Paper presented at the 28th IMP Conference, 13-15September, 2012, in Rome, Italy.

CUSTOMER INVOLVEMENT IN PRODUCT DEVELOPMENT: LEARNING FROM A BEARING MANUFACTURER

Jens Laage-Hellman and Frida Lind

Department of Technology Management and Economics
Chalmers University of Technology
SE-412 96 Göteborg
Phone: +46-31-772 1000
E-mail: jens.laage-hellman@chalmers.se
E-mail: frida.lind@chalmers.se

WIP Paper

Abstract

Many studies have pinpointed the significance of collaboration with other firms in product development. By taking the starting point in a case study of a bearing manufacturer and its R&D activities, this paper focuses on the particular situation of involving customers. With basis in the Industrial Network Approach, we suggest five dimensions of importance to analyse customer involvement in the setting of product development. These five dimensionsconcern the degree of involvement, the purpose of involvement, formalisation, duration of collaboration,and the number of participating actors. The case study captures different ways of involving customers. In particular there are two types of projects, termed customer-driven development and segment-driven development, where customer involvement plays a key role in different ways. In the paper these two types of projects are discussed with regard to the suggested dimensions. The analysis reveals, for example,that customers are involved mainly through dyadic collaborations. Multi-actor collaborations seem to be rare in this context. The creation of discussion forums for customers might be a way to further develop the company's customer involvement practice.

Keywords: Business relationships, Customer involvement, Product development

INTRODUCTION

In industrial (business-to-business) markets companies tend to trade with each other through business relationships, which may be more or less close and long lasting. Within the research tradition of the Industrial Network Approach (INA) there is a vast amount of literature dealing with various aspects of business relationships and their connections to each other. One important topic is the role and use of business relationships in the context of technological development. Numerous studies have shown that companies often interact with suppliers as well as customers in their development of new products and production methods (Håkansson, 1987 and 1989; Laage-Hellman, 1989 and 1997; Wynstra and Pierick, 2000; Håkansson and Waluszewski, 2007). Still, as pointed out by Brown and Eisenhardt (1995) and Alajoutsijärvi et al. (2012) among others, there are few studies that investigate more specifically how customers are used as resources in new product development.

This paper focuses in particular on customer relationships and product development. From previous research we know that companies can interact with customers and users in many different ways depending on their own situation (Gruner and Homburg, 2000; von Hippel, 1988). For example, interaction patterns may differ depending on the characteristics of the market and the technology. In more mature and well-structured networks, companies may establish long-term and close collaborative relationships with certain key customers. In such networks actors tend to rely on existing relationships to pursue joint product development and handle the uncertainty of developing new products and/or solutions (Harrison and Finch, 2008). The same relationship may thus be "used" for continuous improvements of the existing product and/or development of new product generations. In newer and less developed networks, characterised for example by rapid scientific and technological development, firms may instead pursue a more opportunistic strategy where they prefer more short-term collaborative projects, which do not lead to too strong dependencies on their partners and create difficult-to-handle lock in effects.

Benefits of involving customers in product development have been reported from the suppliers' as well as the customers' perspective. There may be benefits related to acceleration of product development, reducing costs and enhancing value for customers (Ritter and Walter, 2003). However, working with collaboration partners in product development is not always easy and there can be conflicts to be dealt with, for example, due to differing views on the joint task or different perspectives on cost calculations (Munksgaard et al., 2011; Brockhoff, 2003). Nevertheless, as pointed out there is much to be gained by involving customers in product development.

There are differences in how firms interact with their customers in product development. The differences do not only occur among firms. Also within a single firm there may be good reasons to use parallel customer relationships in different ways. For example, different types of customer input may be needed in different phases of the innovation process. This is what we will focus on in this paper. It presents a case study of one firm illustrating how customers can be involved in different situations and for different purposes. Thus, in this paper we will only take the supplier's perspective.

KEY DIMENSIONS OF CUSTOMER INVOLVEMENT

In describing and analyzing how a particular firm involves customers in its product development the following key dimensions can be used:

- Degree of customer involvement

- Purpose of customer involvement
- Degree of formalisation of the collaboration
- Duration of the collaboration
- Number of participating actors

First, the extent to which a certain customer is involved may vary and the degree of involvement can be seen as a spectrum, spanning from low to high. Gadde and Snehota (2000) defined high and low involvement relationships with starting point in activity links, resource ties and actor bonds (Håkansson and Snehota, 1995). Low involvement relationships are relationships with limited activity links, resource ties and actor bonds, and they can be handled with limited coordination, adaptation and interaction costs. High involvement relationships, on the other hand, have a high degree of integrated activities, resources and actor bonds. Therefore, high involvement relationships are costly with regard to coordination, adaptation and interaction and they have more of investment logic, where benefits are thought to come in later periods of time than the costs (Gadde and Håkansson, 1993). From the area of product development, Brockhoff (2003) suggests categories of customer involvement, spanning from no involvement, to involvement by advice, involvement by weak control (i.e. the users have certain responsibilities at various stages of the development process), involvement by doing (referring to when users are involved as team members), to involvement by strong control (i.e. the users pay directly for developments and are co-partners).

