ORGANIZATIONAL CHALLENGES WHEN COLLABORATING IN PRODUCT INNOVATION PROJECTS

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ABSTRACT

Nowadays, firms are often involving external organisations into what previously was limited to internal work. Supplier collaboration in new product development is one such example, where suppliers contribute with new technologies and competencies that the customer does not possess. Hence, firms can incorporate new technologies into their products. This paper is based on an on-going case study of a collaborative product innovation project between two large firms. The firms are leading within their respective market. The study focuses on technological and relational challenges in the project. These challenges are present, not only between the partners, but also within the customer. A challenging aspect is when the project is transferred from one organisation to another within the customer. Challenges can be divided into a time perspective, first challenges during concept development, following challenges during the handover from concept development to product development. Results highlights a number of challenges in collaborative product innovation project.

Keywords: *Collaborative product innovation; Technical challenge; Relational challenge; case study*

1 BACKGROUND

In an effort to develop new products more efficiently and enter the market with the most relevant innovations, firms are increasingly seeking to incorporate pertinent ideas and skills from external sources. Firms using open innovation as a means to facilitate inflow and outflow of knowledge accelerate internal innovation, thus expanding their market presence (Chesbrough, 2003). However, despite many advantages of open innovation, noted by both scholars and practitioners (e.g., Christensen et al., 2005; Gassmann, 2006), they also impose significant challenges on the participating firms. The benefits of open innovation and using external sources can only be fully realized if organizations successfully overcome the internal and external challenges.

In this study, we aim to investigate organisational challenges in an open innovation project. In addition, we will suggest organisational approaches to manage these challenges. O'Connor (2008) pointed to the importance of utilizing both internal and external interface mechanisms in innovation projects. First, it is important that development projects have an interface with the mainstream organisation in order to build new competences. Second, linkages with external firms are essential as they provide access to new knowledge bases. In this work, we examine a collaborative innovation project involving two leading technological firms to illustrate a number of challenges, related to both internal and external interface mechanisms, which arise when

collaborating in open innovation. However, while both are addressed, our focus is on external sources for innovation (Dahlander and Gann, 2010; West and Bogers, 2014).

This study is a work-in-progress investigating a collaboration between two large mature firms. Previous studies have shown that developing capabilities for innovation in large mature firms entails a number of challenges and activities and requires explicit management support (Börjesson et al., 2014). Hence, it is interesting from both an academic and a practical perspective to identify potential sources of these challenges and propose strategies for managing them both internally and in collaboration with an external partner.

Our work-in-progress investigates organisational and management challenges that arise due to organisational boundaries. More specifically, we aim to identify a number of challenges in a collaborative product innovation project that requires collaboration between the where customer and the supplier in the development of a new platform for a technically complex product. These challenges can stem from external organisational boundaries (between the customer and the supplier), or arise due to internal organisational boundaries (boundaries within both the buying organisation and within the supplying firm's organisation).

2 THEORETICAL FRAMEWORK

Adoption of open innovation usually involves use of internal and external resources to drive the firm's development process (cf. Chesbrough, 2003). Most firms understand that they do not possess the required competencies in-house to be competitive and thus address this shortcoming by opening their R&D processes to external partners (Chesbrough, 2006). However, managing the activities pertinent to open innovation process can be rather challenging (e.g., Johansson et al., 2011; Grandori, 2001). The work presented here focuses on technological and relational areas, as this is where majority of firms struggle to find the most optimal way to collaborate with external firms in innovative product development.

2.1 TECHNOLOGICAL CHALLENGES

Technological uncertainty is one of the factors that may make external collaboration difficult to manage (Tegarden et., 1999). High levels of uncertainty in this domain may lead to technical challenges that may bring the possibility of incorporation of that technology into question (cf. Oh and Rhee, 2008). Hence, when collaborating with external firms, high levels of uncertainty require close collaboration between firms, as well as willingness of both parties to dedicate ample time and resources (Brusoni and Prencipe, 2001). Moreover, the possibility of task division between the firm and its external partner is contingent on different aspects, one of which is the degree of internal knowledge about the new technology and its future direction (Wagner and Hoegl, 2006; Wynstra et al., 2010). In innovative development that benefits from the external partner competencies, it is important to consider whether technical alignment between the firm and the external partner is possible (Emden et al., 2006). In this context, technical alignment pertains to the extent to which their respective knowledge bases overlap (Emden et al., 2006) and the degree of resource complementarity (Harrison et al., 2001).

