Introduction

How Users and Non-Users Matter

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New uses are always being found for familiar technologies. Sometimes these changes in use are dramatic and unexpected. Before September 11, 2001, no one foresaw that an airliner could be turned by a small number of its occupants into a giant Molotov cocktail. After the Gulf War of 1991, it was discovered that an effective way to put out oil-rig fires was to strap down captured Mig jet fighters and blow out the fires using their exhaust. Such examples remind us that we can never take the use of a technology for granted.

Susan Douglas (1987) has pointed out how amateur operators discovered new uses to which the emerging technology of radio could be put, and how commercial operators soon followed the amateurs' lead. Claud Fischer (1992) and Michele Martin (1991) have drawn attention to the use of the telephone by rural women to overcome their isolation—a use not foreseen by telephone companies, which conceived of the telephone mainly as a business instrument.

Our concern in this book is with the role of users in the development of technology in general. We are interested in how users consume, modify, domesticate, design, reconfigure, and resist technologies. In short, our interest is in whatever users do with technology.

There is no one correct use for a technology. "What is an alarm clock for?" we might ask. "To wake us up in the morning," we might answer. But just begin to list all the uses to which an alarm clock can be put and you see the problem. An alarm clock can be worn as a political statement by a rapper; it can be used to make a sound on a Pink Floyd recording; it can be used to evoke laughter, as Mr. Bean does in one of his comic sketches as he tries to drown his alarm clock in his bedside water pitcher; it can be used to trigger a bomb; and, yes, it can be used to wake us up. No doubt there are many more uses. Of course, there may be one dominant use of a technology, or a prescribed use, or a use that confirms the

manufacturer's warranty, but there is no one essential use that can be deduced from the artifact itself. This is an axiomatic assumption for the scholars whose work we collect here. All the contributors follow the research path of studying technologies in their "context of use"—the society and the web of other artifacts within which technologies are always embedded. In short, we look at how technologies are actually used in practice.

In addition to studying what users do with technology, we are interested in what technologies do to users. Users of technologies do not arrive de novo. Think of the camera. When George Eastman developed his revolutionary new technology of roll film and a cheap camera, he had one outstanding problem: There were as yet no users for it. Photography was seen as a high-end activity practiced by a small group of skilled professionals. Eastman had to define explicitly who the new users might be, and he had to figure out how to recruit them to his new technology. He had to redefine photography and the camera. After he did, photography became something that anyone could participate in, and cameras became usable by all (Jenkins 1975). Working out who the new users are and how they will actually interact with a new technology is a problem familiar to many innovators of new technologies. Some fields, including information technology, are particularly cognizant of the problem of users. It has long been recognized that the most sophisticated and complex computer hardware and software will come to naught if users don't known how to use them. Studies of human-computer interaction, of work practices, and of user interfaces are often carried out by the computer industry, and they have become important not only for that industry but also for developing new ideas of how the user-technology nexus should be conceptualized (Suchman 1994; Woolgar 1991).

One important research question addressed in this book is how users are defined and by whom. For instance, are users to be conceived of as isolated autonomous consumers, or as self-conscious groups? How do designers think of users? Who speaks for them, and how? Are users an important new political group, or a new form of social movement? In short, what general lessons are to be drawn from a renewed focus on users in today's technologically mediated societies?

Different Approaches to Users

Users and technology are too often viewed as separate objects of research. This book looks for connections between the two spheres.

Users and technology are seen as two sides of the same problem—as co-constructed. The aim is to present studies of the co-construction of users and technologies that go beyond technological determinist views of technology and essentialist views of users' identities.

In this introduction we discuss several influential approaches to user-technology relations,[1] focusing in particular on the conceptual vocabulary developed within the different approaches and on the similarities and differences between them.

The SCOT Approach: Users as Agents of Technological Change

In the 1980s and the 1990s, the old view of users as passive consumers of technology was largely replaced in some areas of technology studies, and along with it the linear model of technological innovation and diffusion. One of the first approaches to draw attention to users was the social construction of technology (SCOT) approach.

