

Usage of ICT tools in New Product Development: Creating user-involvement

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ABSTRACT

Involvement of users in new product development is more needed than ever due to the technological and the social progression in recent years. This chapter explores (1) how various ICT tools can aid user-involvement in the new product development process and (2) the organizational challenges of ICT usage. ICT application and implementation is found not to be driven by the same antecedents and these also inflict on the created user-involvement in the new product development process.

INTRODUCTION

The commercial expansion of the Internet in the early 1990s changed the Western world from an industrial to an information society, characterized by the rapid development and the adoption of new information and communication technologies (ICTs). Information accessibility and creation continues to become faster and easier as new ICTs are developed at a rapid pace. Another aspect of the progress in ICT is the change from a focus on the presentation of information to content collaboration through posting, commenting, and writing on the Web. Users search for, read, and compose knowledge together irrespective of group affiliation, and they talk directly to each other. Thus, the information society has transformed into a knowledge society. The knowledge society represents a significant change in the power relationship of users and corporations. The traditional control companies had over the information the users of their products could access has eroded.

Traditionally, the corporate environment has been divided into technology and markets. Yet, a balance of the two has recently been put forward as the most profitable approach to new product development (NPD) (Moorman & Slotegraaf, 1999). From this perspective, users are a sub-dimension of markets. Progress with ICTs has made users an independent dimension of company NPD. Users communicate across markets, share experiences, and refine products outside the control of companies. The “corporate playground” has evolved into a three-dimensional space (technology, markets, and users) that must be navigated when searching for new product projects.

ICT usage has drastically modified communication, sales and information methods, thus enabling companies to achieve strong competitive advantages in both production and product development (Bayo-Moriones & Lera-Lopez, 2007; Ozer, 2000). Greater usage

of ICT in a particular product development effort will lead to greater market success of a given product when launched. Research finds that ICT usage impacts the commercial success of new products in a positive direction (Barczak, Sultan, & Hultink, 2007). Integrating users in company NPD is an opportunity for organizations to enhance their social capital in relation to users and markets. If users are treated only as end-users, a company will lose their competitive advantage to companies that give their users a variety of roles in NPD and, through these roles, tighten their relations with them.

Within the context of user-involvement in NPD, this chapter aims to explore the determinants of ICT usage in case analysis of Danish International operating companies. We utilize five groups of factors: innovative climate, strategic emphasis on ICT tools, ICT champions, competencies and performance expectations. The presented study contributes to existing research on ICT adaptation and user-involvement with observations from actual applications of ICT tools in new product projects. The opportunities and challenges facing companies when pursuing user-involvement with ICT tool usage are provided for future research.

In the following, user-involvement and ICT usage in NPD is conceptualized. After this the antecedents of ICT usage are discussed. The cases are then presented and findings are discussed and a conclusion reached.

USER-INVOLVEMENT IN NPD

The main principle of user-driven NPD is that companies invite users into their NPD process. The key is the incorporation of user information and knowledge into new product projects. User knowledge includes input, comments, and feedback generated through a continuous dialogue with users. The application of user input optimizes product technology and/or product design, and matches a new product to extended and/or latent user needs. User involvement is defined as the integration of feedback from users on projects throughout the NPD process (Jespersen, 2008).

The literature on customer relationship management and relationship marketing stresses the relationship between company and customer as a pre-requisite for involvement (Andersen, 2005; Dwyer, Shur, & Oh, 1987; Morgan & Hunt, 1994). Producers can only involve customers and establish a dialogue if they are connected to them.

The initiative to involve users in new product projects (interaction control) may be taken by users (unsolicited) and/or by companies (solicited). The focus of this chapter lies on user-involvement initiated by the company. Company controlled user involvement can be undirected or directed (Brockhoff, 2003). The difference of the two is whether the company knows the responding users. Undirected user-involvement is often used as part of product marketing in form of contests either between users (e.g. write the best commercial) or between products (e.g. users vote for their favorite product among a given set of products from a manufactory). Directed user-involvement pertains to company processes such as new product development, and gives the company the benefit of personal contact to users through direct invitations. This gives more control over input quality, though users cannot be forced to reply to an invitation. When a company has invited users to collaborate in the NPD process, the interaction of

user and company may be task oriented or socially oriented (Kaulio, 1998; Nambisan, 2002). Task involvement of users refers to a short-term engagement of users on a specific NPD project in a given NPD stage. Social involvement of users refers to a long-term engagement of users by the company. The company invites users to be part of a relationship on NPD that exceeds specific projects and process stages. With this understanding of user-involvement as initiated by the company and directed to pre-identified users either as task or social relations, we will proceed to ICT usage in NPD.