In this situation, the firm needs to rely on the specialized partner knowledge of specific technology for producing a specific component or system (e.g., Koufteros et al., 2007). Hence, greater technical alignment renders firms more technically competent (Lau et al., 2010), as they gain awareness of the type of technology they provide to the collaborative product innovation and obtain from the external partner, respectively.

When firms lack technical competency required to integrate new technology, this can lead to different challenges, one of which is absence of overlapping of knowledge bases among partners. Empirical evidence indicates that having similar knowledge bases that allow firms to fully grasp the value of potential partner's competencies is essential. In fact, overlapping knowledge provides the necessary common ground to recognize technology's potential, determine complementary competencies and communicate inter-organizationally (Emden et al., 2006). Hence, researchers increasingly argue that, for successful collaboration with external partners, firms must possess prior context-specific knowledge (Hitt et al., 2000). Resource complementarity is another precondition, as it is the primary means of creating value (Harrison et al., 2001). However, even when both aforementioned elements exist, partnership with external collaborators must be managed effectively to create value. Authors of extant studies highlight that poor partnership management can be detrimental to the innovation success.

2.2 RELATIONAL CHALLENGES

Relational competencies pertain to the firm' willingness to collaborate with the external partner, as well as the ability of both parties to form a trusting and mutually beneficial relationship. When these relational competencies are absent, firms' interactions with their partners are often compromised. Relational competencies is part of the literature stream of supplier involvement in new product development (Johnsen, 2009). Collaborative efforts in product innovation can be facilitated by both a willingness to collaborate and compatible cultures of the buyer and supplier (Chung & Kim, 2003; Feng et al., 2010). In addition, factors part of relational competences include collaborative aspects such as trust (Emden et al., 2006; Wagner & Hoegl, 2006).

To ensure a partner's performance and commitment, contractual agreements are used in collaborations. However, relying on contracts is not enough, firms also use trust and repetitive collaborations to govern a partner (Blomqvist et al., 2005). Suppliers' relational competences in collaborative product innovation are connected to their interaction with the customers in question. Relational capabilities improve through repeated collaborations between the customer and the supplier. Studies show that firms evaluate suppliers for product innovation collaborations partly based on previous relationships (Melander, 2014; Rundquist & Halila, 2010). By having previous knowledge from a partner, relational challenges can more easily be solved. Also, through multiple relationships, firms build trust and alignment of goals. These factors become more important in a relationships for projects with technological uncertainty, such as collaborative product innovation projects (Zhou et al., 2008).

3 RESEARCH DESIGN

As the objective of the present study was to gain an in-depth understanding of the complex nature of organizational challenges encountered in open innovation projects, single case study was adopted as the research framework. We rely on qualitative data, given that qualitative case approach is deemed most appropriate when in-depth insight into a

phenomenon is required (Yin, 2013). The use of single case study also offers the advantage of a consistent setting, facilitating a detailed analysis of organizational challenges in an open innovation project. Hence, the empirical data employed to meet the research aims is derived from product innovation cases denoted as Alfa and Beta, representing two leading technological firms incorporated in Sweden. Alfa is a valuable customer to Beta, as they have been buying motors from Beta for many decades. The new product to which this investigation pertains is developed jointly by Alfa and Beta, with the aim of increasing energy consumption efficiency. Both companies are world leaders in their respective fields and have more than 50,000 employees worldwide. Their R&D activities are conducted across several centres, located in different countries. They are providing a wide variety of technologies. Both Alpha and Beta are characterized as knowledge intensive company and have long tradition in innovation.

