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Product Lifecycle Management and Distributor Contribution to New Product Development

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Product Lifecycle Management and Distributor Contribution to New Product Development

Abstract

After the initial launch of a new product, distributors are frequently among the first to learn about product-related problems through the information they get about how it is perceived and used by customers, and how it might be improved or adapted for broader market coverage. For producers, such information, which has the potential to impact new product development (NPD) activities during the product lifecycle management (PLM) phase that follows launch, can be decisive for ensuring the continued viability of the product in the medium-to-longer term. The goal of this article is to better understand how distributors contribute to producer PLM activities by engaging in product-related information processing. A typology of four distinct scenarios is developed by integrating three conceptual themes: organizational information processing, dynamic capabilities, and task complexity. Each scenario results from the interplay of the distributor's level (low/high) of capability—specifically, a combination of information coordination and management of inter-organization relations—and of the degree (low/high) of complexity of the product-related problem. The four scenarios are analysed and described in terms of NPD-related information processing. According to the typology, distributors act as 'problem informers' (low capability/high complexity), 'solution advisors' (low capability/low complexity), 'solution implementers' (high capability/low complexity) or 'solution managers' (high capability/high complexity). 14 in-depth interviews with distributors and producers in industrial goods provide empirical evidence for the analysis, description and support of each scenario. The article contributes to NPD by shedding light on the role of distributors in terms of incremental innovation in the context of PLM. Developers of new products can use the typology in planning for distributor involvement in PLM activities; distributors can use it to map out their current and future level of engagement in PLM-related activities.

Practitioner Points

- The typology developed in this article identifies four ways in which distributors contribute to incremental innovation during product lifecycle management (PLM).
- Distributors act as problem informers, solution advisors, solution implementers and solution managers, depending on the combination of level of distributor capability and level of product complexity.
- Developers of new products can use the typology in planning for distributor involvement in PLM activities depending on whether they are looking for information about product-related problems to be solved or input about ways to address these problems.
- Distributors can use the typology to map out current and future level of engagement in PLM-related activities as part of their quest for competitive differentiation and control over customer relations.

Key words: Product Life Cycle Management, Distributor Involvement in NPD, Incremental innovation, New Product Development

Introduction

After a new product is launched, distributors are at the forefront to inform producers about problems they identify through the feedback they receive from customers about product usage, need for technical support, requests for modifications or customization, and information about competitor advances (Crawford and Di Benedetto, 2011; Mudambi and Aggarwal, 2003). Such product-related information is potentially of value for producers during the decisive product lifecycle management (PLM) phase that follows new product launch. During PLM, producers are typically involved in incremental new product development (NPD), including modifications, updates and improvements that ensure the initial viability of the new product and also support its competitive sustainability over the medium-to-longer term (Ausura et al., 2005; Urban and Hauser, 1993). This type of NPD is extremely important as is indicated by Cooper (2011), who notes that close to 40 percent of new products in the NPD program of firms entail incremental innovations. Further, the relevance of distributors in this regard has been shown in Accenture (2009), which notes that top performing manufacturing companies “obtain new ideas from channel members and distributors for more than 25 percent of their new products” (p.12). Indeed, evidence presented in the current article suggests that distributors go beyond the mere transfer of information about product-related problems or ideas for modifications by actually undertaking or actively managing such changes. Thus, independent distributors—including wholesalers, resellers, industrial distributors or manufacturer agents—whose primary function is to make products available for consumption (Coughlan et al., 2006), can also be viewed as contributing to NPD through the information they process and the activities they undertake that are relevant for incremental NPD during PLM. This supports the contention by Yoon and Lilien (1988) that distributors contribute to improving producers’ NPD process, and that companies increasingly make a connection between their innovation program and channel management activities.

A closer look at the PLM literature reveals, however, that distributors are viewed almost exclusively in terms of their traditional channel function as intermediary sales agents (Ausura et al., 2005; Urban and Hauser, 1993)—that is, as a source of information about sales, shipping, inventory handling and channel logistics. Indeed, their role as a source of ‘product-related’ information with the potential to contribute to NPD during PLM has been largely ignored.ⁱ PLM ‘best practices’ do not list distributors as a relevant source of product information for producers; but do detail the value of internal sales personnel or suppliers in this regard (Ausura et al., 2005; Ernst, Hoyer and Rübsaamen, 2010; Saaksvuori and Immonen, 2008). It is important to note that, according to the U.S. Census Bureau (2010), industrial sales through indirect channels outnumber by three-to-one those involving direct connections. Thus, by focusing primarily on internal sales personnel, the literature underestimates the relevance of distributors as a source of information during PLM.

This article addresses this knowledge gap by focusing on independent distributors as a source of information and activity relevant to incremental NPD during PLM. The research adopts a typological approach (Doty and Glick, 1994; George and Bennett, 2005) by which to identify recurring patterns in a given phenomenon—specifically, the different ways in which distributors process NPD-related information—and how these patterns affect a focal outcome; that is, how distributors contribute to producers’ incremental innovation during PLM. The typology and its analysis are based on three conceptual themes: organization information processing (OIP), dynamic capabilitiesⁱⁱ and task complexity. According to OIP and dynamic capabilities theories, knowledge and information processing are among the key mechanisms by which firms make sense of their environment and adapt their processes accordingly (Kleinschmidt, de Brentani and Salomo, 2007; Teece et al., 1997). This is consistent with the primacy of information in NPD as an element underlying all innovation activity (Moenaert et al., 2000; Zahay et al., 2011), and in

channels as an essential for achieving effective working relationships among channel members (Anderson and Narus, 1990; Coughlan et al., 2006). This research proposes that to generate and process information relevant for NPD during PLM, distributors deploy two key capabilities; the coordination of relevant information and the management of inter-organization relations. In addition, the typology incorporates the concept of task complexity as this is key to the type and extent of information processing undertaken (Tushman and Nadler, 1978), and to the level of capability required by firms (Zollo and Winter, 2002) for dealing with problems. Thus, a two-by-two typology is proposed where product-related information processing activities by distributors are described and analyzed in terms of varying (low/high) levels of information coordination and inter-organizational relational capabilities, and of task complexity.

The typology is supported by evidence from 14 in-depth interviews with managers of North American industrial manufacturing and distribution firms. Four distinct scenarios of product-related information processing activities carried out by distributors are identified using the combination of low/high level of capabilities and task complexity. According to the typology, distributors do not limit themselves to the simple *problem informer* function described in the literature, in which they transmit basic information about product-related problems to the producer. The research indicates that this scenario is relevant primarily when distributors have a low capability level and are faced with product-related problems of high complexity. According to the typology, some distributors go beyond simple information transmission and contribute to the actual solution of the problem. In cases where a basic (low) capability level is enough to tackle low complexity problems, some distributors act as *solution advisors* by providing ideas about how the problem might be addressed. Others—those with high capability levels—become even more involved: as *solution implementers*, by actually effecting the product modification needed to address a simple problem; or as *solution managers* by acting as quasi ‘brokers’ between customer and producer for

the purpose of facilitating the solution to a complex problem. Indeed, according to recent literature, environmental dynamics in distribution increasingly call for industrial distributors to go beyond their traditional role and take on more sophisticated tasks such as involvement in NPD in order to provide greater value for customers and thereby gain a competitive advantage (Mudambi and Aggarwal, 2003; Olsson et al., 2013).

The research contributes to both theory and practice by enriching the extant literature about the channel and product management interface (Rosenbloom, 2013). From a scholarly standpoint, the typology adds to the stream of research on distributor contribution to NPD (Biemans, 1991; Song and Zhao, 2004; Yoon and Lilien, 1988) by identifying, analyzing and describing relevant scenarios in this regard. Further, it responds to the call in the NPD literature for a better understanding of PLM (Kahn et al., 2006); this, by expanding on input coming from external channel partners, depending on their level of capability and on the complexity of the problem they encounter. Given the importance of incremental innovation in NPD during PLM (Cooper, 2011; Kahn et al., 2006), the typology offers insights about distributor activities that contribute to this. From a managerial standpoint, the typology can be useful for distributors in mapping out their level of engagement in product-related information processing and in planning for the future in terms of developing more advanced capabilities and resources in this regard. Producers can use the typology to identify what type and level of contribution to expect from distributors, and to decide when and how distributor input should be integrated as part of the NPD program during PLM.

Theoretical Framework

Product lifecycle management (PLM) consists of the continued NPD activities that take place after the launch of a new product by which firms “[change] the features and benefits of the prod-

uct [...] to maximize the profits obtainable from the product over its lifecycle” (PDMA Glossary, 2005, p. 602). These activities lead to product modifications, updates and improvements over the medium-to-longer term and, as such, entail new products that are at the incremental end of the innovation spectrum (Ausura et al., 2005; Urban and Hauser, 1993). For producers, PLM involves important information processing activities oriented towards changing product features and benefits, including: tracking customer satisfaction or problems, monitoring product reinventions or changes introduced by competitors, and observing product usage patterns (Millson and Wilemon, 2002). These activities have in common the issue of identifying and changing the initial new product such that it remains a viable and competitive entity in the marketplace over its lifecycle.

In this article it is argued that, because indirect channel members perform the role of gatekeeper between producer and customer (Coughlan et al., 2006), they are likely to engage in the type of tracking, monitoring and observing so important for PLM. Therefore, distributors may contribute to NPD by identifying product-related problems or by formulating and/or implementing solutions to these. Because distributors engage in multiple activities, ranging from gathering customer feedback to providing technical support, the goal of this research is to better understand the information processing they undertake that is relevant to PLM. This goal is achieved through the development of a typology of distributor information processing activities connected to product-related problems. Using a typological approach allows for the identification of “[generalized] pathways through which particular types [of organizational behaviors] relate to specific outcomes” (George and Bennett, 2005, p.235-236). Typologies qualify patterns in which differences can be captured by a unique combination of attributes that lead to relevant outcomes (Doty and Glick, 1994). Three conceptual themes provide the building blocks of the typology: organizational information processing (OIP), dynamic capabilities and task complexity.