ICT TOOL USAGE IN NPD

Research has put ICT tools forward as instruments for connecting with users. ICT is regarded as a platform for relationship building between company and product/service users. The increase in numbers of virtual communities and self-service technologies reinforces this notion (Andersen, 2005; Casalo, Flavian, & Guinaliu, 2008; McWilliam, 2000). Virtual environments are an effective way of building relationships with users and motivating both the company and its users to participate in collaborative NPD (Miles, Miles, & Snow, 2005; Sawheny, Verona, & Prandelli, 2005). ICT tools may shorten the distance between company and users thereby increasing and strengthening user involvement and engagement in new product development. By combining various new technologies, companies can provide a range of online services to the customers that facilitate user-involvement in NPD (Nambisan, 2002). Many software products do allow companies to establish virtual customers (Dahan & Hauser, 2002).

ICT tools are characterized as either synchronized or not-synchronized tools. This difference between these terms pertains to user-involvement created through the ICT usage in NPD. Synchronized ICT tools build on group logic. With these tools user-input and dialogue are created by a group of users who collaborate and discussion given topics in the NPD process. Not-synchronized ICT tools are those with an input generated on individual basis by users and collected on a shared platform accessible to all. Figure 1 illustrates various ICT tools applicable to the NPD process with synchronized/not-synchronized characteristics and how these relate to task/social user-involvement. Most ICT tools can be used for task-involvement, but not all have the functionalities to generate social user-involvement.

Figure 1. ICT tools and user-involvement

User-involvement

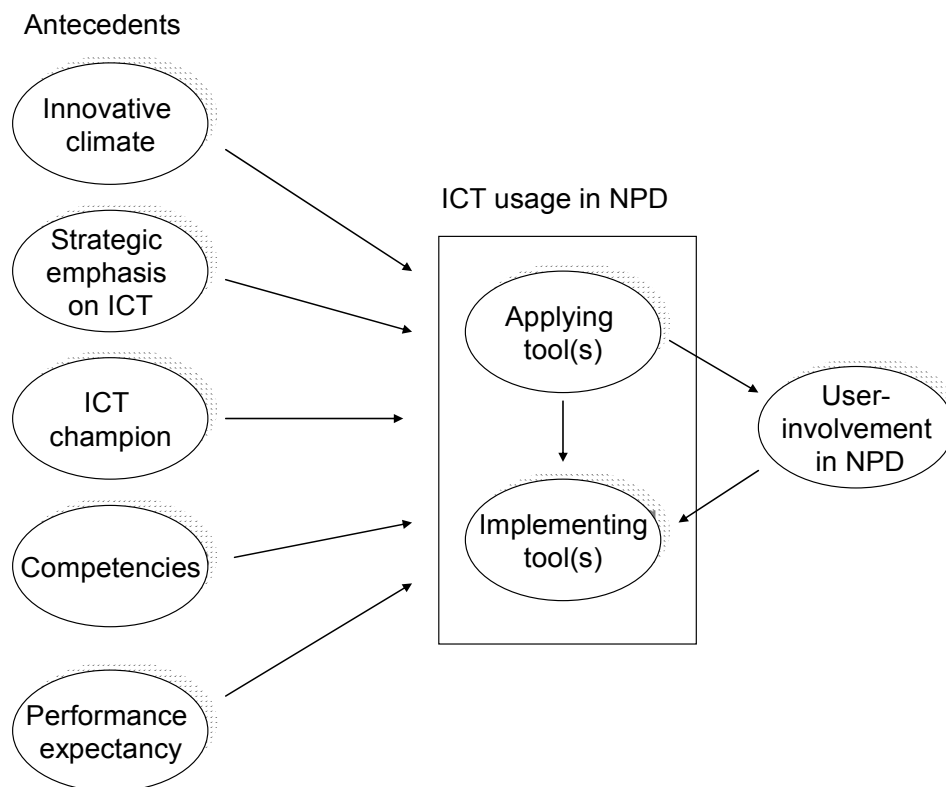
		Task	Social
ICT tools	Synchronized	3D prints	Group technologies
	Not-synchronized	3D images Mobile technology	Web 2.0 applications On-line communities

ICT tool usage in NPD is a two phase process that builds on the innovation diffusion process (Venkatesh, Morris, Davis, & Davis, 2003). First, a company has to apply a minimum of one ICT tool in a NPD project. Through the ICT tool application, users are involved in the NPD project and the company forms an experience of user-involvement and the ICT tool. Based on this, the second phase of the process can be one of two possible: the company either implements the ICT tool in their NPD process, or does not do so. The right part of figure 2 depicts the ICT usage process. With this understanding of ICT usage in NPD, we proceed to the antecedents of the process.

