Supplier-Customer Co-innovation Process in B2B Markets

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ABSTRACT

In B2B markets, innovations are often co-created in interactions between suppliers and customers.The existing studies view supplier-customer co-innovation as a linear processcomprisingphases similar to the traditional firm-internal innovation processwithout questioning the traditional innovation process models' suitability to describe dyadic supplier-customer co-innovation. The present study aims to identify the special characteristics of the supplier-customer co-innovation process by adopting a grounded theory approach to reveal thenature and different kinds of phases in thesupplier-customer co-innovation process. The findings fromexamining eight real life co-innovation processes between a global mining technology supplier and its customer firms suggest that the supplier-customer co-innovation process is often emergent in nature and characterized by alternating interaction focused on needs identification and consensus seeking.The study identifies a total of seven overlapping co-innovation processphases which can be seen embedded as relational sub-processes in the supplier-customer interaction continuum. The findings encourage managers to search for weak signals that reveal the customer's problems and goals in the co-innovation, which can help manage the supplier-customer co-innovation process.

KEYWORDS

Co-innovation, Innovation process, Phases, B2B Markets

INTRODUCTION

The value of interacting closely with customers during the innovation process has long been acknowledged (Von Hippel, 1986; Biemans, 1991; Prahalad and Ramaswamy, 2004), and especially in B2B markets innovations are often co-created in interactions between the supplier and its customers (Håkansson et al., 2009; Noordhoff et al., 2011). This paper focuses on the special characteristics of the supplier-customerco-innovation processin B2B markets.It is necessary to understand the supplier-customer co-innovation process in order to manage co-innovation (Roy, Sivakumar and Wilkinson, 2004), but the microlevel processes of co-innovation between industrial suppliers and their customers have been largely neglected in the academic research. Afew attempts have been made to describe the supplier-customer co-innovation process in B2B markets (Alam, 2002; Alam and Perry, 2002),but these existing process models have been built by adopting a modelfrom the innovation literature without questioning thefirm-internal innovation process models' suitability forthe dyadic co-innovation process. Yet co-innovation involves risks in terms of partner opportunism (Noordhoff et al., 2011) so requires careful selection of the customer partner (Von Hippel, 1986; Urban and Von Hippel, 1988), which differentiatesco-innovation from thesupplier's internal innovation activities.

We argue that the existing mostly linear co-innovation process models do not take into accountthe special features of the often emergent and interactivesupplier-customer co-innovation process.Accordingly,we address this gap through the following two research questions:What are the special characteristics of the supplier-customer co-innovation process in business markets,andwhat kind of phases can be identified in the supplier-customer co-innovation process.The aim is to create a realistic supplier-customer co-innovation process model which helpsdevelop new theory that better describes the intrinsic characteristics of the supplier-customer co-innovation process. As we wish to avoid the traditional view of the innovation process,where the process comprises linear stages (Jespersen, 2012), we adopt an inductive grounded theory approach similar to Tuli et al. (2007) and Blazevik and Lievens (2008) inanalyzing eight reallife co-innovation processes from the supplier's perspective. Thus, we are able to create an in-depth and realistic depiction of the co-innovation process in the studied cases.

The findings reveal that co-innovation processes are either emergent or planned, depending on the nature of the first co-innovation phase. Altogether seven overlapping phases emerge from the studied co-innovation processes, which contribute to the discussion on customer involvement in the innovation process (e.g. Noordhoff et al., 2011; Fang, Palmatier and Evans, 2008, Alam, 2002). The phases are embedded as relational sub-processes in the supplier-customer interaction continuum, and thus also contribute to the literature on managing buyer-seller relationships (Ford et al., 2006) as the phases depict the development of supplier-customer interaction during the co-innovation process.

This research paper begins with an insight into the conceptual background of the research. Secondly, the research methodology is introduced, followed thirdly by the empirical findings on eight supplier-customer co-innovation processes complete with case descriptions. Fourthly, the identified supplier-customer co-innovation process phases are introduced, and finally we present ourconclusions and describe managerial implications.