Second, the purpose of customer involvement is another central aspect. Why does this take place and what do suppliers and customers expect to achieve from the involvement? Understanding the task, costs and the outcomes is important for setting the scene for fruitful collaboration. If this is not done properly, differing perspectives could function as roots for conflicts (Munksgaard et al., 2010) instead of sources of innovation. One way of defining different purposes with customer involvement is to look at the interfaces between supplier and customer. Araujo et al. (1999) defined four types of interfaces: standardized, specified, functional and interactive. The latter three are relevant for suggesting different types of purposes. A specified interface with regard to customer involvement in product development will refer to a supplier that requests certain type of resources to be used in the development process, while a functional interface refers to that the supplier request input regarding a certain function in relation to the product development process. The interactive interface is more open-ended and builds on interaction between the supplier and the involved customer. The planned outcomes may be more research-based and uncertain and lie many years ahead.

Third, the degree of formalisation is another important aspect of business relationships (Gadde and Håkansson, 1993). This issue is of particular importance in the context of product development. For example, are there written contracts that control the collaboration and the outcome or does the interaction rely on informal mechanisms? As shown by Håkansson (1989) technological development collaboration between selling and buying firms to a large extent takes place informally. However, there may be situations where it is important to the parties to make a formal agreement.

Fourth, the duration of collaborative business relationships tends to be long. Håkansson's (1989) study showed that the average age of such customer and supplier relationships was ten years. Duration is then important in three respects – first related to the duration of the relationships *per se*, second related to the duration of the specific product development project and third related to the time frame for the customer involvement in a particular project (Alajoutsijärvi et al., 2012). Embeddedness in time (and space) has impact in different ways

for the product development process (Lind and Dubois, 2008; Gressetvold and Strömsten, 2005).

Fifth, the number of participating actors is also a central aspect of customer involvement in product development (Brockhoff, 2003). In other words, is the collaboration dyadic, i.e. a collaborative initiative between one firm and one of its customers, or is it a multi-actor collaboration project? In the latter case it needs to be made clear how the participating actors relate to each other – for example, if the involved actors see each other as competitors or if any of the customers work also with other suppliers. These are circumstances that could lead to major conflicts (ibid.).

PURPOSE AND METHOD

This paper explores these dimensions by presenting and analyzing a case study. The case is about SKF, a large mechanical engineering company headquartered in Sweden. The main purpose is to illustrate how SKF's Industrial Division involves customers in its product development and identify opportunities and problems related to different forms of involvement.

The present SKF case was written a few years ago as one of twelve cases on customer involvement within the frame of a national research and development programme on product innovation management.[1] The data was collected primarily through personal interviews with a handful of SKF managers at the Industrial Division. Subsequent contacts with other SKF managers, for example in terms of guest lectures, have provided opportunities to update the case.The research design of the paper is thus a single case study methodology relying on personal interviews as the main data collection source.

SHORT PRESENTATION OF SKF

The SKF Group, with total sales in 2011 amounting to SEK 66 billion, is the leading global supplier of products, solutions and services in the area comprising rolling bearings, seals, mechatronics, services and lubrication systems. Ever since its foundation in 1907, SKF has given high priority to technical development and strived to be close to its customers. The investments in research and development (R&D) over the years have resulted in a growing number of technological innovations that have created new standards and new products in the world of bearings.

SKF's Industrial Division is active in more than 30 industrial customer segments in such industries as Aerospace, Renewable Energy, Industrial Drives, Off Highway, Railways, Metals, Pulp and Paper, Food and Beverages, and Marine. In its efforts to create value in the targeted segments and grow, SKF's Industrial Division continuously launches new market offers to existing as well as new customers. Since 2005, more than forty new offers have been developed and brought to the market.

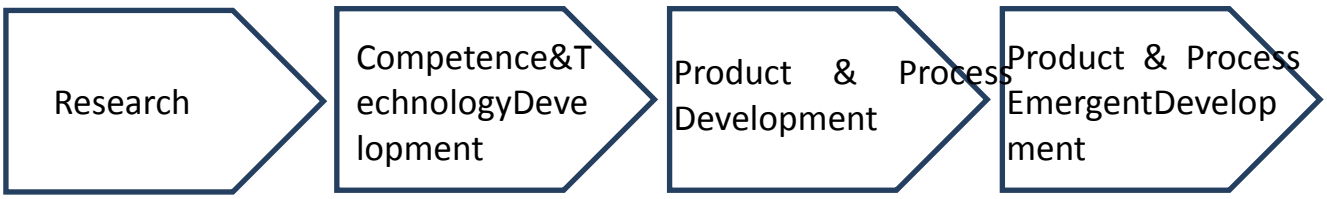
PRODUCT DEVELOPMENT AND CUSTOMER INVOLVEMENT

SKF makes a distinction between four major "phases" of development, corresponding to four different types of R&D project (see Figure 1). First, there are projects aiming to discover and

[1]The programme is called PIEp and is financed by Vinnova, that is, the Swedish National Agency for Innovation Systems, together with several Swedish universities. See http://www.piep.se for more information about the programme.

explore new technology and competence. These more exploratory research activities are carried out primarily at two corporate research centres. Second, there are projects aiming to develop and verify new technologies and competencies and translating them into new products. These projects are carried out by development centres located in different countries. Third, there are projects aiming to develop products and processes according to defined market needs and technology. Here, the goal is to produce something that is ready to be offered to the customers. The fourth type of project aims to maintain and support products that exist in the market. These projects are typically initiated by problems reported by customers or discovered in the production.

