

# Community-Driven Development: Approaching Participatory Design in the Online World

Jan Hess, Volkmar Pipek

## Introduction

Along various lines, design has always dealt with user participation as one of the possible ways to reach a design goal. When Dorst revisited Simon's perspectives on ill-structured problems and design,<sup>1</sup> he suggested the notion of a "design paradoxon" as a design goal statement that potentially contains conflicting sub-goals (belonging to different "discourses," along a Foucaultian notion) as the core concept of design; he described design itself as the "resolution of paradoxes between discourses in a design situation." Swann pointed out the relations between design and action research with its strong consideration of user activities and encouraged designers and action researchers to learn from each other's practices.<sup>2</sup>

Participatory Design methods already have followed these lines since the 1980s. However, it has always been far from obvious what participation exactly means when it comes to information technology design. In the early days of "personal computing," the lines of conflict at the workplace (i.e., employers' interest in efficiency/rationalization vs. employees' interest in good working conditions/ergonomics) provided some orientation concerning different levels of participation and how certain types of processes or user-developer interaction arenas (i.e., Participatory Design methods) influence them.<sup>3</sup> Today, arenas of IT design look different. IT has conquered more and more areas of our everyday life, and it is hidden in more and more devices and technological infrastructures. General computer literacy has increased among IT users, and the Internet as well as the open source movement offer new ways of articulation related to the usage and the development (e.g., support forums and user wish lists). These articulations also might have become more qualified regarding the potentials and limitations of IT. New technologies, products, or uses encounter an existing base of technologies and uses they have to match, and they often face competing socio-technical arrangements. IT development strategies adapted to these market dynamics by becoming

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1 Kees Dorst, "Design Problems and Design Paradoxes," *Design Issues* 22, no. 3 (2006): 5.

2 Cal Swann, "Action Research and the Practice of Design," *Design Issues* 18, no. 2 (2002): 61.

3 Gro Bjerknes and Tone Bratteteig, "User Participation and Democracy: A Discussion of Scandinavian Research on System Development," *Scandinavian Journal of Information Systems* 7, no. 1 (1995): 73–98.

*user-oriented*, maybe even *user-centered*, but not necessarily *participatory*. The user was given a voice in these design processes, but to what extent the feedback is considered is not clear.

Taking these developments into account, Participatory Design researchers are faced with new challenges and opportunities. The two stereotypes of the *user-unaware developer* and the *computer-illiterate user* are replaced by more gradual mixtures of competencies. When suggesting Participatory Design arenas, we have to consider these various mixtures, as well as the ongoing learning processes that accompany a design interaction. While home and leisure settings complement traditional work environments as domains for Participatory Design, different degrees of motivation for, involvement in, and dedication to the Participatory Design interaction have to be considered. Design-time and use-time cannot be separated anymore because IT artifacts have become more flexible and adaptable, and they mutually influence each other's use and, indirectly, each other's further development (e.g., through debates on feasible technology potentials). As a result, it may always be *design-time* for dissatisfied users or users who choose a different socio-technical arrangement (i.e., a different product). As suggested by Pipek and Syrjänen,<sup>4</sup> Participatory Design research might react to this development by focusing on developing infrastructures-in-use rather than on developing IT artifacts.

The framing conditions for technology development offer new potentials for Participatory Design research, as well. The IT infrastructures we have today provide more ways to articulate and exchange needs, ideas, and opinions and offer participation opportunities beyond traditional views of technology design (e.g., with regard to political issues like standardization). Practical experiences and the competition with the open source movement might encourage more and more professional IT developers to take the step from "user-centered" to "Participatory" Design, giving the Participatory Design research more practical relevance and resulting in more opportunities for practice-oriented research.

In this paper, we explore an approach to Participatory Design in practice that demonstrates many aspects of the developments mentioned. A software manufacturer (Omega) for home entertainment software wanted to develop new media center software with the help of an existing online community. For about 18 months, we observed and supported the practice of developer-user relations and the initiative to redesign the product. Focusing on community-driven software development, we conceptualized and gradually improved a Participatory Design arena in order to explore the dynamics of the perceived and actual values of participation, as well as the associated expectations and fears of the

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4 Volkmar Pipek and Anna-Liisa Syrjänen, "Infrastructuring as Capturing In-Situ Design," 7th Mediterranean Conference on Information Systems (Venice, Italy: Association of Information Systems, 2006). Proceedings, eds. G. Jacucci et al. I, (2006): 134-46.