CONCEPTUAL BACKGROUND

In B2B markets, innovations are often created in interaction between the supplier and its customers (Håkansson et al., 2009; Noordhoff et al., 2011). Supplier-customer co-innovation

refers here to customer participation in the supplier's innovation process, which can be understood both as the breadth and depth of customer involvement (Fang et al., 2008). Especially in B2B markets where innovations are characterized by high risk, tailored through high customer involvement and co-created in collaboration between multiple actors (Alam, 2006; Hobday, 1998; 2000),an understanding of the co-innovation process is needed to manage co-innovation (Roy et al., 2004).

Innovation process and new product development models have undergone many generations of modification, but even the latest models depict the innovation process as linear comprising sequential stages (Jespersen, 2012). In the literature, supplier-customer co-innovation processeshave been depicted by adopting one of the traditional new product or service development models,and examining in which of the stages customers are involved. These studies have resulted in linear supplier-customer co-innovation process models comprising up to ten stages of which some may be parallel (e.g. Alam, 2002; Alam and Perry, 2002; Alam 2006; Brockhoff, 2003). For example, Alam's (2002) service co-innovation process model comprises ten stages: 1) strategic planning, 2) idea generation, 3) idea screening, 4) business analysis, 5) formation of the cross-functional team, 6) service and process design, 7) personal training, 8) service testing and pilot run, 9) test marketing, and 10) commercialization. As the literature on lead user method emphasizes the customer selection stage in supplier-customer co-innovation (Von Hippel, 1986; Urban and Von Hippel, 1988), the process models related to lead user method (e.g. Eisenberg, 2011; Olson and Bakke, 2001) add a customer selection stage to the model, but assume that the innovation process otherwise resembles the traditional innovation process.

Thus, the existing studies depict in which of the known innovation process stages the customer takes part,assuming that the phases in the supplier-customer co-innovation process are the same as in the company's internal innovation process. This kind of approach may lead to models that describe a supplier-driven innovation process rather than an interactive and dyadic supplier-customer co-innovation process. As customers are not just passive users of innovations but may actively take part in the innovation process (Blazevik and Lievens, 2008; Prahalad and Ramaswamy, 2004),the nature of the entire innovation process may change. For example, Tuli et al., (2007) suggest a more customer-centric view for innovation in B2B markets, even though the study does not specifically focus on supplier-customer co-innovation. Their process model on customer solutions takes the customer view into account and sees customer needs as a starting point in the process of solution selling (Tuli et al., 2007). This suggests that the supplier-customer co-innovation process model might also be more customer-centric, if the process were studied without adhering to existing supplierdriven innovation models.Therefore, a deeper look is needed to reveal whether the supplier-customer co-innovation process differs from the internal development process. Moreover, as the complex co-innovation processes in B2B markets are difficult to describe through static and linear models, more realistic co-innovation models are neededin order to manage co-innovation in B2B markets.

We argue that innovation paths seldom follow the patterns discussed in the academic literatureand are in reality always more emergent and random than the theoretical models predict.This has long been seen in the studies on strategy formulation. For example, Mintzberg (1978) argues that patterns in strategy formulation are irregular and ad hoc but emphasizes that certain patterns nevertheless do exist. In the strategy literature, a division is drawn between deliberate and emergent strategies, which are the ends of a continuum along which the real life cases exist (Mintzberg and Waters, 1985). In deliberate strategies,the actors involved have precise and common intentions about what is desiredand the intentions are realizedas envisioned (Mintzberg and Waters, 1985). In emergent strategies, intention must be preceded by action (Mintzberg and Waters, 1985).If this view on deliberate and

emergent strategies is adopted for innovation processes, it seems that especially in B2B markets, supplier-customer co-innovation projects could be seen more as emergent than deliberate. This is due to the fact that B2B innovations are complex processes in which customer needsform the starting point for the innovation (Tuli et al., 2007; Hobday, 2000),and it is unlikely that the actor's intentions for the end results are clear at the beginning of the innovation process.

