of these improvements was the early involvement of the purchasing department.

*Reversed sourcing process.* Sourcing practices in Gamma and Omega were completely different from those in Alpha and Beta (see [Appendix B](#)). In the Gamma project, instead of providing technical specifications to suppliers, the purchasing manager asked suppliers to propose new technological solutions or ideas for Anémos's products. Therefore, the sourcing process for the Gamma project differed from the traditional process, according to the purchasing manager: Anémos was undertaking a new and reversed sourcing process.

Asking suppliers to propose new technological solutions for product ideas was neither precise nor clear, and the purchasing department received many propositions, which were difficult to coordinate. The purchasing department decided to contact the marketing department in order to ask about the most important areas or themes for product innovations. After several discussions with marketing, the purchasing manager met with suppliers again to ask them to improve certain aspects of Anémos's products based on customer expectations. Thus, a number of suppliers provided the concept designs and technical solutions for the Gamma project. The purchasing department organized a supplier day, which consisted of presentations by suppliers to show what they had done to support the project's development, and to propose different designs and solutions. On the Anémos side, representatives from the marketing, R&D, and purchasing departments listened to the supplier's propositions. For the first time, the marketing department participated in the supplier selection process.

Together with representatives of other departments, purchasing representatives decided to select one supplier—“Sierra”. Although an unfamiliar supplier to R&D and marketing departments, Sierra was a supplier with which one purchasing manager had previous experience:

“Sierra is a known supplier for me. I encountered it in my prior work in other companies. Actually, I have known Sierra well for a long time”.

For the Omega project, the marketing department's involvement in the sourcing process was limited to communicating customer expectations to a set of selected suppliers from the supply base. The sourcing process in this project started with the identification of innovative suppliers from the supply base. Companies were included in the set of pre-selected suppliers after Anémos evaluated their technical expertise, R&D resources, and historical collaboration with Anémos. Those suppliers were asked to share information on their know-how, technical capabilities, and research. For this purpose, the purchasing department together with the R&D and marketing departments provided the pre-selected suppliers with a presentation on Anémos's customer expectations and the HVAC technological trends.

In summary, we found that the technical and market uncertainty across the four NPD projects pushed Anémos to re-think existing sourcing practices and organization. Our findings show that Anémos explored alternative green technologies in another supplier market. This increased the technical uncertainty of Alpha, Gamma and Omega and

suppliers being unfamiliar with the new HVAC product configurations. We identified few adaptations to existing sourcing practices for the Beta project, which involved a familiar supplier. However, we did find a similar pattern across the four case studies – discontinuous innovation often required the early involvement of purchasing managers in NPD to manage the exploration of supplier technical knowledge. The EPI organization in Gamma and Omega required that purchasing managers generate a new sourcing process, called reversed sourcing, which consisted of supplier presentations, technical and market information sharing or simple, informal exchanges between suppliers and across Anémos departments prior to suppliers becoming involved.

#### 4.4. *Supplier relationship management for discontinuous innovation*

In the Alpha and Beta projects, R&D interacted with suppliers to provide technical specifications. The role of purchasing in both cases was to assist R&D with supplier selection and contracting. Therefore, purchasing was not involved at the point in time when the technologies available in the supplier market were analyzed. Instead, it was brought in when a supplier needed to be involved. In other words, purchasing was not the main source of information in the Alpha and Beta projects about the suppliers' technological knowledge.

In contrast, in the Gamma and Omega projects, the purchasing department was involved earlier playing an active role by coordinating supplier presentations, setting up pro-active innovation meetings, and holding creativity workshops. The uncertainty of the technology and the lack of product specifications in both projects required continual sharing of information with suppliers. Our findings show that communication practices that went beyond the project were developed in the Gamma and Omega cases. This suggests that a number of the supplier-collaboration problems highlighted in connection with the Alpha project can be attributed to the inefficiency or absence of such practices. As the purchasing director stated:

“After some proactive innovation meetings, we realized that we have suppliers that we worked with 15 years ago. They do not even know our products or what is going on in the HVAC industry. This is extraordinary—we must do something. We should get closer to them.”

As a result of this observation, the purchasing director set new objectives for purchasing managers, such as identifying suppliers with strong technical capabilities and research expertise in NPD to be involved in the early stages of Anémos NPD projects. Anémos acknowledged that engaging in co-innovation in the early stages of NPD required completely different patterns of interaction and communication. As shown in the cross-case analysis in [Appendix B](#), supplier relationship management efforts were evident in the Gamma and Omega projects. Two pro-active innovation meetings served to promote supplier technological knowledge exchange in Anémos.