ANTECEDENTS OF ICT USAGE IN NPD

Technological progress and the evolution of Internet technology have turned the use of ICT tools from a question of mere acceptance to an estimation of whether an organization is ready to apply ICT tools. The challenge is not to make companies use ICT in general, since they already do this. Rather, ICT develop rapidly, and many solutions and systems exist to create the dialogue platform necessary for user-involvement in NPD. A number of prerequisites are required to establish the readiness of companies for holistic information generating ICT tools. This part of the chapter describes the antecedents of ICT usage in NPD. The chosen model, which is shown in figure 2, draws on concepts and insights from NPD and IT adaptation literatures such as those developed by (Barczak et al., 2007; Bayo-Moriones & Lera-Lopez, 2007; Sethi, Pant, & Sethi, 2003; Venkatesh et al., 2003).

Figure 2. Antecedents of ICT usage in NPD



Innovative climate

An innovative climate is one that supports creativity, is not risk averse, is willing to try new things, and exemplifies open communication among employees. It is a culture that values the creation and sharing of knowledge as a key driver of NPD (Barczak et al., 2007). The innovative climate is shaped by a company's innovation orientation as it directs the organization's competences in the domains of resource allocation, technology, markets, human resources, and operations (Siguaw, Simpson, &ENZ, 2006). An innovation orientation comprises an organization's learning philosophy, strategic direction, and cross-functional collaboration.

Market orientation and learning in NPD are reported as significant to information acquisition in the NPD stages and the performance of new products (Hills & Sarin, 2003; Matthyssens, Pauwels, & Vandenbempt, 2005). The NPD framework, NPD activities and performance of new products have been established as varying between prospectors and defenders (Dröge & Calantone, 1996; Slater & Mohr, 2006). Research has singled out a focus on technology as a factor that influences value creation, while market focus influences value appropriation (Mizik & Jacobson, 2003). NPD literature balances technology and market input to ensure NPD process practices (Moorman & Slotegraaf, 1999). Cross-functional teamwork and the collaboration between R&D and marketing have been investigated for their significance on product performance and use of information generated by NPD activities (Moenaert & Souder, 1996). Organizations with an innovative climate encourage and reward cooperation and knowledge sharing internally and externally across company boundaries. An innovative climate with these

characteristics has been found to influence the usage of ICT tools in NPD positively (Hargadon, 2002; Sethi et al., 2003).

Strategic emphasis on ICT tools

Strategic emphasis is the focus and obligation of an organization to invest in ICT to increase user collaboration (Ritchie & Brindley 2005). Furthermore, a strategic emphasis on ICT is necessary for usage to overrule existing routines in NPD. A company's strategic focus determines the support of new ICT tools in NPD (Barczak et al., 2007). A strategic focus on differentiation through quality more likely encourages decision-makers to adopt ICT in NPD, rather than a low-cost competitive strategy (Bayo-Moriones & Lera-Lopez, 2007). The application of ICT tools in NPD is strategic as they change a company's relation to its users. Top management emphasis and support is therefore needed for a positive, permanent usage of these ICT tools in NPD.

ICT champions

Research on innovation adoption and ICT implementation both suggest that the existence of an ICT champion has a positive influence on the usage of holistic ICT tools in the NPD process (Barczak et al., 2007; Markham & Griffin, 1998). The present focus is on champions at the project level as these will be involved in the interaction of users from end-to-end in the NPD process. Without a champion or multiple champions on a project, it is more unlikely that new ICT tools are tried and implemented.