Figure 1. Major phases of development
Source: SKF



The first two project types are mainly technology-driven and usually carried out internally, without any involvement of customers. The aim is to produce new intellectual properties that can be further developed into new products and processes in the subsequent “phases”. This paper focuses on the third type of project representing the bulk of product development activities within SKF’s Industrial Division. The fourth type is something that is normally undesirable. These problems are usually dealt with by the plants’ own production engineering departments and should be fixed as rapidly as possible. If they cannot be satisfactorily solved, the problems should be brought to an appropriate development centre for further investigation.

Referring to the third category of R&D activity presented above, one can distinguish between three types of project from a customer involvement point of view:

- Customer-driven development
- Segment-driven development
- Product-driven development

CUSTOMER-DRIVEN PRODUCT DEVELOPMENT

Customer-driven development projects, leading to so-called New Customer Offers (NCOs), take their starting point in problems or needs expressed by a single customer. The preconditions may differ. The customer may know what it wants but not how to make it, or it may know how to make it but wants to outsource. It may also be that the customer does not

know what is wrong with the existing solution, and neither does SKF. This necessitates an R&D effort in order to find a new solution. To give one example, SKF a few years ago started a collaborative project with a globally leading manufacturer of medical equipment. SKF has helped the customer to develop a complete solution for moving an arm, which constitutes a key part of an imaging apparatus. Given the technical uncertainties the risk level of this project was perceived to be high, but at the same time the market potential was also substantial, in case of a successful outcome (since the apparatus is big and expensive). A detailed contract was signed by the two partners according to which the risk would be shared, in case of failure. The customer, having a high bargaining power thanks to its large size, also required that SKF should follow its own project management model, including for example the use of six sigma. After two years of intensive work, involving some 25 people within SKF, a satisfactory movement solution could be presented. While the initial focus of SKF's involvement in the project had been on designing the bearing unit, the end result became that the customer decided to outsource the manufacture of the entire arm to SKF. As typical for customer-driven development projects of this type, the final solution is proprietary to the customer/partner, and it is not possible for SKF to offer it to other customers.

Ideally, customer-driven projects should be initiated by salespersons, who identify customer problems and forward them to the R&D organisation. In order to take care of such ideas in a better way, SKF established a few years ago a special design team for the purpose of developing customer-specific solutions.

According to the experience of this team, it has been difficult in reality to get the salespersons to take the wanted initiatives since, as commented by one SKF manager: "they have been taught to sell catalogued products". Therefore, it is more common that it is the team members who come up with an idea or a new application. It is then presented to the customer, who defines a product specification including external parameters and performance requirements. The customer is involved in all phases of the product development. Active participation of the customer is particularly crucial in the testing phase, since SKF has limited possibilities to carry out tests under real-life conditions. Since open exchange of information is important for achieving a successful outcome, SKF always makes a secrecy agreement with the customer as one of the first steps.[2] Another policy is that the customer should pay for the prototype to ensure commitment.

SKF experiences that the nature of the customer relationship varies a great deal depending on the customer's perceptions, for example, whether the project is seen as part of a partnership or not. Sometimes it is difficult to mobilise sufficient commitment from the customer. It can be that the customer firm's own production department sees SKF's involvement as a threat. Generally, it is easier to establish a trustful collaboration when the customer has decided to outsource the production of the product. Another experience is that the design team's personal relationships with counterparts in customer firms are important. The team members therefore try to use these contacts when approaching firms to suggest new projects.

SEGMENT-DRIVEN PRODUCT DEVELOPMENT

The dominant mode of product development is the segment-driven one and it results in new market offerings. Like the product-driven mode, which we will come back to in the next section, it aims at developing products and solutions for a targeted market segment, and it can

[2] As one segment manager pointed out, SKF learns a lot from the customer-driven projects, even if the solutions cannot be sold to other customers. However, in line with the ethical principles followed by SKF, knowledge obtained from one customer is not forwarded to other customers.

be characterised as “customer-oriented”. The segment-driven development projects are thus based on customer needs but they are not initiated by a specific customer. Instead, the point of departure is market and industry trends of relevance to the segment. Windmills exemplify a segment that is important to SKF and where there is a great need for development efforts. The windmill industry is experiencing serious problems with the gearboxes for large off-shore machines. These are steadily getting bigger with increasing mechanical loads as a consequence. There have been numerous breakdowns caused by gearbox problems. SKF, being a leading supplier of the main bearing of the windmill and other components, e.g. in the gearbox, has identified interesting market opportunities and is working hard to find a solution. This work, aiming to develop a totally new turbine for off-shore applications, is done in collaboration with gearbox manufacturers and windmill producers. Even if certain customers are involved in the development, e.g. by testing different solutions, the project is not driven by them. Furthermore, SKF’s intention is that the final solution will be offered to the entire windmill industry without exclusivity for any particular company.