One innovation meeting held in the Gamma project consisted of supplier presentations on product propositions. This meeting offered an opportunity to discover new suppliers that had previously supplied specific components to Anémos but had never been involved in collaborative projects. Another innovation meeting was held in Omega. That meeting convinced a former supplier—Ocean—to work on a collaborative innovation project with Anémos. The purchasing manager involved in this project organized creativity workshops between Ocean's engineers and Anémos's engineers to evaluate new product ideas. Ocean was a competent and innovative supplier that had previously been involved in a supplier relationship with Anémos, but the relationship had broken down years previously. Ocean's engineer said:

“It seems that there were uncertainties in the Anémos organization about how to handle Ocean as a supplier ... Anémos's new internal

organization and communication interface vis à vis key suppliers are now clearer.”

Creativity workshops were run with the aim of developing incremental and radical product innovations. In the Omega project, the challenge was to provide Ocean with a general vision of the concept design of radiators. According to the R&D department in the Omega project, this creativity workshop can generate a source of competitive advantage as they state:

“Suppliers before proposed existing technologies because they did not want to take risks sharing new technologies and ideas. With these innovation meetings and creativity workshops, suppliers are more confidence to share them because technical and market goals, as well as intellectual property issues, are set before the NPD project. This is good for Anémos because it means that we are in advance regarding new technological knowledge and solutions from suppliers.”

However, Ocean described that this creativity meeting can be translated to an opportunistic collaboration if customers are not able to be open, to have clear discussions, and to communicate regularly, especially if customers want suppliers to believe in their collaborative NPD projects and be engaged.

In summary, we identified new supplier relationship management practices developed in two projects –Gamma and Omega. We found that the lack or inefficiency to adapt existing supplier relationship management practices in Alpha was the source of various supplier collaboration issues. For instance, although Alpha and Gamma projects involved suppliers from other sectors, supplier collaboration in Gamma started by a mutual interest and common agreements, increasing information sharing and reducing market and technical uncertainties. We identified that market and/or technical uncertainty of NPD projects required either adapting communication practices or re-building relationship with existing suppliers.

## 5. Discussion and contributions

### 5.1. How are existing sourcing capabilities adapted for EPI in NPD projects under discontinuous innovation conditions?

In answering the first research question, our findings indicate that Anémos developed two sourcing processes across the four projects: a traditional sourcing process and a new sourcing process. The cross-case analysis presented here identified the use of new practices for EPI in Gamma and Omega, which were different from the sourcing practices used in the Alpha and Beta cases. This revealed different levels of adaptation of existing sourcing practices.

In the dynamic capability theory, studies demonstrate that managerial perceptions of discontinuities in the external environment trigger the use of different levels of adaptation of existing capabilities (Ambrosini et al., 2009; Helfat and Peteraf, 2015). This was evident in our empirical findings where R&D managers argue that traditional sourcing practices were used in Alpha because the level of technical uncertainty was perceived as low. In comparison, purchasing managers argue that new sourcing practices would be used because the application of a new technology “heat pump” provided by an unfamiliar supplier increased the level of technical uncertainty. This finding extends the study of Rothaermel and Alexandre (2009) by providing a purchasing perspective of two sourcing processes: one is the traditional sourcing of new technology with technical specifications defined by the R&D department and another sourcing process focused on exploration of supplier markets performed by the purchasing department.

Building on a dynamic capability perspective, our case studies suggest the development of two dynamic sourcing capabilities for EPI in discontinuous innovation. One is the *renewing* dynamic capabilities which concerned adapting or modifying processes to introduce new

resources or combined them in new ways (Ambrosini et al., 2009 p. 15). For example, in the three projects Beta, Gamma and Omega, existing sourcing practices were adapted by involving purchasing early in the NPD process for searching new technology, in a similar process to Mikkelsen and Johnsen (2019). Likewise, we also found that the sourcing process was adapted by purchasing in searching for new technologies, products and competences outside the traditional supply base or what Cousins (2011) and Rohrbeck (2010) described as a technology scout role.

The second type of dynamic capability for EPI in discontinuous innovation is the *regenerative* dynamic capabilities that allow the firm to move away from previous change practices towards new dynamic capabilities (Ambrosini et al., 2009; Helfat and Peteraf, 2015). This was a striking finding because little research has captured the role of EPI in NPD projects characterized by both technical and market uncertainties. In particular, our findings suggest that purchasing managers can also move away from previously adapted purchasing practices by generating new sourcing capabilities in situations of technical and market uncertainty. Our findings extend Melander and Lakemond (2014) and Mikkelsen and Johnsen (2019) by describing how purchasing interact closely with the marketing function and develop an innovative reversed sourcing method. For instance, in Gamma and Omega projects, existing sourcing practices were not merely adapted by EPI but new sourcing practices were developed as presented in Appendix B. Anémos referred to this as “reversed”—instead of providing technical specifications to suppliers, technical specifications, or solutions, were provided by a number of suppliers. This reversed sourcing process required not only searching for new technologies from the supplier market but also searching for unknown technology by scanning for supplier innovations. This leads to our first proposition:

**P1.** Early involvement in NPD projects requires that purchasing managers both renew existing sourcing capabilities and generate new sourcing capabilities to respond effectively to discontinuous innovation conditions.