The conventional profile of an ICT champion is an ICT expert. An ICT expert is a person in the NPD team who is knowledgeable about the technical operation of the ICT tool and can train the team in using it (Markham & Griffin, 1998). With the technological progression of the Internet we suggest two additional profiles of ICT champions that would influence the usage of new ICT tools in a positive way. Besides ICT experts, ICT champions may also be an ICT super-user or an ICT visionary. An ICT super-user is a person who uses the many web 2.0 applications available, such as blogs, wikis, chat rooms, podcasts, RSS feeds, social software and other online web services, or is experienced with platforms such as Second Life, Sims or 3-D visualization programs (Jespersen, 2008). The ICT champion profile of an ICT super-user is someone who is very knowledgeable about the portfolio of ICT tools available without having the technical insights of their construction. As an ICT champion, the ICT visionary differs from the previous two as this person is inexperienced with ICT. Regardless, the ICT visionary is a person who recognizes the potential of new tools when introduced to them, and will use his or her enthusiasm to promote the usage of a new ICT tool in the NPD process. The usage of ICT in NPD depends on the ICT champion profile and position in the NPD team. The ICT visionary is the weaker ICT champion compared to ICT experts and ICT super-users.

ICT competencies

The competence of corporate ICT can be conceptualized as the degree to which an organization's infrastructure supports the use of ICTs. Due to the human capital held by the company, ICT competences are found to vary between organizations. The qualifications and age of organizational members influence the adoption of ICT and the readiness to incorporate new ICTs into decision-processes such as NPD (Bayo-Moriones & Lera-Lopez, 2007). The younger and/or more educated the human capital, the more ready the organization is for new ICTs. This view of readiness follows the social and demographic diffusion and use of ICTs. Yet, though human capital is significant, it is also important that the organization has the internal competence to support the use and the maintenance of ICT. Without these the functionality of the ICT tool and its suitability to new or other NPD project can not be ensured. The scale of required set-up costs, including human capital and professional, technical advice, delays adoption (Ritchie & Brindley 2005).

Information analytical competencies

ICT tools increase the information flow into the NPD process. With ICT tools, the NPD team may ask questions in interview or survey form. The information flow can therefore be a short text, a story, and/or a string of numbers. To gain a high quality of information from users, it is important that the company possesses the ability: i) to design good questions, ii) to choose the right dialogue method, and iii) to be able to analyze incoming information from users.

Information analytical competencies are the ability to extract meaning from these information flows and thereby make incoming user knowledge usable to the NPD team. Even if companies outsource this analytical task, they still need the internal capabilities to validate the quality. Resources are used on ICT and on maintaining user dialogue, but the benefit from user inputs is lacking because the organization does not have the ability to analyze the information input and generate valuable knowledge for the NPD process. In dialogue with a NPD team, users expect response to their inputs; the analytical ability must not block this expected feedback from the team (Jespersen, 2008).

An internal ability to handle information processing positively affects readiness for new ICTs in NPD. Without this ability, companies may view ICT and the dialogue with users as a non-leveraging investment.

Performance expectancy

This antecedent of ICT usage and user-involvement in NPD pertains to faith. Performance expectancy is defined as the degree to which an NPD decision-maker believes that increased ICT usage and user-involvement in NPD will benefit product innovativeness and new product performance (Venkatesh et al., 2003). The performance expectancy construct within all user acceptance models (TAM, extrinsic motivation, innovation diffusion theory among others) is the strongest predictor of intention and

usage. It remains significant at all points of measurement both voluntary and mandatory settings (Venkatesh et al., 2003).

Performance expectations of ICT usage in NPD and user-involvement are linked. The ICT platform benefits listed by research is that companies i) become engaged with larger numbers of users; ii) experience increased speed in feedback from users; iii) experience a higher persistence of user involvement; iv) find that interactions can happen in real-time without a delay, and with a much higher frequency; v) enhance their capability to tap into the social situation in which user knowledge is created and vi) experience an increased flexibility in the relationship with users. (Maguire, Koh, & Huang, 2007). On this basis, the usage of holistic ICT tools is expected to increase NPD performance and effectiveness (Barczak et al., 2007; Sethi et al., 2003).

METHODOLOGY

The discussion of ICT usage in NPD for the involvement of users is carried out on basis of three cases from companies which adapted one or more holistic ICT tools in a stage of their NPD process. Case analysis was chosen because empirical and analytical grounding of ICT usage in NPD is underdeveloped in NPD and ICT adaptation literature. For this purpose case analysis is a suitable research method. Our study builds on three different cases with various experience and competence levels of ICT usage and user-involvement. The three companies are a food producer, a potted plant farmer and a playground manufacturer. The empirical process consisted of four steps. First, the key NPD managers in each company were interviewed to gain knowledge about antecedents of ICT usage. The interview guide was based on conceptualizations, questions and scales used by (Barczak et al., 2007; Bayo-Moriones & Lera-Lopez, 2007; Sethi et al., 2003; Venkatesh et al., 2003). Second, the case companies were invited on a workshop where the ICT tools (see figure 1) were presented and demonstrated. Third, the companies chose one or more ICT tools to apply to a NPD project in their company. Each application period was observed and documented in detail. Fourth, the key NPD managers were interviewed once more after the ICT application period to follow up on user-involvement and ICT tool implementation. This interview guide was based on conceptualization, questions, and scales used by (Barczak et al., 2007; Bayo-Moriones & Lera-Lopez, 2007; Sethi et al., 2003; Venkatesh et al., 2003). All data was collected in 2008. In the following, the three case companies are presented with a description of the ICT usage antecedents. Hereafter follows a description of the ICT tool usage in NPD for each case.

