

Involving Users In The Product Development Of SMEs

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Abstract

One potential source of risk in product development is its distance from users. This risk is particularly apparent in small and medium sized enterprises (SMEs) which have limited resources to carry out tailored user studies. Additionally, mechanisms that support the adoption of innovations in business-to-business markets are less prevalent in business-to-consumer markets.

We attempt to develop practices for user involvement in the product development of SMEs. In particular, we have carried out four exercises in user involvement. These exercises were carried out together with SMEs that aim to commercialize automatic speech recognition services, a mobile blogging service for tourists, a hybrid media product for volunteer communities, and a learning news reader service.

In the exercises, we first wanted users to gain experiences of the service under development. This meant that users were involved by using a service prototype in three exercises and by participating in the development of product concepts in one exercise. Then we collected feedback from users and helped the product development team to reflect the feedback to the service in question. Product developers were present at all stages of the exercises.

The results of the exercises are encouraging. Small-scale, timely user involvement contributed usability and functionality improvements, input on how to enhance the utility and

enjoyability of the products, as well as new product ideas. Moreover, engaging in the user tests energized the enterprises to devote additional efforts to developing and improving their innovations. Face-to-face interaction between users and developers was highly appreciated by the service developers, and provided actionable information about users.

1. Introduction

The interface of information and communication technology has rapidly approached users during the last decades. Conventional media such as television and radio have evolved and new tools such as personal computers and mobile phones have diffused and developed quickly. This has brought numerous new possibilities for ordinary citizens to utilize these technologies.

At the same time this means that users have a larger say than before in how innovations are adopted. This is an unexpected type of user empowerment in the digital age. Instead of quickly adopting new technologies to utilize them fully, many users have opted to proceed slowly. Reluctant adoption has been evident in the digitalization of television, the mobile Internet and until recently, broadband Internet. These have all been important targets of the Finnish information society policy.

An obvious shortcoming of technology and information society policies is their distance to the end user. It is difficult to transform governmental policies of innovation and technology into successful commercial products and services for end users. Naturally occurring mechanisms of user-producer interaction exist to support the adoption of innovations in business-to-business markets but they are lacking in business-to-consumer markets.

One important reason for failed product development is a limited understanding of what end users value. This is particularly likely in small and medium sized enterprises which have limited resources to carry out tailored user studies.

Interaction with users is important for product development because it helps to focus efforts in the right direction. At the same, it is important to submit working prototypes to user testing to ensure that innovation efforts remain on the right track and preferably meet the users' requirements better.

In our research project we study how small and medium sized enterprises (SMEs) doing innovations in interactive computing respond to these two challenges. We report on methods for gathering user information and on the way in which user feedback modifies innovation. The overall aim of the project is to evaluate and develop practices for user involvement. We are particularly interested in how short term user involvement may benefit product development by introducing an extra loop or iteration in the product development process.

The enterprises involved in our study make innovations in the domains of community network services, game and entertainment applications, hybrid media, industrial and service company network services, and knowledge management applications. They have received funding from the Fenix program of the Finnish National Technology Agency Tekes, which plays an important part in the implementation of innovation and technology policy in Finland.

In our work we build on the theoretical frameworks of user involvement (Alam 2002, Lindsay 2003) and user innovations (von Hippel 2001, Haddon 2003). Our results suggest that there is a strong interest among the small and medium size enterprises to develop their knowledge of users and potential users, that user study methods are not considered as methods but they are implemented in practices, and that an open direct relationship with users and potential users seems to be a challenge.

2. User involvement and user innovation: issues for research and practice

A focus on users is one of the most topical issues in the new product development and innovation management literatures. In the following, the main arguments and methods for involving users are presented, and some of the problems encountered in user involvement are discussed – with a special focus on consumer-users.

