

Guest Editors' Introduction**DESIGN–USE RELATIONSHIPS IN SOCIOTECHNICAL CHANGE**

Sampsa Hyysalo
*Helsinki Collegium for
Advanced Studies
University of Helsinki
Finland*

Mikael Johnson
*Helsinki Institute for
Information Technology
Helsinki University of Technology and
University of Helsinki, Finland*

Eva Heiskanen
*National Consumer Research Centre
Helsinki, Finland*

The last decades have witnessed a significant shift in the orientation towards users in management, design, and innovation research. “Science discovers, technology applies, man conforms,” the motto of the 1933 Chicago World Fair, was for long the received view on the design–use relationship. The linear model of innovation was the norm in textbooks up until the 1980s. Its legacy is still strong. Tens of thousands of large marketing departments in both corporations and universities churn out technologies and research on technologies. In contrast, only a few hundred programs explore what happens with technology after it is purchased and how those events translate back to production. A further twist in this imbalance is that, by far, the most common social science approach to technology focuses on “technology diffusion.” Here, technology is expected to be diffused as is, and the main research methods, such as the diffusion surveys, were until the late 1980s structured so that the practices of using—that is, the local variations and modifications—do not easily come to the fore (Rogers, 1995).

The significance of users in innovation has remained below the radar because of these widely held assumptions. When Eric von Hippel interviewed R&D managers in the 1970s, they were firmly convinced that their products originated in their internal research labs. It was a great surprise to all, for example, that a closer scrutiny revealed that 80% of inventions in medical instruments were in fact initiated by users (von Hippel, 1988).

Today many companies and policy makers argue for a drastic transformation in innovation and design–use relations. Open innovation (Chesbrough, 2003), living labs (Living Labs Europe, n.d.), user innovation communities (von Hippel, 2005), open-source

software, and the proliferation of various user-centered design methods (Beyer & Holtzblatt, 1998; Kuniavsky, 2003) are said to have revolutionized the way innovation takes place.

Two things capture our attention here. First is the “re-invention of novelty” in the recent enthusiasm for users in innovation. The Italian scooter Vespa, VW Beetle, and “Ripple Bonnet” Citroën 2CV clubs were marketed ages ago, and recognized for creating much of the value of these vehicles. Mountain bikes; most modern equipment in surfing, windsurfing, and sailing; environmentally friendly home fixtures, and so on were invented by users, not manufacturers. Tinkering with technology and hacking code are by no means new practices (Ratto, 2003). Influential emancipatory initiatives include the 1950s sociotechnical design approach at the Tavistock Institute in London and the participatory design movement since 1970s. And there always were companies that were quick to get the drift or were founded by user-inventors themselves.

The second noteworthy facet is the relation between the research and events “out there,” in the real world. The previously mentioned user innovation studies by von Hippel were an offshoot of a 1970s debate over whether the science push or the market pull was more important in creating inventions (Freeman, 1979; Pavitt, 1984; von Hippel, 1988, 2005). Another strand of management studies showed that some users make or demand a significant number of modifications. Together, such demands or applications create a great proportion of the eventual economic and practical usefulness of a product, even when they involve only routine engineering (Gardiner & Rothwell, 1985; Leonard, 1995; Rosenberg, 1982; von Hippel, 2005). Such findings were certainly key in laying out the terrain for attempts to tap the innovativeness of users and they reinforced the idea that technically savvy and demanding users are at the core of achieving such benefits (von Hippel & Tyre, 1995).

Meanwhile, in design and computer sciences, research on computer–human interaction and user-centered design has broken into the mainstream, especially under the title of usability (Dix, Finlay, Abowd, & Beale, 2004; Nielsen, 1993). Characteristically, this research has relied on cognitive psychology, human factors, and ergonomics in explaining how humans behave with interfaces and in drawing implications for design improvements (Dix et al., 2004; Sinkkonen, Kuoppala, Parkkinen, & Vastamäki, 2006). Since the late 1980s, recurring attempts have been made to expand the cognitive paradigm and to overcome its limitations in understanding complex interactions (Carroll, 2003), especially in multiuser groupware applications (Grudin, 1994) in the research field of computer-supported cooperative work. In addition to this “turn to the social,” another important development has been a “turn to context” in gathering information on what the users of particular products do by means of observation, interviews, and other kinds of fieldwork (Beyer & Holtzblatt, 1998; Kuniavsky, 2003). Also here, attention to postmarket launch improvements and value creation can be found in the “design for communities” initiatives (Hagel & Armstrong, 1997; Kim, 2000; Preece, 2000), as well as the current Web 2.0 debate (Wikipedia, 2007). The imprint of these lines of research is becoming increasingly visible in how design–use relations are discussed and practiced on company shop floors.