CASES

Background

The food producer develops, produces and sells a range of processed meat products to the retail, fast food and food service sectors as well as the food industry in the Danish and international markets. The company operates on more than 130 markets. The Nordic region is the company's home market; other European countries are also important markets. The company is a well-known supplier to overseas markets,

including USA and Asia. The company's roots date back to 1887 when the foundations for modern industrial food production were laid. Since then, the company has continued to adjust to market requirements through product adaptation and the development of new product categories. Over recent years, the company has turned its product development process into a more structured setting following theoretical guidelines to a larger extent. As part of this work, the company aims for larger user-involvement in NPD which is their reason for joining our study. The food producer has an innovative climate, characterized by an incremental innovative strategy and a marketing focus. Market learning is generated through product tests and partly supported by cross-functional teamwork of NPD and marketing. The company experience with user-involvement in NPD may therefore be characterized as medium on the task dimension and low on the social dimension. The food producer holds no prior experiences with ICT tools in the NPD process. The food producer does not hold a strong innovative orientation and the innovative climate is 'low' following the earlier given definition of the concept in this chapter. This is not unexpected as the food industry in general is characterized by a primary focus on process innovations.

Though the food producer has little prior experience with ICT tools, the NPD manager may be characterized as ICT super-user champion who has enforced an increased strategic emphasis on ICT in NPD. The cross-functional teamwork with marketing and the restructuring of NPD revealed some analytical and ICT competencies in the company.

The potted plant farmer is a family owned company headed by the third generation. The company product portfolio includes potted plants and cuttings. The nursery is one of the world's leading breeders. Their users are horticultures and retailers including supermarket chains, market gardens, florists and end-users. The potted plant farmer is located in Denmark and exports to the entire European market and parts of USA, Canada and Japan. The product development process of a potted plant takes three years from idea to production. It is a NPD process dominated by biotechnology. Technical issues such as the plants sustainability to temperature changes, flower size, leaf size and body richness are the main concerns through the concept, prototyping, production and launch stages. The potted plant farmer joined our study as they were unfamiliar with user-involvement on both dimensions (task and social) and had no ICT tool experience in NPD but wished to increase both in company NPD. The potted plant farmer has an innovative climate, characterized by a bio-technological focus and an incremental innovation strategy. Trend-spotting and surveillance of competitors are the foundation for market learning in the company where cross-functional teams work in the NPD process. Their innovative orientation holds a strong technical focus and within this, the innovative climate ranks as 'medium' following the earlier definition of the concept in this chapter.

The potted plant farmer has an enthusiastic NPD manager but not an ICT champion present in the company. Their inexperience with user-involvement and ICT may be explained partly by a lack of competence to apply ICT and to process input to usable NPD knowledge.

Within the market for playground activities, play and sports, the playground manufacturer is a global market leader. The company offers a wide range of playground equipment. The company was formed in 1970 where Tom Lindhardt Wils realized in

what way his big, colorfully sculptures attracted children and created a great joy to children. With this starting point, he founded the company together with Hans Mogens Frederiksen. The company exports its products to the entire world. The main market is Europe, but secondary markets also include Asia/Pacific and Northern America. The company has a comprehensive assortment of products which are being sold without further adjustments. Furthermore, the playground manufacturer develops and produces products which have been adjusted or developed to suit specific customer requests. The company has recently begun a product development process where the idea is to add technology to the more classic playground concept.

The NPD process of the playground manufacturer follows a Stage Gate Plan, with focus on deliveries. The five stages are conceptualization, design, technical design, implementation and availability. There is an intensified focus on the last stage because launch often relates to implementation functions. At this point, the company supports the customer in building and installing the playground. This focus is particularly present in relation to the new playgrounds where technology is involved. The company development of all products is categorized as playing tools where the child is the pivotal point. The playground manufacturer has traditionally involved different kinds of users in product testing. The company's user-involvement experience may therefore be characterized as high on the task dimension and low on the social dimension. A primary concern has been the ability of the product to further children's development and learning while securing their safety. For this reason the company is motivated to take user-involvement to a new level and therefore entered our study.