METHODOLOGY

DATA COLLECTION

As there are few co-innovation process studies, and the research purpose here is to gain a deep understanding of the co-innovation process, thechosen study method is qualitative (Miles and Huberman, 1994). More specifically, we conducted an exploratory multiple case study as itsupports the target of theory building (Eisenhardt and Graebner, 2007; Bonoma, 1985). This pilot study comprising eight innovation cases taking the supplier perspective aims to gather different kinds of supplier-customer co-innovation process and find suitable cases for dyadic in-depth research. The co-innovation processes are takenfrom the mining technology industry,in which customers are often involved in innovation processes.One of the industry's leading companies was selected as it operates globally and has a long history of running co-innovation processes with customers. All of the cases feature the same supplier,and altogether nine different customers as some cases involve two customer partners. The primary data were collected through in-depth interviews with key informants (Kumar et al., 1993).The interviewees were selected employing a snowball method (Biernacki and Waldorf, 1981)by first contacting a director who was known to have experience in supplier-customer co-innovation processes. After that each interviewee pointed out potential informants. All intervieweeshad some ten or more years' experience in R&D and sales,other than one manager who had around fiveyears' experience in the field (Appendix 1). Each of the eight interviewed managersdescribeda co-innovation process with which they had been closely involved. Whenever needed, the managers were asked to specify the activities in each phase and describe the timing of the phases they had mentioned. In addition, managers were asked open-ended questions about thecustomerrelationship and its atmosphere. Interviews lasted from one to two hours and were tape recorded and transcribed, which resulted in a total of 128 single line spaced pages. The secondary data comprise co-innovation documentation, such as memos from customer meetings.

DATA ANALYSIS

The aim in the data analysis was to identify the supplier-customer co-innovation process phases that appear in the data. To ensure that our framework describes real life cases of supplier-customer co-innovation, the data were analyzed without a theoretical framework of the known co-innovation phases.Thus, we adopted grounded theory coding as it supports theory building from the data (Glaser and Strauss, 1967; Corbin and Strauss, 1990). Nvivo9 software was employed to support the analysis. The coding followed the Corbin and Strauss (2008) approach which involves open, axial, and selective coding. The lead author was responsible for the actual coding but the procedure of creating the categories and selecting the main category was conducted in collaboration between the authorsby discussing, reflecting and combining the emerging themes.

The selection basis for including a co-innovation phase was similar to that employed by Tuli et al., (2007) and Ulaga and Reinartz (2011), and comprises three criteria: 1) Is the co-innovation phase applicable beyond a very specific context? 2) Did multiple participants

mention the co-innovation phase? and 3) Does the co-innovation phase go beyond the obvious to provide interesting and useful conclusions?To follow the exclusion criteria, for example, the “business opportunity check” phase was excluded from the framework as it was mentioned by only one interviewee, and the “concept development” phase was excluded because it was regarded as an obvious part of the co-development phase. At the open coding stage, 15 different co-innovation phases were identified from the data. The phases were coded in-vivoat this stage of the coding process, using the names interviewees employed for each phase in their story(Corbin and Strauss, 2008). At the axial coding stage, the special features of each phase were analyzed based on the managers’ descriptions of each phase. Some of the phases were renamed to describe better the activities they include, and phases that included the same activities were grouped togetherresultingin seven final co-innovation phases which were combined into one framework at the selective coding stage.

CASE DESCRIPTIONS AND THE NATURE OF SUPPLIER-CUSTOMER CO-INNOVATION

The eight reallife supplier-customerco-innovationcases examined represent different kinds of supplier-customer co-innovation process that have resulted in new technology, improved technology or new solutions. Eachof these cases relates to developing process technology or solutions for the mining industry but the nature of the co-innovation processes varies as it seems to depend first on the starting point of the process, and secondly on the actors involved in the process.

In the examined cases the supplier-customer co-innovation process begins either from a customer initiative or the supplier’s decision to develop new technology or a new solution. The nature of these two types of innovation process varies significantly. Customer initiative was decisive in cases wherethe customer contacted the supplier (see Table 1). These customer driven co-innovations emergedalmost accidentally when customer and supplier found each other and the processes were characterized by high uncertainties and unplanned actions from the supplier’s perspective,as they came rather suddenly and the supplier had to react rapidly in deciding whether or not to collaborate with the customer. The cases that stemmed clearly from the supplier’s initiative offered the supplier a better opportunity to plan the co-innovation process and find the best partners for collaboration.

