**Abstract:** Co-innovation has been found to be difficult to control, but especially in industrial context, where the potential partners for co-innovation are often important long-term customers, the co-innovation process needs careful management. Previous literature provides insights into the innovation process and customer integration in it, but combined understanding of these in order to understand the co-innovation process within long-term industrial customer relationships is still developing. Through a qualitative six-case study, this study identifies three types of co-innovation processes with industrial customers and presents related managerial implications.

**Keywords:** Co-innovation; innovation process; innovation management; integrated solutions; relationship management; supplier-customer relationship.
1 Introduction

The current literature has discussed the methods and the benefits of innovating with customers (Franke, 2006; Fang, 2008), but noted that co-innovation projects are difficult to control (Bruce, et al., 1995), requiring careful management to achieve the rewards (Wilson et al., 1995). The established customer relationships are a natural starting point when looking for co-innovation partners (Cusumano and Takeishi, 1991), because trust and fluent cooperation are important issues in co-innovation, but industrial companies have a limited set of customers who can exert influence over a company’s new product development (NPD). These customers often also are of strategic and/or financial importance for the supplier, which makes careful management of co-innovation with them especially important. The co-innovation process management and the customer relationship management are entwined.

Relational approach on co-innovating with customers in business-to-business context has been suggested earlier (Lagrosen, 2005; Tuli et al., (2007), but holistic understanding considering both of the perspectives and capturing the specific characteristics of co-innovating within customer relationships is still developing. Therefore, this study aims to answer the research question What kinds of characteristics of co-innovation processes with industrial customer firms can be identified to affect the management of it? A review of co-innovation and business relationship studies brings together the current understanding of the topic, followed by a qualitative six-case study conducted in industrial solution business context. Finally, conclusions are discussed with the theoretical and managerial implications and future studies.

2 Characteristics of co-innovating with industrial customers

Co-innovation means here developing more or less innovative new products or technologies in cooperation between the supplier and its customer. The process of co-innovation borrows from NPD process descriptions, since in co-innovation the suppliers’ activities are similar to their activities in internal innovation (Alam, 2002). Based on synthesizing co-innovation studies utilizing multi-staged NPD process frameworks (e.g. Gruner and Homburg, 2000; Alam, 2005; Enkel et al., 2005a; Enkel et al., 2005b; Lagrosen, 2005; Fang, Palmatier and Evans, 2008), the co-innovation process includes here the phases of idea generation, concept development, product development, testing, and launch.

Companies seek to engage customers to innovate throughout the innovation process (Carbonell, Rodriguez-Escudero and Pujari, 2009). Nonetheless, customer involvement at certain stages of co-innovation is more beneficial than at others (Gruner and Homburg, 2000). The customer involvement has been suggested to be important in the ideation, concept development, and testing stages (Urban and von Hippel, 1988; Enkel, et al., 2005a; Lagrosen, 2005). Lagrosen (2005) suggests that in transactional customer relationships the early stages of the process should be weighted; in facilitative customer relationships the emphasis should be in the early and in the testing stage and occasionally in other stages; and in the integrative customer relationships the involvement can be longitudinal in all stages. The number of stages or activities in which customer takes part is described through the breadth of customer involvement, whereas the level of involvement is discussed through depth (Fang et al., 2008). Both the breadth and the
degree of involvement can vary inside a process stage (e.g. Enkel et al. 2005a; Lagrosen, 2005; Fang, et al., 2008; Öberg 2010).

Even though the supplier tends to focus on what is delivered at the end, the industrial customer sees the delivery as a relational process and therefore Tuli et al. (2007) underline the importance of suppliers developing social capital with customers. Trust is critical to partnership formation and to the future success of cooperation, and trusting behavior tolerates minor drawbacks in the relationship, but also expects the parties to respond to one another’s needs (Blomqvist, 1997). The prior relationship history helps the co-innovation parties to gauge each other’s trustworthiness and opportunistic intent (Athaide, Stump and Joshi, 2003). The influential customers with whom the supplier has had strong relationships tend to make the most effective contributions to co-innovation (Bonner and Walker Jr., 2004). Strong, embedded ties between a supplier and a customer enhance open knowledge sharing and the exchange of rich, complex information (Bonner and Walker Jr., 2004; Noordhoff et al., 2011). However, such ties work the best when developing less innovative new products, because those benefit more from the exchange of detailed information concerning product ideas, problems, and evaluations (Bonner and Walker Jr., 2004).

Thus, to get insight into the characteristics of the process of co-innovating with industrial customers, of the characteristics of the relationship, the parties, and the co-innovation process need to be examined. Figure 1 presents the elements that are utilized as a guide for the empirical inquiry.

**Figure 1** The elements for studying industrial co-innovation process between a supplier and its customer.
3 Methodology

A qualitative multiple-case study (Denzin and Lincoln 2000; Yin, 2009) explores six co-innovation projects (which varied according to the innovativeness of the outcome, duration, types and number of parties, and the marketability of the outcome) between a supplier of industrial solutions and its customers. Archival data is analyzed from all cases for data triangulation. The interviewees are recruited through snowball sampling (Biernacki and Waldorf, 1981). The interviews (Table 1) lasted about 90 minutes each and were recorded and transcribed resulting in 143 pages.