The case study pertains to this product innovation, as both Alfa and Beta are technology-oriented firms and are thus interesting to study due to their intention to use open innovation in new product development. Hence, the project examined in this work is part of an on-going collaborative effort between Alfa and Beta, revealing many interesting challenges related to open innovation.

During the six-month research study, both researchers visited Alpha and Beta on different occasions, whereby they gathered data from both primary and secondary sources to facilitate data triangulation and develop construct validity (Gibbert et al., 2008). As a part of this endeavour, we have conducted 12 interviews, eight of which involved staff at the customer, with the remaining four performed with their counterparts at the supplier side. However, we plan to conduct seven additional interviews in the near future. The participants we have interviewed thus far were asked to describe the development process, whereby open-ended questions were designed to prompt in-depth discussion pertaining to, for example, the development activities and organizational boundaries they encountered during the development process. The interviewees' roles varied and included technology manager, project manager, technical experts, purchasing manager and development engineer. Individual interviews lasted 1−2 hours and were based on a semi-structured interview guide, comprising of a list of predetermined areas to be discussed, while allowing for probing further into any topics that may arise. The interviews were recorded and later transcribed. Moreover, frequent informal discussions during our visits to both Alpha and Beta contributed to our understanding of the innovation process by providing additional information about the context of the project and the nature of their collaborative efforts. The researchers continuously documented findings and reflections based on the informal discussions, and their initial understandings were subsequently discussed to achieve congruence. Secondary information was collected in the form of project documents, along with those that could elucidate the case context and etc.

Respondent	Firm	Interview length
Global technology manager	Supplier	1h 30 min
Project manager	Supplier	1h 5 min
Manager Department of Technology, Product Centre Separator Systems	Customer	1h 30 min
Manager Concept Development	Customer	1h 30 min
Project manager in the beginning	Customer	1h
Technical expert	Customer	1h
Global purchasing manager	Customer	1h 15 min
Development manager for High speed separators	Customer	1h 25 min
Platform Manager	Customer	1h 15 min
Project Manager	Customer	1h 15 min
Global technology manager	Supplier	1h 10 min
Technical expert	Supplier	1h

Table 1 Interviews

Data analysis involved classification of the interview data through a predetermined coding scheme based on the literature review. On an aggregated level, these included the main dimensions from the theoretical framework, such as open innovation, technological and relational challenges, and partnership collaboration. Throughout the analysis, as our understanding increased, some codes were added or removed in a cyclical process that allowed the empirical data to inform the theoretical framework and vice versa. Data analysis followed the three flows of activities—reduction, display and conclusion drawing/ verification—suggested by Miles and Huberman (1994).

4 RESULT

In this section, we present the findings yielded by the case study of an innovation project carried out by the firm that we denote as Alpha. This firm is a world leader within the key technology areas of heat transfer, separation and fluid management. Alpha aims to develop a new separator design to reduce energy consumption. In order to achieve this aim, Alpha needs contribution of its supplier (Beta), since the induction motor technology on which the separator design is based is new to Alpha.

Owing to the expertise in this field, Beta is thus in charge of developing an induction motor, while Alpha takes the responsibility for the development of the complete separator system. The project started with the concept development phase, led by the Alpha's concept team. The output from this phase was not a final solution; rather, the results were given to the product development team for further refinement. During the process, considerable challenges arose in the collaboration between Alpha and Beta. In the remainder of this section, the focus will be on the technological and relational challenges.

4.1 TECHNOLOGICAL CHALLENGES

4.1.1 DURING CONCEPT DEVELOPMENT

Similar to most innovation projects, this project was affected by a number of challenges stemming from technological uncertainties. Alpha's concept development team was responsible for providing a new design, into which Beta was required to integrate a new motor. Hence, uncertainties on both design and component level arose, along with those pertaining to the interfaces between components. As one technical expert explained:

> *"Examined from an overall perspective, everything seemed fine. However, a more detailed view revealed challenges with combining different pieces produced from different materials. Hence, we discussed improving the design at both component and system level. However, a major redesign was a significant obstacle for us. Indeed, requests for changing design are always met with some resistance."* (Technical expert, Alpha)

Addressing the separator design issues affected the new motor design that Beta was in charge of. This introduced some challenges for Beta as well, as the mechanical dimensions impact on the motor output. Moreover, in order to establish the robustness of the new motor, Beta and Alpha performed different tests at their respective premises. During testing, different issues were identified, which needed to be considered, in particular those pertaining to the calculation error and the selection of interfaces.