- 5 See, e.g., Gro Bjerknes and Tone Bratteteig, "User Participation and Democracy, and M. J. Muller, D. M. Wildman, and E. A. White, "Taxonomy of Participatory Design Practices," *Posters and Short Talks of the 1992 SIGCHI Conference on Human Factors in Computing Systems* (Monterey, CA: 1992), 34.
- 6 Bashar Nuseibeh and Steve Easterbrook, "Requirements Engineering: A Roadmap," in A. C. W. Finkelstein, ed., "The Future of Software Engineering," (Companion volume to the proceedings of the 22nd International Conference on Software Engineering, ICSE'00), (IEEE Computer Society Press).
- 7 Volkmar Pipek and Volker Wulf, "Infrastructuring: Towards an Integrated Perspective on the Design and Use of Information Technology," *Journal of the Association of Information System* 10, no. 5 (2009): 21.
- 8 Kerl Bødker, Finn Kensing, and Jesper Simonsen, *Participatory IT Design: Designing for Business and Workplace Realities* (Cambridge MA: MIT Press, 2004).
- 9 Austin Henderson and Morten Kyng, "There's No Place Like Home: Continuing Design in Use" in *Design at Work: Cooperative Design of Computer Systems*, J. Greenbaum and M. Kyng, eds., (Hillsdale, NJ: Lawrence Erlbaum Associates, 1991), 223.
- 10 Pelle Ehn, "Participation in Design Things," in *Proceedings of the Tenth Anniversary Conference on Participatory Design 2008* (Indianapolis, IN: Indiana University, 2008), 92
- 11 Volkmar Pipek and Volker Wulf, "Infrastructuring: Towards an Integrated Perspective on the Design and Use of Information Technology," *Journal of the Association of Information System* 10, no. 5 (2009): 447-73; Gunnar Stevens, Volkmar Pipek, and Volker Wulf, "Appropriation Infrastructure: Supporting the Design of Usages" in *Lecture Notes in Computer Science* 5435 (Berlin: Springer, 2009): 50-69; Gerhard Fischer and Eric Scharff, "Meta-Design: Design for Designers," in *Proceedings of the Third International Conference on*

participating stakeholders. Our experiences can thus inform other Participatory Design approaches that operate with virtual user communities.

We now briefly address related work that focuses on in-use Participatory Design concepts and community-driven concepts. We then describe our case setting and concept in more detail. We summarize significant effects in which we were able to observe and discuss the course that the Participatory Design interaction took, relating our findings to other Participatory Design approaches to delineate different understandings and practices of participation.

### Participation in Use

Several studies on Participatory Design research already account for different modes and levels of participation,<sup>5</sup> but they merely reflect the historical context of participation in workplace design. One can find the normative, emancipatory direction (i.e., users should be an active part in the design of their workplace), as well as the pragmatic, production-oriented description (users have to be integrated into existing design practices, for example, by using ethnographic methods),<sup>6</sup> but in most approaches the design process (and the user participation) precedes the actual use of the product. Traditional design methods are focused on the professional designer with his or her (re-)design competencies: "Although design methods in IS have improved with regard to the 'technology fit' with users' needs, they are still inherently based on a perspective which focuses on the designers to be the main actor in developing IT infrastructures."<sup>7</sup> Bødker et al. underline the importance of user involvement in the design process.<sup>8</sup> They define participation in the context of Participatory Design as mutual learning processes between designers and users. Instead of involving users only as informants, genuine participation requires a continuous user involvement to obtain a shared understanding of the problems and needs.

Based on Henderson and Kyng's idea of "Continuing Design in Use,"<sup>9</sup> a second approach to user involvement evolved that postpones design activities into the use phase of an IT product. Ehn distinguishes the two approaches as "design for use before use" and "design for design after design" and discusses strategies for professional designers in order to participate in both arenas.<sup>10</sup> Similarly, Pipek and Wulf, Stevens et al., and Fischer and Scharff distinguish the "when" of design between "design-time" and "use-time."<sup>11</sup> In their approaches of "infrastructuring" and "meta-design," they point out that problems in the subsequent use cannot be completely anticipated while designing a product. Users will discover mismatches when they actually use the product. As a Participatory Design-centered approach, Hertzum and Simonsen reference an "Effects-Driven IT Development."<sup>12</sup> In an empirical study

- Designing Interactive Systems: Processes, Practices, Methods, and Techniques*, D. Boyarski and W. Kellogg, eds., (New York: ACM Press, 2000): 396-405.
- 12 Morten Hertzum and Jesper Simonsen, "Effects-Driven IT Development: An Instrument for Supporting Sustained Participatory Design," in *Proceedings of the 11th Biennial Participatory Design Conference* (New York: ACM Press, 2010), 61-70.
  - 13 Henry Lieberman, Fabio Paternò, Marcus Klann, and Volker Wulf, *End-User Development*, HCIS Vol. 9 (Dordrecht, The Netherlands: Springer, 2006), 1.
  - 14 Volker Wulf, Volkmar Pipek, and Marcus Won, "Component-Based Tailorability: Towards Highly Flexible Software Applications," *International Journal on Human-Computer Studies* 66, no. 1 (2008): 1-22.
  - 15 Volkmar Pipek and Volker Wulf, "Infrastructuring: Towards an Integrated Perspective on the Design and Use of Information Technology," *Journal of the Association of Information System* 10, no. 5 (2009): 447.
  - 16 Michael J. Muller, Daniel M. Wildman, and Ellen A. White, "Taxonomy of Participatory Design Practices," in *Posters and Short Talks of the 1992 SIGCHI Conference on Human Factors in Computing Systems* (New York: ACM, 1992), 34.
  - 17 Mark Keil, and Erran Carmel, "Customer-Developer Links in Software Development," *Communications of the ACM* 38, no. 5 (1995): 33-44.
  - 18 Froukje Sleeswijk Visser, and Victor Visser, "Re-using Users: Co-create and Co-evaluate," *Personal and Ubiquitous Computing* 10, no. 2-3 (2006): 148.
  - 19 Anandasivam Gopal, Tridas Mukhopadhyay, and Mayuram S. Krishnan, "Virtual Extension: The Role of Software Processes and Communication in Offshore Software Development," *Communications of the ACM* 45, no. 4 (2002): 193-200.
  - 20 Babak A. Farshchian and Monica Diytini, "Using Email and WWW in a Distributed Participatory Design Project," *ACM SIGGROUP Bulletin* 20, No. 1 (1999): 11.

