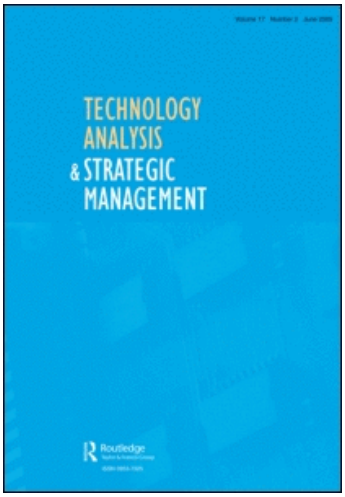

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Constructing innovative users and user-inclusive innovation communities

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This paper reconceptualises the topical issue of user involvement in innovation. We argue that there is more to user involvement than the mechanistic application of methods and tools. Drawing on four case studies, we explore the range of configurations that user-inclusive innovation communities can encompass. We show that user involvement is not a panacea for innovation, and that there is no 'one-size-fits-all' method. Nor is the ability to contribute to innovation an inherent quality of the users themselves. It is constituted by the actions of the producer company in fostering interaction and in responding to users' initiatives. Companies interested in user-inclusive innovation are recommended to closely consider how knowledge sharing between users and producers evolves, what artefacts can serve as mediating representations, and what challenges there are to aligning divergent interests.

Keywords: user; innovation; innovation community; community of practice

Introduction

It is more than 30 years since the influential SAPPHO project identified an inability to understand user needs as a factor determining the failure of new product innovations in chemical processes and scientific instruments (Rothwell et al. 1974). Eric von Hippel (1976) built on this research to further explore the crucial role of users in innovation processes. Over the decades, the message of these path-finders has been received enthusiastically by academics and practitioners. At the same time, the scope of interest in user–producer interaction has expanded from industrial products to consumer products.

Yet the debate on how users can contribute to the innovation process continues. Much of the practice-oriented research has focused on devising tools and methods for involving users (Beyer and Holtzblatt 1998; Leonard 1995). At its most mechanistic, such research tends to overlook the *interaction* and *knowledge-sharing* in user–producer relations. Others do address the collective nature of innovation, but still view the emergence of user-inclusive innovation communities as unproblematic (von Hippel 2005). Our study thus returns to a basic question: how can users contribute to innovation? We also take a step further and ask: why do users and producers engage in collaborative knowledge sharing, and with what consequences?

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Over the past decade, we have studied almost twenty projects involving user–producer interaction. In this article, we focus on four cases that represent different ways in which users can be involved in the development of innovative information and communication technology (ICT) products. We begin by briefly reviewing the literature on user involvement and its methods. We then elaborate on von Hippel's (2005) concept of innovation community and re-conceptualise it as a forum for joint action, meaning-creation, knowledge-sharing and alignment of interests. Drawing on the 'communities-of-practice' literature, we critically examine the limits of 'creating' or 'managing' such communities. Our analysis of the cases focuses on the contribution of users to the innovation process, and on how this is influenced by the dynamics of the emerging innovation community. We conclude by highlighting aspects of user–producer relations within and beyond the innovation communities that determine the usefulness of users' contributions.

Aspects of user–producer interaction

The current focus on tools

While there is a mounting consensus that users' needs should be addressed in product development, it is obvious that merely asking users about their needs is insufficient. Users are often unable to verbalise their needs or predict their preferences (Riquelme 2001). Thus, alongside conventional market research methods such as surveys and focus groups, product developers today are offered a variety of methods to interact with current and potential users (Beyer and Holzblatt 1998; Dix et al. 2004; Preece, Rogers, and Sharp 2002).

Field studies and contextual design provide frameworks for designers to visit the users at their workplace and use ethnographic observation or more structured tools to understand the users' world. For instance, users can be invited to join designers 'at the drawing board' through 'user groups' or in participatory design (Namioka and Schuler 1993; Tomes, Armstrong, and Clark 1997). Less intense forms of collaboration include workshops, idea-generating assignments, user diaries and virtual communities (Monk 2002; Magnusson 2003).

User involvement is particularly challenging when developing products that are radically novel (Trott 2001). Many user-inclusive design methods aim to ensure that users have sufficient experience to contribute constructively. Information acceleration (Herstatt and Lettl 2004) is one example of a method that aims to provide consumers with simulated product experience. Metaphor elicitation (Zaltman 2003) and emphatic design (Leonard 1995), in turn, aim to access aspects of the product and its context that users find difficult to verbalise. Experienced input can be gained from 'lead users', defined by von Hippel (1998) and colleagues (e.g. Lüthje 2004), as users who face needs before the mass of the market and innovate in order to discover solutions to their own problems.

In sum, the literature draws attention to the differences that follow from the nature of users, the novelty of the technology, the tools and arrangements used in involvement, as well as to the appropriate matching of these different aspects. We argue that it there is more to the potential and limits of user involvement than any one of these aspects or their mechanistic match. Experience and interaction are not simply outcomes of 'mixing the right ingredients', but contextual and dynamic processes.