Most projects driven by the segment organisation can be characterised as market pull, rather than technology push, They are always linked to the company’s business development process. Hence, there must be a “business case” motivating why the project should be carried out. In order to develop a New Market Offer (NMO), a product development project is often, but not always, required (e.g., sometimes a new offer can be created by combining existing products in a new way).

SKF applies today a stage-gate model prescribing how NMO projects should be handled. The development of this model began some ten years ago when the company’s efforts to become more market-oriented were intensified. The new orientation towards more complete solutions meant that several technology and product platforms often had to be combined, that is, with several product owners involved. This necessitated a structured process for business development, and in addition a better coordination with product development. See the Appendix for a description of this process.

Methods and tools for collecting and analysing customer information

Unlike the customer-driven development projects, the NMO projects are not carried out in order to satisfy a specific customer’s requirements. Instead, they are based on needs that are common to all, or most, customers within a certain industry segment (or sub-segment). The purpose is to develop a new market offer helping SKF to fulfil these needs, for example, by enabling customers in the target segment to increase productivity or reduce costs. The offer may include products from one or several of the SKF’s five technology platforms: Bearings and units, Seals, Lubrication systems, Mechatronics and Services.

The understanding of customer needs is built very much through *direct contacts with customers*. The global sales organisation plays an important role by giving feedback to the central functions of the divisions. In addition, it is not unusual that representatives of marketing, manufacturing or product development accompany the salespersons when they visit customers. This is something that is becoming more common as a result of SKF’s increasing sales of complete solutions, such as sub-systems which constitute parts of the OEM-customers’ own products. This often necessitates technical adaptations to be carried out by production engineering or development centres.

Like other large companies, SKF carries out various *business intelligence* activities. This includes, for example, meta studies and measurements of CSI (Customer Satisfaction Index). The latter, covering different types of customers, gives information about how SKF is seen relative to its competitors.

Historically, broad market studies and other business intelligence reports have not been used as an important source of knowledge in the business and product development. This is partly due to the heterogeneity of SKF's markets. SKF's products are used in so many different applications, which makes it difficult to make broad customer surveys with relevance for product development. However, one segment manager says that SKF has not been good at this, and therefore should try to improve its ability to carry out and use market studie.

SKF is using a number of more specific tools to understand the customers. In recent years, *Quality Function Deployment (QFD)* has emerged as a particularly important tool used to identify and verify customer needs.[3] Data at a relatively high level (i.e. not too detailed) is collected from a smaller or larger number of customers and then analysed internally by involving people with various backgrounds. Typically, the responsibility for carrying out the QFD resides in a team with representatives of marketing, sales and R&D. The expressed customer needs are often a bit fuzzy and there is a need to translate them into more technical parameters and rank the importance of different aspects. A QFD exercise is often carried out in the early phase of an NMO project. But it is just the start of the analysis. The QFD helps the team to identify the key issues and make priorities – for example, what the NMO project should focus on (it could, e.g., be on reducing the maintenance costs for a specific machine, if this is a big problem for the customers in the segment). Thus, the QFD constitutes a starting point for further, more detailed analyses. Here, the involvement of "pilot customers" may be used for the purpose of getting more precise information (see the next section).

There are a few other techniques which in different contexts are used primarily by the marketing side. *SPIN* (Situation, Problem, Implication, Need) and *5S* (Situation, Sympton, Source, Shift, Solution) are two rather similar techniques providing a set of questions to be used when approaching customers. They are helpful for identifying the real needs and what implications they give. *Voice of the Customer (VoC)* is related to design for 6 sigma and includes several methods, such as surveys, interviews and focus group discussions. *Kano*, finally, is a tool used to rank the importance of different requirements. For example, which are "must be" and which are "delighters" (these are things that the customer enjoys when getting it but they would not ask for it)?

Pilot customers

Even if the segment-driven projects are not carried out on behalf of specific clients, so-called pilot customers often play a key role in the development process. They are "a must" as one interviewee expressed it. These customers are usually not involved from the beginning, but are brought in at a later stage. They are normally selected together with SKF's sales companies. They should be customer firms that have the problem to be addressed and are interested in testing SKF's solution. In other words, they should be "early adopters".

In general, it is regarded important to have more than one pilot customer for each offer in order to get a nuanced picture of the needs and enable a representative design that can be sold to other potential customers within the segment.