### 5.2. How are existing supplier relationship management capabilities adapted for EPI in NPD under discontinuous innovation?

Our findings indicate that NPD characterized by a discontinuous innovation context requires the adaptation of certain supplier relationship management practices. For instance, the Gamma and Omega projects illustrate a proactive purchasing department able to adapt existing communication practices for improving supplier collaboration early in the NPD process. Purchasing managers during interviews realized some supplier collaboration problems in Alpha could be partially attributed to the inefficiency of adapting existing communication practices. As mentioned earlier, the R&D department faced the challenge of asking unfamiliar suppliers to provide technical solutions where before they used to provide specific technical specifications to suppliers. This is the classic example of adaptation from a parent/teacher role to child/pupil role which requires completely new ways of communication focused on learning from suppliers for NPD under high technical uncertainty (Lane and Lubatkin, 1998; Lewis et al., 2010; Saenz et al., 2014).

In the Gamma and Omega cases, purchasing managers' efforts to reduce dissimilarity through establishing and communicating cultural, technological, and market goals during proactive innovation meetings during the early stages of the NPD projects were evident. Arguably, the role of purchasing managers consisted of facilitating exploration, communication and integration of technical knowledge exchanges between Anémos R&D department and suppliers (Pihlajamaa and KaipiaSäiläTanskanen, 2017) by creating a “learning atmosphere” through proactive innovation meetings. In our cases, two proactive innovation meetings were coordinated by purchasing as the basis for adaptation of existing supplier relationship management from targeting and developing supplier relationship to probing and learning supplier

relationship (Bessant et al., 2005; Phillips et al., 2006b). This practice is consistent with what Schiele (2010) defines as supportive tools used by the purchasing department to develop technological ideas with suppliers and to assist in the firm's innovation process.

The first proactive innovation meetings served to promote internal supplier technical exchange. In the Gamma case which involved an unfamiliar supplier, proactive innovation meeting consisted of supplier presentations on NPD propositions. The case study indicates that purchasing managers face several challenges in introducing new supplier proposition. For example, promoting supplier ideas and concept design proposals, required purchasing managers to move beyond their "zone of comfort" (Phillips et al., 2006b) or, beyond "the steady state" (Bessant et al., 2005). It is described by a new dynamic process that involved interactions with the marketing department to understand supplier proposals and potential customers' expectations (Gonzalez-Zapatero et al., 2016; Matthyssens et al., 2016).

In Omega, a similar meeting convinced a former supplier to work on an NPD project under discontinuous innovation conditions even though the relationship had broken down several years earlier. The objective of this meeting was convincing innovative familiar suppliers to participate in open discussions with representatives of the R&D department. The planning of these meetings involved the early identification of innovative suppliers, evaluating their motivations and willingness to participate. Thus, supplier selection was not only less-cost focused as observed by Mikkelsen and Johnsen (2019), but also took into consideration criteria such as supplier R&D capability, motivation and collaboration that were evaluated by matching technical and market objectives. To convince engineers from suppliers and engineers from Anémos to participate actively in technical knowledge discussions, purchasing managers prepared new confidentiality agreements to protect technical knowledge before starting the development of NPD projects.

The second proactive innovation meetings were in the form of creativity workshops organized by the purchasing department to meet innovative suppliers selected, relying on R&D to appraise NPD project ideas. Through these workshops purchasing managers contributed to R&D by acquiring advanced products and technologies from supplier markets; by facilitating emerging technology sourcing and by combining technological capabilities with the ability to shape inter-organizational relationships for discontinuous innovations. (Anderson and Tushman, 1990, 1991; Bergek et al., 2013; Lewis et al., 2010). This leads to our second proposition:

**P2** Early involvement in NPD projects requires purchasing managers to adapt existing communication practices for renewing supplier relationship with familiar suppliers and generating new supplier relationship with unfamiliar suppliers for discontinuous innovations.

In summary, our propositions focus on renewing and generating new purchasing capabilities for EPI in NPD under high market and technology uncertainty conditions. Our propositions do not apply in conditions of low market and technology uncertainty because established technologies are well-known. In this case, R&D may be better placed to manage the searching and the communication of technical specifications to suppliers. Our first proposition extends the study of Rothaermel and Alexandre (2009) and Cousins et al. (2011) by providing a purchasing perspective of two sourcing processes: one is the sourcing of new technology where the R&D department defines specifications and another is the sourcing of unknown technologies where suppliers provide specifications. Although two sourcing processes were identified in our study, there was no evidence of any structural division within the purchasing department to pursue dual sourcing practices for continuous and discontinuous innovations (Calvi, 2000; Mikkelsen and Johnsen, 2019; Schiele, 2010).