Organizational information processing (OIP) theory is a key conceptual theme of this typology because of the primacy of information to the functioning of both channels and NPD processes (Coughlan et al., 2006; Moenaert and Souder, 1990). Thus, distributor contribution to PLM is investigated and analysed in terms of such information processing activities as: information acquisition, interpretation, transmission, storage, retrieval and usage (Huber, 1991). But, not all distributors demonstrate the same activity with respect to product-related information processing. In order to capture this variation, the second conceptual theme underlying the typology is dynamic capabilities theory, which proposes that firms develop specific capabilities in order to cope with a changing environment and to achieve a sustainable competitive advantage (Teece et al., 1997). Given the dynamic environment in which industrial distributors operate (Olsson et al., 2013), their ability to thrive, indeed survive, has been associated with their ability to create value through the development of more advanced levels of market and technical knowledge, as well as skills in relating with customers, partners and suppliers (Mudambi and Aggarwal, 2003). Thus, a key factor in defining the typology is the dynamic capabilities of firms—specifically, those involved in coordinating and combining product-related information and in managing inter-organizational relationships (Kleinschmidt et al., 2007; Lorenzoni and Lipparini, 1999). The third conceptual theme underlying the typology is the complexity of the task involved. The extant literature links complexity to the type and level of information processing undertaken by organizations (Choo, 2002; Tushman and Nadler, 1978). A higher level of complexity increases uncertainty and thus calls for greater and deeper information processing by individuals and organizations (Campbell, 1988; Clark, et al., 2006). This link is also relevant in the contexts of NPD (e.g., Kim and Wilemon, 2003) and dynamic capabilities (e.g., Zollo and Winters, 2000). Thus, it is expected that organizations (including distributors) demonstrate different patterns of information

processing depending on their level of capability and on the complexity of the task (or problem) they are confronted with.

Distributors, Information and PLM

As a by-product of their channel function, distributors process a substantial volume and variety of information (Coughlan et al., 2006; Frazier et al., 2009; Pimentel Claro and Oliveira Claro, 2010). This view is in line with OIP theory, according to which information processing is a key mechanism by which organizations interact with their environment (Tushman and Nadler, 1978). More specifically, information processing begins with information need, which can result from an emerging problem, an uncertainty, an ambiguity or a forthcoming decision (Choo, 2002; Day, 1994). In response, organizations engage in information acquisition, where data are collected from relevant stakeholders, both internal and external (Frishammar and Åke Hörte, 2005; Zahay et al., 2011). Interpretation follows, giving meaning to the information (Huber, 1991), while transmission consists of sharing the interpreted information with potential users (Frishammar and Åke Hörte, 2005; Huber, 1991). Then comes information storage (Choo, 2002); this, for varying amounts of time, depending on whether the information is immediately usable (Choo, 2002; Day, 1994). The final activities entail information retrieval and usage, where the stored data are accessed and deployed to make decisions (Moorman, 1995). Information usage can take the form of actual or potential changes in organizational activities (Huber, 1991).

To qualify the role of distributors as processors of information related to NPD, different streams of research in marketing and NPD were considered. According to the literature on market orientation, distributors are a relevant source of market knowledge (e.g., Kohli et al., 1993) and in the NPD literature, are seen as a potential source of ideas and feedback regarding new product introductions (Crawford and Di Benedetto, 2011). Table 1 provides a summary of the literature. This indicates that distributors are seen as a relevant source of information in general and to a

lesser extent in regard to NPD. It should be noted that information generated by distributors is valuable to producers only if shared. This highlights the importance of relational capabilities on the part of distributors that facilitate information sharing dynamics such as interdependence, trust, and transaction-specific investments (Frazier et al., 2009).

--- Insert Table 1 about here ---

As shown in table 1, little attention has been paid to the role of distributors as information processors with the potential to contribute to incremental NPD during PLM. In the PLM ‘best practices’ literature (Ausura et al., 2005), it is company sales personnel and suppliers (Ernst et al., 2010; Petersen et al., 2003) who are seen as primary sources of information in this regard. In the case of distributors, given their downstream position in the supply chain, the emphasis is on the handling of channel logistics and achieving market coverage (Ausura et al., 2005). While some scholars do refer to distributor information processing activities after new product launch, topics deal primarily with marketing mix variables other than ‘product’ (i.e., promotion and pricing) (Song et al., 2008; Song and Zhao, 2004). This limited role is linked to the view in the NPD literature of distributors as external sales agents in charge of bringing already developed products to market (Hultink et al., 1997; Song and Zhao, 2004). A minority of authors refer to distributors as potential contributors to the product variable, and such references tend to be nonspecific and exclude PLM activities. More specifically, distributor input to NPD is noted in the literature as a possible source of information for: new product ideas (Crawford and Di Benedetto, 2011; Lonsdale et al., 1996); feedback on product usage, acceptance and problems (Crawford and Di Benedetto, 2011; Mudambi and Aggarwal, 2003); and for quality improvements (Weber, 2001). In sum, the potential for distributors to generate product-related information relevant for NPD has been largely neglected in the extant literature on PLM.

Despite this neglect, given that activities of gathering and transmitting information about product-related problems by distributors take place primarily after new product launch (Mudambi and Aggarwal, 2003), one can expect that their contributions to innovation during PLM have the potential to be more significant. From the more general statements found in the literature about distributors as a source of information about product-related problems, at the minimum it can expect the relatively passive role, referred to in this study as *problem informer*. There is evidence to suggest, however, that distributors go beyond just sharing information about problems; Weber (2001) notes that they can contribute to the enhancement of product quality. Such changes to existing products typically take place during PLM (PDMA Glossary, 2005), suggesting the potential for a broader range of contributions resulting from the information processing activities of distributors. This study shows that by deploying specific capabilities, more sophisticated contributions are indeed made by distributors that go beyond simply raising awareness about to formulating or even implementing changes to product features in order to solve problems.

Resources, Capabilities and Information Processing

To expand on the view of distributors as simple ‘problem informers’, it is proposed that enhanced contributions to NPD during PLM are made when distributors deploy specific capabilities by which to combine relevant information and to manage inter-organizational relationships (Kleinschmidt et al., 2007; Lorenzoni and Lipparini, 1999). To this end, resource-based/dynamic capabilities theory provides the theoretical foundation to further qualify distributors’ information processing activities during PLM.

Resource-based theory postulates that the key source of sustained competitive advantage is the firm’s resource endowments (Barney et al., 2011). These include inimitable intangibles developed over time such as organizational culture, knowledge, experience, and working relation-

ships (Teece et al., 1997). Resources are defined as “assets linked semi-permanently to the firm and that allow it to conceive and execute value-creating strategies” (Morgan et al., 2009, p.910). In changing business environments, however, organizations also need specific dynamic capabilities by which to leverage and deploy their resources (Teece et al., 1997). Accordingly, *capabilities* are processes, skills, actions or routines developed by firms in order to “adapt, integrate and reconfigure internal and external organizational skills, resources and functional competences to match the requirements of a changing environment” (Verona and Ravasi, 2003, p.578).

Modern industrial distribution is characterized by changing environmental conditions where specialization in logistics-related activities and simple product handling are no longer adequate for ensuring success. Recent industry reports show that consolidation trends have led to significant concentration in this sector (Tompkins International, 2013) while at the same time, customers expect distributors to create value not only by means of competitive prices and product availability, but especially through support and timely answers to their increasingly complex needs (Mudambi and Aggarwal, 2003). This puts significant pressure on distributors to differentiate themselves from competitors by responding more effectively to customers and thereby achieve a competitive edge (Mudambi and Aggarwal, 2003; Olsson et al., 2013).

Olsson et al. (2013) underline that distribution intermediaries respond to changing conditions by developing “diversity in the capabilities they represent [and through which they] generate value for their business partners” (p.1138). In their analysis of distributor sources of value creation, Mudambi and Aggarwal (2003) point to three key processes: 1) building personalized and meaningful relationships with downstream and upstream channel partners; 2) increasing efficiency and effectiveness in production and operations management; and 3) developing and sharing technical and market knowledge. It is worth noting that the second capability—the logistics role of handling physical goods—is the traditional view of the distributor in the PLM literature

(e.g., Ausura et al., 2005). Thus, to expand on the view of distributors beyond their role as logistics intermediary, the typology focuses on the other two value-creating capabilities. Of particular relevance to distributor product-related contribution to PLM are the following capabilities:

- *Information Coordination Capability*: a knowledge-based ability developed by firms to obtain and combine information, belonging to both the marketing and technical sphere (Kleinschmidt et al., 2007; Moenaert and Souder, 1990); this is linked to distributors' market and technical *knowledge* resource base (Mudambi and Aggarwal, 2003).
- *Inter-organization Relational Capability*: an ability developed by firms involved in inter-organizational networks to establish and manage relationships with partners (Dyer and Singh, 1998; Lorenzoni and Lipparini, 1999); this is linked to distributors' experience in *relationship building* and as gatekeeper between producers and customers (Coughlan et al., 2006).

Information Coordination Capability: An information coordination capability is highly relevant for firms when it comes to achieving a sustained competitive advantage (Eisenhardt and Martin; 2000; Teece et al., 1997). Through effective information gathering and processing, firms make sense of their environment and are able to adapt their course of action accordingly. In the innovation literature, this capability has been shown to have a decisive and positive impact on the success of companies' NPD efforts. According to Kleinschmidt et al. (2007), the capabilities or routines developed by firms for gathering and processing information are central to success because "information about markets and the ability to respond to opportunities and threats underlie all NPD activities" (p.425). In the indirect channel setting, given distributor proximity to markets (Coughlan et al., 2006; Rosenbloom, 2013), they are in an ideal position to access this type of information and thus to make a positive contribution to NPD during PLM.

To achieve this potential, distributors need a capability that incorporates both market and technological information, as these are the primary dimensions of any NPD-related endeavour (Clark and Wheelwright, 1993; Cooper, 2011; Zahay et al., 2011). Given their proximity to customers, *market* knowledge is likely to be strong, providing distributors with expertise about demand, customer needs and wants, and competitor activity (Kohli et al., 1993; Mudambi and

Aggarwal, 2003; Song and Zhao, 2004). In addition, distributors possess *technical* knowledge. This results from their need to understand the technical specifications of the products they sell, their experience with after-sales service, and also from their access to information about how products are used by customers and the problems they incur. Some distributors develop this technical expertise to a more advanced level as a way of providing improved technical assistance and thereby responding to the growing demand for increased service in this regard (Mudambi and Aggarwal, 2003). Thus, by developing routines to combine and interpret information related to both marketing and technical aspects, distributors are in a position to leverage this knowledge resource base and thereby contribute to PLM.