The customer normally knows that it is participating in a special project. It is also aware of the fact that the product/offer is developed for the whole segment and that it will not get any exclusive access to the solution. However, it can be an advantage for the pilot customer to be first – for example, by getting a one-year start over its competitors.

[3] QFD is a systematic, group decision-making method for identifying customer-related problems, needs, requirements and wishes, and translating them into an optimally designed product/solution.

Nonetheless, it can sometimes be difficult to find suitable pilot customers. One reason may be that the contacted customers demand exclusive rights to the solution. Here, the sales persons in the field have a central role to play by convincing the customers about the potential benefits and making them attracted to participate in the project. The SKF-internal personal networks, e.g. between sales and segments, are important in this context. As one segment manager points out, the segment organisation should be seen as “service units”, and actively transfer and share its own knowledge within the company in order to build fruitful collaborative relationships and create synergies.

To what extent the pilot customers are willing to act as a reference for SKF in its marketing of the offer to other potential buyers varies. Thus, while some customers are quite closed, others are positive to receive visitors and tell about their experiences. Whether a specific customer belongs to one category or the other depends of course on the competitive situation in the industry, but also on the company culture of the customer firm.

From customer-driven to segment-driven solutions

It is not unusual that an NMO project is preceded by an NCO project. It can be that the development of a customised solution gives ideas to develop a standardised solution for other customers which have similar problems. This is often cheaper for SKF than developing a series of NCOs for different customers in a certain segment. In these NMO projects the experiences from the first customer is an important starting point, but it is still necessary to involve pilot customers to ensure that the new product satisfies the general needs of the segment.

PRODUCT-DRIVEN PRODUCT DEVELOPMENT

The product-driven development is more internally oriented than the former. Such projects are motivated by the need to upgrade an existing product platform into a new and better one. Thus, they are concerned with product renewal for the purpose of defending competitiveness. The projects take their starting point in general industry trends and market needs, for example, in terms of performance and efficiency. A recent example is the launch of a new family of energy-efficient bearings. This project addresses the general mega trend towards environmental sustainability and energy savings. By optimising the internal geometry of the bearing and using a new type of polymer cage and low friction grease the new products have the potential to reduce energy consumption of many machines by 30 percent or more. The customers are not screaming for the product, yet, but it is SKF’s conviction that it will meet fundamental customer needs. To open up the eyes of the customers and make them realise the advantage of the new product, compared to competition, SKF may need to take the lead and help customers to calculate energy savings.

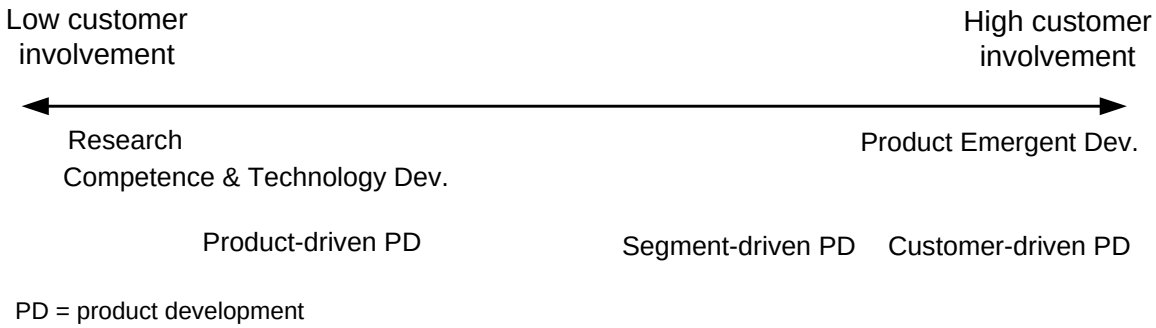
DISCUSSION

In the beginning of this paper we identified five key dimensions for describing and analysing customer involvement in product development. Let us return to these dimensions in this section and see what we can learn from the SKF case.

The first dimension is the *degree of customer involvement*. The case clearly shows that the extent to which customers are involved in R&D varies depending on the type of project. This is schematically illustrated in Figure 2. In one extreme – i.e. projects within Research and Competence & Technology Development respectively – customers are usually not involved at all. These projects can be characterised as technology-driven. In the other extreme, we find

the so-called Product Emergent Development projects triggered by individual customers' problems with specific SKF products. Here, it goes without saying that SKF has to work closely with the customer in order to fix the problem.

Figure 2. Overview of customer involvement for different project types



In product development, which in this context is the most interesting category of R&D, we have three different project types. Also in the extreme end of the spectrum we find the customer-driven projects. Here, SKF interacts with the partner throughout the whole development process. These projects are often big and costly for SKF. Therefore, the handling of the risks is important and calls for a detailed contract (see below).

The product-driven projects are basically carried out without active customer involvement, but take their starting point in identified and well-known customer needs. These are known to SKF in advance thanks to pre-existing knowledge collected, for example, through broad and general market studies and by using ongoing customer contacts as a source of information.