Pinch and Bijker (1984), in defining the SCOT approach, conceived of users as a social group that played a part in the construction of a technology. Different social groups, they noted, could construct radically different meanings of a technology. This came to be known as a technology's interpretive flexibility. In a well-known study of the development of the bicycle, it was argued that elderly men and women gave a new meaning to the high-wheeled bicycle as the "unsafe" bicycle, and that this helped pave the way for the development of the safety bicycle. The SCOT approach specifies a number of closure mechanisms—social processes whereby interpretative flexibility is curtailed. Eventually, a technology stabilizes, interpretative flexibility vanishes, and a predominant meaning and a predominant use emerge (Bijker and Pinch 1987; Bijker 1995). The connection between designers and users was made more explicit with the notion of a technological frame (Bijker 1995). Users and designers could be said to share a technological frame associated with a particular technology.

Many of the classic SCOT studies were of the early stages of technologies. For example, there were studies of how the bicycle, fluorescent lighting, and Bakelite moved from interpretative flexibility to stability. Early on, social groups were seen as the shaping agents. Not until later, with notions such as that of sociotechnical ensembles, did SCOT fully embrace the idea of the co-construction or mutual shaping of social groups and technologies (Bijker 1995b). The SCOT approach was rightly criticized for its rather cavalier attitude toward users—it closed down the problem of users too early, and it did not show how users could actively

modify stable technologies (Mackay and Gillespie 1992). Kline and Pinch (1996) remedied this with their study of how a stable technology, the Model T automobile, could be appropriated and redesigned by groups such as farmers who used cars as stationary power sources. Kline and Pinch referred to such users as "agents of technological change." Also attempting to correct SCOT's neglect of gender, Kline and Pinch argued that users should be studied as a crucial location where often-contradictory gender identities and power relationships were woven around technologies. Bijker (1995) argued for a semiotic conception of power whereby power is embedded and mediated by artifacts as well as by frames and social groups. However, this semiotic notion of power (like most semiotic approaches within technology studies) seems inevitably to leave out invisible actors and social groups, which in the SCOT approach might be termed "non-relevant social groups."

Feminist Approaches: Diversity and Power

Feminist scholars have played a leading role in drawing attention to users. Their interest in users reflects concerns about the potential problematic consequences of technologies for women and about the absence of women in historical accounts of technology. Since the mid 1980s, feminist historians have pointed to the neglect of women's role in the development of technology. Because women were historically underrepresented as innovators of technology, and because historians of technology often focused exclusively on the design and production of technologies, the history of technology came to be dominated by stories about men and their machines. Moreover, these stories represented a discourse in which gender was invisible. Historians did not consider it relevant in settings where women were absent, thus reinforcing the view that men had no gender.[2] Feminist historians suggested that focusing on users and use rather than on engineers and design would enable historians to go beyond histories of men inventing and mastering technology (Wajcman 1991; Lerman et al. 1997). In response to this criticism, users were gradually included in the research agenda of historians of technology.[3] This "turn to the users" can be traced back to Ruth Schwartz Cowan's exemplary research on user-technology relations. In the late 1970s, Cowan brought the fields of history of technology and women's history together, emphasizing that women as users of technology perceive technological change in significantly different ways from men (Pursell 2001). Cowan's notion of "the consumption junction," defined as "the place and time at which the consumer makes choices between competing technologies" (Cowan 1987: 263), was a landmark. Cowan argued that focusing on the consumer and on the network relations in which the consumer is embedded enables historians and sociologists of technology to improve their understanding of the unintended consequences of technologies in the hands of users. Focusing on users would enrich the history of technology with a better understanding of the successes and failures of technologies (ibid.: 279). In contrast to actor-network theory (which we will discuss below), Cowan urged historians and sociologists of technology to choose the user, rather than the artifact or the technologist, as a point of departure in network analyses of technology, and to look at networks from the consumer's point of view (ibid.: 262). The scholarship that Cowan inspired rejects the idea that science and technology begin or end with the actions of scientists and engineers. Scholars in the field of Science and Technology Studies (STS) were urged to follow technologies all the way to the users (Rapp 1998: 48). An exemplary study is Cynthia Cockburn and Susan Ormrod's 1993 book on the microwave oven in the United Kingdom, which analyzes the design, the production, and the marketing as well as the use of a new technology.