The playground manufacturer has an innovative climate that is at the same time conservative and proactive. Buyers order from a catalogue of products, but the company acts as an innovative market leader introducing new products to the market. The company's innovative strategy is therefore split in an incremental (80 percent) and a radical part (20 percent). Market learning in the company is based on qualitative exploration of markets and users. The ICT tool experience in NPD of the playground manufacturer is higher than for the food producer and the potted plant farmer. The company has used cultural probes, focus groups and questionnaires in the attempt to involve users. The result is lots of input but little success in implementing it into NPD. In the company cross-functional teams are not working structured on new products. The innovative climate and the innovative orientation of the company rank as 'high' according to the earlier definition of the concept in this chapter. Despite the high experience levels of user-involvement and ICT tool usage, the playground manufacturer revealed low competence levels of both ICT and information analysis as these had been outsourced and if not, then information still stood in its boxes waiting to be processed. Still, the NPD manager saw the potential of ICT tool and may be characterized as a visionary champion.

Table 1 depicts the case companies' antecedent levels of ICT usage and their choice of ICT tool application in NPD. The latter is elaborated in the following.

Table 1. Antecedent levels and ICT tool application

	Food producer	Potted plant farmer	Playground manufacturer
Innovative climate	Low	Medium	High
Strategic emphasis on ICT tools	High	Low	Low
ICT tool champion	ICT super-user	No champion	ICT visionary
ICT competencies	Medium	Low	Low
Analytical competencies	Medium	Low	Low
Performance expectancy	High	Medium	High
ICT tool	Ideastormer	3D images	MBOARD ZING PIMP
NPD stage	Idea/Concept	Concept	Prototyping

ICT tool application in food product development

The food producer wished to increase their user-involvement in the idea and concept generation stages of the NPD process. The purpose was to collect the users' ideas, comments on concepts, identify interests and spot new trends. Rather than solemnly testing products, the company sought early input to the NPD process. The food producer had recently built a large panel of end-users based on personal invitations and screening criteria regarding consumer food behavior and demographic characteristics. The company would like to apply ICT tools to support them in building strong relations with the panel members and increase the interaction frequency with the panel. They were especially interested in creating a virtual platform for dialogue and knowledge exchange with users. The users included both end-users and company employees as both groups were seen as valuable resources by the NPD department. To honor this, a web-platform with an ICT tool based on group technology were chosen for the food product development case. The basic idea of this ICT tool, Ideastormer, is that panel members can come up with ideas on invited topics or on their own initiative. This virtual platform is closed and entrance requires an invitation. The food producer's NPD department may oversee the creative work of the panel, ask specific questions, provoke with statements, refine ideas with own inputs, and related it all to consumer characteristics. Also, with the platform, the food producer can give feedback and demonstrate actions taken on specific ideas or clusters of ideas. The Ideastormer makes it possible for both the NPD team and the users to interact. As the ICT tool operates on a closed platform, the company can address the user-panel members through a campaign system. Thereby they ensure that not only the currently active users receive questions or challenges given on the platform.

ICT tool application in potted plant development

From their end-users, the potted plant farmer wanted to get input about the physical attributes of plants such as flower size, plant size, color, plant dimensions, overall plant liking. For this purpose, a 3-D visualization technology was applied to the concept phase. This ICT tool was expected to be beneficial for the company as prototyping is a three-year process. Seven existing plants were manipulated in a 3-D computer program which resulted in 21 computer manipulated plants. The 3-D visualization made it possible to present not yet bio-technically possible colors and flower combinations. The 3-D visualizations of manipulated plants were presented in an experimental setup in combination with a survey. The purpose was to collect impressions from the end-users, being able to compile those in the NPD process. Involvement of the users made it possible to pick up plant attributes that the users found attractive and thereby target prototyping with this input. The user inputs were collected at an open reception on company grounds.