Our second proposition extends the study of Schiele (2010) and Pihlajamaa et al. (2017) by illustrating how proactive innovation meetings can create a "learning atmosphere." Organized by purchasing managers, these meetings were shown to facilitate exploration,

communication and integration of technical knowledge exchanges between R&D and suppliers. This way, purchasing becomes a go-between actor in the relationship between R&D and suppliers. Existing research adopting a dynamic capability perspective of purchasing involvement in NPD has concentrated on supplier capability issues, such as finding and selecting effective supplier capabilities for NPD (Burt and Soukup, 1985; Le Dain et al., 2011; Van Echtelt et al., 2007). Focusing on uncovering buyer capabilities, most studies on EPI have taken a transaction cost and governance perspective (Melander and Lakemond, 2014), with the exception of Cousins et al. (2011), Luzzini et al. (2015) and Mikkelsen and Johnsen (2019) that suggest new capabilities for purchasing to play an effective role in NPD under technological uncertainty. Our propositions extend this line of research by providing empirical findings on why and how purchasing managers may need to renew existing capabilities and generate new capabilities to respond to discontinuous innovation challenges.

### 5.3. Theoretical and managerial contributions

Previous studies suggest that when managing NPD under conditions of discontinuous innovation, firms must adapt their existing capabilities (Bergek et al., 2013; Bessant et al., 2010; Birkinshaw, 2007; Durisin and Todorova, 2012; Kishna et al., 2017; Phillips et al., 2006b). Research within purchasing has found no relationship between product complexity and the involvement of the purchasing function (Lakemond et al., 2001; Van Echtelt et al., 2007). Research to date has not analyzed how purchasing capabilities are adapted in the case of discontinuous innovation, where complexity may also be studied by the different perceptions from other functions involved in the NPD (Glock and Hochrein, 2011).

Our findings indicate that renewing and generating new purchasing capabilities is a critical prerequisite for purchasing to cope with NPD characterized by discontinuous innovation conditions. Cross-functional communication between purchasing and marketing departments can facilitate the adaptation of existing supplier selection and assessment practices during the NPD ideation stage (Gonzalez-Zapatero et al., 2016; Matthyssens et al., 2016). Contrary to prior studies, notably Van Echtelt (2007) and Melander and Lakemond (2014), that indicate purchasing has limited influence on technology selection for NPD, our cases indicate that purchasing involved in the NPD ideation stage can influence technology selection by asking suppliers to propose product solutions based on potential customer expectations from marketing.

Based on our findings and propositions, we propose an initial managerial framework of EPI practices that can be used by consultants, project managers, and purchasing managers in contexts of discontinuous innovation (Table 5). Although several best-practice frameworks define the rules of the game with respect to purchasing's involvement in NPD projects, even the best firm can fail when the focus moves from continuous innovation to discontinuous innovation. Therefore, we offer a framework of EPI in NPD projects that managers can use to evaluate existing purchasing practices and guide the implementation of new (parallel) purchasing practices in contexts of discontinuous innovation.

As can be seen in Table 5, we suggest that EPI in NPD under discontinuous innovation may require adapting and generating new sourcing and supplier relationship management capabilities. In continuous innovation, it is best practice to manage sourcing and supplier relationships based on R&D technical requirements and supplier cost propositions. In contrast, in discontinuous innovation, sourcing and supplier relationships require open communication based on emergent customer demands and technical solutions from suppliers, framed by confidentiality agreements and led by the purchasing department. We have developed a more detailed framework to identify appropriate EPI practices for managing NPD projects under discontinuous innovations.

**Table 5**  
Managerial framework for EPI practices in NPD under discontinuous innovation contexts.

		Managerial practices
Revised sourcing capabilities for discontinuous innovation	<i>Adapt existing sourcing capabilities</i>	<ul style="list-style-type: none"> <li>● Understand R&amp;D needs</li> <li>● Attend trade exhibitions with R&amp;D</li> <li>● Scan supplier technical knowledge</li> <li>● Select suppliers with strong technical capability and R&amp;D resources</li> <li>● Assess intellectual property</li> <li>● Understand potential market needs</li> <li>● Gather information on potential customer expectations from marketing</li> <li>● Ask suppliers to bring new product ideas or technological solutions based on potential customer expectations in an experimental way</li> <li>● Coordinate supplier ideas and product planning propositions with R&amp;D and Marketing functions</li> </ul>
	<i>Generate new sourcing capabilities</i>	
Revised supplier relationships for discontinuous innovation	<i>Adapt existing communication with suppliers</i>	
	<i>Generate new supplier-relationship practices</i>	

## 6. Conclusion

Our study addressed the lack of research on how purchasing, when involved early in NPD projects, can adapt existing sourcing and supplier relationship management practices to actively respond to discontinuous innovation. Our analysis of four embedded NPD projects provides rich insights into purchasing's role in NPD projects in contexts involving discontinuous innovation. In each case, we were able to capture the various sourcing and supplier relationship management practices developed by purchasing agents in their attempts to respond to the discontinuous environment.