related to an electronic patient record system, they show that four types of changes need to be considered for (re-)designing a system: planned, emergent, opportunity-based, and curtailed ones. Because the latter three occur only during use, they highlight the relevance of pilot implementations. Research on "End-User Development" (EUD) also is bridging the gap between design- and use-time. Participation in the sense of EUD "empowers end-users to develop and adapt systems themselves."<sup>13</sup> These adaptations on a run-time level can only be realized with highly flexible software architectures.<sup>14</sup> Pipek and Wulf introduce the concept of "infrastructuring" for a "design in use" that involves all stakeholders over a longer period of time and provides support beyond development and adaptation: "We describe the methodological approach of *infrastructuring* to develop methodological and tool support for *all stakeholders' activities* that contribute to the successful establishment of an information system usage" (emphasis added).<sup>15</sup>

Muller et al. classify participative techniques along two dimensions.<sup>16</sup> The first is the level of user involvement: A user either can be observed or can actively participate in discussions; the second is the temporal position of the user's participation in the development process. A company can employ different techniques to encourage the exchange of information between users and developers, including interviews, surveys, questionnaires, or observation. Keil and Carmel reference "customer-developer links" that include support hotlines, bulletin boards, or trade shows.<sup>17</sup> In comparing different projects, they found that more successful projects employed more customer-developer links than less successful ones. S. Visser and Visser emphasize that the same users should participate not only at a single stage of the design process, but also at later ones.<sup>18</sup> Such "returning participants" provide more effective feedback because they already have a relatively deep knowledge of the application's concepts.

As a result of globalization and the spread of new technological facilities, development processes can be managed in more distributed settings.<sup>19</sup> The development in distributed projects differs from traditional ones and requires a rethinking by different stakeholders. On the one hand, the process of implementation can be *distributed*. On the other hand, user involvement can be stimulated by the use of Internet tools. Farshchian reported on a case study in which users participated in an international software development project via email and the Internet.<sup>20</sup> Because informal communication mainly took place asynchronously through the use of mailing lists, prototypes were the main formal reference for stimulating discussions and improvements. Such cases underline the importance of new forms of online articulation related to the design artifact.

- 21 Gunnar Stevens and Torben Wiedenhöfer, "CHiC: A Pluggable Solution for Community Help in Context," in *Proceedings of the 4th Nordic Conference on Human-Computer Interaction: Changing Roles*, Anders Morch, Konrad Morgan, Tone Bratteteig, Gautam Ghosh, and Dag Svanaes, eds., (New York: ACM Press, 2006), 212-221.
- 22 Penny Hagen, and Toni Robertson, "Social Technologies: Challenges and Opportunities for Participation," in *Proceedings of the 11th Biennial Participatory Design Conference*, (New York: ACM Press, 2010), 31.
- 23 Howard Rheingold, *The Virtual Community: Homesteading on the Electronic Frontier* (Reading, MA: Addison Wesley, 1993), 20.
- 24 Jonathan Lazar and Jennifer Preece, "Social Considerations in Online Communities: Usability, Sociability, and Success Factors," in *Cognition in a Digital World*, H. Van Oostendorp, ed., (Mahwah, NJ: Lawrence Erlbaum Assoc., 2003), 119.
- 25 Arthur Armstrong and John Hagel III, "The Real Value of On-Line Communities," in *Creating Value in the Network Economy*, Don Tapscott, ed., (Boston, MA: Harvard Business School Publishing, 1999), 173-85.
- 26 Barry Wellman, "Virtual Community: Introducing a New SIGGROUP Focus Area," ACM SIGGROUP Bulletin 19 no. 1 (1998): 19.
- 27 Johann Füller, Michael Bartl, Holger Ernst, and Hans Mühlbacher, "Community-Based Innovation: How to Integrate Members of Virtual Communities into New Product Development," *Electronic Commerce Research* 6, no. 1 (2006): 57.
- 28 Jonathan Lazar and Jennifer Preece, "Social Considerations in Online Communities: Usability, Sociability, and Success Factors," in *Cognition in a Digital World*, H. Van Oostendorp, ed., (Mahwah, NJ: Lawrence Erlbaum Assoc., 2003).
- 29 Volkmar Pipek, "From Tailoring to Appropriation Support: Negotiating Groupware Usage" (PhD thesis, University of Oulu, Finland, 2005).