Why are there so many calls for user involvement? The social shaping of technology tradition has pointed out that users are usually present in one way or the other when new technologies are invented (e.g., Bijker et al. 1987). Yet empirical studies indicate the user representations drawn on in technology development are often problematic and incoherent (Akrich 1995). The user representations most frequently employed are implicit, and product developers rely on personal experience (the “I method”, Akrich 1995) much more often than is commonly believed. Yet designers and users may be very different kinds of people. Increasingly, new users of technical devices are laypeople with little experience or expertise, and the user context is new and unfamiliar to the designers (e.g., Hyysalo 2004). Defining the user as “everybody” and using the “I method” lead to a disregard for important differences among users (e.g., gender and age), and place serious constraints on the development of technologies aimed for a broad range of users (e.g., Oudshoorn et al. 2004).

Usability testing has become a standard procedure in many industries (cf. Dumas, 2007), and there are a number of standards for usability testing and human-centered design. Traditionally, usability research focused on functional aspects of the technology: efficiency, effectiveness and user satisfaction, conceptualizing the user as someone performing a clearly bounded, pre-specified task. In the past few years, usability research has taken on board a number of new challenges (Karat and Karat 2003). Usability researchers have recognized the need to develop a more profound understanding of the contexts of use. Participatory design has also become a popular topic, as well as the inclusion of other than purely efficiency criteria (e.g., “user satisfaction”). For example, Monk (2002) has examined the new challenges involved in designing information technology products for the home, such as including fun, social interaction and dependability into a broader view of usability.

In information systems, there is also a long-standing tradition of research into technology acceptance and the determinants of technology adoption. A large body of research in this field is based on attitude-behavior models, and aims to identify factors underlying the acceptance, adoption and use of information technologies (e.g. Venkatesh et al. 2003, Davis et al. 1989). This stream of research, however, says fairly little about the cultural and contextual factors that underlie the attitudes and behavioral intentions measured in surveys (cf. e.g., Higgins 2000). The acceptability of new technologies and product innovations is also an evolving issue – new interactive ICT products may have significant social consequences and involve ethical design issues that need to be acknowledged in early stages of the design process (Whitworth and de Moor 2003).

2.1 A diversity of approaches to user involvement

A number of reviews have been recently published on user involvement methods. For example, Kaulio (1998) reviewed seven different usability methods (*quality function deployment (QDF), user-oriented product development, concept testing, beta testing, consumer idealized design, the lead user method and participatory ergonomics*) with an aim to identify different forms of interaction between users and designers. Kujala (2003) reviewed four common approaches to user involvement (*user-centred design, participatory design, ethnography and contextual design*) from the perspective of their benefits and challenges. It is telling that none of the methods reviewed in the two articles have the same name, even though some refer to overlapping or similar methods. Further concepts introduced include user groups (Tomes et al. 1996) and user modeling (see e.g., Fischer 2001), as well as the lead user approach (von Hippel 1986; Lilien et al. 2002).

The existing methods differ on at least the following dimensions:

- *Industry focus*: many of the methods have been developed in the field of information systems and ICT (see e.g. Karat and Karat 2003; Kujala 2003). There are also methods used primarily in the consumer durables and other consumer goods industries (Kaulio 1998). Industrial engineering and ergonomics have been the origin of many participatory design initiatives, which have since also made a significant entry into IT-design (Brockhoff et al. 2004). An emerging issue is user involvement in the design of “traditional” services such as financial services (Alam 2002) and new ones such as mobile telecommunication services (Magnusson et al. 2003).
- *Users in focus*. In some cases, the term used is “customer involvement”, in which case customers may refer to well-identified and long-term business or organizational customers. In a company context, the actual users of the products may, however, be a totally different group than those making the purchase decision – in which case, “user” may refer to “shop-floor” users. Consumers are often the most problematic type of users, as it may be difficult to identify and contact representative consumers (e.g., Heiskanen et al. 2005), which is why consumers are often studied using surveys (Choudrie and Dwivedi 2005).
- *Focus on users’ ideas and requirements vs. users’ experiences*. Methods such as quality function deployment (Kaulio 1998) and idea-generation (e.g., Magnusson et al. 2003) aim to discover user requirements or generate new product ideas. They thus approach the user from a ‘clean slate’ perspective, with no specific product in focus. On the other hand, methods such as beta testing or concept testing allow users to interact with first versions of the product, see how it fits their everyday life, and provide their comments on this basis (Kaulio 1998; Hyysalo 2003).
- *Focus on participation vs. investigating the user context*. Participatory design aims to invite users to “join the design team”, and it involves a normative element of democratizing design (Kujala 2003). Direct participation also usually involves face-to-face interaction between users and designers (Tomes et al. 1996, Hyysalo 2003). In contrast, field studies such as ethnographic research and different kinds of product testing settings allow researchers to identify issues in the user context that may be difficult for users to verbalize (Kujala 2003).
- *Timing of user involvement*: Users may be merely involved by eliciting their requirements using questionnaires or interviews at an early stage of product development – after which