Our case study findings give insights into both cross-functional and supplier perceptions of purchasing's early involvement in discontinuous innovation, specifically those from R&D, purchasing and marketing departments. Prior studies have reported that R&D often does not believe that purchasing could bring much value to NPD under technological uncertainty (Melander and Lakemond, 2014). Our findings suggest that this may be due to the perception of R&D that purchasing managers need to first develop dynamic capabilities (Atuahene-Gima, 1995).

We have sought to conceptually advance the existing research on

### Appendix C. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.pursup.2019.100555>.

### Appendix A. Interview protocol

I would like to discuss with you regarding your experience in the innovation project X (Alpha, Beta, Gamma or Omega).

#### Early Purchasing Involvement

Could you please describe your involvement in this project?  
Has the purchasing department involved in this project? When? Why?

#### Sourcing practices

How would you describe the sourcing process for this project?  
Did you use contract? How are IP issues handled?  
Do you explore new supplier markets? For example, attend new trade exhibitions, research or special conferences.  
How do you keep track of technology trends?  
Is there a methodology of correlating the technology roadmap of your company with those of suppliers? If so, how?  
Did purchasing and R&D departments work together in this process? If so, please tell me about their role and responsibilities face to new

the role of EPI in discontinuous innovation. Building on a dynamic capabilities perspective, we developed two propositions to elaborate theory and guide further research into EPI in NPD. Our propositions extend prior research on purchasing involvement in NPD literature (Melander and Lakemond, 2014; Mikkelsen and Johnsen, 2019; Schiele, 2010; Servajean-Hilst and Calvi, 2018; Wynstra et al., 2003) by arguing that renewing and regenerating existing purchasing capabilities is an important prerequisite for purchasing managers to play an effective role in this type of innovation.

The case-study method was appropriate, as it allowed for flexibility in terms of the scope and aim of the study over time. However, a common critique of this method is its limitation in terms of generalizability. We did not set out to provide empirically generalizable results, but to provide rich empirical insights into the role of EPI in discontinuous innovation and on this basis develop theoretical propositions to elaborate existing theory and guide future research. We suggest that future research focus on the role of purchasing managers at the individual level e.g., by exploring the factors influencing the choice between adapting or generating new sourcing and supplier relationship management practices for discontinuous innovation.

suppliers.

Could you describe your responsibilities and goals together with the department of R&D for achieving innovation opportunities from suppliers?  
Who were involved in the selection/evaluation of suppliers?

*Supplier relationship management*

Could you please describe the supplier relationship in this project?

How would you describe the negotiations that you used to convince new suppliers to collaborate in the development of this project?

How open can you be with the supplier? Sharing information? Discussing problems?

How would you describe the project meetings internally with potential suppliers for this project?

What is your overall impression about the collaboration between buyer-potential suppliers for the development of this project?

What knowledge the supplier contributed to (e.g. new application, state of the art techniques or new product) for this specific project?

Are you satisfied with the project outcome? Why (not)? If you could change anything in the project, what would that be?