Stevens and Wiedenhoefer present an interesting approach to minimize the gap between use-time and design-time.<sup>21</sup> With their "Community Help in Context" (CHiC) concept, they provide a wiki-based help system that empowers users to extend and modify help descriptions related to the current context. This and other similar concepts can support in-situ design activities on the user-side, e.g. resulting in contextualized feedback that can be considered in later redevelopment stages. More generally, Hagen and Robertson describe evolving practices of "Participatory Design in the wild" that are made possible by social technologies.<sup>22</sup> Such technologies create new opportunities for user participation early in the design phase and become an opportunity for "socialising the research, bridging existing and future practices, and developing seed content."

### Virtual Communities and Participation

Many Participatory Design approaches have focused on stimulating local discourses in the workplace. With the availability of the Internet, existing or future users of a product can connect to each other in a virtual/online community. Spatial limitations lose some of their importance, and the motivation for being part of such a community very often is a shared interest. Howard Rheingold characterizes virtual communities as "social aggregations that emerge from the Net when enough people carry on those public discussions long enough, with sufficient human feeling, to form webs of personal relationships in cyberspace."<sup>23</sup> However, everyone has their own interpretation of what connectivity in such social aggregations means: "We all have our own notion of what an online community is. It isn't hard to understand, but it is slippery to define and tricky to measure," note Lazar and Preece.<sup>24</sup>

Communities can be classified according to different aspects, e.g. as done by the classification from Armstrong and Hagel.<sup>25</sup> They distinguish between four different types of communities: transaction oriented, interest oriented, fantasy oriented, and relationship oriented. Barry Wellman proposes other categories of virtual communities, including one called communities of consumers.<sup>26</sup> Such communities have a product or product category as the constitutive shared interest. Users who are engaged in such communities often bring in many innovative ideas for product improvements.<sup>27</sup> In addition, members of such communities can contact and help each other. While profound help and recommendations from other users support the usage of a product, companies see positive commitments as an effective form of marketing.<sup>28</sup> With the idea of use discourse environments as a platform for "built-in" communities related to technological artifacts, we fostered user-user collaboration to support our appropriation work.<sup>29</sup>

- 30 Nikolaus Franke, Eric von Hippel, and Martin Schreier, "Finding Commercially Attractive User Innovations: A Test of Lead User Theory," *Journal of Product Innovation Management* 23, no. 4 (2006): 301-15.
- 31 Nikolaus Franke, Eric von Hippel, and Martin Schreier, "Finding Commercially Attractive User Innovations: A Test of Lead User Theory," *Journal of Product Innovation Management* (Massachusetts: MIT Press, 2005), 301.
- 32 Johann Füller, Michael Bartl, Holger Ernst, and Hans Mühlbacher, "Community Based Innovation: How to Integrate Members of Virtual Communities into New Product Development," *Electronic Commerce Research* 6, no. 1 (2006): 57-73.
- 33 Eric von Hippel, "Lead Users: A Source of Novel Product Concepts," *Management Science* 32 (1986): 797.
- 34 Erling Bjoergvinsson, Pelle Ehn, and Per-Anders Hillgren, "Participatory Design and 'democratizing innovation'" in *Proceedings of PDC* (2010), 41-50.
- 35 Ibid, 41.
- 36 Ari Heiskanen and Jouni Similä, "Gatekeepers in the Action Structure of Software Contracting: A Case Study of the Evolution of User-Developer Relationships," in *ACM SIGCPR Computer Personnel* 14, no. 1-2 (New York: ACM Press, 1992), 30-44.
- 37 Flore Barcellini, Françoise Détienne, and Jean-Marie Burkhardt, "Users' Participation to the Design Process in a Free Open Source Software Online Community," *Proc. of the 18th workshop Psychology of Programming PPIG '06* (2006), 99-114.
- 38 Johann Füller, Michael Bartl, Holger Ernst, and Hans Mühlbacher, "CommunityBased Innovation: How to Integrate Members of Virtual Communities into New Product Development," *Electronic Commerce Research* 6, no. 1 (2006), 57-73.