Beyond tools: dynamics of user–producer interaction

Von Hippel (2005) and colleagues (Jeppesen and Molin 2003) have explored innovation communities that involve users as key sources of innovation. While their work on 'lead users' is heavily

cited in the 'tools-oriented' literature, their studies also address the community dynamics that foster or hinder users' involvement in innovation. Von Hippel (2005) defines innovation communities as 'meaning nodes consisting of individuals or firms interconnected by information transfer links which may involve face-to-face, electronic or other communications'. They can, but need not be (a) membership groups and (b) social communities with interpersonal ties and social identity. In innovation communities, participants reveal their innovation freely and others find the information revealed to be of interest.

The term community implies some form of continuity. This is not explicitly discussed by von Hippel (2005), but it is implied in characterisations of innovation communities as repositories for specialised knowledge and as offering participants tools for sustained communication. A further note on the concept of innovation communities is the assumed alignment between users' and producers' interests. In the existing user-driven innovation communities, users innovate to find solutions to their own problems or to problems stated by their peers (Jeppesen and Molin 2003; Jeppesen 2005), yet often freely share their innovations with other users, as in the open source software community (von Hippel and van Krogh 2003). A further motivation to participate in innovation communities is the intrinsic pleasure of creativity (von Hippel 2005).

It is thus assumed that harnessing the creative potential of users through user-inclusive innovation is a win–win proposal: users gain solutions to their problems, producers gain new commercial opportunities, and all gain the intrinsic pleasure of participating in creative work. Participation in such communities is expected to help to solve the problem of 'sticky' information in user–producer relations (Figure 1), i.e. the fact that information about users' needs and manufacturers' capabilities is highly contextual, tacit and difficult to transfer from one site to another (von Hippel 1998, 2005).

Critical insights into the learning process in innovation communities can be gained from the literature on communities of practice (CoP). Communities of practice are also groups that reveal and share information (Wenger 1998). The knowledge created by CoPs resides in the community and in its shared practice (Lave and Wenger 1991), and it is difficult to move outside the community (it is 'embedded' and 'sticky') (Brown and Duguid 1991). The CoP perspective also stresses the myriad of ways in which different CoPs interact and influence each other. Moreover, the literature emphasises the role of various mediating artifacts in combining and transferring 'sticky' knowledge (Wenger 1998; Bechky 2003).

It is important to distinguish between innovation communities and the indigenous communities of practice of product developers and users. Studies show that there is no pre-existing alignment between users' and producers' interests. Companies may have strategic interests that

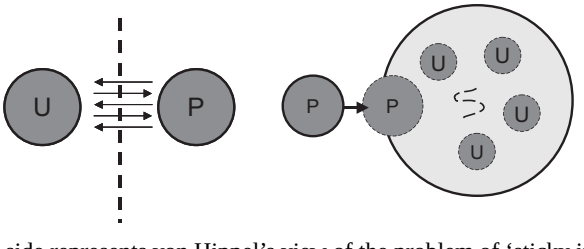

Figure 1. The left-hand side represents von Hippel's view of the problem of 'sticky information' in product innovation, with horizontal arrows depicting rounds of information exchange to specify product characteristics. The right-hand side represents one solution – participation in innovative user communities, in which information flows freely (on the basis of von Hippel, see also Jeppesen and Molin 2003).

do not coincide with users' needs (Namioka and Schuler 1993; Ivory 2004). Working with non-expert users may challenge the professional authority of designers (Suchman 1994) or simply wreck tight schedules. Conversely, it is not obvious that the thrill of creativity and the possibility to gain better products will always motivate users to co-operate with producers (Brockhoff 2003). Users may be interested in innovating, but not exactly what, when and where producers desire them to innovate. Moreover, it is not obvious that all users share the same interests: specialised groups of enthusiasts are rather different from users of more mundane consumer products.

The literature on communities of practice also questions whether innovation communities can be created at will, and what the role of corporate interests is in such communities (Contu and Willmott 2000). Many of the innovation communities discussed by von Hippel (2005) were set up for purposes other than commercial innovation. The communities are intermittently innovation communities, but primarily social communities or special interest communities. Such communities are not easily created, nor do all created knowledge-sharing groups grow into 'communities'. We need to question whether a group is merely an *ad hoc* clustering of people, a loose and temporary knowledge collectivity (Lindkvist 2005) or a durable and tight-knit community of practice (Wenger 1998). Such different groups are likely to have different ways of sharing, creating and storing knowledge (Lindkvist 2005).

We have thus added a number of issues to the analysis that are usually overlooked by the tools-oriented literature. The questions about tools turn from their mechanistic application to how they *mediate* the interaction of users and producers. We also consider the interests of the different parties: how are they aligned – or misaligned – and why are the parties motivated to participate? Finally, we consider the evolution – or non-evolution – of user-inclusive innovation communities, i.e. networks of meaning-creation and knowledge-transfer that stimulate mutually beneficial innovations.