Regarding the segment-driven projects we saw that customers are involved both early, in the requirement specification phase (e.g. in the form of QFD) and late, in the validation phase (pilot customers). Thus, unlike in the customer-driven projects customers are usually not involved in the design phase. Here, the development work can be based on the specifications coming from the QFD and other needs-analysis techniques. It is not until a prototype has become available that SKF involves customers again, this time for the purpose of testing and fine-tuning the product design. This is a pattern also found in other studies, such as Gruner and Homburg (2000) who conclude that customer involvement in the engineering stage of product development has little impact on success: "Thus, during the technical development, companies should rely on their own skills and should not expect technical solutions from customers" (ibid., p. 10-11). Other case studies carried out in parallel to our work on SKF also showed that B2B-companies had a tendency to involve customers early and late but not so much in between (Anderson and Lindström, 2008). In the early phase, the companies typically get an input from a larger number of customers who provide information. In the late phase, the collaboration is used for the purpose of testing how the new product works in practice and the number of counterparts is therefore more limited. Instead, the interaction with each customer is more extensive.

The observed pattern in the segment-driven projects is understandable and quite logic. However, one may question if it could not be worthwhile to have some customer interaction also during the design phase. For example, early feedback on proposed solutions could reduce

the risk of going in the wrong direction and having to make costly design changes at a later stage.

The second dimension is the *purpose* of customer involvement. In the segment-driven projects the purpose is obviously different in the early and late phases, and the form of interaction also differs. In the customer-driven projects the purpose of the whole project is to develop a new solution for one customer. However, from SKF's point of view, despite the fact that the solution is proprietary to the partner firm, another possible advantage of engaging in such projects is that they may provide knowledge and ideas useful in the development of future NMOs.

Previously, we introduced the concept of interfaces in business relationships. The customer-driven projects clearly illustrate the interactive interface. The projects take their starting point in the customer's specific needs but the more detailed purpose of the development work is developed jointly by the two collaborating companies. In the example above in which the customer was a manufacturer of medical equipment, the project started with designing the bearing unit and later on the purpose became to develop the whole moving arm of an imaging apparatus.

Referring to the segment-driven projects the late-phase involvement of pilot customers is an example of a functional interface. The interaction is less intensive than in the customer-driven projects and the purpose, from a development point of view, is limited to functionality and testing the new product in a real-life setting. Nonetheless, this type of customer interaction is very important for SKF's ability to bring about new market offers.

The third dimension is the *degree of formalisation*. In the type of customer-driven projects that SKF is running the establishment of formal contracts is important. It is needed, *inter alia*, in order to handle such sensitive issues as risk sharing and ownership of the results. For example, the customer is normally granted exclusivity. For SKF it is a serious matter what to put into the contract. It is important, for example, to create fruitful conditions for open exchange of information and give both parties incentives to commit themselves to the project. The experiences show that the negotiations can easily become complicated and that it can take several years to reach an agreement. It is not until a contract is in place that the work can start.

In the case of segment-driven projects formalising the collaboration with pilot customers is less critical. The collaborative projects are more short-term, less uncertain, and do not require the same amount of R&D investment. The lower risk, compared to the customer-driven projects, reduces the need of the partners to use detailed written contracts as control mechanism. Instead, the joint testing of SKF's proposed solution can more often be based on trust. Needless to say, the customer visits and interviews carried out for collecting information for the QFD analysis do not require formal contracting. In many cases, they can be made with customers with whom SKF already has an ongoing business relationship.

Hence, for the segment-driven projects, the contracts are not emphasised as much as in the customer-driven projects. Relying on trust rather than formalisation in technological development in business relationships is also in line with what previous studies have found (Håkansson, 1989). In our case, we see that SKF uses written contracts as well as informal mechanisms for controlling customer involvement in product development.

The fourth dimension is the *duration* of the collaboration. Also here we can observe clear differences between the customer-driven and segment-driven projects. With regard to the joint R&D activities the former projects normally take longer time. Developing a new NCO may require several years of intensive R&D efforts. Pilot customer projects are usually not as time-consuming, but also here it may sometimes take a long time to sell in a new solution to a

specific customer and achieve volume sales. What is similar between the two project types is that both aim to create – or maintain in the case of an existing customer – a long-term business exchange with the partner. This illustrates that joint R&D activities carried out by buying and selling firms often constitute an "episode" in an ongoing business relationship. Over a longer period of time there may be a series of such episodes where the buying and selling firm jointly improve the technical solution used by the customer.[4]

The fifth dimension is the *number of participating actors*. As we have seen SKF works mainly with individual customers. This dyadic approach is quite natural in the case of customer-driven projects. In the NMO projects SKF normally works with several pilot customers in parallel, but these activities are not directly related. However, knowledge gained from interacting with different pilot customers can be brought together by the NMO team and used to develop the final offer to be launched in the market at a later point in time. In that way there may be indirect connections between the different customer activities. It is obvious that each pilot customer has to be dealt with individually, since they may have their own specific problems and needs. But at the same time, a mutual exchange of experiences among pilot customers testing the same type of solution could possibly be beneficial to all parties. In industrial markets it is not unusual that firms create forums, for example in terms of research centres, where several customers can meet and have a broader discussion about problems as well as solutions (Styhre and Lind, 2010). Such initiatives could be a complement to the mainly dyadic approach used by SKF in the segment-driven projects.