An important theory for involving users in the design process is given with the 'Lead User Theory'.<sup>30</sup> Based on several studies, Franke et al. define lead users as users who fulfill two characteristics:<sup>31</sup> First, they are intensively engaged with the particular product and the associated market; therefore, they can discover new trends and demands in an early stage. Second, lead users anticipate advantages that lie in new technologies for themselves. These two characteristics lead to a high engagement for participation. The motivation for taking part in such design processes was explored by Füller et al., who found that users help to create an improved product that meets their personal needs better. The aspects for participation are manifold and include factors as fun, curiosity, desire to learn, personal interest, acceptance from others, and the access to exclusive information.<sup>32</sup> In addition, users feel more accepted and build up a deeper relationship to the producer. Von Hippel splits the process of lead user involvement into four phases.<sup>33</sup> In the first stage, a new trend is identified. Then, based on the users' requirements and experiences, some lead users are chosen. In the third stage, the lead users' demands are analyzed, which results in new product concepts. Finally, these new concepts are projected on a larger market. Innovations that are driven by users also are referenced in the work from Björgvinsson et al.<sup>34</sup> In their understanding, democratic innovation is more than a process that is *democratized* by the involvement of lead users. Instead, "democratizing innovation" practice as an alternative can appear in "an open innovation milieu where new constellations, issues, and ideas evolve from bottom-up, long-term collaborations among diverse stakeholders."<sup>35</sup>

The involvement of users in the design phase is not trivial. Users as well as employees have to be prepared for such a process. On the developer side, programmers often resist contributions from external stakeholders. One solution is the involvement of so-called "gatekeepers."<sup>36</sup> Gatekeepers have the users' as well as the employees' confidence. They connect a company with external sources by filtering relevant information in a structured way. Such gatekeepers often exist in open-source software projects. Barcellini calls them "cross-participants" because they participate in parallel discussion spaces and, therefore, may have the best overview of ideas and improvements.<sup>37</sup>

Füller et al. describe a concept that allows for the involvement of members of virtual communities in a structured way.<sup>38</sup> Called "Community-Based Innovation" (CBI), their concept can be applied in four phases. In the first phase, attributes of the users are identified that fit the requirements of the task at its best. Second, a community is identified where the key users can be found. In the third step, a virtual interaction design is developed

to support communication with the users. The last step focuses on the real involvement of the users, starting with establishing contacts and resulting in design participation. This way, users can participate already in early design phases: “Members of online communities who are characterized by high product and activity involvement represent an ideal resource for co-designing products when confronted with those new methods.”<sup>39</sup> As one of the major findings of the study, users are able and willing to participate in such a process.

### **Community-Driven Development**

In the previous sections, we described concepts that have users somehow involved in the design and innovation process. However, none of the known studies treats users and employees with equal importance. Users can express wishes and take part in the development process, but they do not have any influence on the decisions that are finally made. As a development process that is really driven by users, we introduce “Community-Driven Development” (CDD). The concept is closely related to the traditional understanding of Participatory Design in workplace settings.<sup>40</sup> User representatives and IT designers work together throughout the whole development process to gain a deep understanding of demands and needs. But CDD goes beyond traditional forms of collaboration, by applying Participatory Design to the online world. Distributed users are involved, providing their knowledge and their ideas.

### **Concept**

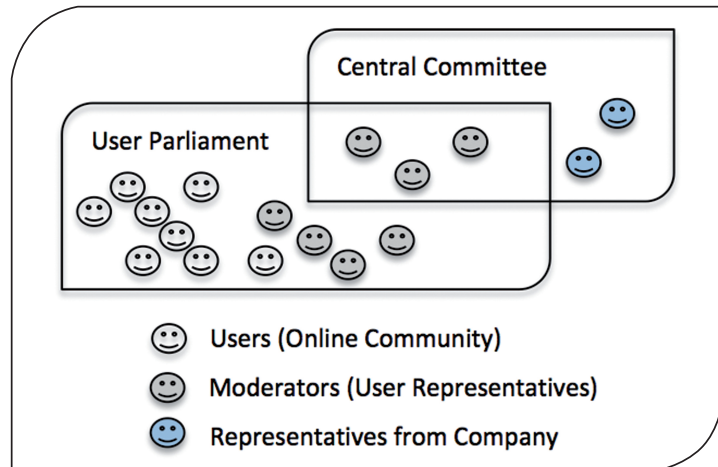
Involving users from online communities in a software design process requires room for discussions. Virtual platforms (e.g., forums) where all interested users can share and discuss their ideas and opinions provide an alternative to physical meeting places. In the CDD approach, the group of users involved in design is called the “user parliament” of the community. The company can limit the number of members in the user parliament and establish an application procedure. The concept’s second institution is the “central committee,” which consists of elected users and staff members who collect information and make the final decisions. As representatives from user’s side, the most engaged ones are qualified for such a position. In our case, the role of “moderators” already was established (see Figure 1). Moderators are users who stay in closer contact to the staff members of the company and voluntarily contribute in helping other users. The members of the central committee play a very important role in the process; they should consequently enjoy the full confidence of both users and staff. The election process can vary from case to case, depending on aspects such as size of the community, number of existing moderators, and the available time of staff members.

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39 Ibid.,

40 Kerl Bødker, Finn Kensing, and Jesper Simonsen, *Participatory IT Design: Designing for Business and Workplace Realities* (Cambridge, MA: MIT press, 2004).

Figure 1  
Community-Driven Development Approach.