We elaborate on these themes by drawing on four case studies of user involvement conducted by the authors. Out of a total of 18 cases that we have analysed over the past decade, we have selected four that represent key variations on the original 'user-inclusive innovation community' as presented by von Hippel. The cases illustrate four ways in which user communities can be involved in innovation, as well as the different problems encountered in each type of interaction. Case 1 represents the 'ideal' case of innovative user communities. Case 2 represents a different type of 'naturally occurring' user–producer interaction. Cases 3 and 4, while less 'ideal', represent common approaches today: companies or third parties attempt to facilitate user-inclusive innovation, with some short term success, but great difficulties in ensuring continuity.

We focus our analysis on particular aspects (Table 1). First, we examine the nature of the innovation community or collectivity that emerges or is created. Because each innovation community derives its members from a number of existing communities, we also describe its relations to those 'parent' communities. This shows how the microcosm of the innovation community interacts with the broader communities of practice (the 'parent communities'). We also examine how the innovation community was organised, what different interests were present in the community, and how various tools served to mediate interaction.

An important variable in our cases is the duration of the user involvement. Moreover, we consider how the innovation communities (or collectivities) evolved over time, highlighting the problems in creating self-sustaining user-inclusive innovation communities. Finally, we consider the contribution of the user-inclusive innovation communities or collectivities to divergence and convergence (Leonard and Sensiper 1998) in the innovation process.

The case analyses are based on careful reconstructions of the R&D process and the user involvement in it. All case analyses draw on field observations, in-depth interviews and analyses of

Table 1. Characteristics of the innovation communities examined in the cases.

	1 Diabetes	2 Wristop	3 mTourism	4 eGrocery
Nature of the parent communities	Longstanding existing user communities	Semi-professional sports communities	Diverse friendship groups of consumers	More or less organised interest communities
	Developer and other work communities	Developer and other work communities	Developer and other work communities	Developer and other work communities
Organisation of the innovation community/collectivity	Self-organised by users to serve their professional needs, company joined in later	Designers in the work community are simultaneously users in their free time	Users involved by the researchers to help the designers	Users, producers and societal actors involved by researchers to solve societal problems
Different interests within the community/collectivity	Producers: creating a benchmark case for illness specific data management program	Company: commercially successful devices	Companies: technical viability of service	Producers: strategic assessment of e-business opportunities
	Users: creating information handling tools for diabetes treatment and research. Enforcing their view of treatment	Users: new suitable features	Users: lack of interest	Consumers: questioning the social value of e-business Societal actors: introducing environmental improvements
Role of tools in mediating interaction	Sketches, prototypes, conversations and problem sheets supported interaction	Professional hobbyists themselves mediate	Outdoor trials created shared experiences	Brainstorming and idea generation tools created a temporary shared 'workspace'
		Hobbyism creates room for more formal tools and prcedures	Focus groups and questionnaires provided explicit feedback	

(*Continued*)

Table 1. Continued.

	1 Diabetes	2 Wristop	3 mTourism	4 eGrocery
Timing of the user involvement	Encompassing multiple product development cycles	Encompassing multiple product development cycles	Small part of one product development cycle	Short-term, pre-competitive 'launch' event
Evolution of the user–producer interaction	Deepening of the sustained innovation community; disintegration and new partnering	Gradual evolution of hobbyism into a legitimate practice	Intensive short term interaction followed by disintegration	Rapid evolution of a temporary innovation collectivity; rapid disintegration after facilitation stopped
Contribution of the user inclusive community/collectivity to the design process	Multiple cycles of convergence and divergence, contributing to multiple consecutive design cycles	Multiple cycles of convergence and divergence, contributing to multiple consecutive design cycles	Convergence in terms of technical design, divergence in terms of business models	Divergence in terms on business models, no convergence on one implementable design solution

artifacts. Content analysis and systematic comparisons between different data sources and informant reports formed the core of the analysis. All cases featured a modest action research element, as the researchers facilitated the processes by helping to organise encounters between stakeholders. The research methods are further specified in each case description.

Case 1. Diabetes software: long-term interaction between lead users and technology experts

The first innovation examined is an illness-specific electronic health record for diabetes professionals. This process was studied in an eight-year project combining document analysis with 35 interviews, field observations including 40 hours of video recording, and documentation of three seminars discussing the research findings (Hyysalo and Lehenkari 2002, 2003).

The innovation process was initiated by a group of lead users, medical researchers and practitioners, whose interest was to improve the instrumentation for handling the complex documentation required in treating and doing research on diabetes. These users had faced high information handling demands very early and had tried to build databases to ease this burden. When they applied for funding to develop their prototype further, they were introduced to a small software company, which sought to create an Internet-based medical archive. Their interests and resources met: the company saw diabetes as a good starting point, while the users regarded the resources and the expertise of the cutting edge programming firm as a welcome boost to their project. The innovation community hence consisted of a group of users representing several communities of practice (CoP) in diabetes care and an IT-company (Figure 2).