Inter-organization Relational Capability: Distributors have an inter-organization relational capability resulting from their role and experience as intermediary between producers and customers (Coughlan et al., 2006), which are considered to be a key resource (e.g., Lusch et al., 2011). *Inter-organization relational capability* is defined as the ability of firms embedded in an inter-organizational network to effectively establish and manage relationships with partners (Dyer and Singh, 1998; Lorenzoni and Lipparini, 1999). As per dynamic capabilities theory, it is essential to enhance this capability if the company is to address the challenges of exchanges within and between organizations (Eisenhardt and Martin, 2000). Establishing working relationships that ensure the smooth functioning of the channel itself (Anderson and Narus, 1990; Mudambi and Aggarwal, 2003) is closely associated with information flow in the channel; this, because information is the key resource generated and exchanged among channel partners (Coughlan et al., 2006; Frazier et al., 2009). As such, a strong relational capability can be seen as positively impacting both the information processing and the collaborative NPD activities performed by companies (Frazier et al., 2009; Sisodiya et al., 2013). This capability is expected to be relevant in facilitating interactions between channel members during PLM.

In sum, the deployment of two types of capabilities—information coordination and inter-organization relations—can be expected to impact how and to what extent distributors process product-related information during PLM. In the context of this study, some distributors deploy a higher level of capability than others, thus leveraging their knowledge resource base regarding marketing and technical aspects, and their experience in managing inter-organization relationships. Distributors defined as ‘high’ in terms of these capabilities are in a better position to acquire, interpret and use information to solve product-related problems, sometimes without involving producers. At the other end of the spectrum are distributors whose information coordination capability is focused on channel- and market-related factors rather than on technical matters, and whose interactions with upstream and downstream partners are minimal. In the context of PLM, these distributors are qualified as ‘low’ in terms of capabilities, offering only limited contribution to NPD.

Task Complexity: The second attribute underlying the typology of distributor information processing activity is task complexity. For the purpose of this study, task complexity is defined in terms of the objective characteristics of the task encountered during information processing (Campbell, 1988). Consistent with Novak and Eppinger’s (2001) definition of complexity in the context of NPD, this study views task complexity as the number of product components affected by the problem encountered by customers (and therefore by distributors) and the extent of interaction between these components. (Note: a third dimension in this definition, degree of product novelty, is not retained as PLM activities typically involve only incremental NPD; see Urban and Hauser, 1993). Choo (2002) observes that problems at the origin of information processing can be categorized along a continuum ranging from simple to complex. Thus, for the typology, a low/high dichotomy is used as a basis for categorizing product-related problems occurring during PLM.

Task complexity is highly relevant in connection with both dynamic capabilities and OIP. In the context of dynamic capabilities, Zollo and Winter (2002) underline that firm capabilities are contingent on the level of uncertainty and complexity found in the environment. This view is aligned with a key tenet in OIP theory that organizations face different levels of uncertainty in the tasks they perform and have limited levels of information processing capacities (Galbraith, 1973; Tushman and Nadler, 1978). Research shows that increased complexity calls for greater and deeper information processing (Campbell, 1988; Clark et al., 2006). In the NPD literature, increasing complexity of new products is seen as leading to greater effort spent on combining and making sense of the information gathered and to longer development times (Griffin, 1997; Kim and Wilemon, 2003). Thus, the varying level of complexity of the product-related problem encountered by distributors during PLM is used as the second attribute defining the typology.

Proposed Typology of Distributor Involvement during PLM

This article proposes that the deployment of specific capabilities—*information coordination* and management of *inter-organization relations*—allows distributors to leverage key resources (i.e., market and technical knowledge, and established inter-organizational relationships), depending on task complexity (i.e., complexity of the product-related problem). The literature acknowledges that capability (Barreto, 2010) and task complexity (Choo, 2002) vary on a continuum from low to high. In line with this, a two-by-two matrix is developed resulting in four scenarios, based on the interplay of low/high levels of capability and of task complexity. This typology is then characterized in terms of the distributor role and activities involving NPD-related information processing during PLM. The typology, which is described below, is presented in exhibit 1. (NOTE: the ‘problem informer’ label comes from the literature; labels for the other scenarios are based on the fieldwork.)

- Insert exhibit 1 about here -

Starting from the top-left side of the matrix, a first scenario is identified when task complexity is high and the capability level of distributors is low. Distributors cannot handle the complex problem with their basic information coordination routines, especially with regard to the technical dimension. Even though they are receptive to customer requests and other market-related information, distributor involvement in information processing is limited to gathering data and informing producers about the problem(s) they identify. The label of 'problem informer' is used for this scenario, which corresponds to the traditional view of distributors as a source of information about product-related problems (e.g., Mudambi and Aggarwal, 2003).

The second scenario (bottom-left) results from the match between task complexity and capabilities, both of which are at a low level. In this scenario, despite their only basic information coordination and relational capabilities, distributors are in a position to become more involved with the problems encountered by customers. Because task complexity is low, they are able to engage in information processing activities that provide insight to the problem, thus allowing them to enter the domain of 'solution' provision. As part of their role as gatekeeper between customer and producer, these distributors often recommend possible product modifications that could solve the relatively simple problem; hence, the label of 'solution advisor'.

Moving to the bottom-right side of the matrix, the third scenario entails low task complexity, but high levels of capability both in terms of information coordination and inter-organizational relations. This provides a greater capacity for distributors to process information, allowing them to comprehend and deal with the problem in a more thorough manner. Instead of waiting for producers to act on a given problem, these distributors prioritize their relationships with customers and implement solutions themselves by deploying their capability to coordinate a higher level and broader range of information. These distributors play the role of 'solution implementer'.

Scenario four (top-right) depicts a situation where both task complexity and distributor capability level are high. Distributors become involved in a full range of information processing activities, getting a good understanding of the problem and actively participating in facilitating a solution; this, due to superior technical and marketing expertise, along with an advanced capability to manage relationships with customers and producers. Given the complexity of the task, however, distributors cannot fully exploit the information; producers must become involved. Distributors in this scenario play a quasi ‘project broker’ role (de Brentani and Reid, 2012), assembling different stakeholders and facilitating a solution to the problem; hence, the label ‘solution manager’.

Methodology

The literature provided the building blocks for developing the typology, but offered only limited evidence regarding the specific topic in question. Thus, a qualitative approach was used to explore the scenarios under investigation (Miles and Huberman, 1994; Patton, 2001). Because interviews “yield in-depth responses about people’s experiences, perceptions, opinions, feelings, and knowledge” (Patton, 2001, p.4), this approach is of particular value for gaining a rich description in the context of typologies (Doty and Glick, 1994), providing a better understanding of distributors’ product-related information processing activities during PLM.

The interviews targeted managers of North American industrial equipment and supply firms. Producer and distributor companies were included in the study in order to explore perceptions from both sides of the channel relationship. Industrial equipment and supply sectors were chosen for the fieldwork because information sharing dynamics between producers and distributors have been shown to be highly relevant here (Frazier et al., 2009). Prospective respondents were identified through a combination of public lists (NAICS code 4238: Machinery, equipment

and supply merchant wholesalers) and business contacts available to the research team. As incentives, respondents were assured anonymity and promised an executive report. This report was also used to validate the research conclusions with participants (Miles and Huberman, 1994).

After developing contacts with 50 firms, data from 14 usable in-depth interviews (time: 25 to 75 minutes) that took place over a six month period were analysed. The study used a key informant approach (John and Reve, 1982; Kumar et al., 1993). Interviewees held positions of president, VP, or senior manager, thus ensuring that respondents had significant decision-making experience in their fields. They were knowledgeable about NPD practices in their firms (producers) or about product-related interactions with producers (distributors). Table 2 provides a summary of the research participants, including selected descriptive characteristics (e.g., firm size, sector, market coverage, type of product offering). To ensure confidentiality of participants, producer and distributor firms are identified in this study by 'P' and 'D', respectively.

-- Insert Table 2 about here --

Except for one interview (telephone, D2), all interviews took place at company headquarters. To structure the data collection, two interview guides—one for each side of the channel relationship (see Appendix)—were developed based on the existing literature and the preliminary typology derived from this. Questioning moved from general topics to more specific ones. To begin, respondents were asked to provide general information about their firm (e.g., history, organizational structure) and the markets in which they operate (e.g., local/international, types of products). They were questioned about their indirect channel relationships and how NPD-related information was typically generated and shared within these relationships. Particular attention was given to spontaneous references to information processing activities involving distributors. Whenever respondents mentioned these, additional questions were asked to probe the details.

When this issue did not arise spontaneously, specific questions were asked to gain insight about these activities.

Interview data were content-analysed according to qualitative data analysis guidelines (Miles and Huberman, 1994; Patton, 2001). Verbatim transcription of interviews was undertaken before the data were coded using Atlas-TI qualitative data analysis software. Coding was performed using a list of codes developed from the literature and integrated with emerging codes. The codes covered the different information processing activities, the level of task complexity, and the level of information coordination and relational capabilities. A code-check verified the reliability of the coding scheme. A trained independent judge coded a randomly chosen interview, comprised of 90 thought units defined as a single idea expressed by the respondent across one or multiple sentences. The resulting Cohen's Kappa was 0.795, indicating substantial agreement among coders (Landis and Koch, 1977). Disagreement was resolved through discussion.

Data analysis took place over several stages. First, interview data were analysed to identify instances of information processing activity. Next, the results relating to the two groups of respondents (producers, distributors) were compared to identify similarities and differences. Third, the results relating to the two respondent groups were again compared in order to recognize common patterns in the information processing activities reported. This process led to over 30 instances of product-related information processing activities involving distributors. Next, based on the theoretical framework, each case was characterized in terms of: level of task complexity, level of information coordination capability and inter-organization relational capability, and information processing activities. These instances were grouped to reflect similarities in terms of low/high task complexity and capability levels. In line with the two-by-two matrix (exhibit 1), *ad hoc* labels were derived to describe the patterns of information processing activities beyond the 'problem informer' one derived from the literature. Given the exploratory nature of the study, the

frequency of each type should not be seen as representative of the extent to which the scenarios occur in the universe of the phenomenon (George and Bennett, 2005). Rather, this research is aimed at providing evidence of different pathways of product-related information processing by distributors conducive to changes and improvements in product features during PLM.