**Appendix B. Cross-case-analysis**

Themes	Emerging themes	Alpha project	Beta project	Gamma project	Omega project
Early Purchasing involvement	NPD stages	Concept development	Final design review	Ideation	Ideation
Purchasing cross-functional interaction	R&D and purchasing interaction	Giving suppliers product specifications	Supporting role by advising the R&D in supplier issues	The project began in the Purchasing department. Anémos took the first step to searching for suppliers who have the capacity for innovation	Purchasing organized creativity workshops for the R&D of Anémos and suppliers for developing new ideas for NPD projects
	Marketing and purchasing interaction	Not interaction	Not interaction	Advanced purchasing and marketing interaction. Marketing director was involved for the first time in supplier selection.	Purchasing organized meetings with R&D, marketing and suppliers
Sourcing	Traditional sourcing	Searching suppliers with specific technology expertise. Selecting suppliers by an internal approval process to assess risk, quality and supplier financial situation.	Searching suppliers with specific technology expertise. Selecting suppliers by an internal approval process to assess risk, quality and supplier financial situation.	Sourcing process in this project was very different from the traditional process.	Sourcing was different from traditional sourcing as market context (customer expectations instead of technical specifications) were introduced to suppliers
	Reversed sourcing	Not reversed sourcing	Not reversed sourcing	Asking suppliers for product ideas and/or technical solutions. Selecting an unfamiliar supplier. Selecting suppliers by involving different functional department in a supplier day presentations.	Asking suppliers for product ideas and/or technical solutions. Selecting a supplier base. Supplier selection is based on the signature of a research contact where the commitment is to share product ideas technology knowledge for innovations.
Supplier relationship management	Historical/new supplier relationship	New supplier relationship	Historical supplier relationship	New supplier relationship	Re-new supplier relationship
	Information exchange	Very limited information –to specific technology	Establishing and communicating targets of the NPD with the supplier	More and more the marketing department is involved in the supplier relationship but it is a very new practice.	Communicating new market axes to the supplier for the NPD project
Technology scouting	Gather information to facilitate the sourcing process	Attending trade exhibitions	Attending trade exhibitions	Exploring supplier technology knowledge.	Find new technological solutions or product ideas from the supply base
Purchasing communication with suppliers	Pro-active innovation meetings	Communication limited to the NPD project.	Anémos asked for specific technology application knowledge to suppliers	Organizing supplier day presentations for sharing opportunities, ideas or new products for potential NPD projects	Opportunistic strategy. Organizing face-to-face discussions with suppliers to work on complementarity technologies, technology roadmap alignment and product ideas
	Creativity workshops and review meetings	N/E	N/E	Coordinating review meetings for supplier technical exchange during the early stages of the NPD project	Organizing innovation meetings to share and to match market, technical and cultural goals with suppliers
Purchasing internal communication		One-way communication between purchasing and R&D	One-way knowledge exchange and communication between purchasing and R&D	Multiple knowledge exchanges and communication involving different organizational departments and large number of suppliers. Involving marketing function to exchange information about	Face-to-face monthly review meetings to discuss about innovation

customer expectations with suppliers

R&D department was reluctant to continue with the project  
Transfer the prototype to production

Access to innovative NPD project and product prototype  
Potential product development time to market  
High supplier collaboration

Unexpected design problems

Access to new technology before competitors  
High supplier collaboration

Issues/problems encountered

Unclear product specifications  
Unexpected technical problems  
Discussion supplier design and R&D capabilities  
Cost of final product  
Quality problems  
Ambiguity of partner's role and responsibilities of the project