A democratic way to elect the representatives to the central committee would be a poll by members of the user parliament; but, several aspects make such a procedure difficult. Users in the parliament cannot estimate how much time the representatives can spend, what knowledge they have, and in which voice they speak. Moderators, on the other hand, are users and company representatives who already have earned acceptance by the community for an extended time. They are characterized by their ability to help others and stimulate discussions. Because of these already established competencies, moderators are best qualified for such a position. Moderators and staff together then elect the members of the central committee. These persons can take part in the discussions of the user parliament as private users, but in their function as committee members they should be neutral and act as moderators, if necessary. The committee hosts regular conferences, either in person or by telephone, to discuss users' ideas and interests about previously defined topics and to seek consensus on user needs. Such decisions should represent the prevailing opinions based on discussions in the user parliament. To allow for transparency and room for reflective user feedback, the results are summarized in a public space. Later on, the final decisions can be used as a central requirements specification that forms the basis for the software development process. An initial prototype should be built and given to all interested users as soon as possible, so that they can constantly test and improve it. The online forum can further be used by the user parliament to provide feedback about advantages and disadvantages of the prototypes. This input is gathered and discussed by the central committee again and then brought to the development team. From an engineering point of view, the design cycles should follow the STEPS model. In the STEPS process, developers and users work closely with each other to cooperatively generate a system specification and cyclical improve early versions.<sup>41</sup>

41 Gerhard Fischer and Eric Scharff, "Meta-Design: Design for Designers" in *Proceedings of the 3rd conference on Designing Interactive Systems: Processes, Practices, Methods, and Techniques*, D. Boyarski and W. Kellogg, eds., (New York: ACM Press, 2000), 396-405.



### Use Case: CDD in a Software Design Process

Omega, a medium-sized software company developing products that help to connect personal computers and televisions (i.e., media center software) has applied the CDD concept in practice. Media center software typically offers functionalities that include pausing and recording live TV, managing existing video, audio, and image files, and streaming media files to other clients. The development of a new media center *OmegaTV* was studied as an example of the involvement of a user community in the design process.

#### Setting

Omega provides an online community space for its users. The portal consists of a wiki system that allows users to share their knowledge about Omega's products, and a forum that serves as a platform for information exchange (e.g., problems and potential improvements) between users and Omega employees.

An active community was established over the course of three-plus years; about 200 of the more than 15,000 registered users regularly took part in discussions. The Omega team had introduced the CDD concept both in the forum and in a weekly newsletter several months before the project started. The members of the forum had the opportunity to apply for seats in the user parliament via an online form. The original plan included only 30 persons in the user parliament, but because each applicant seemed highly motivated and reliable, all 70 applicants were allowed to serve.

The Omega staff and the moderators of the forum elected the members of the central committee. The moderators are nine private users who work on a voluntary basis and have been cooperating with Omega for a long time. All applications received for membership on the central committee were presented in the internal moderators' forum. The moderators and the staff quickly agreed on four users who were convincing because of their experienced knowledge about the product and their ability to discuss objectively. From time to time, forum discussions between users become overheated. In such cases, moderators must be able to defuse the tension and focus on the facts. From the Omega team's side, the central committee was complemented by the product manager, the product supervisor, and the quality manager.

The cooperation began with the central committee's kickoff workshop, where all members met in person. At this first meeting, Omega introduced the technical framework, provided the unalterable definitions already established by the developers, and shared the basic concept for the project procedure. The user parliament started working when the first technical preview was published, and the preview version provided a first visual representation.

## **Progress**

The discussions of the user parliament were held in a separate forum where write access was restricted to its members. New entries could be written as text, as text with attachments, or as surveys. The members of the central committee had their own forum, as well, although it was mainly used for making appointments. Central committee members contributed their ideas and opinions to the user parliament forum. Each member of the committee specialized in a certain topic, depending on personal interest. They each took part in discussions and worked as moderators in these areas.

The product manager summarized forum discussions and sent them to the members of the central committee as a basis for the weekly conference call. In these calls, the average duration of which was two hours, previously defined topics were discussed intensively, and decisions were made. The results of every conference call were published in the wiki system. The requirements listed there served as the basis for the requirement specification the developers used to implement the system.

## **Methodology**

We studied the use case both qualitatively and quantitatively. The quantitative analysis was concerned with the participants' forum entries. The gathered data allowed us to make statements about the community itself (e.g., how many users, how many entries), as well as about the participation of individual users with regard to certain topics over a particular period of time. The qualitative analysis included evaluation of the entries in the forum and wiki, as well as of semi-structured interviews conducted with 14 representatives of the different committees. Both users and employees were interviewed: six members of the Omega team, two of whom were members of the central committee, and eight users (four members of the user parliament and four of the central committee).

We interviewed each person twice. The interviews held at the beginning were primarily concerned with the participants' motivation and the conditions for the project. Later interviews targeted possible alterations in the participant's opinion: Did the project meet the expectations and did the attitude toward a CDD process change? The interviews with employees lasted up to 30 minutes, and those with users up to 23 minutes. All of the interviews were recorded for later analysis.