> *"We had made some mistakes, such as calculation errors, which we can address later. We also had problems with rotors, as their design could not achieve the desired efficiency. However, we discovered the issue on time, analysed it and found the solution."* (Technical expert, Alpha).

In fact, to overcome the issues, developments needed to be coordinated with Beta, resulting in is a closer relationship between the two companies. In particular, Alpha needed to explain and participate in the supplier's development efforts, as some design specifications cannot be easily implemented in practice. This was explained by the Alpha's platform manager as follows:

> *"It is not like the car industry, where they have a supplier and say: please develop this for us. One reason why we do not work like that is that the product functions are highly integrated and interrelated. We cannot write that demand specification and send it out and say: pleas help us with this. We try to work with the modular thinking but we have not come to the point where we can isolate different modules for separate developments. Rather, the entire system is developed in one piece. For this reason, why cannot give something to a supplier and obtain something in return."* (Platform manager, Alpha)

4.1.2 HANDOVER FROM CONCEPT TO PRODUCT DEVELOPMENT

When the time came to handover the project to the product development team, the concept team felt that the prototype, which they have developed in collaboration with Beta, is almost ready for industrialization. However, they did not verify all the aspects that need to be taken into account. The product development team believed that there were different aspects and situations that needed to be tested to achieve the robust product before

delivering it to the customer. This is described by the product manager, member of the product development team:

> *"When we started this project, we already had a concept prototype, developed in the lab by the concept development team, who believed that it was ready for launch. In fact, we had to work intensely for further two years until we launched it." We had many minor issues in the beginning and it took us a long time to remove all the problems. This was a valuable lesson, as we realized that, even if everything works in the lab 24-7 without any problems, we need to conduct further stress tests, and in particular subject single components to more extensive tests, before we finalize the design. In other words, a component may work without issues in isolation. Yet, when integrated in a complete product, it will fail."* (Project Manager, Alpha)

The product development team has started to collaborate with the Beta's engineer on assessing the prototype feasibility. They have performed some tests together to evaluate the prototype and have exchanged some ideas on the Alpha's customer demand. However, the challenges regarding the handover between Alpha's concept development and product development team made the situation uncertain for Beta. The supplier was not confident at that stage that the development team would believe that the product has future from the technical standpoint. The R&D manager at Beta described the situation as follows:

> *"Our feeling was that Alpha developers did not really believe that the product had the future technically. We think that there are still differences in opinions, and not everybody agrees that dedicating significant resources to this project is a high priority. I think that they are still weighing up their options and are not sure if this product would be a hit in the market or not and are struggling with the technical points."* (R&D Manager, Beta)

4.2 RELATIONAL CHALLENGES

4.2.1 BEGINNNG OF CONCEPT DEVELOPMENT

Alpha's concept development manager made several attempts to establish contact with Beta to explain the potential of the new product and demonstrate how Beta could contribute in an open innovation project. However, by using the standard communication channels, the Alpha's purchaser was not able to reach the right individual at Beta with whom to discuss these issues. The Alpha's technology manager observed:

> *"We have good contacts. However, they (purchasing-sales) normally engage in day-to-day business and even though we had a very good purchaser here at the time, he tried to communicate with the customer but did not have sufficient authority. Consequently, we could not start up something as big as this."* (Technology manager, Alpha)

In order to succeed, Alpha needed to find the right contacts at Beta. In fact, it was the concept manager's personal contacts at Beta that enabled the Alpha to secure a high-level meeting at Beta, which was attended by a number of technology development managers. Hence, Alpha could present their product and its market potential to a technical audience.