Findings

The results of the fieldwork allow for a more complete picture of the typology initially developed from the literature. The *problem informer* type of distributor (i.e., a basic source of information about product-related problems) could be derived from previous research; but, a paucity of detail is available regarding the other three scenarios, the features of which were predicted based on the interplay between level of capability and task complexity. The in-depth interviews with managers addressed this issue, providing specifics and insights about the information processing activities that take place in each of the four scenarios. In total, interviewees mentioned over 30 instances of product-related information processing activities performed by distributors during PLM, ranging from generic descriptions to detailed accounts of specific cases.

Exhibit 2 provides details of the product-related information processing activities performed in each scenario. Overall, all distributors engaged in at least three of these: information acquisition, interpretation and transmission. Information usage was performed by only two of the distributor types—that is, *solution implementers* and *solution managers*. The four scenarios varied, however, in the way the activities are performed.ⁱⁱⁱ *Problem informers* and *solution advisors* undertake information acquisition more passively than *solution implementers* and *solution managers*. In the latter scenarios, there is more purposeful information interpretation oriented towards implementing a solution to a problem or cooperating in developing it. The only significant depar-

ture from the typical sequence of information processing activities occurs in the *solution implementer* scenario, where transmission to producer follows, rather than precedes, information usage.

-- Insert exhibit 2 about here --

Before detailing the scenarios, it should be noted that respondents agreed that these product-related information processing activities represent only a portion of distributor interactions with upstream partners. D10 stated, “it happens with only some manufacturers” typically when a strong channel relationship exists. This is in line with past research on information sharing dynamics in channels (e.g., Frazier et al., 2009). Yet, the situations were reported repeatedly and appeared to be a noticeable part of distributors’ regular activities. The fact that some respondents described such instances, but that each fit with a different scenario, indicates that distributors decide to deploy their capabilities to a greater or lesser extent when faced with product-related problems. This suggests that in some cases, despite having the capability, the distributor does not have the interest or motivation to doing something about a problem. To this end, evidence is provided about the reasons for the actual deployment of a high capability level in the two scenarios concerned. Independent of the specific scenario, there was an awareness on the part of respondents that problems and ideas shared by distributors usually represent “directions for improvements” (D6). Respondents recognized that most decisions to act on product-related information generated by distributors belong to producers, who assess these inputs according to their NPD objectives.

Problem Informers

The study includes nine cases of distributor information processing activity most often referred to in the literature and labelled in this study as *problem informer*. In this scenario, distributors gather information about product-related problems and transmit it to producers with minimal interpretation taking place (see exhibit 2). This is typical when distributors confront a level of problem

complexity that goes beyond their technical skills. Essentially, using their basic level of information coordination and relational capability, they inform producers about customer needs and concerns. Evidence from respondents suggests that most interactions with customers occur during the initial information acquisition stage; those with manufacturers occur during information transmission.

Examples of problems identified by problem informers include: “customer requests for new features in an electrical transformer” (D1); threats from “new products launched by competitors” (P3); and “lack of conformity to the [National] Standards Association” (D1). As underlying reasons for engaging in problem informer type of behavior, respondents noted: “we need to ensure that products remain competitive” (D1, P3, P4); “explicit requests from customers” (D2, P4); “part of our daily sales activities” (P5) and “a missed sale” (P1). A quotation by D1 is a representation of the problem informer scenario that incorporates several information processing stages:

We [distributors] take the pulse of the market and bring it to producers. We tell them that there is a problem with this kind of equipment because customers regularly mention the concern and that something should be done to resolve it. We ask the manufacturer if it is possible to develop something. There would be more sales potential if it were fixed, given the number of requests we receive. Companies are quite open to listening to us and try to develop something accordingly.

Detailing this scenario in terms of OIP, distributors acting as problem informers engage in relatively passive *information acquisition* in that they react to product-related problems arising from the field (e.g., “several customers mentioned the concern”, D1). They undertake minimal *information interpretation* by focusing on market-based data about specific product characteristics (e.g., “our distributors can give us some feedback on usage issues, as our products are very complex”, D2). The final stage of information processing for this group is *information transmission* (e.g., “we bring the pulse of the market to producers”, D1), which typically entails objective data about customers. These distributors were quite proactive in transmitting information about a problem, typically after repeated incidences or specific customer requests triggered an iterative

cycle of information acquisition and interpretation. This happens when “customers regularly mention [a problem]” (D1) or bring up “a recurrent issue” (P5). No evidence of distributor *information usage* was found; only regarding actions taken by the producer based on information provided by distributors. According to respondents, information generated by problem informers is useful “at the initial stages of the [PLM] development process” (P4), when manufacturers are exploring ways to improve their products (e.g., “producers ask us to let them know what is/is not working”, D2). Overall, the posture of problem informers is quite passive, involving awareness of a product-related problem, which they transmit to producers either proactively or in response to producer requests.

Solution Advisors

The second information processing pattern involves *solution advisors*. Solution advisors perform the same information processing activities as problem informers, but differ in how they engage in the interpretation and transmission phases. They do not stop at collecting and sharing information about a product-related problem, but typically recommend a course of action to solve it. Because they deal with a product environment involving low task complexity (i.e., few product components or simple modular design), they can deploy their basic information coordination capability to develop ideas about a possible solution. Such ideas are often facilitated by the presence of technically trained sales personnel (e.g., “our technicians looked into the problem”, D6). Respondents in this scenario describe few in-depth interactions with customers and producers, suggesting only limited deployment of their relational capability. Typically, solution advisors “talk with the customer during the sale” (D5), and then “tell the manufacturer our idea about a possible new feature” (D7).

The fieldwork identified twelve instances of distributors acting as solution advisor. Some examples of potential solutions to problems included: “adding a third impeller to a two-impeller

pump to match better performing products launched by competitors” (D7); “modifying an agricultural attachment for a telescopic handler to fit with olive-picking methods in Greece” (D9); and providing “a service component to the sale of the [product] to address customer difficulties with after-sale support” (D8). As underlying reasons for engaging in these activities, respondents mentioned: “the product was no longer competitive due to new products launched by competitors” (D7); “we came up with an idea for a new product feature during a sales meeting with a customer” (D5, P1), and “we wanted to differentiate the product from what was currently available in the market” (D8). D5 provides an example of the solution advisor scenario:

A customer wanted the sawing equipment to be remotely controlled. Even though we made the sale without that feature, we thought that adding a modem-internet connection might address this need. We shared the idea with the manufacturer and it was incorporated as part of the next product generation. So, it can happen that for subsequent machines, the manufacturer will add a feature that we suggested. When this happens, these become improved pieces of equipment, which are easier for us to sell.

As is evident from the above, solution advisors perform *information acquisition* in a similar fashion to problem informers and are also relatively passive in that information is acquired through regular contact with clients (e.g., “we noticed that several of our customers had similar problems”, D8). Important differences, however, emerge during the information processing stages that follow. During *information interpretation*, instead of noting that a problem might deserve attention, respondents stated that they themselves tried to make sense of the technical dimension and to come up with a solution. Due to this enhanced interpretation of, for example, a problem of “local differences in terminology in the product interface” or “a too rigid sequence in questions to be answered when using an electronic device” (P5), distributors suggested ideas for “making the product interface fully adjustable by the user” and “creating a dynamic structure that allows the nesting of questions depending on the previous answer” (P5). Thus, during *information transmission*, solution advisors not only alert producers about a problem, but offer ideas about how it might be solved, leading to a more elaborate information transmission stage. Regarding *infor-*

mation usage, similar to problem informers, there was no evidence of actual usage by distributors. As stated by D5: “manufacturers decide whether or not to incorporate our suggestions”. Nevertheless, compared to problem informers, solution advisors adopt a more proactive posture in that they engage in sketching out potential changes to product features, which can then be adopted by producers during PLM.

Solution Implementers

The third information processing pattern entails distributors acting as *solution implementers*. In this scenario, distributors go beyond gathering and interpreting information to share with producers; they become actively involved in information usage. In other words, these firms use the information they collect to actually address the problem. Several distributors were identified who, on becoming aware of a problem, went about implementing a solution (sometimes temporarily) that facilitated the sale of the product or its post-sale support. These distributors benefit from their knowledge and relational resources, and deal proactively with a relatively simple problem. To this end, solution implementers deploy strong relational skills with customers in order to learn about particular concerns and then use their advanced marketing and technical information coordination capabilities to solve the problem. For example, D9 stated: “I bring to the sales process my own expertise as a graduated engineer”; and D6 noted: “our sales reps talk to our technicians when there is a problem.” The research shows that solution implementers have an excellent capability to manage relationships with customers and this facilitates their task throughout the information processing activities. A typical solution implementer scenario is described by D9:

One customer explained: “Although I like this platform for the telescopic handler, it will be tiring to use on a continual basis. I’d like to be able to remove this barrier from the platform of the attachment.” After getting assurance of purchase from the customer if we solved this problem, we started talking with our technicians about what we could do to modify the platform. The customer really liked the modification we made and bought the product. And...the producer eventually decided to include our modified platform as a regular item in the catalogue!

The question of why some distributors go substantially beyond their traditional role as marketing intermediaries and take over part of the producer's role of changing specific product features was addressed by several respondents. Five cases offer some detail, providing insight to the motivation to engage in this type of activity. Solution implementers felt compelled to deploy their capabilities due to the perceived urgency of "addressing the weaknesses of the product" (D9) because it is ultimately they who "are responsible for customer satisfaction" (D6). Distributors also mentioned that they "cannot afford that customers are not able to work with the tools that we sell them" (D9). Thus, for solution implementers, having the ability to respond in a timely fashion to a problem experienced by customers is an essential part of their effort to create greater value and thereby differentiate themselves from competitors. Failing to deploy the 'right' level of capability to meet customer expectations was perceived as detrimental due to the high-pressure competitive environment in which these distributors operated.

