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# Understanding the complexity of knowledge integration in collaborative new product development teams: A case study

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### ABSTRACT

Knowledge integration is important in collaborative new product development (Co-NPD). The research literature shows that the way actors create a shared understanding about the new to create products is a quality indicator of Co-NPD. This study investigates what factors influence the creation of a shared understanding in Co-NPD. The results show factors at three different levels; the actor, project and company level. Additionally, there exist relationships across the factors. The related factors form four different types of interfaces. The interfaces differ from each other since different types of collaborative mechanisms exist within them.

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## 1. Introduction

Consider a telephone. From the 1940s till the 1990s, a phone did not change much with regard to its product functionality and product architecture (Valkenburg, 2000). However, in the last 15 years, the product had changed in many ways. The switch from a shared house phone to a personal phone has had a significant impact on both the product appearance as well as product use. People do not use their personal phone only for calling, but also for taking pictures, making movies, playing games, listening to music and as an agenda. This has changed the consumer attitudes towards a phone. What once was a rather functional product has become a product that expresses one's personality. Therefore, customers required their phone to be modern, easy to use, and of good quality. In the meantime, they did not want the phone to be expensive, as they would like to buy a new one every 2 years.

These customer needs reflect increasing customer demands and increasing product complexity, requiring a far-reaching integration of the different knowledge domains of the actors from different

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disciplines during collaborative new product development (Co-NPD) (Garcia and Calantone, 2002; Swink, 2000; Veryzer, 2005). Granstrand et al. (1992) found that the first generation of cellular phones in the 1980s only required electronic skills to be developed. However, in the 1990s, the development of the third generation of these phones demanded knowledge in physical ergonomics, electronic, mechanical, and computer engineering, and physiological and psychological aspects. In the last 10 years, the knowledge needed to develop today's mobile phones had increased yet again.

Since the increased product complexity requires knowledge and skills from different fields, Co-NPD teams within companies have the responsibility to integrate these different knowledge bases (Edmondson and Nembhard, 2009). Knowledge integration appeared to be difficult for them, because actors often had different, interests and perspectives on the new to develop product (Bond and Ricci, 1992; Bucciarelli, 1996; Dougherty, 1992; Emmanuelides, 1993; Griffin and Hauser, 1996; Moenaert and Souder, 1990; Moenaert et al., 2000). Furthermore, it was demanding for companies manage the actors towards thinking along the same line since actors faced difficulties in interpreting and understanding each other's knowledge (Adams et al., 1998; Bucciarelli, 2002; Dougherty, 1992; Griffin and Hauser, 1996; Hage et al., 2008; Moenaert and Souder, 1990). The reason for this was that actors from different disciplines used different languages and different representations of the design artefact. Additionally, they often had different interests and responsibilities. Therefore, negotiations and trade-offs were required to make the actors' efforts coherent (Bucciarelli, 1996).

In the case study presented in this paper, Co-NPD is defined as: the process in which actors from different disciplines share their knowledge about both the development process and its content. They do that in order to create shared understanding on both aspects, to be able to integrate and explore their knowledge, and to achieve the larger common objective: the new product to be designed (Kleinsmann, 2006). Knowledge sharing is a critical intervening variable in organizational performance in Co-NPD (Mohrman et al., 2003), which shows the importance of an effective Co-NPD process. Research showed that companies face some major knowledge management challenges during Co-NPD since it thrives upon the exploration of knowledge under a high degree of uncertainty (Berends et al., 2007). Since actors do not have to become experts in each other's fields, they do not have to share all their knowledge. Yet, they have to be able to integrate their knowledge bases in a sensible manner.

Therefore, Berends et al. (2007) claimed that, during Co-NPD, knowledge management should focus on knowledge integration instead of focusing on knowledge transfer. They also stated that the effectiveness of knowledge integration required a mutual understanding of the actor's contributions. This is in line with research on design communication, which finds that the quality of the Co-NPD project is dependent on the process of creating a shared understanding (Dong, 2005; Kahn, 1996; Valkenburg, 2000). In addition, our interviews with product managers revealed that managers need more knowledge on how they could manage the creation of a shared understanding among actors from different disciplines, as the following quote from a product manager illustrates:

“... There is no problem that cannot be solved technically. At least I have never experienced that personally. Finally, they always solve it. They use project management tools to map the problem and to find the solution. However, the real problem is the communication among the teams. Did they understand each other and are they critical enough to each other? ... Dependent on their discipline, they have a feeling for each other's discipline, but the real details ... It is complex to be able to know all parts about every discipline. As a Project Manager, you really have to be aware of this. That is also the reason why I need something to monitor that ...” (Project Manager Philips).

The study presented in this paper focuses on the process of creating a shared understanding in Co-NPD projects. The paper starts with a literature review about the role of shared understanding in Co-NPD projects. It continues with a description of the case study executed, followed by a description of the learning history method that was used as the research method. The paper concludes with its results, limitations, implications for future research and with a discussion of the results and implications for managerial practice.

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