CONCLUSIONS AND IMPLICATIONS

The present study contributes to the research on how customers are used as resources in new product development by illustrating the diversity of ways regarding degree, purpose, formality and time frame of customer involvement atSKF. Generally, when developing new products for a single customer or a market segment it can sometimes be useful to involve other types of actors, such as suppliers, end-users, and other firms that sell complementary products to the same customers. However, in our SKF case we have not come across such examples. The potential of multi-actor discussion forums might be something to aim for in the future. Implications from this study regard the importance of using individual customers in different ways, since the benefits vary depending on how the customers are involved. Furthermore, the individual relationships need to be developed as well as the whole "portfolio" of customer involvement projects need to be organised. Some forms of customer involvement, such as the customer-driven projects at SKF, are very resource intensive and consequently only a limited, and carefully selected, number of such projects can be run in parallel.

[4] See Laage-Hellman (1997, Ch. 4) for a case study of such a relationship.

REFERENCES

Alajoutsijärvi, K., Mainela, T., Salminen, R. and Ulkuniemi, P. (2012). Perceived customer involvement and organizational design in project business, *Scandinavian Journal of Management*, 28(1), 77-89.

Anderson, H. and Lindström, G. (2008). Skapa kundnärvaro i innovationsprocessen. In PIEp, *Innovationsförmåga*. Stockholm: PIEp.

Araujo, L., Dubois, A. and Gadde, L-E. (1999). Managing Interfaces with Suppliers, *Industrial Marketing Management*", 28(5), 497-506.

Brockhoff, K. (2003). Customers' perspectives of involvement in new product development, *International Journal of Technology Management*, 26(5/6), 464-481.

Brown, S.L. and Eisenhardt, K.M. (1995) Product development: past research, present Findings and future direction, *Academy of Management Review*, 20 (2), 343-378.

Gadde, L-E. andHåkansson, H. (1993).*Professional Purchasing*. London: Routledge.

Gadde, L-E. andSnehota, I. (2000). Making the Most of Supplier Relationships, *Industrial Marketing Management*, 29 (4), 305-316.

Gressetvold, E. and Strömsten, T. (2005). Managing product development: Challenges related toembeddedness in time and space, 21st annual *IMP Conference*, Rotterdam Netherlands.

Gruner, K. E. and Homburg, C. H. (2000). Does Customer Interaction Enhance New Product Success?, *Journal of Business Research*, Vol. 49, pp. 1-14.

Håkansson, H. (ed.) (1987).*Industrial Technological Development: A Network Approach.* London: Croom Helm

Håkansson, H., (1989).*Corporate Technological Behaviour: Cooperation and Networks*, London: Routledge.

Håkansson, H. and Snehota, I. (eds) (1995).*Developing Relationships in Business Networks*. London: Routledge.

Håkansson, H. and Waluszewski, A. (eds),(2007).*Knowledge and Innovation in Business and Industry – The importance of using others*. London: Routledge.

Harrison, D. and Finch, J. (2008). New Product Development When You Have To: Frames and Temporary Collaboration in Industrial Nets, *IMP Journal*, 3(3), 35-52.

Laage-Hellman, J. (1989). Technological Development in Industrial Networks, ActaUniversitatisUpsaliensis, *Comprehensive Summaries of Uppsala Dissertations from theFaculty of Social Sciences 16*. Stockholm: Almqvist&Wiksell International (diss.).

Laage-Hellman, J. (1997).*Business Networks in Japan:Supplier-Customer Interaction in Product Development*. London: Routledge.

Lind, F. and Dubois, A. (2008). Analysing Dimensions and Consequences of Project Embeddedness, *IMP Journal*, 3(2), 2-18.

Munksgaard, K.B., Clarke, A.H., Storvang, P. and Erichsen, P.G. (2011). Product development with multiple partners: Strategies and conflicts in networks, *Industrial Marketing Management,*Article in press.Available online.

Ritter, T. and Walter, A. (2003).Relationship-specific antecedents of customer involvement in new product development, *International Journal of Technology Management*, 26(5/6), 482-501.

Styhre, A. and Lind, F. (2010). Balancing centripetal and centrifugal forces in the entrepreneurial university: A study of ten research centres at a technical university in Sweden, *Technology Analysis and Strategic Management*, 22(8), 909-924.

vonHippel, E. (1988).*The Sources of Innovation*. Oxford: Oxford University Press.

Wynstra, F. and Pierick, E. (2000). Managing supplier involvement in new product development: a portfolio approach, *European Journal of Purchasing and Supply Management*, 6(1), 49-57.