Supplier choice questioned  
Difficult to sell the product

Aligned of technology and product roadmap  
Product development time to market

Outcomes of the NPD project

Access to supplier technology

## References

- Ambrosini, V., Bowman, C., Collier, N., 2009. Dynamic capabilities: an exploration of how firms renew their resource base. *Br. J. Manag.* 20, 9–24.
- Anderson, P., Tushman, M.L., 1990. Technological discontinuities and dominant designs: a cyclical model of technological change. *Adm. Sci. Q.* 604–633.
- Anderson, P., Tushman, M.L., 1991. Managing through cycles of technological change. *Res. Technol. Manag.* 34, 26.
- Atuahene-Gima, K., 1995. Involving organizational buyers in new product development. *Ind. Mark. Manag.* 24, 215–226.
- Bergek, A., Berggren, C., Magnusson, T., Hobday, M., 2013. Technological discontinuities and the challenge for incumbent firms: destruction, disruption or creative accumulation? *Res. Policy* 42, 1210–1224.
- Bessant, J., Lamming, R., Noke, H., Phillips, W., 2005. Managing innovation beyond the steady state. *Technovation* 25, 1366–1376.
- Bessant, J., Von Stamm, B., Moeslein, K.M., Neyer, A.-K., 2010. Backing outsiders: selection strategies for discontinuous innovation. *R. D. Manag.* 40, 345–356.
- Birkinshaw, J., Bessant, J., Delbridge, R., 2007. Finding, forming, and performing: creating networks for discontinuous innovation. *Calif. Manag. Rev.* 49 (3), 67–68.
- Bowen, F.E., Cousins, P.D., Lamming, R.C., Farukt, A.C., 2001. The role of supply management capabilities in green supply. *Prod. Oper. Manag.* 10, 174–189.
- Brown, S.L., Eisenhardt, K.M., 1995. Product development: past research, present findings, and future directions. *Acad. Manag. Rev.* 20, 343–378.
- Burt, D.N., Soukup, W.R., 1985. Purchasing's role in new product development. *Harv. Bus. Rev.* 63, 90–97.
- Calvi, R., 2000. Le rôle des services achats dans le développement des produits nouveaux : une approche organisationnelle (The role of purchasing in new product development: an organizational approach). *Finance Contrôle Stratégie* 3 (2), 31–55.
- Chen, I.J., Paulraj, A., Lado, A.A., 2004. Strategic purchasing, supply management, and firm performance. *J. Oper. Manag.* 22, 505–523.
- Corbin, J., Strauss, A., 2014. *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory*. Sage publications.
- Cousins, P.D., Lawson, B., Petersen, K.J., Handfield, R.B., 2011. Breakthrough scanning, supplier knowledge exchange, and new product development performance. *J. Prod. Innov. Manag.* 28 (6), 930–942.
- Dubois, A., Araujo, L., 2007. Case research in purchasing and supply management: opportunities and challenges. *J. Purch. Supply Manag.* 13, 170–181.
- Dubois, A., Salmi, A., 2016. A call for broadening the range of approaches to case studies in purchasing and supply management. *J. Purch. Supply Manag.* 22 (4), 247–249.
- Durisin, B., Todorova, G., 2012. A study of the performativity of the “ambidextrous organizations” theory: neither lost in nor lost before translation. *J. Prod. Innov. Manag.* 29, 53–75.
- Eisenhardt, K.M., Martin, J.A., 2000. Dynamic capabilities: what are they? *Strategy Manag. J.* 21, 1105–1121.
- Fereday, J., Muir-Cochrane, E., 2006. Demonstrating rigor using thematic analysis: a hybrid approach of inductive and deductive coding and theme development. *Int. J. Qual. Methods* 5, 80–92.
- Fisher, G., Aguinis, H., 2017. Using theory elaboration to make theoretical advancements. *Organ. Res. Methods* 20, 438–464.
- García, R., Calantone, R., 2002. A critical look at technological innovation typology and innovativeness terminology: a literature review. *J. Prod. Innov. Manag.* 19, 110–132.
- Gibson, C.B., Birkinshaw, J., 2004. The antecedents, consequences, and mediating role of organizational ambidexterity. *Acad. Manag. J.* 47, 209–226.
- Glock, C.H., Hochrein, S., 2011. Purchasing organization and design: a literature review. *Bus. Res.* 4, 149–191.
- Gonzalez-Zapatero, C., Gonzalez-Benito, J., Lannelongue, G., 2016. Antecedents of functional integration during new product development: the purchasing–marketing link. *Ind. Mark. Manag.* 52, 47–59.
- Griffin, A., 1997. PDMA research on new product development practices: updating trends and benchmarking best practices. *J. Prod. Innov. Manag.* 14, 429–458.
- Gualandris, J., Legenvre, H., Kalchschmidt, M., 2018. Exploration and exploitation within supply networks: examining purchasing ambidexterity and its multiple performance implications. *Int. J. Oper. Prod. Manag.* 38, 667–689.
- Helfat, C.E., Peteraf, M.A., 2015. Managerial cognitive capabilities and the micro-foundations of dynamic capabilities. *Strategy Manag. J.* 36, 831–850.
- Herrmann, A., Gassmann, O., Eisert, U., 2007. An empirical study of the antecedents for radical product innovations and capabilities for transformation. *J. Eng. Technol. Manag.* 24, 92–120.
- Hill, S.A., Birkinshaw, J., 2014. Ambidexterity and survival in corporate venture units. *J. Manag.* 40, 1899–1931.
- Hsieh, H.-F., Shannon, S.E., 2005. Three approaches to qualitative content analysis. *Qual. Health Res.* 15, 1277–1288.
- Ketokivi, M., Choi, T., 2014. Renaissance of case research as a scientific method. *J. Oper. Manag.* 32 (5), 232–240.