The supplier-customer co-innovation processes examined do not have a clear-cut beginning or end. Often the cases wereon a continuum of a supplier-customer collaboration that has lasted for decades. Actually, in all the examined cases,supplier-customerco-innovation was strongly based both on the supplier’s previous innovation projects and the collaboration history between the supplier and customer. Even the cases that were initiated by the customerwere rooted in the supplier’s internal technology development history as they related to the supplier’s previous research projects. Thus, it seems that none of the examined innovation processes began in a vacuum. Instead the collaborationbuilt on relationships that may have lasted for decadesas co-innovation processesare part of the supplier’s continuous new technology development and customer relationship management.

The actors that participated in the co-innovation processesexamined included customer partner or partners, expert partner and financier. Customer was involved in each of the examined processes, expert partner in four, and two processes had a financier who shared the costs inpart but also limited the potential to create fully commercial solutions as their interest was in supportingnational technology developmentrather than delivering commercial solutions. The expert partners in particular played an important role in co-development;unlike customer companies, they hadthe resources to focus on the development seen to speed up the

process. However, this research limits the focus to the supplier’s and customers’ part of the co-innovation process in orderto simplify the overall framework.Customers provided important ideas and feedback, but in some of the processes their participation was considered to slow the process down because they did not have the resources required to collaborate effectively, while information sharing with the customer took up the supplier’s time and resources.

Table 1. Studied co-innovation processes.

No.	Collaboration partner(s)	Customer(s) characteristics	Result of innovation	Duration *no clear start date	Phases	Special features
1	Global mining unit	Good personal relationships from previous co-innovation project.	**Analysator, s**uccessfully commercialized	4 years	Contracting, Co-development, Further development, Commercialization	Jump start from customer's prototype. Only one person from the customer company was actively involved in co-development, and when he left the company the supplier took over the project. License agreement for IPRs.
2	Local mining unit	No previous collaboration or sales.	**Reporting tool,** commercialized	6 months	Customer need identification, Co-development and Testing intertwined	Started from selling a customized solution. The IPRs were not discussed as it was never stated to the customer that it was a co-innovation project.
3	Local mining unit, Research center	No large sales but good personal relationships.	**Analysator**, commercialized	1 year	Customer selection, Contracting, Co-development and Testing intertwined, Commercialization, Further development	The customer brought the supplier and British research center together. Contracting took several months but co-development was efficient.
4	Local mining unit and global mining unit	No large sales to either customer. Some collaboration history with the local unit.	**Mixer**, commercialized	4 years	Testing and Development intertwined, Commercialization	No agreement about IPR as the customer was not regarded asbeing involved in problem solving.
5	Two local mining units from the same mining company	Important strategic partner and good personal relationships from previous co-innovation projects.	**Analysator software**, not commercialized	Few years*	Customer need identification, Co-development and Testing intertwined	The result was too product-centric and it was not commercialized.
6	Local mining unit, University, National funding agency	Important strategic partner and good personal relationships from previous co-innovation projects.	**Virtual education tool,** commercialized	Few years*	Testing and Co-development intertwined, Re-development, Commercialization	Massive re-development was needed for commercialization. The expert partner played an important role in the process.
7	Local mining unit, University, National funding agency	Important strategic partner and good personal relationships from previous co-innovation projects (as #6)	**Analysator,** commercialized	Few years*	Customer need identification, Co-development, Testing, Re-development	Customer expressed what was needed. Expert partner had a leading role in the co-development but the supplier took the leading role in commercialization.
8	Local mining unit and global mining unit,engineering company	Same local customer as in cases 6 and 7. Extremely good personal relationships with the global customer.	**Camera for analysator**, commercialized	Few years, first 1.5 years with the local partner, and then with the global partner.	Testing and Co-development intertwined, Commercialization	The technology was bought from an engineering company and further developed with customers. Collaboration with the global unit was especially important for commercialization.