<table>
<thead>
<tr>
<th>The co-innovation processes of the supplier</th>
<th>Interviews</th>
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<tbody>
<tr>
<td>1. New solution development with two customers</td>
<td>Supplier interviews 1 and 4; Customer interviews 1, 2 and 3</td>
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<tr>
<td>2. Customized solution selling with one customer</td>
<td>Supplier interview 2</td>
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<tr>
<td>3. Explorative development project with an university and a customer</td>
<td>Supplier interview 3</td>
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<tr>
<td>4. Explorative development focused project with an university and a customer</td>
<td>Supplier interview 5</td>
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<tr>
<td>5. New solution development with a technology supplier and a customer</td>
<td>Supplier interview 6</td>
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<tr>
<td>6. Testing focused project with two customers</td>
<td>Supplier interview 7</td>
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</table>

The interviewees represented different functions and organizational levels. The content analysis followed abductive logic (Dubois and Gadde, 2002), and the stages of data reduction, data display and conclusion drawing (Miles and Huberman, 1994). The interviews were analyzed first separately, then on a case and on a process type levels.

4 Empirical findings

The customer involvement can cover all of the process stages, and in general, the customers are more deeply involved in idea generation, concept development and testing, but less involved in development and launch, as assumed. When analyzing the data in detail according to the breadth and depth of customer involvement and other characteristics of the process, three types of co-innovation processes were identified. In Figure 2 the deeper shade represents deeper customer involvement in a stage.
Co-innovation in a customized solution selling process

- Idea generation
- Concept development
- Solution development
- Testing
- Delivery and implementation

Co-innovation in a testing-focused process

- Testing
- Launch

Co-innovation in a truly cooperative new solution development process

- Idea generation
- Concept development
- Solution development
- Testing
- Launch

Figure 2 The breadth and depth on co-innovation in different types of co-innovation processes.

In the customized (solution) selling type of co-innovation the customer is involved more or less throughout the co-innovation process but not deeply, because is in the role of a paying customer. The process can take just a few months. The process is not atypical in solution selling, since customer needs are thoroughly discussed and the customer provides the supplier with information about its processes especially for ideation and concept development, and often for testing, because customization is nearly always needed. This kind of process can lead to a commercially viable new solution, even though the supplier’s original motive has been to close a deal. The cooperation and the innovation sides of co-innovation are present, but not always strongly.

The testing focused type of co-innovation process focuses on testing the solution developed by the supplier. The customers are not involved in the earlier stages and the motive of the supplier to develop a new product is the major force driving the process. This kind of process can take years. The customers are providers of information and feedback when operating as testing sites. The breadth and especially the depth of customer involvement vary between the involved customers. Some customers have interest and knowledge to develop the product and are more deeply involved in testing and offer ideas, whereas some customers merely offer the facilities for testing.

The truly cooperative type of co-innovation includes intensive cooperation between the parties throughout the process. The customers are often long-term co-innovation partners for the supplier. Co-innovation can focus on developing new products or be explorative working on new technologies resulting in new knowledge and concepts, when not only customers but also research institutions and suppliers can be involved. The problems the parties are interested in provide the starting point for co-innovation. Co-innovation can be initiated by any of the parties, because all parties have strong motives to co-innovate, that also leads to broad and deep involvement. Financial and personnel-related commitments are usually required to work on the project, even for over ten years.

The characteristics of the parties, the type of their relationship and goals vary across the process types. The characteristics of the parties and their relationship type are linked, as the supplier co-innovates in a truly cooperative manner continuously only with a few customers with strong know-how and trust-based and long relationship history with the
supplier. Joint-problem solving, communication and feedback giving is efficient when the parties know and understand each other. These long-term customers are often geographically and culturally close which makes the cooperation fluent and the testing periods easier, since they require supplier's presence at the customer's facility. However, there are risks for innovativeness and marketability of the product in limiting the pool for potential partners in this way. Customers consider references from their own market area more relevant. Since in the testing-focused co-innovation process the cooperation is less deep and trustful relationship is not that crucial, it is easier to involve more customers, which can accelerate the build-up of the convincing reference portfolio. In the examined cases, when the customer initiated the co-innovation, the customer was geographically distant, but motivated and committed to co-innovate.

The goals of the parties are important, because the one whose goals are in line with the expected end result is often also coordinating the co-innovation process, and the breadth and depth of involvement is rooted to parties’ goals. The business goals of the supplier usually drive the process and they have the resources to commercialize the new product. Accordingly, the supplier coordinates the co-innovation process and usually gets the intellectual property rights. In more explorative truly cooperative co-innovation processes also other parties can act as coordinators or initiate the process, but the supplier typically takes the coordination responsibility when the intensive development begins. The customer can achieve financial benefits through a competitive advantage provided by a novel product before others, a discounted price, and improved operational performance. Co-innovation can strengthen the personal relationships between the parties, and offer the image of being on the leading edge of technology and learning opportunities for both parties, even when the customer is not deeply involved.