the designers or developers draw their own conclusions. Users may also be involved in concept testing by asking them to evaluate models, mock-ups or prototypes. In later stages, users may be involved in product testing or long-term studies such as ethnographic research. Kaulio (1998) identified three main phases in which users are involved: specification, concept development and prototyping.

The methodological diversity gives a mixed impression of the benefits of user involvement. In any case, it can be seen as an indication of that the field is still emerging. Appreciative practitioners may also wish to see multitude rather as a resource than as a potential source of conflict (cf. Hyysalo 2006).

2.2 Beyond user involvement: users as innovators

As mentioned above, ordinary users' lack of experience and expertise has been one of the arguments for increased user involvement. A quite different argument is put forth by the literature focusing on "lead users" and the role of sophisticated customers in product innovation. This perspective originated in research on specialized industrial and professional products, in which users may in many cases be the primary source of innovation (von Hippel 1988) – and are, in this case, quite similar to the customers of make-to-order or tailor-made products (Brockoff 2003). Later on, von Hippel and colleagues have extended the lead user approach to consumer products. In this context, lead users are defined as those who (1) face needs that will be general in the market place, but face them much earlier than the bulk of the market, and (2) who are positioned to benefit significantly by obtaining a solution to those needs (von Hippel 1986).

Important, innovative consumer user communities have been identified, for example, in the computer games industry, where online consumer communities communicate and extend the game from its original format by exchanging ideas and software (Jeppesen and Molin 2003, cf. Heiskanen et al. 2007). Sports such as windsurfing, skateboarding and snowboarding are other examples of fields in which user communities have had an important role in product innovations (Shah 2005). Enterprises have tried to harness this important source of new innovations and link it more closely into their own product development process, e.g., by setting up support functions that assist user-driven innovation, offering users toolkits that facilitate their participation in the design process, and making systemic use of interactions with consumers in order to learn from their innovations (von Hippel 2001, Jeppesen and Molin 2003) or even recruiting members of such communities (Kotro 2005). A similar approach can also be used to support user innovation in more mundane fields of interest (Haddon 2003, Repo et al. 2006a).

2.3 Prospects and problems of involving users

As the interest in user involvement mounts, it also becomes more and more evident that the research and practice in this field is largely at an experimental stage. While the importance of user involvement is generally acknowledged, a number of problems have also been identified:

What is the role and expected input of the users? Are users a source of information on the user context, a source of new ideas, partners in the product development process, or providers

of useful feedback? Obviously, users may have all or any of these roles, but the expected input of users, and the ways in which it will be used do not seem to be very clear at the start of all user involvement projects.

Are users capable of presenting useful information? It is often noted that users may find it difficult to verbalize their needs (termed “sticky information”, by von Hippel 1998), or may themselves be unaware of their requirements (Riquelme 2001). This observation motivates the use of field methods such as ethnography, or forms of product testing that are strongly directed by the product development team. Obviously, merely “asking users” (through, e.g., surveys or idea competitions) in an inadequate approach. There are, however, methods through which users can be progressively involved in the design process (e.g. Tomes et al. 1996) or in which user ideas can be used indirectly as a resource for learning in product development (Lemasson and Magnusson 2002).