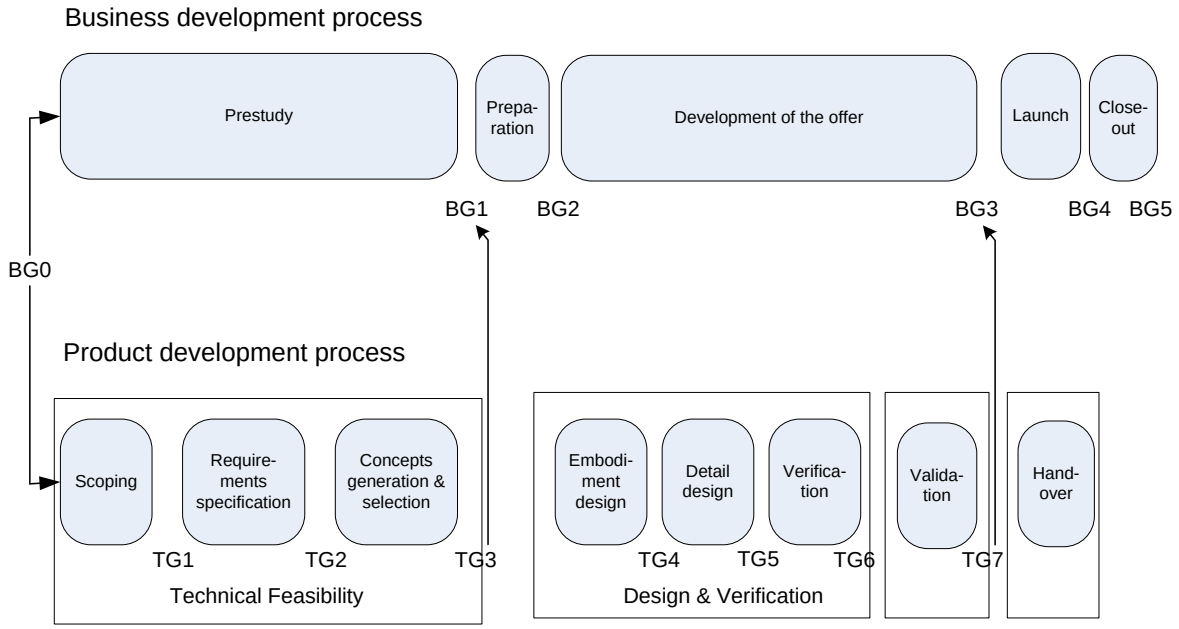
APPENDIX

According to the NMO model, the decision to start a new project is taken by a Portfolio Board together with a Project Sponsor. The former consists of senior managers from the marketing, sales, and R&D functions. The representative of sales varies among projects depending on which market that is targeted (e.g., OEM or aftermarket). The NMO Project Sponsor is always a physical person who has responsibility for achieving the end-results. Usually, it is one of the segment managers.

When it has been decided to start a new project, a NMO team is appointed. Besides a person from the segment organisation, who is responsible for driving the project, this team includes representatives from Product Development & Engineering Platforms, Sales and, importantly, the product owner. The latter is usually someone from Manufacturing & Supply, that is, some person who owns the business (product line).

The business development process consists of five steps separated by Business Gates (BGs, where go/no go decisions are taken). This process is illustrated in Figure A1, together with the parallel product development process. The Portfolio Board together with the Project Sponsor are responsible for the early BG decisions. When the NMO is ready to be launched, the decision is taken by the Launch Board, whose members are the heads of the Industrial Division and the Service Division respectively, and area directors concerned (e.g. OEM Sales Europe).[5]

Figure A1. Business and product development process for New Marketing Offers (NMOs)



[5] The final step is Close-out, which means that the project is formally terminated and the project team is dissolved. One segment manager points out that in reality there is no close out. The relationships that have been established during the project, both within SKF and with pilot customers, are there and continue to matter.

The sponsor role has turned out to be very important for the outcome of NMO projects. For example, the sponsor is responsible for securing that there is appropriate financing. The project funding typically comes from different sources/stakeholders (e.g. manufacturing, marketing, sales companies and development centres).[6] Solving of the financing is something that lies outside of the business development process itself. This means that even if a project has passed through the BGs, enough financing may still be lacking. There are examples of successful projects that have periodically experienced difficulties to get funding.

As also illustrated in the figure, the product development process consists of eight steps, each one separated by a Technical Gate (TG), where it is decided whether the project should continue, be stopped or go back to a preceding step. These decisions are not as formalised as in the business development process, and are normally taken by the NMO team.

The three Technical Feasibility steps correspond to the Prestudy phase in the business development process and provide information for the Business Gate decision (BG1). If there is a go decision taken by the Portfolio Board, the subsequent design, verification and validation steps are carried out by the product development organisation in order to develop the offer and provide input to the Launch Board's decision whether to launch the offer or not, or go back to development (BG3).

[6] Until 4-5 years ago, development projects could get Group-level financing from "International Management Expenses", i.e. special money dedicated to strategic projects. Today, this kind of funding does no longer exist. The idea is that the sponsors should find the money closer to the market. That is, someone must be convinced that there is a market potential and be prepared to allocate the necessary resources.