In terms of OIP, distributors acting as solution implementers become much more actively involved in *information acquisition* about product-related problems. They do this by maintaining a strong link with customers, and by wanting to learn about and respond to their concerns. Examples include: "this problem has a major impact on our customer's operations" (D6), or "there may be a failure of motion sensors during cold and humid winter days" (D9). Further, in this low task complexity environment, distributors are in a position to deploy their high level information coordination capability to improve *information interpretation* in a 'purposeful' manner by formulating insights about actual changes to product features. Several respondents discussed how "trained engineers" (D6) or "staff technicians" (D9) became actively involved in making sense of the information gathered and "found a concrete solution to the problem" (D6). In contrast to the two previous scenarios, solution implementers also directly engage in *information usage* (note the qualification of 'internal' usage in exhibit 2). Instead of counting on manufacturers to handle the

problem, they respond to the needs of customers more immediately by executing product modifications themselves. For example, D6 described the decision to “change the position of a moving arm in the print-and-apply labelling machine in order to accommodate the round (rather than square) boxes used by the customer”. Although occasionally these distributors communicate with manufacturers prior to implementing a solution (“to ensure that it does not interfere with the rest of the product”, D9), in most cases *information transmission* takes place only after the information usage stage (note the qualification of ‘post-hoc’ in exhibit 2). For example, D6 related: “we told the manufacturer about the temporary solution we had implemented after the sale was completed.”

Compared to the two previous scenarios, solution implementers demonstrate an active posture when faced with a simple product problem. This proactivity is revealed not only by their in-depth involvement during earlier stages of information processing, but especially by their direct engagement in *information usage*. The resulting implementation of the product modification was carried out for at least two purposes: (1) “[it] is a temporary solution that allows the machine to work with this customer” (D9); and (2) “[it] represents an improvement to the equipment” (D9). One respondent highlighted how, at a later date, “the manufacturer actually built on our temporary ‘fix’ to develop a more permanent solution” (D9). Thus, from the producer’s point of view, while problem informers and solution advisors influence the idea generation or concept development stage when developing incremental new products during PLM, solution implementers can contribute to the development of an actual prototype of the improved product.

Solution Managers

The fourth type of product-related information processing scenario identified in this study is labelled the *solution manager*. Eight respondents discussed situations where, instead of implementing a change to a product feature, distributors became actively involved in coordinating a custom-

ized solution in collaboration with customers and producers, performing the intermediary role of ‘project broker’ (de Brentani and Reid, 2012). In this scenario, what contributes to high task complexity is a complex, integral product design with interrelated components that are not easily modified or adapted without impacting the functioning of other elements or the product as a whole. Given this high task complexity, solution managers engage in repeated cycles of information acquisition, interpretation and transmission oriented towards finding a solution that meets the criteria of the relevant stakeholders. Thus, in addition to a high information coordination capability, distributors’ inter-organization relational skills play an important role in achieving success.

According to respondents, engaging in this type of information processing by deploying high capability levels derives from a commitment “to make the life of our customers easier” and also because “we want to distinguish ourselves [from competitors] by bringing about a solution” (D3). They deploy these capabilities because of the “need to respond to our customers and to quickly adapt to changes in the market” (D2). Furthermore, active participation in the process was seen as an “opportunity to achieve higher revenues in the future [from this and other customers] resulting from the product modification” (D8). As such, solution managers appear to be driven to develop and deploy a high capability level by motivations similar to those of solution implementers; that is, competitive differentiation and consolidation/expansion of market position. Different from the implementer scenario, however, solution managers do not achieve these goals independently. Due to the complexity of the task, they need to “include suppliers in the process, notwithstanding [their] high level of competence” (D6). Examples of product changes ‘brokered’ by solution managers include:

- changes to facial recognition equipment arising from its integration into an hardware/software solution that we provide to our customers (D10);

- adaptations to signal testing equipment as part of a solution developed in collaboration with a distributor for a major German phone operator (P4); and
- modifications to print-and-apply labelling equipment using an electronic board that was developed and tested in conjunction with the manufacturer (D6).

Solution managers develop routines by which they combine relevant information—customer-related and technical—required for developing a solution. In effect, they “bring both expert customer experience and product knowledge to the manufacturer” (D10). Despite a strong market-plus-technical capability that allows them to play this more sophisticated role, they nevertheless are “not able to implement the solution on [their] own” (D2) due to the high level of task complexity. Therefore, a high level of relational capability is also needed by these distributors in order to manage the multiple and on-going interactions between themselves, customers and producers. This is evident from the description by D3:

We sit down with customers to determine what their needs are. Based on this, we start to see what we can do with the individual components we offer or with a combination of products and services...an assembled solution. We also determine the resources required to address these needs. Once we have a better understanding of what is involved, we turn to the manufacturer and provide the facts, the detailed needs and sometimes even the resources required to address the issue. While the manufacturer works on the solution, we take charge of all the back and forth between customer and producer...At this point, the manufacturer’s engineering department starts working on the actual solution; but, we are in charge of deployment at the customer site.

As shown above and in exhibit 2, solution managers deploy substantial effort when it comes to *information acquisition*. Repeated exchanges of information regarding market and technical factors take place in order to gain an “in-depth understanding of the issues at stake” (D8). During *information interpretation*, solution managers delineate the product adaptations, accompanying services and customizations needed. As part of this purposeful interpretation, distributors compare the information gathered with the “competencies, products and services available in-house and through producers” (D6). Once producers become involved, several respondents noted that *information transmission* between the firms becomes an on-going and iterative affair. As

described by D2: “we make sure that what we do with the producer corresponds to customer needs.” Finally, this scenario involves shared *information usage* by both producer and distributor: the producer develops the modified component(s) or redesigns the product; the distributor oversees “integration of the [solution] at the customer site” (D2).

In OIP terms, solution managers take on an active posture when it comes to solving problems during PLM. They not only identify the product-related concerns and transmit these to producers (similar to problem informers), they also interpret the information and undertake sophisticated information integration in order to facilitate a solution. Further, they use advanced inter-organization relational capabilities to mediate the interactions among stakeholders. The scenario entails a ‘quasi-partnership’ as channel members become interdependent in terms of the information processing activities and, differently from the other scenarios, gives producers easier access to the information processed by distributors. As in the case of solution implementers, product modifications resulting from solution managers fulfil at least two goals: they address customer needs, providing distributors with greater influence over achieving sales objectives; and they help producers during PLM to make “potentially more permanent product improvements based on the customized modifications already undertaken” (P4). As stated by D2, “most exchanges with producers take place only for the initial prototype; after that, we are out of the picture.”

In many respects, not the least that the key capabilities of information coordination and relationship handling must be deployed at a high level, solution managers represent the most complex scenario described in this study. It should be noted, however, that distributors do not always begin their contribution to PLM in this role. One respondent (D6) discussed migrating over time from a less involved role such as solution advisor to the more complex one of solution manager:

It was a slow process. At first, the producer realized that whenever we exchanged information, this led to an improved product. Sometimes, rather than having a simple conversation, we engaged in several exchanges. We would make some drawings, show a video, and ultimately this led to more product changes. We did this several times and, at a certain point, it became part of our relationship with that manufacturer. At a later stage, we worked together on solutions where our company played a proactive role in that we identified which parts of the product needed to be modified. This allowed us to achieve important successes, such as signing a contract with a [major] customer.

Summary and Discussion

The study builds on evidence in the channels and NPD literatures indicating that, through their feedback to producers, distributors contribute to NPD by potentially enhancing product quality (Weber, 2001) and as a possible source of new product ideas (Crawford and Di Benedetto, 2011; Lonsdale et al., 1996). But, these literatures offer only limited insight about the dynamics underlying the generation and transmission of product-related feedback especially during the important PLM stage that follows new product launch. Further, the extant PLM literature primarily emphasizes the logistics-related role of distributors (e.g. Ausura et al., 2005), thus providing only limited insight about how and the extent to which information coming from distributors benefits incremental NPD (Urban and Hauser, 1993). To address this knowledge gap, an original typology was developed, based on the themes of task complexity and dynamic capabilities, and then used the concept of OIP to describe distributor product-related information processing activities during PLM. The typology frames the information processing activities of distributors as driven by the (low/high) level of two key dynamic capabilities—that is, the combination of information coordination and inter-organization relational capabilities—and level of task complexity. Insights from the literature are complemented with empirical evidence from managers of B2B producer and distributor firms. Based on this, four distinct patterns of distributor product-related infor-

mation processing during PLM are identified, including: problem informer, solution advisor, solution implementer and solution manager.

Distributors act as *problem informers* when they provide simple feedback to producers about product usage issues and/or customer problems. This scenario occurs when task complexity is high and when distributors deploy a basic (low) capability level. These distributors focus on their normal channel-related functions, engaging in relatively passive information acquisition, minimal interpretation, and only factual information transmission to producers. The study shows, however, that distributor involvement is not limited to this traditional role. In three of the four scenarios, they go further by actually getting involved in bringing about a solution to the problem. In the *solution advisor* scenario, distributors provide producers with ideas about how a problem might actually be solved. This occurs when task complexity is low and when distributors use their basic capabilities not only to acquire and transmit information, but also to interpret the data and providing insights about solving the problem. While the latter of these two scenarios enriches the information that is transmitted, in both situations the decision to use the information and to solve the problem is left to the producer. Looking at the two high-capability scenarios, the potential for contribution to PLM by distributors is substantially increased. Deploying their higher capability in information coordination and inter-organizational relations, these distributors become more proactive active in the realm of solution provision. In cases of low task complexity, distributors acting as *solution implementers* actually change specific product features to address the problem. These distributors adopt a more proactive stance towards information acquisition and interpretation, and make deliberate use of the information in order to solve the product-related problem. Finally, some high capability distributors, when faced with a complex problem, become *solution managers*. They act as ‘brokers’ who coordinate a collaborative effort involving the relevant stakeholders in order to bring about an integrated solution. This scenario is particularly

demanding as distributors are required not only to coordinate a variety of information (marketing and technical), but also to have a distinctive capability to manage the often complex inter-organizational relationships involved.