SUPPLIER-CUSTOMER CO-INNOVATION PROCESS PHASES

A total of seven supplier-customer co-innovation phases were identified from the eight cases examined: problem identification, coincidental mating vs. purposeful selection, need matching dialog, seeking governance consensus, balancing co-development, segregate re-development, and commercialization co-preparation (see Table 2). Even though these phases are introduced as separate entities, it must be noted that they are not stages in a linear process; the examined co-innovation processes included overlapping phases and loops back and forth. In addition, the order of the phases varies and some may be skipped completely.

PROBLEM IDENTIFICATION

In the examined co-innovation processes, problem identification is one of the early phases as it aims to find the ultimate problem that the innovation should solve. The ultimate problem can come from any of the actors involved in the process but in the cases examined it was typical that the customer need was the source of inspiration forthe supplier to start looking for the ultimate problem.

In the case examples, the customer'smain activity in this phase wascommunicating the problems they face. This feedback is a natural part of the customer relationship and is not usually regarded as a part of the co-innovation process. However, in all the studied cases, the customer's problems were the starting point for the co-innovation, even though the feedback was given without plans to co-innovate a solution to the problem.Usually, the customer was not able to state the ultimate problem in the feedback,describinginstead the symptoms that the problem is causing. Thus, it was the supplier's task to determine the ultimate problem. However, in a few of the eight cases, the customer was able to state its needs and even propose some solutions to the problems. These customers displayed a high degree of knowledgeability concerning their own process and related technology. Especially in the first case, the customer who stated the need was extremely knowledgeable,so it was natural that when the supplier and customer came together, the innovation process began with this particular customer. Thus, if the supplier encounters a knowledgeable customer, it might be that no other selection for the partner customer is needed.

In addition to determining the ultimate problem, the supplier's activitiesin the co-innovation processes included identifying weak signals. As the customer is not always capable of stating the ultimate problem or even its symptoms, the cases revealed that the supplier should be familiar with the customers' situation. This required extremely good sensing of the customer's problems even if the customer does not mention them. Two managers stated that there should be a continuous dialog with the customers in order to understand their needs.

Even though problem identification was one of the first phases in all the innovation processes examined, it is not always the starting pointof the supplier-customer co-innovation process,as sometimes the supplier first selects the partner customer and then looks to find the problem. In some of the cases examined, the supplier had a strategic partnership with the partner customer, and in these co-innovation processesthe supplier had already decided it wants to collaborate with this particular customeronce the problem was identified.

COINCIDENTAL MATING VS. PURPOSEFUL SELECTION

In the examined co-innovation processes, the business mating phase included the activities required to create a partnership between the actors participating in the co-innovation process. These activities include creating partner criteria, testing potential partners and selecting thecustomer partners for the co-innovation process. However, partner selection was not conducted purposefully in all of the co-innovation processes; in some of the examined

processes it happened almost accidentally and partner selection activitiescould not then be identified.

Four managers stated that physical distance is an important factor in partner selection and six pointed out that good personal relationshipsand previous experiences of joint collaboration with the customer impacted partner selection. However, neither of these factors proved decisive as in some of the examined cases the customer unit is situated on another continent, and in in some collaboration emerged with a unit the supplier had no previous sales or collaboration with. Thus, what mattered most in partner selection inthe examined cases was each actor's goalsand the input they could offer for collaboration. Nearly every manager stated that they do not collaborate with customers that do not share the same goal of creating a solution that the supplier can commercialize. It seems that in the examined processes the supplier ultimatelycollaboratedwith partners that, first, can offer complementary resources, such as information about customer needs and, second, who have similar objectives.

In thispartner selection phase, there is a clear difference between co-innovation processes that emerge from the customer's initiative and processes that are at least to some extent planned by the supplier. In the planned innovation projects, partner selectionwas formal and included testing several customers' suitability for the co-innovation process, which is a sign of more purposeful customer partner selection.In the emergent supplier-customer co-innovation processes, the entire phase of purposeful selection is absent as the idea for the co-innovation comes from the customer and customer partner selection resembles a coincidental mating. So, the casesrevealed that the question is not which partners the supplier chooses, but more generally: who gets chosen.