ICT tool application usage in playground innovation

The playground manufacturer chose to apply ICT tools for tests of a new product entering the market. The ICT tools applied were a mix of mobile technologies and group technologies, named MBOARD, ZING and Pimp-the-concept version 2. The combination of these three ICT tools made it possible to test specific product attributes (MBOARD), then evaluate the prototype based on user experience with the product (ZING) and end with a visualization of the ideal concept (PIMP). The users involved were end-users; they represented different age groups of children and a group of teachers. The experiment took place at their school, where a playground was set up. The use of three different ICT tools made it possible for all children to give their comments in a controlled way where all had equal time to formulate an answer. The purpose was to collect comments from end-users about the playground before working further with it in the NPD process.

The first ICT tool applied in the session was MBOARD which is a mobile technology. The users were playing at the playground as usual for half an hour, and during the playing session the users send SMS text messages from labeled areas to specific numbers. After the playing session, the users went to a meeting room where they could see their SMS text messages at a big screen. In focus groups, the users discussed and elaborated on their comments from the playground session. The focus group followed up on the SMS text messages. Thereby the ICT tool provided information about product use, product options and how product fit with behavior.

The overall evaluation of the playground prototype was evaluated with the ICT tool ZING which is a group technology. This second ICT tool application took place in a meeting room with a big screen, and a wireless keyboard for each of the users. The moderator wrote questions and each of the participants anonymously wrote their comment which was added to the others comments and numbered continuously. The users commented on each others comments and added other aspects to the questions

from the moderator. The purpose of applying ZING as an ICT tool was to collect data from a group discussion with predefined questions about the product prototype.

The third applied ICT tool was PIMP. The purpose of applying this ICT tool was to enable a visual development of an ideal playground. The users were split up in to two gender specific groups. At each of the screens, a blank white document with a picture of the playground in the middle was the starting point. The users were told to download pictures to visualize features and functions they image as part of their ideal playground. The users added pictures from Google pictures, and added short comments to the document.

RESULTS AND DISCUSSION

Case findings with regard to the influence of antecedents on ICT usage (application and implementation) and user-involvement in NPD is outlined in table 2. In each cell it is stated how the antecedent characteristics of the case companies influenced ICT application, user-involvement and ICT implementation respectively. These finding are elaborated on and discussed in the following.

ICT adaptation literature suggests that an aggressive innovative focus is more likely to lead to ICT tool integration (Sethi et al., 2003). Studies on ICT usage in NPD find that innovative climates do not affect ICT usage (Barczak et al., 2007). Though these previous findings contradict each other, our case findings support both. First, a highly innovative climate leads to a choice of synchronized and non-synchronized ICT tools while a less innovative climate leads to a choice of non-synchronized tools. Hence, there is a difference of innovative climate, but not an either/or of ICT usage. Rather, what we see is a selective difference on ICT tools. Second, innovative climate does not act as a strong determinant of neither user-involvement nor ICT tool implementation. Antecedents like ICT champion, strategic emphasis and competencies are stronger drivers than innovative climate.

From the case findings it can be stated that the presence of an ICT champion influences ICT application and user-involvement. Innovation literature supports that champions get necessary things done to get products into the market ((Markham & Griffin, 1998). The existence of champions is important (Barczak et al., 2007). The case findings extend this notion by showing that the type of ICT champion matters for ICT tool application and user-involvement. An ICT visionary Champion creates enthusiasm for ICT tools and thus leads his or her company to the application of several ICT tools in NPD as in the playground manufacturer cases. The playground manufacturer chose a combination of synchronized and not-synchronized tools. Interestingly enough, an ICT super-user champion does not lead to a choice of several ICT tools, but rather a more selective choice. The food producer chose a web 2.0 application tool. In cases of web 2.0 applications the design can be outsourced, but the operation of the tool has to be handled by the organization which requires a solid amount of competencies. Contrary, the potted plant farmer with no champion chose 3D images which can be ordered from a supplier and require little competencies to operate afterwards. These findings are

important as they support the significance of ICT champion presence and give insights as to the roles played in the ICT adoption process by different types of ICT champions.