Theoretical Contributions

By integrating the literatures on innovation and channels, this article responds to the call by Kahn et al. (2006) to develop extant knowledge about PLM. It shows that it is possible to “turn industrial distributors into partners” (Narus and Anderson, 1986, p. 55). The typology developed and investigated in this article provides both theoretical and empirical evidence in favour of a broader role for distributors during PLM, beyond what past research has acknowledged in terms of support for logistics and market coverage. Further, it provides important evidence and insight about how the interplay between task complexity and level of firm capabilities—both information coordination and inter-organizational relations—affect the information processing activities underlying the generation and handling by distributors of product-related feedback.

The research enriches the innovation literature by focusing on the manufacturer-distributor interface during PLM. It significantly enhances with specific detail the general statements about the usefulness of distributor feedback and the checklists that deal with distributors involvement in NPD-related activities (Crawford and Di Benedetto, 2011; Song and Zhao, 2004; Weber, 2001). The research further qualifies the type of product feedback coming from distributors, over and above the simple problem informer type. It identifies specific scenarios where distributors contribute to the actual solution of a problem by formulating ideas about what product features should be changed (solution advisors), by directly implementing product changes (solution implementers), or by cooperating in and managing collaborative efforts to develop solutions (solution managers). These insights about distributor information processing patterns relevant for NPD during PLM make an important contribution. Through the typology, a better understanding is

gained into distributor-producer relationships and into their role in the incremental NPD program of firms, which is considered “important” or “very important” by 80 percent of firms (Andrew et al., 2010).

Building on dynamic capabilities theory, this article sheds light on the mechanisms underlying value creation in channel relationships through information flow. The typology underscores the importance of developing organizational dynamic capabilities as a preliminary condition for contributing to product innovation. As shown in the findings, processes and skills aimed at coordinating market and technical information, and managing inter-organization relationships are not only key drivers of value creation in modern distribution (e.g., Mudambi and Aggarwal, 2005; Olsson et al., 2013), but are fundamental to the ability of distributors to effectively deal with the product-related concerns of their customers. The findings show that these dynamic capabilities must be developed and deployed not only by manufacturers, but also by distributors if they are to take full advantage of the information available to them. When these capability levels are high, distributors can deal more effectively with the needs of customers and thereby gain a significant competitive edge (solution implementer and solution manager).

This more active role of distributors suggests that producers’ innovation processes can benefit from enhanced connections with distributors, similar to what occurs between suppliers and manufacturers in a ‘Keiretsu’ context. Dyer (1996) shows how industrial innovation benefits from linkages between producers and upstream suppliers in what is defined as an ‘American Keiretsu’ approach to value chain relationships. This article enriches past studies listing distributors as partners in Keiretsu configurations^{iv} (e.g., Lincoln et al., 1996), by exploring the ways in which downstream partners contribute to incremental NPD during PLM.

Managerial Implications

Distributors can use the typology to better plan for achieving differentiation and competitive advantage thanks to the product-related feedback they have access to. As a hands-on tool, the typology can assist distributors regarding the type of information processing they should undertake depending on the complexity of the problem encountered. Distributors can assess their current position in terms of information coordination and relational capabilities and decide whether or not to invest in the enhancement of the resources underlying these capabilities. When operating at a 'low' capability level, distributors are more dependent on producers for achieving differentiation; this, because they must wait for producers to implement ideas for product modifications that result from their input as problem informers or solution advisors. With more advanced capabilities, distributors can become more actively involved in addressing their customers' concerns. This occurs either as primary decision makers when acting as solution implementers or as project coordinators, or project brokers, when acting as solution managers. Whereas a higher capability level opens to distributors the possibility of contributing directly to differentiation and competitive advantage by solving product-related problems, these intermediaries need to be aware of the commitment in time and resources required to develop such capabilities.

For producers, the typology can serve two purposes. First, they can categorize distributors based on their level of information coordination and inter-organization relational capabilities, and product modification tasks planned for the PLM phase in terms of degree of complexity. This mapping activity would provide an idea of what type of product-related feedback to expect from which distributors. They can also use the typology to identify at what stage of the incremental NPD process to integrate input from distributors. Up-front idea generation could benefit from both problem informers and solution advisors. Including these two types of distributors has the potential to: gain a better understanding of market needs, increase the number of credible ideas

put forward, and reduce this front-end stage in terms of cost and time. The product prototyping stage would benefit from input from solution implementers and solution managers. In the case of solution implementers, at least one prototype has already been developed, usually in response to a relatively simple, but urgent, problem. When undertaking development activities for the next product generation, producers can potentially use the modification 'as is', thus reducing development cost and time; and also lowering uncertainty and risk by using the quasi-gamma test data resulting from the distributor-implemented solution. When dealing with more complex redevelopment scenarios, partnering with solution managers can help to jointly develop a prototype and gain more direct access to relevant customer and product-related information. In both of these scenarios, changes to product features are sometimes made to meet the needs of customers who are ahead of the market (i.e., 'lead users'; von Hippel, 1986), resulting in markets with substantial potential for the future.

Finally, the typology can be used by distributors and producers to determine the potential impact of the information processing activities undertaken by distributors on channel relationships. Distributors with advanced information coordination and relational capabilities can provide a rich contribution to PLM; but, they might also claim more autonomy in the process. In the longer run, this power asymmetry has the potential to increase channel conflict (e.g., Webb and Lambe, 2007) due to diminished compatibility in the goals of channel members and changed expectations regarding the roles and rights of each party. To address these issues, channel members must ensure the presence of appropriate incentives, communication mechanisms and trust levels to facilitate alignment of interests and cooperation (Anderson and Narus, 1990; Palmatier, Dant, and Grewal, 2007).

Limitations and Future Research

Our study contributes to both theory and practice, as detailed in the previous sections. Nevertheless, certain limitations are acknowledged that should be addressed by future research. In particular, the small sample size and its focus on industrial goods, while coherent with the exploratory nature of the investigation and its goal to achieve greater understanding of distributor contribution to PLM, limits the generalizability of the findings. Thus, future research should validate this typology through a larger scale quantitative study (Doty and Glick, 1994). To ensure that the typology is a generalized description of distributor information processing activities during PLM, the sample should include both manufacturers of goods and service providers. Extant research shows that service innovation benefits from information from frontline employees or sales representatives due to their privileged access to customers (de Brentani, 1989; 2001; Lievens and Moenaert, 2000). Thus, because of their proximity to local markets, the role of distributors in the service sector might be even more decisive. Due to the inherently interactive nature of service offerings (Grönroos, 1998), a more prominent role of relational capabilities could be expected in the service context.

Future research should add measures of NPD performance and of environmental conditions. Given that information processing has a beneficial impact on NPD success (Pentina and Strutton, 2007), the inclusion of performance measures would help in verifying the positive impact on performance suggested by some of the respondents in this study. Whereas distributor input was linked to reduced development time and to competitive advantage, no performance indicators were used in this study. It would also be beneficial to study the impact of key environmental factors—e.g., competitive intensity, market instability or degree of globalization (de Brentani et al., 2010; Frazier et al., 2009; Song et al., 2008)—on the occurrence of distributor information processing types. Future research could test whether an environment that is subject to more rapid

change accelerates the development of information coordination and relational capabilities on the part of distributors, leading to more sophisticated information processing scenarios during PLM.

Finally, future research could explore whether distributors with more advanced capabilities—i.e., solution implementers and solution managers—can help producers to identify ‘lead users’ (von Hippel, 1986; Franke, von Hippel and Schreier, 2006). Distributors acting in these roles sometimes detect pressing needs that are in advance of the majority of customers in a given market. Distributors’ active posture towards the problems experienced by these pioneering customers can help producers to achieve the enhanced benefits associated with solving them.

Notwithstanding the limitations, the study responds to key questions about the role of distributors during the PLM phase of the NPD process. Given the dearth of research and the importance of lifecycle management activities to long-term performance, it provides new insights to this important topic and a more solid basis both for managerial action and for undertaking further research in this area.

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References

- Accenture. 2009. High performance through product development. In: *Accenture research and insights into product development mastery*: Accenture, 15.
- Anderson, J.C. and J.A. Narus. 1990. A model of distributor firm and manufacturer firm working partnerships. *Journal of Marketing* 54(1): 42-58.
- Andrew, J.P., J. Manget, D.C. Michael, A. Taylor and H. Zablit. 2010. *Innovation 2010: A return to prominence and the emergence of a new world order*. Boston, MA: Boston Consulting Group.
- Ausura, B., B. Gill, and S. Haines. 2005. Overview and context for life-cycle management. In: *The PDMA handbook of new product development*, ed. K.B. Kahn, 497-512. Hoboken, NJ: John Wiley and Sons.
- Barney, J.B., D.J. Ketchen, and M. Wright. 2011. The future of resource-based theory. *Journal of Management* 37(5): 1299-1315.
- Barreto, I. 2010. Dynamic capabilities: A review of past research and an agenda for the future. *Journal of Management* 36(1): 256-280.
- Biemans, W.G. 1991. User and third-party involvement in developing medical equipment innovations. *Technovation* 11(3): 163-182.
- Campbell, D.J. 1988. Task complexity: A review and analysis. *Academy of Management Review* 13(1): 40-52.
- Choo, C.W. 2002. *Information management for the intelligent organization: The art of scanning the environment*. Medford, NJ: American Society for Information Science and Technology; Information Today.
- Clark, B.H., A.V. Abela, and T. Ambler. 2006. An information processing model of marketing performance measurement. *Journal of Marketing Theory and Practice* 14(3): 191-208.
- Clark, K.B. and S.C. Wheelwright. 1993. *Managing new product and process development: Text and cases*. New York, NY: The Free Press.
- Cooper, R. (2011). PERSPECTIVE: The innovation dilemma: How to innovate when the market is mature. *Journal of Product Innovation Management*, 28 (s1), 2-27.
- Coughlan, A., E. Anderson, L.W. Stern, and A. El-Ansary. 2006. *Marketing channels*. Englewood Cliffs, NJ: Prentice Hall.
- Crawford, C.M. and A. Di Benedetto. 2011. *New products management*. 10th edn. New York, NY: McGraw-Hill/Irwin.
- Day, G.S. 1994. The capabilities of market-driven organizations. *Journal of Marketing* 58(4): 37-52.
- de Brentani, U. 1989. Success and failure in new industrial services. *Journal of Product Innovation Management* 6(4): 239-258.
- de Brentani, U. 2001. Innovative versus incremental new business services: Different keys for achieving success. *Journal of Product Innovation Management* 18(3): 169-187.
- de Brentani, U., E.J. Kleinschmidt, and S. Salomo. 2010. Success in global new product development: Impact of strategy and the behavioral environment of the firm. *Journal of Product Innovation Management* 27(2): 143-160.
- de Brentani, U. and S.E. Reid. 2012. The fuzzy front end of discontinuous innovation: Insights for research and management. *Journal of Product Innovation Management* 29(1): 70-87.
- Doty, D.H. and W.H. Glick. 1994. Typologies as a unique form of theory building: Toward improved understanding and modeling. *Academy of Management Review* 19(2): 230-251.
- Dyer, J.H. 1996. How Chrysler created an American Keiretsu. *Harvard Business Review* 74(4): 42-56.