What kinds of users should be involved? While user involvement and acceptability approaches highlight the importance of understanding “ordinary” users and acknowledging the diversity of, e.g., the current and future users of ICT applications, the lead user approach explicitly questions the role of “novice” users in generating useful product ideas (e.g., von Hippel 1986). “Ordinary” users are problematic in many ways. In consumer products, it is difficult to involve a representative group of the diverse population of potential users, and the capabilities and motivation of ‘ordinary’ users may be limited. Yet the concept of “lead users” is still very much under development in the context of consumer products, too – it is not always obvious who are such lead users, and whether they will be eventually followed by the mass market, or whether they represent specialized market niches.

What are the costs and benefits of user involvement? From the producer’s perspective, Kujala (2003) has considered the costs and benefits of user involvement, showing that user involvement may be a costly process that requires time and effort, which does not automatically lead to better design. In most cases, however, this effort is merited by cost savings due to design failures or problems (see also Brockoff 2002).

How are users integrated in the product development process? Integrating expertise in product development is always problematic (Buijs 2003; Kotro et al. 2005). User involvement appears to encounter similar problems (Kujala 2003): participatory design may be conducted in isolated projects, designers may be unwilling to engage with users, user involvement may disrupt time-limited product development cycles, and methods such as field studies and ethnographic research may generate an excess of raw data. Magnusson et al. (2003) have indicated that ordinary users’ ideas may be unrealistic and excessively fanciful, and need intensive processing in order to make a useful input into the design process. Thus, user involvement requires intensive management in order to be truly useful.

Thus, it appears that user involvement is important, but not easily implemented. Different types of innovation and product development problems obviously call for different forms of involvement. Similarly, the role of lead users vs. ordinary people may vary at different stages of the innovation process. It seems to be important to understand that user needs are not pre-existing, but evolve gradually (Hyysalo 2003). Much consideration needs to go into planning the form of user involvement used: what kinds of users should be involved, at which stage of the innovation and development process, and in which way? It also appears to be clear that user involvement does not automatically solve the problem of incoherent and non-convergent user representations (cf. Akrich 1995) – it is equally important to involve technology and

product developers in integrating the information gained from users at different levels and stages of the innovation process. Obviously, much work remains to be done in this field.

3. User involvement as a practical exercise

The practical exercise of user involvement is studied within the framework of the Onni-project, which is a joint project by the Finnish Funding Agency for Technology and Innovation (Tekes) and the National Consumer Research Centre in Finland. The project investigates how SMEs involved in the Fenix technology programme on interactive computing obtain and manage user knowledge, and how current practices could be improved. Tekes will use the results of the project to determine how to promote better user management practices among the companies in its technology programmes and by the policy implications arising from the project. An essential aim of the Onni project is to assess current practices and experiment with intensified user interaction together with selected SME participants.

Our preceding survey of how SMEs in the Fenix programme obtain and manage user information indicated that designers' personal experience and gaining impressions from the media were dominant sources of user information. Customers and previous studies were also frequently used as a source of information about future users. Some enterprises did engage in formal user research efforts, such as focus groups, testing pilot products or market surveys. Yet most enterprises viewed learning about their potential customers the largest challenge. Many were eager to test their products with a broader group of users, and considered it important to develop systematic means for collecting and managing user information. As was to be expected, financial resources and time were the most frequently mentioned obstacles to user involvement – but lack of capabilities did play a role, as one respondent stated: “there is certainly room for improvement, but it is hard to say exactly how”.

Similarly, our preceding survey of usability and user research service providers indicated that SMEs in the industry rarely use such services. They are concerned about costs and consider the benefits uncertain. User studies are usually contracted too late, and sourcing user studies requires skills and understanding that many enterprises lack. Yet younger people in the customer enterprises have learned to appreciate the importance of “knowing the user”, and perceive it as part of good customer service quality. According to the service providers, the acquisition and management of user knowledge could most effectively be promoted by informing enterprises about its benefits.

