



## Triggers for virtual customer integration in the development of medical equipment – From a manufacturer and a user's perspective

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### ARTICLE INFO

#### Article history:

Received 4 August 2008

Received in revised form 4 August 2009

Accepted 21 August 2009

Available online 6 May 2010

#### Keywords:

Virtual product development

Virtual customer integration

Co-creation

Consumer motives

Theory of planned behavior

### ABSTRACT

Virtual customer integration (VCI) involves customers throughout all stages of the new product development process. Firms across industries have started to experiment with virtual user integration and expect to utilize their knowledge, creativity, and judgment. However, little research exists that looks at the motivations of customers and managers to engage in virtual product development projects. In this paper we try to identify the triggers for virtual customer integration (VCI) from the manager's as well as from the customer's perspective. Using Ajzen's Theory of Planned Behavior we aim at explaining managers' motivation for the adoption of VCI based on a sample of 104 managers engaged in the product development process of manufacturing firms of medical technology. Drawing on motive research, we test six categories of customer motivations to engage in VCI projects on a sample of 105 users of medical technology. The results show that for managers subjective norms and attitude predict the intention to use VCI. For customers, interest in innovation and product improvement are the most important drivers, whereas monetary compensation and prestige are not significant, and surprisingly the desire to help people even has a negative impact on the participation of VCI.

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### 1. Introduction

Product innovation is a key success factor for industrial firms (Hult, Hurley, & Knight, 2004). Recent literature has widely addressed the importance of customer integration in product development and numerous aspects of customer interaction in collaborative new product development of industrial firms have been discussed (e.g. Bonner, 2005, 2009; Lam & Chin, 2005). Customers' wants and needs, as well as their acquired knowledge through the actual use of products, make them an essential external resource for new product development (NPD) (Thomke & von Hippel, 2002; von Hippel, 2005). As the Internet lowers the cost of employing large samples of customers (Dahan & Srinivasan, 2000; Iansiti & MacCormack, 1997) and allows instantaneous feedback from customers all over the world, new possibilities for customer integration into NPD arise (Dahan & Hauser, 2002; N. Franke & Piller, 2004; Nambisan, 2002; Ozer, 2003; Prahalad & Ramaswamy, 2004). Whereas the possibilities to integrate customers into NPD via the internet have been studied from a variety of aspects in consumer goods markets, empirical research on the

application of VCI for industrial goods markets is still in a nascent state (Hemetsberger & Godula, 2007).

VCI is a promising idea and offers new opportunities to improve customer integration in NPD in a business market context. Its diffusion however is still very limited and little research exists that explains the adoption of VCI in business markets. VCI can only be successfully implemented if companies are able to access motivated customers that are willing to participate in virtual NPD projects. The customers' willingness and ability to contribute to NPD is of central importance. Companies willing to integrate them and to capture their knowledge, their ideas and solutions, must understand what motivates these customers and which incentives increase the likelihood of valuable contributions. Whereas some studies in a consumer market context address such questions, little is known about motivations of customers in a business-to-business context. Therefore, another lack of research lies in the identification of customers' motivations to engage in VCI.

With our research we aim to contribute to the understanding of the diffusion of VCI in practice, and to reveal the triggers for VCI implementation from the managers' perspective as well as from the view of integrated customers in the context of industrial goods markets. As a research setting, medical technology has been chosen, which has been described as a highly product embedded environment in a business-to-business context (Bonner, 2009). Product embeddedness has been defined as “the degree to which the product impacts

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how customers perform important functions, influences significant customer processes, requires customer effort in learning the product, creates customer dependencies on the product, and influences customers' policies and procedures" (Bonner, 2009, p 4).

The contribution of this paper is threefold. First, as one of the first studies to do so, we quantitatively test customers' motivations to participate in a VCI project of NPD in a highly product embedded business-to-business context. The results show that in the business-to-business context it is also not the monetary reward but intrinsic motives that are the primary triggers leading customers to contribute. Second, we study the managers' intentions to introduce VCI in their firms by applying Ajzen's Theory of Planned Behavior (TPB) (Ajzen, 1991). A third contribution lies in the extension of TPB and motive research on virtual customer integration to a new context, thereby expanding the theory to a new domain.

## 2. Virtual customer integration

### 2.1. Concept and benefits

Virtual customer integration (VCI) considers customers as a valuable resource for NPD, providing an opportunity to improve the overall success of innovations (Chesbrough, 2003). It virtually involves customers throughout all stages of NPD and utilizes their know-how, creativity, and judgment. By using VCI companies may assign their customers specific roles along the phases of the NPD process (Nambisan, 2002). In the ideation phase, customers are considered as a source of innovation. In the design and development phase, customers assume the role of co-creators and in the product testing and product support phase, customers take on the role of users testing new products. In each of these phases, a number of web-based tools exist that enable customers to articulate and contribute their ideas, to interact with the product development team and other customers during product development, and facilitates the visualization of virtual prototypes in order to gain customers' feedback (Prandelli, Verona, & Raccagni, 2006).