- Dyer, J.H. and H. Singh. 1998. The relational view: Cooperative strategy and sources of interorganizational competitive advantage. *Academy of Management Review* 23(4): 660-679.
- Eisenhardt, K.M. and J.A. Martin. 2000. Dynamic capabilities: What are they? *Strategic Management Journal* 21(10/11): 1105-1121.
- Ernst, H., W.D. Hoyer, and C. Rübsaamen. 2010. Sales, marketing, and research-and-development cooperation across new product development stages: Implications for success. *Journal of Marketing* 74(5): 80-92.
- Franke, N., E. von Hippel, and M. Schreier. 2006. Finding commercially attractive user innovations: A test of lead-user theory. *Journal of Product Innovation Management* 23(4): 301-315.
- Frazier, G.L., E. Maltz, K.D. Antia, and A. Rindfleisch. 2009. Distributor sharing of strategic information with suppliers. *Journal of Marketing* 73(4): 31-43.
- Frishammar, J. and S. Åke Hörte. 2005. Managing external information in manufacturing firms: The impact on innovation performance. *Journal of Product Innovation Management* 22(3): 251-266.
- Galbraith, J.R. 1973. *Designing complex organizations*. Boston, MA: Addison-Wesley Longman Publishing Co.
- George, A.L. and A. Bennett. 2005. Integrating comparative and within-case analysis: Typological theory. In: *Case studies and theory development in the social sciences*, ed. A.L. George and A. Bennett, 233-262. Cambridge, MA: M.I.T. Press.
- Griffin, A. 1997. PDMA Research on new product development practices: Updating trends and benchmarking best practices. *Journal of Product Innovation Management* 14(6): 429-458.
- Grönroos, C. 1998. Marketing services: The case of a missing product. *Journal of Business & Industrial Marketing* 13(4/5): 322-338.
- Huber, G.P. 1991. Organizational learning: The contributing processes and the literatures. *Organization Science* 2(1): 88-115.
- Hultink, E.J., A. Griffin, S. Hart, and H.S.J. Robben. 1997. Industrial new product launch strategies and product development performance. *Journal of Product Innovation Management* 14(4): 243-257.
- John, G. and T. Reve. 1982. The reliability and validity of key informant data from dyadic relationships in marketing channels. *Journal of Marketing Research* 19(4): 517-524.
- Kahn, K.B., G. Barczak, and R. Moss. 2006. PERSPECTIVE: Establishing an NPD best practices framework. *Journal of Product Innovation Management* 23(2): 106-116.
- Kim, J. and D. Wilemon. 2003. Sources and assessment of complexity in NPD projects. *R&D Management*, 33(1): 15-30.
- Kleinschmidt, E.J., U. de Brentani, and S. Salomo. 2007. Performance of global new product development programs: A resource-based view. *Journal of Product Innovation Management* 24(5): 419-441.
- Kohli, A.K., B.J. Jaworski, and A. Kumar. 1993. MARKOR: A measure of market orientation. *Journal of Marketing Research* 30(4): 467-477.
- Kumar, N., L.W. Stern, and J.C. Anderson. 1993. Conducting interorganizational research using key informants. *Academy of Management Journal* 36(6): 1633-1651.
- Landis, J.R. and G.G. Koch. 1977. The measurement of observer agreement for categorical data. *Biometrics* 33(1): 159-74.
- Lievens, A. and R.K. Moenaert. 2000. New service teams as information-processing systems: reducing innovative uncertainty. *Journal of Service Research* 3(1): 46-65.

- Lincoln, J.R., M.L. Gerlach, and C.L. Ahmadjian. 1996. Keiretsu networks and corporate performance in Japan. *American Sociological Review* 61(1): 67-88.
- Lonsdale, R.T., N.M. Noël, and S.F. Stasch. 1996. Classification of sources of new product ideas. In: *The PDMA handbook of new product development*, ed. M.D. Rosenau, A. Griffin, G.A.Castellion and N.F. Anschuetz, 179-193. New York, NY: John Wiley & Sons.
- Lorenzoni, G. and A. Lipparini. 1999. The leveraging of interfirm relationships as a distinctive organizational capability: A longitudinal study. *Strategic Management Journal* 20(4): 317-338.
- Lusch, R.F., J.R. Brown, and M. O'Brien. 2011. Protecting relational assets: A pre and post field study of a horizontal business combination. *Journal of the Academy of Marketing Science* 39(2): 175-197.
- Miles, M.B. and M. Huberman. 1994. *Qualitative data analysis: An expanded sourcebook*. Thousand Oaks, CA: Sage Publications, Inc.
- Millson, M.R. and D. Wilemon. 2002. The impact of organizational integration and product development proficiency on market success. *Industrial Marketing Management* 31(1): 1-23.
- Moenaert, R.K. and W.E. Souder. 1990. An information transfer model for integrating marketing and R&D personnel in new product development projects. *Journal of Product Innovation Management* 7(2): 91-107.
- Moenaert, R.K., F. Caeldries, A. Lievens, and E. Wauters. 2000. Communication flows in international product innovation teams. *Journal of Product Innovation Management* 17(5): 360-377.
- Moorman, C. 1995. Organizational market information processes: Cultural antecedents and new product outcomes. *Journal of Marketing Research* 32(3): 318-335.
- Morgan, N.A., D.W. Vorhies, and C.H. Mason. 2009. Market orientation, marketing capabilities, and firm performance. *Strategic Management Journal* 30(8): 909-920.
- Mudambi, S. and R. Aggarwal. 2003. Industrial distributors: Can they survive in the new economy? *Industrial Marketing Management* 32(4): 317-325.
- Narus, J.A. and J.C. Anderson. 1986. Turn your industrial distributors into partners. *Harvard Business Review* 64(2): 66-71.
- Novak, S. and S.D. Eppinger. 2001. Sourcing by design: Product complexity and the supply chain. *Management Science* 47(1): 189-204.
- Olsson, R., Gadde, L. E., and Hulthén, K. (2013). The changing role of middlemen: Strategic responses to distribution dynamics. *Industrial Marketing Management*, 42(7): 1131-1140.
- Palmatier, R.W., R.P. Dant, and D. Grewal. 2007. A comparative longitudinal analysis of theoretical perspectives of interorganizational relationship performance. *Journal of Marketing* 71(4): 172-194.
- Patton, M.Q. 2001. *Qualitative research and evaluation methods*. Thousand Oaks, CA: Sage Publications Inc.
- PDMA Glossary. 2005. In: *The PDMA handbook of new product development*, ed. K.B. Kahn, 59-72. Hoboken, NJ: John Wiley and Sons.
- Pentina, I. and D. Strutton. 2007. Information processing and new product success: a meta-analysis. *European Journal of Innovation Management* 10(2): 149-175.
- Petersen, K.J., R.B. Handfield, and G.L. Ragatz. 2003. A model of supplier integration into new product development. *Journal of Product Innovation Management* 20(4): 284-299.
- Pimentel Claro, D. and P.B. Oliveira Claro. 2010. Collaborative buyer-supplier relationships and downstream information in marketing channels. *Industrial Marketing Management* 39(2): 221-228.
- Rosenbloom, B. 2013. *Marketing channels: A management view*. Mason: OH: South-Western.

- Saaksvuori, A. and A. Immonen. 2008. *Product lifecycle management*. Berlin: Springer-Verlag.
- Sisodiya, S.R., J.L. Johnson, and Y. Grégoire. 2013. Inbound open innovation for enhanced performance: Enablers and opportunities. *Industrial Marketing Management* 42(5): 836-849.
- Song, X.M. and Y. Zhao. 2004. A neural network for predicting manufacturers' perceived cooperation with distributors in the new product development process. *Journal of Business to Business Marketing* 11(3): 53-78.
- Song, X.M., C. Di Benedetto, and Y. Zhao. 2008. The antecedents and consequences of manufacturer–distributor cooperation: An empirical test in the U.S. and Japan. *Journal of the Academy of Marketing Science* 36(2): 215-233.
- Teece, D.J., G. Pisano, and A. Shuen. 1997. Dynamic capabilities and strategic management. *Strategic Management Journal* 18(7): 509-533.
- Tompkins International. (2013). Industrial distribution at a crossroads. Available at: <http://www.tompkinsinc.com/wp-content/uploads/2013/03/tompkins-industrial-distribution-crossroads.pdf>
- Tushman, M.L. and D.A. Nadler. 1978. Information processing as an integrating concept in organizational design. *Academy of Management Review* 3(3): 613-624.
- U.S. Census Bureau. 2010. Monthly and annual wholesale trade. Available at: <http://www.census.gov/wholesale/index.html>
- Ulrich, K.T. and S.D. Eppinger. 2004. *Product design and development*. New York, NY: McGraw-Hill/Irwin.
- Urban, G.L. and J.R. Hauser. 1993. *Design and marketing of new products*. Englewood Cliffs, NJ: Prentice-Hall, Inc.
- Verona, G. and D. Ravasi. 2003. Unbundling dynamic capabilities: An exploratory study of continuous product innovation. *Industrial and Corporate Change* 12(3): 577-606.
- von Hippel, E. 1986. Lead users: A source of novel product concepts. *Management Science* 32(7): 791-805.
- Webb, K.L. and C.J. Lambe. 2007. Internal multi-channel conflict: An exploratory investigation and conceptual framework. *Industrial Marketing Management* 36(1): 29-43.
- Weber, J.A. 2001. Partnering with resellers in business markets. *Industrial Marketing Management* 30(2): 87-99.
- Yoon, E. and G.L. Lilien. 1988. Characteristics of the industrial distributor's innovation activities: An exploratory study. *Journal of Product Innovation Management* 5(3) : 227-240.
- Zahay, D., A. Griffin, and E. Fredericks. 2011. Information use in new product development: An initial exploratory empirical investigation in the chemical industry. *Journal of Product Innovation Management* 28(4) : 485-502.
- Zollo, M. and S.G. Winter. 2002. Deliberate learning and the evolution of dynamic capabilities. *Organization Science* 13(3): 339-351.