Table 2. Research findings

Antecedents	ICT tool application		User-involvement		ICT tool implementation
	Synchronized	Not-synchronized	Task	Social	
Innovative climate	High	Low/ Medium/High	Medium/ High	Low	Low
Strategic emphasis on ICT tools	Low	Low/ High	Low	High	High
ICT tool champion	Visionary No champion	Visionary Super-user	Visionary No champion	Super-user	Super-user
Competencies	Low	Low/ Medium	Low	Medium	Medium
Performance expectations	High	Medium/ High	High/ medium	High	High

Also significant from the cases is that user-involvement and ICT implementation created by ICT champions is contingent upon the NPD manager's competence level. The importance of ICT and information analytical competencies in user-involvement is stressed by the findings in the three cases. Though competencies do not affect choice of ICT tool(s), they do influence the out coming user-involvement and ICT implementation significantly. The playground manufacturer applied synchronized, social ICT tools in combination with not-synchronized, task ICT tools. From the case observations it was found that the low competence level pulled user-involvement towards a task-oriented type irrespective of the over weight of ICT tools with social involvement functionalities. The low competence level (ICT and information analytical) stands as a barrier for user-involvement and ICT tool implementation in NPD. This is illustrated in the low-low quadrant in figure 3. Also, the findings show that a high competence level is not needed to accomplish ICT implementation. The ICT super-user champion opted for social user-involvement and secured ICT tool implementation. As noted by Jespersen in her research, some insights of what to do with the ICT and the user input is needed. Otherwise ICT adoption may most likely be regarded as a waste of time (Jespersen, 2008). This is illustrated in the high-medium quadrant in figure 3.

Figure 3.

		Competence level	
		Low	Medium
ICT champion expertise	Low	Task involvement of users	Task involvement of users and ICT implementation
	High	Intended user-involvement	Intended user-involvement and ICT implementation

The importance of ICT as part of the company strategic profile is supported by research (Dubelaar, Sohal, & Savic, 2005; Mahmood, Hall, & Swanberg, 2001). The case findings not only concur with this notion, they extends it as strategic emphasis is found to be less influential on ICT tool application and as significant for user-involvement and ICT tool implementation. Strategic emphasis influences what type of involvement aimed for through the chosen ICT tool. A high emphasis on ICT strategically leads to social user-involvement. The Food producer wanted to create long-term relations to users, whereas the potted plant farmer and the playground manufacturer focused on the task to be done in NPD.

CONCLUSION

ICT application

The ICT tool application in our study was determined by innovative climate and type of ICT champion present in the organizations we looked at. The playground manufacturer with a high innovative climate and an ICT visionary champion chose to apply several ICT tools. In the less innovative climates it mattered whether there was an ICT champion present. The potted plant farmer chose an ICT tool demanding a small amount of resources and competences to be comprehended. The ICT super-user champion at the food producer ensured a long-term view of the ICT tool with the choice of a web 2.0 application.

User-involvement

User-involvement in NPD becomes task-oriented if there is a low strategic emphasis on ICT, a low level of competences, and no ICT champion or an ICT visionary champion present in the organization. In these case companies the ICT tools become a digitalized version of existing data collection methods such as focus groups, interviews and questionnaires. Methodologies that are beneficial to NPD but not driving NPD towards user-driven NPD. This finding stresses the challenge of user-involvement in NPD (Jespersen, 2008). NPD managers have to ensure a competence level to handle the technological and social progress of users. Otherwise, resources, energy and creativity held by users will not be accessible to the company; leading the company to miss out on innovative opportunities (Jespersen, 2008).

ICT implementation

The determinants of ICT implementation in NPD are high strategic emphasis, the presence of an ICT super-user champion, at least medium competencies (ICT and information analytical) and fulfillment of performance expectations. The food producer honored these four and is today seeking to implement more ICT tools; all web-based. When the food producer had run Ideastormer for two weeks, users had already given input to line-extensions with high turnovers filling a niche market in catering. Users were rewarded for these inputs and the new products were scheduled for launch in 2009. This experience encouraged the continuation of ICT tool application, but also became an occasion to involve more creative and visionary applications of other ICT tools in NPD.

In case of the play ground manufacturer, the ICT visionary champion was positive as to the user input generated by the ICT tools; especially the digital compilation of data was found beneficial. The challenge in such a case as the playground manufacturer is that the enthusiasm was not anchored in the organization. In fact, despite the innovative climate of this organization, a decision was made to close NPD projects involving user-involvement through ICT tools. The organization found that the ICT tools were too resource demanding to be beneficial. This emphasizes the importance of strategic emphasis on ICT and organizational competencies to handle ICT and user-involvement.

For the potted plant farmer, the ICT application did not lead to user-involvement in NPD at all as the ability to see the benefits of user-involvement in NPD has large barriers to cross in the organization. Still, the experience with the ICT tool has initiated a discussion of the strategic issue of ICT and user-relations in the future potted plant market. This demonstrates that user-involvement

demands a change of mindset in the organization that cannot be taken lightly (Hargadon, 2002; Jespersen, 2008)

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