Collaborative design began in 1996 and continued for several years. This self-organised community gradually expanded as the program was adopted by new healthcare organisations and occupational groups. The innovation process featured cycles of divergent searches that converged into prototypes or new versions. The contributions of the users in the innovation community were formidable throughout the process. Users were a major source of strategic decisions: what ideas were feasible, which directions had commercial potential within diabetes care, what should the product consist of and in which order should its realisation and the enrolment of new user-partners

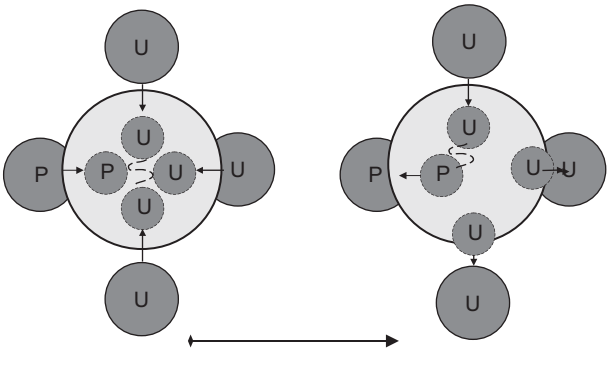

Figure 2. Constellation of the participating communities at the early and late stages of the diabetes software project. During the early years, producer (P) and representative users (U) from several 'parent' user communities (grey circles) formed an innovation community. Later the producer began to discourage user contributions, causing the community to wane. After struggling by other means it had to re-introduce some user collaboration with new user communities.

proceed. Users were also the key source of major design decisions by providing all content knowledge and tens of suggestions for design solutions. In addition they created hundreds of incremental improvements to the software both in concept design and in the later testing of prototypes and working versions. As a community, the different users were able to present for the company much of the range of differences required for mass-customisation in the somewhat differing practices of their communities of practice.

In terms of tools for mediating the interaction, the project relied on fairly informal means including face-to-face discussions, e-mail, hand-written notes and drawings and later extended test use of prototypes and working versions. The company was active in encouraging and incorporating ideas and improvements into design decisions, as well as in 'managing the cacophony of opinions' when the innovation community grew to over 20 user-experts in more than 10 locations. This multiplicity of users and the close connections between them and the company allowed for rapid iterations of users ideas' – crucial for spurring yet further improvements. The designers' responses also facilitated users' learning about how to be useful in the design effort and were thus instrumental in bridging the notable professional and interest distance between designer and user communities present in this case. These observations were verified when the company later withdrew from its active role in processing user feedback: the flow of user-initiated ideas and improvements waned as well.

The evolution of the user–producer innovation was further spurred by conflicts of interests among users. The solutions and ideas from the participating lead users were geared towards comprehensive and accurate data gathering. However, the majority of diabetes was treated in primary care by regular physicians and nurses. Diabetes not being their specialist concern, the high quality of accumulated data was not the top priority for them, whereas they needed more swift and easy data entry and retrieval. In 2002, the company realised this discrepancy when its sales in regular healthcare centres lagged: these effectively refused to use any design that caused more work as their resources were already stretched. The company eventually collaborated with regular doctors and nurses to re-customise the product more to their CoPs. Also in its internationalisation campaign the company sought collaboration with local physicians, but only after five years of unsuccessful manufacturer-centred design attempts (Figure 2).

In sum, the outcomes of designer–user interactions were highly positive for the company, which received a substantial resource for its R&D from the expertise of the medical practitioners as well as a substantial resource in marketing the program. The success of this collaboration relied on intense and long-term interactions between the company and multiple users. The diabetes specialists participating in the project gained a program that helped them to do their daily work. It also became a *de facto* standard for recording and measuring diabetes in Finland, and served the interests of the specialists in their attempts to enforce their view of proper diabetes treatment in Finland on primary health care. The specialist lead-user participation thus had more deep-seated interests at stake than mere practical utility, economic considerations or the joy of problem solving.

Case 2. Wristop-Computer: when hobbyism fuses user and developer knowing

The second innovation examined is a wrist computer made for demanding outdoor sports. In 1998, this entirely new product category was generated at Suunto, a Finnish sports equipment manufacturer, partly based on know-how gained in manufacturing diving computers. Thus, an existing convergent development process turned into a divergent one because of changes in the business environment. Expansion into the new markets needs lead user approval, which was gained in this case by having enthusiastic sportsmen within the product development team.

The Suunto case study is based on a four-year research project (Kotro 2005), where the research method was to interview all the team members developing the outdoor wristop computer product line. The data consist of 14 recorded interviews together with hours of more informal discussions. Additionally, the researcher spent time in the company, having lunch with the employees and also having a desk in the design office, which gave insight into the designers' daily routines and practices of working. The researcher also accompanied some of the team members for their leisure activities and followed free diving exercises, after it was found that the communities of practices of sports served as an important reference for work in Suunto.