Need Matching Dialog

In the examined supplier-customer co-innovation processes, the need matching dialog phase comprisedthree different kinds of activity: evaluating the need to co-innovate, matching the customer need to the supplier's goals and, finally, committing the customer to the co-innovation process. Each of these activities was completed in the multiple dialogs that the supplier and customers shared during this phase.

First, evaluating the need to co-innovate included matching the needs of each actor regarding the co-innovation project. From the customer side, evaluating the co-innovation need included an evaluation of the solution's capacity to solve the customer's problem, and from the supplier's side the task was to consider whether the result of co-innovation has commercial potential. Second, the customer's need and the supplier's goals regarding its new product development were matched and the innovation result sketched. Finally, the customer has to be committed to the co-innovation process, which meant that the supplier had to convince the customer of the innovation's potential to solve the customer's problems.

Seeking Governance Consensus

Seeking governance consensus was recognized as a phase during which the actors aimed to reach a consensus on the goals and end result of the supplier-customer co-innovation process. Also issues related to the governance of the collaboration, such as obligations, were discussed in this phase. In most of the cases examined, this phase resulted in a contract in which the parties agreeon joint development, a non-disclosureagreement,and intellectual property rights.

Even though several interviewed managers emphasized the importance of seeking governance consensus, in two of the examined cases these issues were not agreed on. In one case, the missing phase of seeking governance consensus depicts the ad hoc nature of a co-innovation process that lasted just a few months, during which no intellectual property rights were discussed. In the examined cases, the supplier's goal to commercialize the product

became obvious to the partner customer during this phase, as the supplier demanded the innovation's intellectual property rights. In one case, the supplier wanted to avoid negotiations on intellectual property rights,so the governance consensus seeking phase was skipped and the supplier disguised the co-innovation process as one of selling a customized solution and automatically received all intellectual property rights.

In the examined cases, the co-innovation processes that have multiple actors,and were therefore more planned,seemed to have a clearer phase of seeking governance consensus. The nature of this phase was most formal in the cases that included an external financier.The seeking governance consensus phase was also especially obvious in the case in which seeking governance consensus slowed the entire innovation process down by several months as the lawyers took their time to negotiate the contracts.

BALANCING CO-DEVELOPMENT

In the examined supplier-customer co-innovation processes, the co-development process was the phase that included development and testing activities in several iterative rounds. This phase in particular was characterized by the constant balancing of diverging goals that the supplier and the customer hadas the goals actualized in this phase. In all the examined co-innovation processes, the supplier was aiming for a universal solution that could be commercialized,while the customer was looking to solve a particular problem related to theproduction process. The problem of diverging objectives in this phase is also due to the fact that the contracts were drawn up by people other thanthose who actually co-developed the solution. Thus, the consensus that hadbeen reachedin theseeking governance consensus phase had to be renegotiated with the people who were involved in the actual co-development phase.

The level of consensus and thus the end result's suitability forsolving the customer's problem and at the same time meetingthe needs of alarger market seemed to be related to the supplier's skills in managing the project and being aware of its own objectives. It was recognized that there arehigh risks involved in this phase for the supplier, because both the innovation's commercial success and the customer relationship are at stake. From the supplier's perspective, acting according to its own goals and aiming for a commercial solution damaged customer relationships if the final solution did not succeed in also solvingthe customer's problems. On the other hand, acting according to the customer's goals and solving the customer's problem hampered the commercial potential of the innovation whichwas ultimately over-customized.

SEGREGATE RE-DEVELOPMENT

Surprisingly, even if co-innovation was branded a success by the interviewed managers, the co-innovation process often included a phase during which the developed solution was re-developed since the co-developed version was over-customized. During this phase, the intensity of the interaction with the customer decreased while the supplier was developing the new version alone. This phase is here termed segregate re-development.

Segregate re-development can be extensive, as for example in one of the examined cases it involved total re-development. This meant that only the concept of the co-developed system remained and for example software was rewritten and products re-redesigned.In a few of the examined co-innovation processes, segregate re-development clearly impacts supplier-customer relationship development. Segregate re-development resulted in a discontinuationof the supplier-customer relationship for example in the first case,where collaborative activities with the customer ceased when the supplier purchased the rights to the innovation and started to develop a commercial version on its own.