5 Discussion

Conclusions

This study aimed to identify the characteristics of the co-innovation process with industrial customer firms which can affect the management of such a process. Based on the findings, the characteristics of the parties and their relationships, and their goals have implications on the type of the co-innovation process, and therefore on the co-innovation process management. Based on these characteristics three types of co-innovation processes were identified: customized selling, testing-focused and truly cooperative co-innovation.

This study contributes to the co-innovation research by identifying the types of co-innovation processes with managerial considerations from the relational perspective, which is possible by analyzing together the customer relationships, the goals of the parties, and customer involvement types. Öberg (2010) and Davis and Eisenhardt (2011) have discussed the shifts in supplier and customer roles in co-innovation, but the underlying goals of the parties nor the relational perspective have not been focused on.

Supporting Athaide and Stump (1999) and Tuli et al. (2007), the importance of the relationship approach on co-innovation, and co-innovating repeatedly among a certain group of customers, was emphasized also in this research, because several characteristics entwined in the long-term and trust-based customer relationships enhance truly
cooperative co-innovation. This supports also Füller, Hutter and Faullant (2011), who note that the number and quality of the outcomes are improved when the co-innovating with experienced co-innovators.

For managers, this study suggests that relationship approach is needed in co-innovation. Long-term, trust-based customer relationships are a good basis for co-innovation, and co-innovation can enhance customer relationships and help to understand customer needs. Also testing focused co-innovation is usually conducted with existing customers, and the learning opportunities and relational benefits are enhanced if customers are not seen as mere testing facilities. All types of co-innovation processes can occur with long-term customers, but especially truly cooperative co-innovation often happens with these familiar, technically suitable and knowledgeable long-term customers. Initiating co-innovation includes considerations on the customer’s technological know-how, motivation, trustworthiness, location, and influence in the business field, as the customer should represent customer needs on a broad basis. To support the marketability of the product, insights from several customers with similar problems across markets are needed, but the supplier might need to operate as a trusted coordinator between the customer firms. Figure 3 summarizes these findings with the managerial implications of the study.

<table>
<thead>
<tr>
<th>Co-innovation process</th>
<th>Customer relationship and involvement</th>
<th>Managerial implications</th>
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<tbody>
<tr>
<td>Customized-selling</td>
<td>- Supplier to sell a product</td>
<td>- Managed by the supplier</td>
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<tr>
<td></td>
<td>- Occasionally new innovative</td>
<td>- If a new, commercially viable product is aimed at, suitability for the supplier's current portfolio and resources for the development, the market need for the product need to be secured. Managed by the supplier.</td>
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<td></td>
<td>- commercially viable products</td>
<td>- Beneficial to involve several customers from different market areas in order to speed up the development of a convincing reference portfolio. Procedures for maintenance and support for the installed prototypes need to be clarified with the customer.</td>
</tr>
<tr>
<td></td>
<td>- developed within a sales process</td>
<td>- Procedures for maintenance and support for the installed prototypes need to be clarified with the customer.</td>
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<td></td>
<td>- Customer to get the solution they need</td>
<td>- Managed by the supplier</td>
</tr>
<tr>
<td>Testing focused</td>
<td>- Supplier to test a concept or prototype with customers</td>
<td>- Existing customer relationship, trust crucial</td>
</tr>
<tr>
<td></td>
<td>- Customer to get a new product with a discount to affect the features of the product, to improve operational performance, to learn</td>
<td>- Customer involvement in testing, some level of trust needed</td>
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<tr>
<td>Truly cooperative</td>
<td>- Both parties want to develop a new product or technology</td>
<td>- Long-term, trust-based customer relationship</td>
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<tr>
<td></td>
<td>- Supplier to develop a new commercially viable product, to develop new knowledge</td>
<td>- Customer actively involved throughout the process</td>
</tr>
<tr>
<td></td>
<td>- Customer to solve an important problem to improve operational performance, to develop new knowledge</td>
<td>- Formal contract often needed from the beginning. Geographical and cultural distance beneficial. Evaluation of learning opportunities and effects on the customer relationship in addition to direct business potential when deciding on committing to the process</td>
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Figure 3 findings of the study with the managerial implications according to the type of co-innovation process

The findings of the study are applicable to co-innovation projects within industrial suppliers-customer relationships. As the examination is limited to a single supplier and its co-innovation projects in a specific industry, and only one case includes customer data, further studies are needed to elaborate the findings. The customer perspective is needed
to take further the findings from Urban and von Hippel (1988) and Enkel et al. (2005a) and to study the actual cooperation process in co-innovation, focusing equally on the supplier and the customer, detached from the innovation process stages that emphasize the supplier-dominated perspective. Prior studies that have suggested the relationship approach have so far focused on a single episode at a time (Tuli, et al., 2007; Lagrosen, 2005). In order to understand better the relationships between the relationship characteristics, co-innovation process type, and co-innovation success, long-term relationships including consecutive co-innovation projects could be further examined.

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References