Table 1. Distributor Involvement in New Product Development: Summary of Past Research

Topic	Highlights	Representative Works
Distributors as source of information	Information is key resource exchanged between channel members <ul style="list-style-type: none"> - Strategic and tactical information - Market-based issues - Technical elements 	Coughlan et al., 2006, Rosenbloom, 2013 Frazier et al., 2009; Pimentel et al., 2010 Kohli et al., 1993; Mudambi & Aggarwal, 2003 Mudambi & Aggarwal, 2003
Distributor role: NPD activities	<ul style="list-style-type: none"> - Cooperation with producers during NPD (in general) - Source of new product ideas and contributors to product quality improvements - Feedback on promotion- and pricing-related issues during launch - Source of feedback: product usage, acceptance and/or problems - Primary role during PLM: achieve market coverage, logistics support 	Biemans, 1991; Crawford & Di Benedetto 2011; Yoon & Lilien, 1988; Song et al., 2008 Lonsdale et al., 1996; Crawford & Di Benedetto, 2011; Weber, 2001 Song et al., 2008; Song & Zhao, 2004 Crawford & Di Benedetto, 2011; Mudambi & Aggarwal, 2003 Ausura et al., 2005; Urban & Hauser, 1993

Table 2. Description of Respondents

Label	Position	Industry Sector (Channel Function)	Employees	Market Coverage
P1	VP: Business Development	Electrical and Electronic (Producer)	51-200	International
P2	VP: Sales	Biometrics (Producer)	201-500	International
P3	President	Diamond Tools (Producer)	10-50	International
P4	VP: Test & Measurement Division	Telecom Equipment (Producer)	>1500	International
P5/D10	VP: Security & ID	Security Equipment (Producer & Distributor)	51-200	International
D1	Associate Partner, Co-Founder	Electrical Equipment (Manufacturer Agent)	5-10	National
D2	Territory Manager	Safety & Industrial Equipment (Manufacturer Agent)	11-50	National
D3	President	Industrial Equip. & Supplies (Manufacturer Agent)	5-10	National
D4	President	Industrial Printing Equipment & Supplies (Distributor)	< 5	Regional
D5	Territory Manager	Woodworking Equipment (Wholesaler)	51-200	National
D6	Technical Director	Product ID Equipment & Supplies (Producer and Distributor)	51-200	National (US & Canada)
D7	VP: Projects, Operations & Innovation	Pumping Equipment (Producer and Distributor)	51-200	National
D8	Branch Manager	Maintenance Supplies (Wholesaler)	1001-2000	National (US & Canada)
D9	VP: Marketing	Telescopic Machinery (Distributor)	51-200	National

Exhibit 1. Typology of Distributor Information Processing Activities during PLM

		Information Coordination and Inter-organization Relational Capabilities	
		Low	High
Task Complexity	High	<p>1. Problem Informer Distributors focus on their traditional market expertise and on basic connections with their upstream and downstream partners. When faced with product-related problems involving several/complex components, they identify (from customer input) and share with producers information about the problem and need for a solution.</p>	<p>4. Solution Manager Distributors have high technical and market-related capabilities, and strong inter-organizational skills. With these advanced capabilities, they have a good understanding of complex product-related problems (involving several components and/or interactions with other parts). Their advanced ability to establish and maintain connections with partners allows them to ‘broker’ the process of finding a solution in partnership with producers, and participate in its delivery to customers.</p>
	Low	<p>2. Solution Advisor Distributors deploy essential technical knowledge and maintain connections with upstream and downstream partners. When product-related problems faced by their customers are low in complexity (limited number of components or interactions with other parts), they not only acquire information about the problem, but also come up with ideas for possible solutions.</p>	<p>3. Solution Implementer Distributors have both the technical and market-related expertise to deal with a low-complexity problem, and can manage interactions with both upstream and downstream partners. They are able to use these advanced capabilities to cover the entire process of identifying and, independent of producers, actually implementing a solution to a relatively simple product-related problem (few components and/or interactions).</p>

Exhibit 2. Summary of Scenario Information Processing Activities

Information Coordination and Inter-Organization Relational Capabilities

		Low	High
Task Complexity	High	<p>1. Problem Informer</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> Passive Information Acquisition Collects information from customer/ market-place </div> <p style="text-align: center;">↓</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> Minimal Information Interpretation Makes sense of information collected from mostly market-based sources </div> <p style="text-align: center;">↓</p> <div style="border: 1px solid black; padding: 5px;"> Factual Information Transmission Shares data about problem(s) with producers </div>	<p>4. Solution Manager</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> Active Information Acquisition Actively engages in collecting information to achieve in-depth understanding of problem </div> <p style="text-align: center;">↓</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> Purposeful Information Interpretation Direct efforts to make sense of the information towards identifying a solution </div> <p style="text-align: center;">↓</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> Iterative Information Transmission On-going exchange & coordination of information with producers and customers </div> <p style="text-align: center;">↓</p> <div style="border: 1px solid black; padding: 5px;"> Shared Information Usage Producer develops product modification; distributor manages integration </div>
		9 cases: (P) 1, 2, 3, 4, 5; (D) 1*, 2, 3	8 cases: (P) 4; (D) 2*, 3, 6*, 8, 10
	Low	<p>2. Solution Advisor</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> Passive Information Acquisition Collects information through customer contact </div> <p style="text-align: center;">↓</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> Enhanced Information Interpretation Active analysis of information; direct efforts to identify solution </div> <p style="text-align: center;">↓</p> <div style="border: 1px solid black; padding: 5px;"> Elaborate Information Transmission Shares information with producer about problem and potential solution(s) </div>	<p>3. Solution Implementer</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> Active Information Acquisition Actively engages in learning about the problem </div> <p style="text-align: center;">↓</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> Purposeful Information Interpretation Direct efforts at finding implementable solution </div> <p style="text-align: center;">↓</p> <div style="border: 1px solid black; padding: 5px; margin-bottom: 5px;"> Internal Information Usage Uses information to actually change product </div> <p style="text-align: center;">↓</p> <div style="border: 1px solid black; padding: 5px;"> Post hoc Information Transmission Shares information with producer after solution was implemented </div>
		12 cases: (P) 1, 2, 5*; (D) 2, 4, 5, 6, 7, 8*, 9	6 cases: (D) 4, 6*, 9*

Legend: D#/P# = Distributor/Producer respondents; * = Respondents with repeated mentions within scenario

Appendix

Interview Guide for Producers

1. Could you briefly describe your field of activity?
2. How do you generate, develop and launch new products?
3. When do you develop new products? Do you collaborate with business partners?
4. Do your distributors give you feedback about new products that you launched to the market? If yes, please respond to the following questions:
 - 4.1 Can you provide more details about some of the product modifications associated with feedback from your distributors over the past five years?
 - 4.2 What type of information was provided?
 - 4.3 How was this information gathered, interpreted and transmitted to you?
 - 4.4 How did your distributor(s) manage the interactions with all of the parties involved?
5. Do you use any incentives to motivate your distributor(s) to take part in the process?
6. What is your relationship with your distributor(s)?
7. How knowledgeable is/are your distributor(s) about the market? How knowledgeable are you about your market?
8. How expert is the distributor in technical matters related to this product?
9. What percent of your sales depend on this distributor (past five years)?
10. According to your experience, what are some of the results of distributor participation in NPD activities that followed the initial launch of the product?
 - 10.1 What were some positive outcomes?
 - 10.2 What were some negative outcomes?
11. Considering your total NPD program over the last 5 years, roughly what is the percentage of improvement/adaptation projects in which your distributor(s) participated in some way?

Interview Guide for Distributors

1. Could you briefly describe your field of activity?
2. When your suppliers develop a new product, do you get involved in any way? If so, how?
3. Do you provide feedback to producers about new products that have been launched to the market? If yes, please respond to the following questions:
 - 3.1 Can you provide more details about some of the product modifications associated with your feedback over the past five years?
 - 3.2 What types of information did you provide?
 - 3.3 How was the information gathered, interpreted, transmitted? (interviewer: probe each activity)
 - 3.4 What was the level of interaction with the parties involved (e.g., customers, suppliers)?
4. Did your suppliers undertake any actions to increase your participation in the process?
5. How would you describe your relationship with this supplier?
6. How would you rate your level of knowledge about your market? How well do you think your suppliers understand the market?
7. What is your level of expertise on technical matters related to this product?
8. Roughly, what percent of your sales depend on this supplier (over past 5 years)?
9. According to your experiences, what were some of the consequences of your participation in NPD with your supplier(s)?
 - 9.1 What were some of the positive outcomes?
 - 9.2 What were some of the negative outcomes?
10. Taking into account your normal activities as a distributor, what is the extent of your involvement in product improvement or modification activities with your supplier(s)?
11. How often did you engage in these types of activities over the last 5 years?

ⁱ Because this article deals with distributor contribution to NPD, as opposed to their primary function as logistics intermediary, the term ‘product-related’ activities is used to distinguish between the two sets of functions. Also, because in this study the product-related information generated by distributors has the potential to impact NPD, ‘product-related’ and ‘NPD-related’ are used interchangeably.

ⁱⁱ The authors thank an anonymous reviewer for the suggestion to use dynamic capabilities theory.

ⁱⁱⁱ Because all distributors handled information storage and retrieval in a similar manner and because these two information processing activities are less relevant to the topic in question, they were omitted from exhibit 2 and only briefly acknowledged in the text where appropriate.

^{iv} The authors thank an anonymous reviewer for this insight.