## **Findings**

*Motivation:* The users' motivation for taking part in a CDD process was very high, especially at the beginning of the project. The opportunity to participate in the development process and to

bring in own ideas was considered valuable. About 2,000 entries were written in the first three weeks, and several of them were rather long. After four weeks, the discussions slowed down. Users who contributed had expressed their ideas and were waiting for first results. As soon as the first alpha version was released, the users again got heavily involved. However, of the 70 members of the parliament, only 49 persons participated in the first design process. Only 15 users took part in the project throughout the 8-month process. On the other hand, 30 new participants joined the project and provided regular contributions to discussions after the first prototype was released.

The motivation of staff members to participate in such a project was difficult to access. On the one hand, the management saw great potential, and on the other hand, the developers were quite reserved, especially at the beginning of the project. This same distinction could also be observed in the central committee: While the product manager was the main driving force, the developer participated only occasionally in discussions. From the developer's point of view, the CDD disturbed his usual work. The manager, on the other hand, had been familiar with media center systems for many years and initiated many discussions in the user parliament. Because his ideas often were accepted, he had a strong influence on the design process. This outcome does not contrast with the original concept because as member of the central committee he also was allowed to participate in the discussions of the users' parliament. In fact, the stimulating influence of the manager was observed to be absolutely necessary in structuring the process and addressing every subtopic (including several functionalities, usability, and controlling mechanisms).

### *Technology*

One aspect we regarded as critical already in the starting phase was the technical infrastructure used to support communication. We optimistically expected that users could handle a CDD process that used the existing and familiar infrastructure (forum and wiki). But our results show that the existing infrastructure is insufficient for supporting a highly dynamic process like CDD. The separation of discussion (forum) and functional specification (wiki) resulted in an environment in which both tools were seen as independent instances with different responsibilities. For the members of the central committee, the wiki was the center of reference; for the members of the user parliament, the statements in the forum discussions were regarded as important. Another problem was the presentation of the specifications in one document. Although the wiki has a changelog function, the readability of the specification obviously did not fulfill users' needs. Furthermore, the document contained many images and screenshots so that downloading it took quite a long time, especially for users with a low bandwidth.

### *Organization*

The subdivision of the CDD concept into user parliament and central committee has proven to be suitable in principle. However, members of the user parliament had reservations about the central committee because members of the committee were seen as favored in the direct communication with the development team staff members. Members of the user parliament thought that members of the committee kept information secret or held information back. Concerning these matters, users in the parliament stated that members of the central committee should serve on a rotating basis. Furthermore, making the communication within the committee more transparent would be valuable (e.g., by letting members of the user parliament participate in the weekly telephone conferences in a passive way or by recording the conferences and presenting the results in the online area afterwards). Another suggestion for the early stage of the design process was to use personal group discussions. Both users and representatives from the company were interested in module-oriented, face-to-face workshops. However, the planning of the physical central committee meetings generally was difficult, because of time and travel constraints. Traveling to reach a common meeting point would have been too time-intensive. In the whole process, only two meetings between the members of the central committee took place. Web conferences were, therefore, seen as alternatives to the weekly telephone conference sessions.

Another important aspect is related to a clear separation of the roles and tasks of the members of the central committee. Because everyone was responsible for everything in the first stage of the process, members of the committee asked for a clear role assignment. In the feedback interviews, they recommended that several tasks (e.g., communicating with members of the user parliament, summarizing requirements, or coordinating milestones) should be assigned to committee members so that a clear and transparent assignment of roles is made public, and the members of the user parliament would know who is responsible for a particular task. Such clarity can help to correct misunderstandings faster.

The amount of time for supervision, as well as for the whole process, is a critical issue, too. Especially for the moderators (as representatives for the user), the amount of work became crucial. One of these persons left the commitment during the project, because the personal situation (private and work) did not allow for enough time to invest in the project. Even employees of Omega mentioned that the effort of time to manage the project was much higher than was expected at the beginning of the project. A full-time employee would have been needed just for the communication with the user parliament. The process as a whole was more

time-consuming than traditional software development. The duration of a CDD process cannot be predicted exactly because users assign time for contribution individually. Nearly all the participants of the CDD process mentioned that the time frame for applying the whole project was too short.

### *Satisfaction*

Both users and staff members learned from each other through the CDD process. The user parliament generated a number of ideas, which were gathered and discussed in the central committee. However, the restriction of a virtual discussion space comes with several limitations compared to traditional Participatory Design as described by Bodker et al.<sup>42</sup> The central committee members discussed issues and demands in weekly telephone calls, even though they had their own forum; and, although the conference calls generally lasted about two hours, sometimes ensuring that all voices were heard was difficult. Especially in the requirements phase, mediating between the user parliament and the central committee was challenging. An Omega staff person reflected at the end of the project: "They [the users] come to us very pragmatically with any suggestions and discuss on the basis of any visual scripts, PowerPoint pages, but [they] don't see the results afterwards. [...] Many [of them]...have to see it ..., and we could here not deliver enough [by discussing and defining functionalities and improvements in textual form only]." The comparison of the different reactions to the first prototype is quite interesting. Members of the user parliament were disappointed to a certain degree, while persons from the uninvolved online community gave positive feedback in the public forum. The negative comments by members of the user parliament probably resulted from the fact that the developed prototype could only be a compromise between the different suggestions (as it was defined in the public wiki documentation). Users who participated in the project may have been less satisfied because they invested time and effort making a contribution to the process, and dissatisfaction increases when suggestions offered are not considered. The whole second phase of the project ran more smoothly after the alpha versions were published continuously in intervals of only a few weeks. Because most of the criticisms mentioned were considered, the discussion was less active. After the release of the last two alpha versions, contributions often were limited to the reporting of program errors.