3.1 Building a practical approach

We have used the three identified issues in the literature review as a starting point for the practical exercise of user involvement. Firstly, we have attempted to make use of a number of aspects of the diverse approaches to user involvement. We have particularly focused on users, their participation and experience, and the timing of the exercises in the innovation process. In this sense, we have been more user-centered than is common in usability testing. At the same time, however, we have also been communicative with product developers, allowing them personal participation to an extent that is also beyond market research.

Secondly, we have attempted to keep our research design open to leave room for the potential emergence of user innovations. Thirdly, we have attempted to use our experiences to

recognize the prospects and problems of involving users. We report on these as challenges for user involvement.

In addition to the literature review, our approach stems from surveys of 14 SMEs carrying out product development and seven consultancies providing services in usability and user research. The companies participating in the surveys called for feasible solutions to practical problems. Weighing benefits against costs was also emphasized, which promoted the idea of short term intervention exercises.

The starting point of our approach is to gather experiences for our users of the products being developed. Experiences are gathered through the use of a prototype version of the service in question in its intended context. Then we gather insights from those experiences by means of focus group interviews and questionnaires. The insights are reflected in discussions with product developers. The aim of the exercises is to provide impetus and possible reassessment in product development.

This approach combines a number methods used to gather information on users (cf. Hyysalo 2006). We have carried out interviews, observed use, conducted usability trials, tested prototypes, and situated the use of services in their contexts. In essence, little attention has been paid only to product developers' experience and presuppositions, and external expert knowledge.

3.2 Four cases of user involvement

The exercises carried out in the project all represented technologies and services that are new to both service providers and users (Figure 1). In this respect, user involvement *per se* was a particularly suitable approach to gather data on potential users (Hyysalo 2006). An additional common element was the use of technology for interaction between users or between users and technology.

Three of the four exercises focus on technologies that are at a functional stage and, therefore, can be tried out by users. A service based on speech recognition was used to reserve a doctor's appointment at a health centre by telephone (Heiskanen & Hyvönen 2006). A moblog service (taking pictures and posting them on the web) initially developed for the business leisure market was tried out on a sightseeing tour by non-business tourists (Repo et al. 2006b). An exercise involving a news portal that learns about the interests of its users is currently in process.

The fourth exercise focuses on the development of hybrid media concepts to support community interaction, in this case the interaction between members of a community of football volunteers (Forsell et al. 2007). In this particular exercise, users came up with a concept that was focused more on external communication between the football club and the broader community, rather than interaction among the volunteers. Quite interestingly, an approach building on empathic design and involving others than the volunteers came up with concepts that were more focused on the communication needs between volunteers.

Figure 1. Description of exercises.

Generating service concepts by and for volunteers ¹

Personalizing news

Making phone services simple ²

Moblogging while sightseeing ³

Picture credits: ¹Mika Saastamoinen, ²Permission to use picture granted by Suomen Puheentunnistus Oy, ³Petteri Repo

The product innovators' general interest in user involvement, which was evident in our preceding survey, also became practically evident in the four exercises. Accordingly, we could come up with ways of focusing methodological insights in user involvement toward the practical interests of the participating SMEs.

It also turned out that a certain level of user innovation could be secured in the involvement process. This meant that users could bring forth ideas that the product developers initially did not consider relevant, but which they came to appreciate during the involvement process. We also found that practical user involvement exercises benefited from variations in standard methods to make them more appropriate for specific problems and contexts (Table 1).

Table 1. Four cases of user involvement.

	Community interaction	Learning newsreader	Speech recognition	Tourist moblog
Prototype description or aim of involvement	Concept of hybrid media for communication between volunteers	Demo of web portal that learns users' interests	Demo for reserving doctor's appointment	Transfer of service from b2b market to b2c market
Focus	Concept modelling	Insights in new way of reading news	Functionality of service, applications of technology	Adaptation of service for non-business tourists
User innovation or outcome	Concept modelled by users	* The case is still in process.	Insights in heuristic interaction with technology, applications	Solutions for support services
Methods	Empathic design, participatory design	Trial, focus group interviews, questionnaire	Trial, focus group interviews, questionnaire	Trial, focus group interviews, questionnaire

Interviews conducted with the involved SMEs after the exercises confirmed that the exercises had been considered beneficial for product development. An obvious benefit was feedback on technical issues and usability. User involvement was one way of providing such feedback, although arguably similar feedback could have been obtained from professionals.