Whereas the role of customers in idea generation has been relatively well explored in the marketing and NPD literature – also in the virtual environment (Nambisan, 2002), VCI offers new and promising opportunities in the design and development as well in the product testing phase. The virtual presentation of new products, their functions and design, as well as innovative interaction methods such as user based design (Dahan & Hauser, 2002) and toolkits (von Hippel & Katz, 2002), allow customers to participate in NPD in a much more active and in-depth way than is possible with current market research methods, even before physical products and prototypes come into existence (Franke & Piller, 2004; Füller & Matzler, 2007; Hemp, 2006; Kohler, Matzler, & Füller, 2009). Further, VCI may help overcome barriers of functional fixedness, the missing ability of customers to imagine alternative functions of currently familiar products (Ulwick, 2002). Moreover, it is a way of supporting customers in articulating and designing their own customized innovations (Jeppesen, 2005) and providing managers with unambiguous information about customer expectations and aspirations, especially in the early stages of NPD (Sawhney, Verona, & Prandelli, 2005). These advantages lead to three key benefits of VCI: 1) direction of the communication, as the internet leads to an interactive dialogue with the customers; 2) intensity and richness of the interaction, as the richness of interaction with virtual communities enables companies to tap into the social knowledge of customers in addition to the individual knowledge, and 3) size and scope of the audience, as even physically remote customers can be reached at low costs (Hemetsberger & Godula, 2007; Sawhney et al., 2005).

To date, most research on VCI has focused on the design of tools to be used, and on customers' abilities qualifying them for participation in new product development. Some authors have concentrated on

toolkits that allow the transfer of tacit knowledge and enable consumers to become innovators themselves (Piller & Walcher, 2006; von Hippel & Katz, 2002) while others have focused on the development of superior market research tools for valid virtual concept evaluation and product testing (Dahan & Hauser, 2002). However, despite the positive findings, till now, VCI has neither become widely spread in consumer goods nor in industrial goods markets.

### 2.2. Research on VCI applications in practice

In their study on the diffusion of web-based product innovation in the automobile, motorcycle, electronics, toiletries, and food industries Prandelli et al. (2006) conclude that "web-based tools are not always implemented to accelerate and improve new product development through customer involvement ... only specific stages of the innovation process are supported by the web, a limited set of two-way communication tools are still included and not all companies seem to show an optimal level of interest in leveraging these tools" (p. 124). VCI concentrates on the early stages (i.e., idea generation) and on the later stages (i.e. product launch and management). Prandelli et al. (2006) also found that if companies use VCI, they mainly use tools that perform their offline activities at a lower cost online and tend to use a gradual approach by first adopting web-based tools to support already functioning activities offline before they begin to intensively develop more radical VCI approaches. Hemetsberger and Godula (2007) extensively review the literature of VCI tools in a business-to-business context and conclude that although VCI is a promising idea and the number of methods and tools proposed in the literature is increasing "... business experience with the application of these methods is still nascent" (p. 38).

Some exploratory studies and anecdotal evidence analyze how the internet can be used to virtually integrate customers in NPD and highlight some challenges and success factors (Füller, Bartl, Ernst, & Mühlbacher, 2006; Füller & Matzler, 2007; Sawhney et al., 2005). Most of these studies however focus on business-to-consumer markets. It is rather doubtful whether these experiences can be transferred to a business-to-business context. First, in a business-to-business context, customers are both collaborators and competitors in a NPD project (Fang, Palmatier, & Evans, 2008; Prahalad & Ramaswamy, 2000). As collaborators, customers share important information, coordinate activities, integrate and adapt engineering and manufacturing processes with the supplier, which eventually improves the value of the product. As competitors, customers seek to maximize their individual benefits, negotiate with the supplier over pricing, delivery, and other terms of the products. As a consequence, the customer not only increases value through co-creation but also wants to capture value. Second, in a business-to-business context, products are highly embedded in the customer's organization (Bonner, 2009). As the products often significantly influence work processes, job responsibilities, job titles, competitive strategies etc., customer motivation and ability to engage in VCI may be quite different from a business-to-consumer context. High embeddedness also means that due to the complex interplay of a wide range of technical, economic, user, service and management needs, the articulation of customer needs may be a major problem and high customer interactivity in NPD could be critical (Bonner, 2009).

## 3. Hypotheses development

### 3.1. Theoretical frameworks

In order to explain the adoption of VCI in product developing firms we apply the model of Ajzen's Theory of Planned Behavior (TPB) (Ajzen, 1988, 1991). TPB has often been applied to explore managers' intention to adopt new tools or methods. In organizational contexts,

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