COMMERCIALIZATION CO-PREPARATION

In the examined co-innovation processes, the commercialization phase includes many activities the supplier performs alone, such as creating the value chain for the innovation and educating sales staff. The customer's activities were limited to commercialization preparation. The activities identified in this phase were joint activities the supplier and customer complete prior to commercialization. In practice, this meant collecting data on the benefits the innovation creates.

Activities related to the commercialization preparation phase were not limited to the end of the co-innovation process, but wereexecuted throughout the processas for example recording the initial state in the customer's process is important for tracking the benefits. After the launch of the innovation, the traditional role of reference customer was identified in the examined cases,and customers were also involved in other marketing activities,for example presenting publications on the benefits of the innovation at industry conferences.Another interesting point about customer involvement in the commercialization of a supplier-customer co-innovation came to prominencein the analysis of the first case wherethe customer receives royaltieson sales,which was seen to impact the customer's motivation for involvement in commercialization activities.

Table 2. Summary of the co-innovation phases, activities and empirical examples.

Co-innovation phases	Activities	Empirical example
Problem Identification	Searching for weak signals and interpreting them to identify the problem that innovation should solve.	*"The beginning is like searching for weak signals and problems. Then the problems are chosen and we start to look how we could develop things together."*
Coincidental Mating vs. Purposeful Selection	Creating criteria for selecting partner(s), and choosing partner(s) on the basis of mutual orientations and complementary input.	*"We carried out some kind of market research by interviewing them [customers] and took some samples from typical customers. We tried to classify them into segments and then find a representative partner customer.""The customer was not selected but it [the partnership] was born."*
Need Matching Dialog	Evaluating the need for co-innovation, matching the customer's need to the supplier's objectives, and committing the customer to the co-innovation.	*"...in that phase we are matching the need and technology and then starts the discussion on whether we can get the customer committed to that."*
Seeking Governance Consensus	Negotiating mutual objectives and seeking a consensus on collaboration. Sharing the responsibilities and governance of the co-innovation process and the end result.	*"…and then the lawyers spent about four months negotiating the contracts and finally we signed a joint development agreement in which we agreed on co-innovating a product for certain markets."*
Balancing Co-development	Developing the innovation in collaboration with all actors through several iterative rounds of development and testing, while balancing the partners' divergent goals.	*"With the persons we first discussed, it was clear that we will develop a product that will be sold to others as well, but if we think about the production unit personnel, I believe their idea clearly was that we are developing a system for them."*
Segregate Re-development	Re-developing the innovation internally, by the supplier, to serve a larger customer portfolio.	*"When the phase of prototype testing ends and the system proves to be workable, then productization must be completed, which usually means that the system is totally re-developed from the scratch."*
Commercialization Co-preparation	Creating the prerequisites for commercialization and marketing the innovation in collaboration with the customer.	*"Colleting benefits and giving evidence about the benefits, those are things that the commercialization needs and the better those can be documented with the customer, the better is the outcome"*

CONCLUSIONS

The purpose of this research is to describe the characteristics of and identify the phases in eight real life case examples of the B2B supplier-customer co-innovation process. There is norealistic depiction of the supplier-customer co-innovation process in the existing literature on supplier-customer co-innovation, as in previous studiesthe co-innovation process has been depicted using models similar to those employed for traditional internal innovation

processes,with few modifications (e.g. Alam, 2002; Brockhoff, 2003; Olson and Bakke, 2001; Eisenhardt, 2011).

First, the research contributes to the discussion on co-innovation in B2B markets (Carbonell et al., 2009; Fang, 2008; Fang et al., 2008; Noordhoff et al., 2011) by revealing the special characteristics of the examinedsupplier-customer co-innovation processes. Based on the starting point, these processes can be divided into two classes whose nature varies significantly. If the initiative for supplier-customer co-innovation stems from the customer, the process is emergent and characterized by unplanned, ad hoc actions and high uncertainty. Processes driven by supplier initiative are by nature more planned and formal as they include, for example, purposeful selection of the customer partner. Based on the data, both emergent and planned co-innovation processesshare the same characteristic describing a continuous balancing act between diverging supplier and customer goals. This balancing act is evident at every phase of the innovation process and actualizes in the development phase. The diverging goals may result in the total failure of the innovation. The research also revealed that some of the examined supplier-customer co-innovation processes should not be regarded as single projects but lie onthe supplier-customer relationshipcontinuum, and many co-innovation phases, such as partner selection, are absent from these kinds of co-innovation process.