At the end of the study, both users and employees reported appreciating the opportunity to participate. Even though the process of the CDD was problematic at certain points, it was nevertheless "a bigger success [that] the method can apparently work and might work even better for other projects," according to one

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42 Kerl Bødker, Finn Kensing, and Jesper Simonsen, *Participatory IT Design*.

employee. Except for one person, all employees were willing to conduct another CDD, although they would try to solve the now known problems. It was particularly important for them to reserve more time for the project. The users that we interviewed also saw a lot of potential in the concept: According to one member of the user parliament, "User driven development works when certain things are clearly defined, tasks are clearly distributed, the team supports it, and the communication with the users is good."

### Conclusion

In this paper, we explored the involvement of a virtual user community in the whole development process of a software system. Compared to previous work, e.g. from Füller et al.,<sup>43</sup> we introduced the concept of a community-driven software development process, in which participants not only give feedback, but also have the power to influence decisions. The results of the evaluation underline previous work (e.g., members of an online community are able and willing to contribute; fun is an intrinsic motivation to participate; users provide valuable information). But our study also shows that especially the structures of professionalization lead to a power imbalance toward the designers' side, even if it is not intended: What started as a nice leisure activity for the users in the central committee felt like unpaid real work during the project, e.g. what became visible when a moderator left the membership in the central committee. The "work character" of user participation was also illustrated by the demand for explicit and transparent roles for certain tasks, by the perceived need for self-organization among users, and by the efficiency concerns with regard to the technological infrastructure that was used.

Using existing virtual user communities as a starting point for a Participatory Design process seems to be obvious, but the advantages of using an existing discussion culture needs to be exploited carefully. The normal discontinuities of participation in online communities can become a problem when they appear among user representatives in a process model like ours. As a consequence, we would suggest that responsibilities for the user representatives have to be framed according to the concrete use case. Personal interests, varying time to contribute, and different levels of experience may result in an unbalanced reflection of the users' needs. Instead of giving the most engaged users the power of decisions, the more valuable contribution is for them to act as mediators who summarize and reflect the previous results. Such summaries should be linked directly and integrated into the discussion and decision process. At this point, it should be clearly defined which aspects can be decided about by members of the online community (e.g., in the sense of polls as reaction to the

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43 Johann Füller, Michael Bartl, Holger Ernst, and Hans Mühlbacher, "Community Based Innovation: How to Integrate Members of Virtual Communities into New Product Development," *Electronic Commerce Research* 6, no. 1 (2006), 57-73.

summary documents). With respect to duration and the quality of results, the process itself is hard to estimate. Nevertheless, we would advise designers to articulate the framing conditions for a CDD approach in a clear and continuously manner.

Finally, although users may be familiar with general community tools, specialized tool support might increase the quantity of participation, as well as the quality of articulations (e.g., by referring to representations of the technology). While wikis and Web forums are sufficient to run a user community, a participation process demands more specialized technological support (e.g., with respect to references to other parts of the discussion or to design aspects under consideration), even if users are already familiar with the community infrastructure. By providing more flexible tools that run on a meta-level and consider the context of use, we expect a much better integration of the participants' input in the whole design process. When design-time is supported during use-time (e.g., by allowing users to give direct feedback when a problem occurs) — on a tool level as well as on an organizational level — the process of a continuous community-driven development will run more fluidly.

When Ehn distinguished between “design for use before use” and “design for design after design,” he pointed to the challenges professional designers face for the latter case.<sup>44</sup> Our study illustrates the challenges for users in this latter case: Democratic design comes at a cost that is difficult to estimate against the benefit one gets. Our experience with the delegation patterns described suggests that modest redesign goals and shorter redesign cycles, together with a stronger integration of these activities into use practice, could be helpful. This finding complements and concretizes the discussion around the “when” of design-in-use in our notion of “infrastructuring” with the necessary “how.”<sup>45</sup>

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44 Pelle Ehn, Participation in Design Things in *Proceedings of the Tenth Anniversary Conference on Participatory Design 2008*, (Bloomington, Indiana, October 01 - 04, 2008, 2008), Indiana University, Indianapolis, IN, 92-101.

45 Volkmr Pipek, Volker Wulf, Infrastructuring: Towards an Integrated Perspective on the Design and Use of Information Technology, *Journal of the Association of Information System (JAIS)* 10, no. 5 (May 2009): 306-32.