- Kishna, M., Negro, S., Alkemade, F., Hekkert, M., 2017. Innovation at the end of the life cycle: discontinuous innovation strategies by incumbents. *Ind. Innov.* 24, 263–279.
- Lakemond, N., Echtelt, F., Wynstra, F., 2001. A configuration typology for involving purchasing specialists in product development. *J. Supply Chain Manag.* 37, 11–20.
- Lane, P.J., Lubatkin, M., 1998. Relative absorptive capacity and interorganizational learning. *Strategy Manag. J.* 19, 461–477.
- Lavie, D., 2006. The competitive advantage of interconnected firms: an extension of the resource-based view. *Acad. Manag. Rev.* 31, 638–658.
- Lawson, B., Samson, D., 2001. Developing innovation capability in organizations: a dynamic capabilities approach. *Int. J. Innov. Manag.* 5, 377–400.
- Le Dain, M.-A., Calvi, R., Cheriti, S., 2011. Measuring supplier performance in collaborative design: proposition of a framework. *R. D. Manag.* 41, 61–79.
- Legenvre, H., Gualandris, J., 2018. Innovation sourcing excellence: three purchasing capabilities for success. *Bus. Horiz.* 95–106.
- Leonard-Barton, D., 1990. A dual methodology for case studies: synergistic use of a longitudinal single site with replicated multiple sites. *Organ. Sci.* 1, 248–266.
- Lewis, M., Brandon-Jones, A., Slack, N., Howard, M., 2010. Competing through operations and supply: the role of classic and extended resource-based advantage. *Int. J. Oper. Prod. Manag.* 30, 1032–1058.
- Lincoln, Y.S., Guba, E.G., 2002. Judging the quality of case study reports. *Qual. Res. Companion* 205–215.
- Luzzini, D., Amann, M., Caniato, F., Essig, M., Ronchi, S., 2015. The path of innovation: purchasing and supplier involvement into new product development. *Ind. Mark. Manag.* 47, 109–120.
- Lynn, G.S., Morone, J.G., Paulson, A.S., 1996. Marketing and discontinuous innovation: the probe and learn process. *Calif. Manag. Rev.* 38, 8–37.
- Magnusson, T., Lindström, G., Berggren, C., 2003. Architectural or modular innovation? Managing discontinuous product development in response to challenging environmental performance targets. *Int. J. Innov. Manag.* 7, 1–26.
- Matthyssens, P., Bocconcelli, R., Pagano, A., Quintens, L., 2016. Aligning marketing and purchasing for new value creation. *Ind. Mark. Manag.* 52, 60–73.
- Melander, L., Lakemond, N., 2014. Variation of purchasing's involvement: case studies of supplier collaborations in new product development. *Int. J. Procure. Manag.* 7, 103–118.
- Mikkelsen, O.S., Johnsen, T.E., 2019. Purchasing involvement in technologically uncertain new product development projects: challenges and implications. *J. Purch. Supply Manag.* 25 (3).
- Noke, H., Perrons, R.K., Hughes, M., 2008. Strategic dalliances as an enabler for discontinuous innovation in slow clockspeed industries: evidence from the oil and gas industry. *R. D. Manag.* 38, 129–139.
- Pettigrew, A.M., 1992. The character and significance of strategy process research. *Strateg. Manag. J.* 13, 5–16.
- Phillips, W., Lamming, R., Bessant, J., Noke, H., 2006a. Discontinuous innovation and supply relationships. *Strat. Dalliances R. D. Manag.* 36, 451–461.
- Phillips, W., Noke, H., Bessant, J., Lamming, R., 2006b. Beyond the steady state: managing discontinuous product and process innovation. *Int. J. Innov. Manag.* 10, 175–196.
- Pihlajamaa, M., Kaipia, R., Säilä, J., Tanskanen, K., 2017. Can supplier innovations substitute for internal R&D? A multi case study from an absorptive capacity perspective. *J. Purch. Supply Manag.* 23, 242–255.
- Rice, M.P., Leifer, R., O'Connor, G.C., 2002. Commercializing discontinuous innovations: bridging the gap from discontinuous innovation project to operations. *IEEE Trans. Eng. Manag.* 49, 330–340.
- Rohrbeck, R., 2010. Harnessing a network of experts for competitive advantage: technology scouting in the ICT industry. *R. D. Manag.* 40, 169–180.
- Rothaermel, F.T., Alexandre, M.T., 2009. Ambidexterity in technology sourcing: the moderating role of absorptive capacity. *Organ. Sci.* 20, 759–780.
- Saenz, M.J., Revilla, E., Knoppen, D., 2014. Absorptive capacity in buyer–supplier relationships: empirical evidence of its mediating role. *J. Supply Chain Manag.* 50, 18–40.
- Schiele, H., 2010. Early supplier integration: the dual role of purchasing in new product development. *R. D. Manag.* 40, 138–153.
- Servajean-Hilst, R., Calvi, R., 2018. Shades of the innovation-purchasing function –the missing link of open innovation. *Int. J. Innov. Manag.* 22 (1).
- Silverman, D., 2014. *Interpreting Qualitative Data*. Multiple countries, Los Angeles.

- Subramanian, A.M., Soh, P.-H., 2017. Linking alliance portfolios to recombinant innovation: the combined effects of diversity and alliance experience. *Long. Range Plan.* 50, 636–652.
- Teece, D.J., Pisano, G., Shuen, A., 1997. Dynamic capabilities and strategic management. *Strategy Manag. J.* 18, 509–533.
- Van Echtelt, F.E., Wynstra, F., Van Weele, A.J., 2007. Strategic and operational management of supplier involvement in new product development: a contingency perspective. *Eng. Manag. IEEE Trans. Eng. Manag.* 54, 644–661.
- Wagner, S.M., 2012. Tapping supplier innovation. *J. Supply Chain Manag.* 48 (2), 37–52.
- Wynstra, F., Weggeman, M., Van Weele, A., 2003. Exploring purchasing integration in product development. *Ind. Mark. Manag.* 32, 69–83.