A benefit that was more closely related to user involvement involved non-technical aspects. Many of the user innovations had to do with situations of use rather than the features of the service being developed. In particular, the users came up with ideas that they considered missing or underdeveloped. Examples of such issues included maps for guidance and the risk of theft.

Finally, one perhaps often overlooked benefit of user involvement related to personal engagement in the involvement process. Direct contact with users was a memorable experience for product developers. Initially, product developers came to look for solutions for their problems, but instead received insights stemming from users' experiences. This process was partly painful, but was also considered rewarding.

3.3 Prospects and challenges for user involvement

We recognized a number of prospects and challenges for user involvement when conducting the exercises. These relate to the methods of users involvement and the utilization of the results of user involvement in the product development of SMEs.

Many of the methods of user involvement presented in literature have been designed thoroughly and comprehensively. SMEs are likely to have little resources to carry out such methods to a full extent. In our exercises, short term user involvement produced benefits without extensive use of resources which the participating SMEs appreciated. Involving users – even in a limited scale – was arguable better than doing nothing at all. On the other hand, there are obvious risks in carrying out lightweight short term exercises in user involvement. In particular, product developers' views on users may become or remain biased (cf. Akrich 1995). Caution is needed when balancing the benefits of such exercises against the risks.

It may also be difficult for product developers to utilize the results of user involvement. The product development of many SMEs builds on an overly positive enthusiasm. This may result in utilizing on such results that conform with this enthusiasm. Action rationality then dominates over decision rationality (Brunsson 1985, Heiskanen & Repo 2007). On the other hand, user involvement itself seems to introduce an element of decision rationality as it challenges a straightforward product development process.

Due to the schedule of the product development process, the benefits of user involvement may sometimes be used only in succeeding versions of the product. This means that user involvement cannot necessarily provide a final solution to urgent issues in product development. Therefore, it may in some cases be worthwhile to adopt a strategic view alongside an instrumental view on user involvement. The timing of user involvement may be as much related to the phase of the enterprise as it is to the phase of the product being developed (cf. Kaulio 1998).

4. Discussion

User involvement is highly topical in several disciplines and fields of practice. New methods are being continually developed and tested, such as contextual design, empathic design, participatory design and the lead user method. Current topics of interest include the issue of how users are represented and how their perspectives are mediated into the design process. For example, when should we include experienced and expert users, and when should we include 'ordinary' users? How are users capable of providing valuable input on products that do not yet exist, and how useful are different methods in generating the necessary user experience? Another topical issue is how the input gained from user studies and involvement exercises is converted into practical design solutions, and how useful different forms of user input are for enterprises developing innovative products.

We have conducted four short term user involvement exercises with small and medium sized enterprises (SMEs). These enterprises' innovations were at different stages, ranging from the development of product concepts to the testing of new application prototypes. The results of the exercises are encouraging. The enterprises gained obvious benefits from the user involvement exercises that we organized for them. Small-scale, timely user involvement contributed usability and functionality improvements, input on how to enhance the utility and enjoyability of the products, as well as new product ideas. Moreover, engaging in the user involvement exercises energized the enterprises to devote additional efforts to developing and improving their innovations.

Along the benefits of user involvement, we recognized a number of caveats. These had to do with the methodological risks of lightweight involvement approaches, the abilities of the SMEs to utilize the results of user involvement, and the stage of the product development process. It would appear that SMEs need to assess their situation and resources more comprehensively than literature suggests.

The user involvement exercises confirmed some of the issues identified in the literature review and in the service provider interviews. For instance, it has been previously noted that externally produced studies may be difficult to integrate into the service development process. Face-to-face interaction between users and developers was highly appreciated by the service developers, and provided actionable information about users. It can be recommended

that if product developers in SMEs wish to involve users, they should be prepared to engage themselves in the involvement process.

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