Along these lines of research, social and cultural studies of technology have increasingly been seen as a potential source for insight on technology design and use. While the economic importance of users’ contributions to innovation is increasingly clear, it remains rather unclear how these contributions are made (von Hippel & Tyre, 1995). The processes and practices of designers, users, and various third parties thus need to be understood more in depth than has

been possible with traditional quantitative research designs (Miettinen, Hyysalo, Lehenkari, & Hasu, 2003; Pantzar & Shove, 2005; Williams, Slack, & Stewart, 2005).

The findings from these studies show that usage is more than a matter of adopting or rejecting given technologies. It concerns the very shape of technologies, as users tend to subvert, reinvent, and recontextualize designs. This processual approach to consumption can be illustrated by Igor Kopytoff's concept of "the biographies of things" (Kopytoff, 1986, 66-67). He asks us to consider "the biography of a car in Africa... the way it was acquired... the uses in which the car is regularly put, the identity of its most frequent passengers and of those who borrow it, the frequency of borrowing, the garages to which it is taken... and in the end...the final disposition of its remains. All of these details would reveal an entirely different biography from that of a middle-class American, of a Navajo, or French peasant car" (Kopytoff, 1986, p. 67). Such biographical differences have encompassing significance for design, production, and sales as well.

In turn, studies on the actual practices of product developers have shown that they are indeed active—even if not always very successful or skillful—in preparing for the prospective use and in responding to users' actions. Explicit investigations, such as market research or usability tests, have been shown to be merely one of the means in which future use is represented (Akrich, 1995; Hasu, 2001; Hyysalo, 2004; Oudshoorn, Rommes, & Stienstra, 2004; Woolgar, 1991). The relationships between design and use are critical in the creation of the economic and societal impact of new technology. Often various forms of social learning—learning about the appropriate functions, form, uses, values, styles, and so on, of products or concepts—between stakeholders play a key role at this (Williams et al., 2005). However, the prevailing models of innovation and technology policy still foster somewhat more rigid and linear views of what constitutes "designing," "using," or "regulating" within the various venues and times in the life-span of new technology. In contrast to the "received" innovation models, our emerging understanding of actual design practice forces us to reopen the question regarding the actual roles played by product developers, consumers, citizens, activists, and government officials (Sorensen & Williams, 2002).

This special issue of *Human Technology* hopes to foster multidisciplinary discussion that refines our understanding of how technology is shaped in the different phases of its existence. The issue grew out of a track of papers in the international "Innovation Pressure" conference, held in Tampere, Finland, in March 2006. Examples of the questions that we set out for the conferences and this special issue were:

- How is use anticipated and "designed in" during product development?
From where and how do designers draw their understandings? How realistic (or fluid) are these conceptions? What are the possibilities and limits of user involvement? To what extent does prior design determine the eventual use?
- What is "using" and how does it affect design?
What happens when people appropriate technologies? How do technologies, people, and organizations shape one another? Is "the critical and active consumer" merely a fashionable slogan?
- How should the models of technological change, innovation, and consumption be refined?
Is there an overemphasis on design in most current models of innovation and, if so, in which ways? How should we conceptualize social learning between producers,

various users, and regulators to inform the development of better technologies? What methodological questions become salient in studying design–use relationships?

To our satisfaction many of these concerns are indeed addressed by the papers in this special issue. In the first article, Mikael Johnson considers the design–use relationships of the on-line chat and game environment Habbo Hotel. A literature review delineates different approaches toward the user in design: users as social actors, as participants, and as configured users. Through examining one developer’s use of a figure of speech, the “average user,” Johnson aims to create an understanding about the practices of categorization in design. A qualitative analysis illustrates not only the meaning of the “average user,” but also the work that both the developer and the category do. The analysis highlights the developers’ role in balancing and governing different users’ interests. In comparison with the many other product development contexts in this special issue, the Habbo Hotel developers have the benefit of easy access to users and use practices: They can log in to the hotel and observe the action, or read what the users write on on-line discussion forums.

In the second article, Tanja Kotro presents a particular and interesting form of user involvement in design—one in which the designers employed by the company are also long-term and enthusiastic users of the products. Through their engagement in sports communities, these designers develop “hobbyist knowing,” that is, a practice of making sense of the user context through participation in the relevant social and physical environments. Such hobbyist knowing allows designers to translate the values and ideals of user communities into the product development process. Kotro compares hobbyism within the company with other forms of user involvement and concludes that, through the ongoing nature of participation and the types of tacit knowledge developed, hobbyists are able to develop a long-term relation to the intended contexts of use of the product.