The wristop innovation community that emerged drew on existing stable 'parent' CoPs, i.e. communities of practitioners of various outdoor sports, as well as the product development teams within Suunto. User involvement and interest mediation occurred primarily through the involvement of members of the wristop computer product development team in the practices of sports communities outside the organisation, in which the employees belonged to CoPs of free divers or adventure sports. Such 'hobbyist knowing' allowed the product developers to align company interests with the interests of user communities. 'Hobbyist knowing' refers to factual details, such as knowing how to talk about specific materials, as well as to a more general ability to act in the community in socially recognised ways. In addition to embodying current practices and values, hobbyist knowing also embodies a reference for generating new practices that can be adopted by the community – as well as a reference for generating images of the product.

Following the first, successful innovation cycle, the contribution of this specific kind of user-inclusive innovation community was acknowledged in the company. At first, the practice of representing users through in-house hobbyists had been implicit and not even quite legitimate. After the researcher uncovered the phenomenon, it became an explicit strategy for the company (Figure 3). For example, in a job advertisement, Suunto explicitly stated that it would recruit applicants with a strong background in sports. Participant knowledge within the company was acknowledged as a resource for successful product development. This meant appreciating employees' non-professional knowledge that derived from the tacit knowledge inherent in the communities of practices of sportsmen (Kotro 2007).

The dual membership of hobbyists in Suunto also created capacity for involving users through more specified methods of user involvement. These methods included interviewing and observing users and asking them to write notes, keep a diary and describe their hobbies and practices.

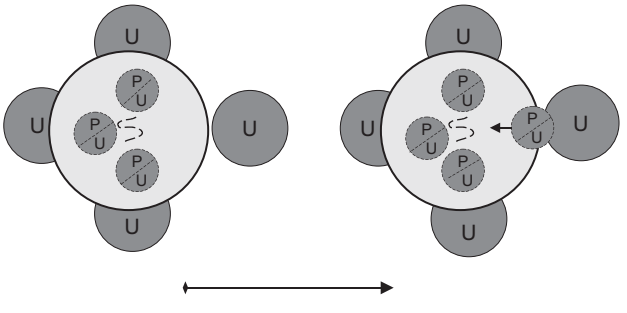

Figure 3. Constellation of user–producer relations in the product development of Suunto wristop computers: designers are both user communities and producer communities at the same time (designated by P/U in the figure). After the phenomenon was articulated, it became an explicit resource for product development, promoting the recruitment of designers from new user communities and facilitating the utilisation of 'formal' user involvement methods by enhancing the integration of 'outside' users' knowledge into the company.

Hobbyist knowing thus made room for studying end-users more explicitly, because hobbyists valued the innovativeness in the sports communities and were able to locate the most innovative users. Hobbyists have 'special boundary roles' and they serve as 'gatekeepers' (e.g. Tushman and Katz 1980; Wenger 1998). Brown and Duguid (1991) note that 'joining a community (of practice) gives access to that community's identity and through that its collective knowledge'. Having users as permanent and fully authorised members of the product development team thus enables companies to surmount some of the 'stickiness'(von Hippel 1998) of user and producer knowledge.

The dynamics of this case highlight how 'hobbyist knowing' may precede formal inquiries and methods of end-user engagement. The wristop computers produced became a commercial success, and they were valued by active and 'wannabe' sportsmen alike. In this case, hobbyism contributed more than formal user involvement methods or tools, because it enabled a long-term relation to the intended contexts of use of the product. The presence of hobbyists within the company formed a natural alignment between the interests of Suunto and those of the user communities. Nonetheless, the hobbyist knowing present in the organisation facilitated the utilisation of 'formal' user involvement methods by enhancing the integration formal methods and 'outside' users' knowledge into the company. Moreover, the role of hobbyist knowing itself was enhanced by its explicit recognition and legitimisation.

Case 3. Mobile blogging: artificial *ad hoc* user communities

The third innovation examined is a tourism service to be used on mobile phones. The service is intended for groups of tourists who wish to get to know a location. They create documentation and interact with members of their group when using the service. In essence, the service is a commercial application of the notion of mobile blogging, i.e. using a mobile phone to post pictures and messages in a web gallery. The service is a descendant of a similar service used as a part of business tours intended to enhance better acquaintance of company participants and provide memorable experiences. Having successfully launched the business-to-business service, the product developers decided to target the consumer market. Obviously, no user communities using this particular commercial type of a service existed.