Second, the research increases understanding on the phases of the supplier-customer co-innovationprocess (Alam, 2002; Alam and Perry, 2002; Brockhoff, 2003) by identifyingseven phases that existed in the eight real life case examples: problem identification, coincidental mating vs. purposeful selection, need matching dialog, seeking governance consensus, balancing co-development, segregate re-development, and commercialization co-preparation. None of the examined co-innovation processes was linear,and the phases can overlap, exist in a different order, or some phases may be droppedout depending on the nature of the co-innovation.For example, the supplier may purposefullyomit the phase of seeking governance consensus, as it wants to disguise the co-innovation process as one of selling a customized solution, concealingthe fact that it is developing commercial product for a larger market. Thus, after identifying the different phases of the supplier-customer co-innovation process, we can also better understand the nature of the co-innovation process.

In addition, the findings increase understanding on buyer-seller relationships (Ford et al., 2006) because,following the idea of Tuli et al., (2007), the seven identified supplier-customer co-innovation phases can also be seen embedded as relational sub-processes along the supplier-customer interaction continuum. The activities in these processes comprise multiple dialogs whose nature varies from fierce negotiation on shared goals to careful sensing of the customer’s hidden feelings. Finally, the mutual consensus and joint goals that are achieved through the dialogs are decisive to the success of the co-innovation.

MANAGERIAL IMPLICATIONS

The more realistic co-innovation process framework now developed, and theinsights gainedinto the special features of the supplier-customer co-innovation process phases,will help companies manage their supplier-customer co-innovation processes more effectivelyby taking the following two aspects into account.First, understanding that customer needs are a starting point for co-innovation will help companies produce customer-driven innovations. As knowledge on customer needs is required early in the innovation process for problem identification, managers are encouraged to searchcontinuously for weak signals about potential customer needs,which can be employed for idea generation.Second, it is important for managers to acknowledge that the co-innovation process is a continuous battle of diverging goals between actors involved in the process. The customer’s primary goal is to produce a customized solution that will deliver competitive advantage, and this is in conflictwith the supplier’s aim to produce a solution that can be sold to multiple customers.

Thus, managers should keep in mind that despite close collaboration each actor hasits own agenda.

LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

The research has some limitations that concern the research method, sampling and interviews, but these limitations also offer fruitful avenues for future research. First, the research was conducted in one industry which limits the generalizability of the results. However, the aim of this pilot research was not to create a general framework of supplier-customer co-innovation and its phases,but to describe eight real life cases and the nature of co-innovation in these selected cases. Second, the data were obtained from the supplier's perspective alone. So, in future studies, the customer perspective should also be taken into account. That would offer the required dyadic perspective on the activities performed during each phase.Also the special characteristics of the interaction between supplier and customer in the co-innovation process should be subject to future study, because we believe it is key to creating a holistic understanding of the supplier-customer co-innovation process. We trust that this study offers a new perspective on the supplier-customer co-innovation process and thus stimulates further research in this area.

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Appendix 1. Data collection through interviews.

Title	Experience	Date	Duration
Product Manager	Around10 years experience in development activities	11.11.2011	1 h 36 min
Sales Manager	Previous experience in R&D, a few years in sales	14.11.2011	1 h 22 min
Development Manager	Around10 years experience in R&D	17.11.2011	1 h 46 min
Sales Director	More than 20 years experience in R&D and sales	17.11.2011	1 h 57 min
Automation Director	Around10 years experience in sales and R&D	22.11.2011	59 min
Research & Concept Development Manager	More than 20 years experience in R&D and sales support	23.11.2011	1 h 45 min
Technology Director	Around10 years of experience in R&D	20.12.2011	1 h 23 min
R&D Vice President	More than 15 years of experience in R&D and sales	24.1.2012	1 h 11 min