Eva Heiskanen and Petteri Repo examine the effectiveness of a set of interventions aimed at enhancing user involvement in small entrepreneurial companies. This article analyzes the capacity of designers and their superiors to make sense of “users” and “use” and to enact changes. They explore these issues within a framework of action rationality, which refers to a biased, action-oriented but effective mode of managerial behavior that is typical to entrepreneurs. They conclude that direct, face-to-face interaction serves a number of purposes for companies in learning about their users. Yet there are limits to user participation that cannot be overcome merely through increased awareness or short-term interventions.

Next, Hannele Hyppönen examines the roles of customers, users, and technology providers in the integration of ICT into healthcare services. The aim of the study is to develop a conceptualization that would allow future practitioners to be more successful in achieving their goals. On the basis of two case studies on eHealth codevelopment cycles, Hyppönen develops a conceptualization that reveals a lack of coordination and balance between different objects of development: the development of the service and that of the technology. The conceptualization directs attention toward the need to analyze and learn from the practices in which the technologies are to be implemented, and to build a balanced network of actors who have adequate knowledge about the technology, the service, and the use of both.

We then move to examine in more depth what constitutes technology usage. Christie and Verran examine the complexities in how DVD technology is viewed and applied by indigenous Australians. Aboriginal Australian peoples’ ontologies and epistemologies regarding teaching and learning are grounded in perspectives that every lesson is unique

performance of knowledge, while contemporary Western technologies create a definitive representation of events and knowledge. These contractions of use of the DVD technology continue to be explored as a means for the Aboriginal leaders to pass on essential historical and social information to their peoples, as well as to make clear statements of ownership, history, and communal significance of Aboriginal lands when dealing with representatives of mainstream Australia. Christie and Verran elaborate how the necessary (re)designing-in-use hangs in a delicate balance between assisting to undo some the capacities of the technologies to represent, while retaining just enough for them to remain appropriate in the knowledge practices in question.

Finally, Hyysalo provides a literature review of what technology use is seen to consist of in the light of ethnographies of work and consumption. He then examines how a novel medical alarm and monitoring appliance was appropriated in the work of home-care nurses and in the everyday living of elderly people. Analysis shows that these technically unsavvy users shape technology considerably by various, even if mundane, acts of adapting it materially and by attributing different meanings to it. The paper argues further that the full significance of these modifications and meanings becomes visible only when they are interrelated and mapped with different versions of technology that are enacted in de facto practices of its users.

Even the limited number of in-depth studies on design–use relations presented in this issue highlight the diversity of contexts in which both design and use can occur. Yet the studies, taken together, point out that we indeed should revise our understanding of design and perceive of it more as a situated and relational activity. All of these cases further highlight the differences and significance of the multifaceted contexts within which the relations between designers and users take place. It matters greatly how removed from each other design and use are situationally and culturally and what kinds of intermediaries and mediators there are to bridge these differences.

Many of the articles draw attention to various ways of learning about the usually distinct priorities and rationales of various stakeholder groups as a prerequisite of success. But such learning tends to take place alongside more pressing concerns and priorities, regardless of whether one looks at designers or at users. Actions crucial to the evolvement of desirable technology appear somewhat fragile by their very nature. Thus, more is needed than merely demanding that designers subscribe to more apt values or keep pace with latest knowledge from cognitive science or with cutting edge requirements gathering techniques in their work.

The term user is also rendered problematic. When the perspective is shifted to users-in-context and to the relationality of users, new concepts such as “everyday informatics,” “work and life projects,” and users as “doers” emerge to challenge the passive concept of users as recipients of or merely operating a technology. This perspective questions established categories in usability engineering: The usefulness, utility, and usability of a technology do not appear to be intrinsic properties of the artifacts or measures of fit to their eventual user base. Rather, usability and utility appear as achievements that evolve over time so that parts of them are done by designers, parts by users, and parts by various third parties that maintain, configure and sanction (and reward) the use of the technology (cf. McLaughlin, Rosen, Skinner, & Webster, 1999; Williams et al., 2005).

These observations carry practical implications: Attempts to intervene in the design–use relations by initiating codesign processes require sensitivity to the context and process and are by no means limited to the early stages of development or to formal R&D organizations.

We challenge the readers of this issue to open up their perceptiveness to the diversity of design–use relations that exist, and their imaginations to the diversity of interventional modes and strategies that could serve to enhance the relations between design and use.

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Authors' Note

All correspondence should be addressed to:
Sampsa Hyysalo
Helsinki Collegium for Advanced Studies
PO Box 4
FIN-00014 University of Helsinki, Finland.
sampsa.hyysalo@helsinki.fi
Phone +358 9191 23460
Fax +358 9191 24509

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