We piloted a sightseeing tour into the centre of the Finnish capital Helsinki as the first implementation of the mobile blogging service (Repo, Hyvönen, and Saastamoinen 2006; Heiskanen and Repo 2007). The tour consisted of visits to eight sightseeing sites within walking distance and of performative tasks as appointed for each site. The trial was arranged on two different occasions and involved altogether 19 participants. Before the trial, we conducted a semi-structured interview with the company representatives in charge of the product development of the service, and interacted repeatedly with the product development team. During the trial we gathered data using participatory observation. Afterwards we conducted focus group interviews involving all 19 participants and received filled questionnaires from 18 participants. Finally, we interviewed the product development team on how they experienced the trial.

The innovation community in this case was created explicitly by the researchers in order to mediate interests between the companies and potential users. It involved two companies developing the mobile blogging service, as well as two groups of potential users assembled by the researchers. The companies involved had stable communities with experience of previous interaction, but the user groups were derived from various friendship groups of ordinary consumers interested in mobile-based tourism services as well as from a consumer panel maintained by the researchers.

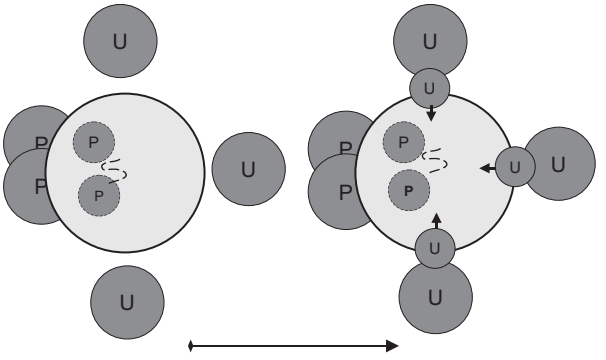

Figure 4. Constellation of user–producer relations in the product development in the mobile blogging case: Product developers (P) and ad hoc user community members (U) approached each other in the study. Nevertheless, product developers remained in control and users remained at the outskirts of product development.

The users were only involved in a small part of one product development cycle. Product developers and users did approach each other, yet one could say that users only 'visited' the outskirts of the innovation process (Figure 4). The product development team received its feedback directly from users during the sightseeing tour and in focus group discussions conducted after the tour, and drew its own conclusions after the pilot.

The product development team had expected this prototype testing event to provide convergence on technical viability and usability issues. Dysfunctional features were indeed identified and screened out by participants. The users did also propose a number of improvements, but we cannot be sure of their feasibility as the participants could neither develop these solutions nor test them in action. In other words, the responsibility for all changes remained within the product development team instead of being shared with a user community. Yet, user involvement also resulted in feedback pertaining to the business concept especially on issues with social dimensions such as group formation and playfulness, and issues such as technical support and pricing. Shared experiences during the outdoor trial made the product development team more open to participant feedback and less drawn to justify the existing service design based on their own expertise. In essence, the product developers entered into dialogue with the users involved in the study. In this respect, the user involvement event made a significant contribution to the product development process: the convergent process focusing on technical details and usability was reopened after the user involvement, and the companies then started to diverge their service into a variety of business models for tourism services.

The other essential contribution was the alignment of interests between the companies and the *ad hoc* user groups. The users took the perhaps surprising role of mediators between the service concept and the technical solutions. They were also agents promoting change in the product development process. In this respect, direct user feedback gave momentum to product development. Creating *ad hoc* micro-communities to pilot the service, accordingly, turned out to be a successful procedure.

The *ad hoc* communities of users did not gain much from the pilot as intensive short term interaction was followed by disintegration of the embryonic innovation community. Individually experienced novelty value and commitment to improving consumer technology had motivated the participants.

The evolution of interaction in this case illustrates how *ad hoc* communities can be created and incorporated in product development. User interests were aroused and to a certain extent aligned with producer interests. This implies that the successful creation of user communities (or collectivities) with little initial interests can indeed be facilitated by producers. Nonetheless, the longevity of such communities would, however, depend on the continuous community building by the producer and on the successful recruitment of committed and innovative users (Jeppesen and Fredriksen 2006).

Case 4. Sustainable online grocery retailing: community-building for socially responsible innovation

The fourth case examined is a societal innovation process (see Schot 2001) organised on behalf of a government body to assess and develop the potential for environmental and social sustainability in online grocery shopping, i.e. the possibilities for reduced traffic, more environmental product information and better service. The exercise was carefully documented (e.g. all sessions were recorded and all materials photographed, and written feedback was collected from participants). Content analysis was conducted to examine the evolution of the different parties' interests and contributions. Moreover, seven participants, representing various interested parties, were interviewed about six months after the exercise to gain feedback on its outcomes (Heiskanen 2005).

In this case, representatives from several more of less stable 'parent' communities formed a collectivity for the duration of the exercise. They included large retailers experimenting with online grocery shopping as an additional service and smaller retailers focusing on it as a core business. Users were represented by members of a consumer panel maintained by the researchers; other interests were represented by environmental NGOs and urban planning and logistics experts from R&D establishments. The participants formed a short-term, user-inclusive innovation collectivity, which never developed into a stable innovation community.