It was through this meeting that Alpha established the initial contact with the right technical personnel at Beta and could start discussing potential developments and collaboration for the open innovation project.

> *"A key element to the success was also that we approached them from the technical perspective, rather than solely through supplier contacts, such as KAM. This would not be the right approach to start a new technology partnership like this."* (Technology manager, Alpha)

4.2.2 *HANDOVER FROM CONCEPT TO PRODUCT DEVELOPMENT*

In addition to establishing contact with Beta, some other relational challenges emerged. As the Alpha's innovation project starts with the concept development, this team initiated the contact with Beta. The concept team was thus responsible for establishing collaboration with Beta, which the development team should take over once the concept has been proven. This can be problematic, as explained by the development manger:

> *"The concept team works extensively with suppliers. The problem is that they have not typically been involved in our purchasing. As a result, on previous occasions, they have sometimes chosen unsuitable suppliers. These suppliers might have been perfect for development work, but not for serial production. That is why we need to involve purchasing from the beginning. Failure to do so has resulted in being forced to work with suppliers that are not suitable as partners."* (Development manager, Alpha)

5 DISCUSSION AND CONCLUSION

Analysis of the innovation project executed by Alpha in collaboration with Beta revealed some technological and relational challenges.

Technological challenges typically arise due to technological uncertainty, which can adversely affect the process development and possible outcomes. Technological uncertainty can stem from complexity and lack of knowledge (Koufteros et al., 2007; Lau et al., 2010). In general, complexity pertains to the number of elements in the system or product and the interfaces among the elements (Baldwina and Clark, 2000). In the collaborative innovation project analyzed in this work, both Alpha and Beta struggled with high complexity of component and system design. They addressed these issues by developing a closer relationship between each other. In particular, representatives of both firms participated actively in the development activities, in order to ensure that detailed design specification was implemented in practice. As noted above, inadequate knowledge of new technology required to provide a design solution and accomplish project tasks can also increase uncertainty (Tushman and Nadler, 1978). For instance, in the project analyzed in the present study, several ideas were put forth regarding development; however, both Alpha and Beta's technical knowledge required to assess the outcome of the new solution. This uncertainty can sometimes impact on motivation to proceed with the project, thus potentially limiting the external and internal resources dedicated to its execution.

Relational challenges, on the other hand, are caused by the inconsistent commitment (cf. Feng et al., 2010) and trust (cf. Blomqvist et al., 2005) by the collaborative firms in

development process. In addition, the internal relational challenges could arise from incongruence between the new solution and the customer's organizational structure. Our findings also revealed that commitment of resources by both collaboration partners is instrumental in overcoming both internal and external challenges. Particularly, it is essential that the key personnel in each organization are fully supportive of the project, as this high-level endorsement increases the likelihood of its success. Table 2 outlines key issues related to technological and relational challenges.

	Concept development	Handover from concept development to product development
Technological challenges	• Considerations of component and system designs • Testing, robustness and quality • Product functions that are highly integrated and interrelated. Limited modularity, system is developed in one piece	• A design functioning in a lab is not the same as functioning in the field • Uncertainty as to wether the new technology/product will be a success
Relational challenges	• Finding the right contacts at the supplying firm • Getting in contact with technical personnel at the supplier	• Considerations regarding the suitability of supplier chosen by concept development • Purchasing's involvement

Table 2. Division of challenges

In sum, this study has highlighted the importance of addressing the technological and relational challenges that arise as a part of collaboration between firms, as well as internally within the buying firm. Based on these findings, we suggest that closer study of technological and relational challenges may aid in gaining further understanding of problems that arise when collaborating with other firms in product innovation projects. As our project is an ongoing endeavor, the focus of this paper was on the early development efforts only. Thus, we have grouped challenges into those arising in the concept development phase and those pertinent to handover from concept development to product development. As this is an ongoing study, additional challenges will be subjected to further analysis and will be included in the framework that will be developed in our future work. The study has a number of limitations, one of which is its focus on a single case study. In addition, as at this stage in our work, product development phase is not yet completed, it remains to be ascertained if the product will become a success when introduced to the market.

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