User involvement was organised as an interactive, multi-stakeholder workshop. Before the workshop, participants received an information package on the existing e-business models and studies on societal effects. At the workshop, participants worked in small groups including representatives from different parent communities, using groupwork techniques to identify problems and brainstorm ideas for better designs.

One aim of the exercise was to critique existing business models by encouraging divergence. Thus, efforts were devoted to articulating the different participants' agendas. It turned out that many service providers were interested in the strategic assessment of e-business opportunities. Many consumers questioned the value of e-business, for example by asking 'can personal contacts be maintained over the web?' NGOs raised issues concerning the environmental impacts of online grocery shopping. The logistics professionals were interested in the potential for reduced traffic through centralised deliveries.

While the work started out with a divergent search, the aim was to ultimately converge on an implementation plan for sustainable solutions. Tools (brainstorming and group work exercises) were important in mediating the various interests and creating a shared 'workspace' that allowed differences to be temporarily set aside. Thus, new solutions were found to the problem of sustainable online grocery shopping. Some of the ideas were incremental improvements, but others were more novel and radical, such as the 'Internet-Supported Local Grocery Shop' and the 'Suburban Delicatessen'. These ideas centred on using e-business to enhance the competitiveness of local corner shops by reducing inventories (and hence costs) and increasing the product range, while at the same time reducing traffic and intensifying relations between food producers and consumers.

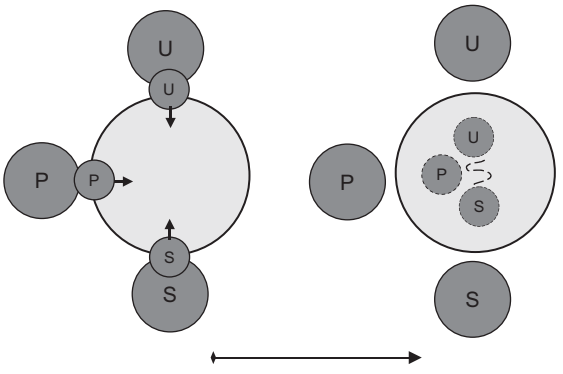

Figure 5. Constellation of the participating communities at the start and end of the electronic grocery workshop. At the start they are firmly connected to their 'parent' communities (Producers, P, Users, U and Social Interest Groups, S). By the end, they have formed their own community that shares knowledge freely, but is disconnected from the 'parent' communities.

At first sight, the experiment seems to evidence the feasibility of creating innovative communities. Yet it turned out that the alignment achieved was only temporary. The workshop was intended as a first input in a process driven by the actors themselves, which never materialised because no one had a strong motive to initiate the next step. Although the knowledge sharing at the workshop was appreciated, the concepts were not so important for the social interest groups or the users. The smaller companies with an interest in the 'local-based' solutions lacked the capital needed for developing novel distribution systems. The mainstream retailers enjoyed the workshop as a learning experience, but, because of their sunk investments in existing retail structure, the concepts developed at the workshop were not in their strategic interests. Thus, true convergence on an implementable solution never emerged.

The dynamics of this case illustrate how user–producer interaction can be facilitated by idea-generation tools, enabling differences to be temporarily set aside (Figure 5). Before the workshop, the participants were firmly connected to their 'parent' communities' interests. The intensive, short-term interaction enabled the participants to form a temporary 'innovation collectivity' and break down the boundaries between interest groups. By the end, they had formed a community of their own that shared knowledge freely. At the same time, the participants' connections with their 'parent' communities were weakened. The specific form of interaction created in the workshop was useful in 'unsticking' the different participants' knowledge (i.e. allowing it to move freely with the group), but the outcome of the workshop was 'sticky' to move outside the group of its originators. Thus, resources could not be drawn from any of the 'parent communities' for sustained work on the ideas generated.

Discussion

The four cases, selected for their diversity, reveal some of the opportunities and challenges of user-inclusive innovation. User involvement was at least a partial success in all cases. At the same time, it was never a 'silver bullet' to permanently transform the way the company worked. In the diabetes case, the company started backing off from the network of active user-partners when the initial product was finished and the company felt they knew the users' practices sufficiently. It did implement user-collaboration again later in international markets, but only after it had tried other

ways first. In the wristop computer case, Suunto continued its strategy for hiring sports enthusiasts in R&D, but this is not the only hiring policy that it exercises.

The second theme cutting across the cases is the nature of an 'innovation community'. The e-grocery shopping case is a good point of departure. There, representatives of different CoPs came together to elaborate innovative new concepts. While the outcomes were appreciated by most participants, the exchange of ideas did not lead to concrete convergence and further detailed elaboration. In contrast, the mobile tourism case featured an innovation community that was centred on the developer company and focused on a specific task. *Ad hoc* users were enrolled to test a novel application for a short period of time. Even with this limited *engagement*, users' did manage to *participate* (cf. Lave and Wenger 1991) as designers interpreted and turned their input into product characteristics. These two cases are closer to the notion of 'knowledge collectivity' (Linkvist 2005) than to a genuine community of practice.

The diabetes software case takes the theme of innovation community considerably further. Diabetes professionals had already prior to the formation of the software company formed collaborations and attempts to develop suitable software for diabetes treatment. When the company joined in, it brought in more resources and started to coordinate and bring together the partially diverging interests of the CoPs of various diabetes specialists in the country. This is close to how 'innovation community' tends to be portrayed in the literature. It was a sustained group of representatives of several pre-existing CoPs, many of which included proficient lead users, coordinated by a highly motivated and resourceful company to develop a specific innovation. Finally, the wristop computer case reminds us that CoPs are not mutually exclusive: the developers were simultaneously able participants in the sports CoPs for which they designed their innovation. Such simultaneous membership in multiple communities goes beyond the portrayal of innovation communities by von Hippel (2005) and colleagues as both manufacturing and user domain expertise are fused in a set of people sitting on two chairs.

Comparing these four rather different 'innovation communities' allows us to explicate some key characteristics of such social formations. The cases highlight the need for caution in what is called a community as well as in regard to its relation to innovation. The cases suggest that an innovation community *needs to include at least one sustained Community of Practice* committed to the furthering of the innovative concept. The other actors – developers or users – may include representatives of pre-existing CoPs or more loosely coupled constellations of people. Moreover, these actors tend to have divergent resources, cultures, perspectives and interests, which are not limited to rational utility or the joy of problem solving. Their motives for participating in innovation can differ drastically from those they have in participating in CoPs. Users' motivations for participating in innovation may range from a sustained interest in creating new solutions to mere curiosity or the desire to further a particular agenda. Substantial work may go into aligning the different interests and securing commitment for sustained development of the innovation.

There is a lively debate about whether one can create CoPs or whether they merely emerge and can only be nurtured to better serve the innovation management of the firm. Some authors argue that CoPs are local and contextual, and cannot be created or managed using generic 'recipes' (Contu and Willmot 2000). Communities are products of history – conditions for their emergence can be fostered, but artificially creating communities or harnessing existing communities to outside purposes may prove problematic. These concerns are accentuated in the case of innovation communities, where no 'one-size-fits-all' advice is warranted. The formation of successful innovation communities involves a strong component of contingency in that a mutually beneficial alignment of resources and interests falls into place. All our cases show how much effort is required to sustain even a limited innovation collectivity. In affinity to CoPs, innovation *communities* cannot

be assumed, but develop over time in as much as the participants in the collectivity begin to act as members of *this* community and not merely as representatives of their other commitments.

In spite of these reservations, it does indeed appear worthwhile for companies to chart what possibilities and innovative communities exist. When embarking on such a journey, companies will encounter many tools and methods. In all our cases, however, the most valuable experience for designers was the close, face-to-face interaction with users, allowing for a transfer of tacit knowledge. There are many ways to involve users in innovation, but it seems that all require some level of involvement by the designers themselves. The wristop computer case is an epitome of such simplicity: designers are users – hence, sophisticated methods for user involvement are a complement rather than the sole source of user information. In the cases that relied more on explicit tools, the tools only partially compensated for the short duration of the interaction.

In our cases, the interaction of communities was more important than the tools and means, but the context of the interaction and community-formation also sets the tools in a new light. Tools and tasks serve an important purpose in creating a concrete context of shared work. Participants thus gain a legitimate way to participate, if peripherally, in each others' social worlds (Lave and Wenger 1991). Tools also serve to create shared 'mediating representations' (Hyysalo 2003) that enable members of different groups to communicate. Thus, tools can serve to sensitise designers to users' perspectives, as well as to enable users to recognise and respond to issues that are relevant for designers. Yet formal user involvement is merely the first 'eye-opener'. Significant commitment and alignment of interests is needed to sustain a user-inclusive innovation community.

We thus argue that more work needs to be done on von Hippel's conceptualisation of innovation communities primarily as a set of information transfer links. Issues to be considered include the alignment of different interests, the maintenance of stability and the mobilisation of resources and sustained commitment. Our analysis indicates that further work is merited on the role of time and sustained face-to-face interactions in creating a stable community. We also stress the need to analyse where such communities draw resources for sustained innovation work.

Conclusions

We can now provide at least a partial answer to the question: what can users offer for innovation? The cases have shown that it is pointless to speak of users in general – user–producer interaction can involve a range of different configurations. The usefulness of involving users is partly dependent on the users' abilities and proficiencies, i.e. 'lead users' can make some specific contributions to product innovation in particular product groups, but the relations between users and designers – '*in vitro*', i.e. in the specific form of involvement, and '*in vivo*', in the broader communities and markets that they represent – are decisive. Our analysis has shown that crucial elements include the historical evolution of knowledge-sharing communities, the way their interaction is mediated through shared representations and activities, and the way in which interests and resources are aligned.

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