Gender studies, like technology studies in general, reflect a shift in the conceptualization of users from passive recipients to active participants. In the early feminist literature, women's relation to technology had been conceptualized predominantly in terms of victims of technology. The scholarship of the last two decades, however, has emphasized women's active role in the appropriation of technology. This shift in emphasis was explicitly articulated in the first feminist collection of historical research on technology, *Dynamos and Virgins Revisited* (Trescott 1979), which included a section on "women as active participants in technological change" (Lerman et al. 1997: 11). The authors of the essays in that section argued that feminists should go beyond representations of women as essentially passive with respect to technology. Having accepted that challenge, feminist historians, anthropologists, and sociologists have published numerous accounts of how women shape and negotiate meanings and practices in technology, including studies of the relationship between reproductive technologies and women's health and autonomy,[4] of the gendered medicalization of bodies,[5] of women's relations to computers and the impact of computer technologies on women's work,[6] of the consequences of household technologies for women's lives,[7] and of the exclusion of women from technologies.[8] Granting agency to users, particularly women, can thus be considered central to the feminist approach to user-technology relations.

Another important concept in feminist studies of technology is diversity. As Cowan (1987) suggested, users come in many different shapes and sizes. Medical technologies, for example, have a wide variety of users, including patients, health professionals, hospital administrators, nurses, and patients' families. "Who is the user?" is far from a trivial question. The very act of identifying specific individuals or groups as users may facilitate or constrain the actual roles of specific groups of users in shaping the development and use of technologies. Different groups involved in the design of technologies may have different views of who the user might or should be, and these different groups may mobilize different resources to inscribe their views in the design of technical objects (Oudshoorn et al., forthcoming). And these different type of users don't necessarily imply homogeneous categories. Gender, age, socio-economic, and ethnic differences among users may all be relevant. Because of this heterogeneity, not all users will have the same position in relation to a specific technology. For some users, the room for maneuvering will be great; for others, it will be very slight. Feminist sociologists thus emphasize the diversity of users and encourage scholars to pay attention to differences in power relations among the actors involved in the development of technology.

To capture the diversity of users[9] and the power relations between users and other actors in technological development, feminist sociologists have differentiated "end users," "lay end users," and "implicated actors." End users are "those individuals and groups who are affected downstream by products of technological innovation" (Casper and Clarke 1998). The term "lay end users" was introduced to highlight some end users' relative exclusion from expert discourse (Saetnan et al. 2000: 16). Implicated actors are "those silent or not present but affected by the action" (Clarke 1998: 267). And there are two categories of implicated actors: "those not physically present but who are discursively constructed and targeted by others" and "those who are physically present but who are generally silenced/ignored/made invisible by those in power" (Clarke, forthcoming).[10] All three terms reflect the long-standing feminist concern with the potential problematic consequences of technologies for women and include an explicit political agenda: the aim of feminist studies is to increase women's autonomy and their influence on technological development. A detailed understanding of how women as "end users" or "implicated actors" matter in technological development may provide information that will be useful in the empowerment of women or of spokespersons for them, such as social movements and consumer groups.

The concept of the implicated actor also reflects a critical departure from actor-network approaches in technology studies. Feminists have criticized the sociology of technology, particularly actor-network theory, for the almost exclusive attention it gives to experts and producers and for the preference it gives to design and innovation in understanding socio-technical change.[11] This "executive approach" pays less attention to non-standard positions, including women's voices (Star 1991; Clarke and Montini 1993: 45; Clarke 1998: 267).[12] Moreover, the "executive approach" implicitly assumes a specific type of power relations between users and designers in which designers are represented as powerful and users as disempowered relative to the experts. Feminist sociologists suggest that the distribution of power among the multiple actors involved in socio-technical networks should be approached as an empirical question (Lie and Sørensen 1996: 4, 5; Clarke 1998: 267; Oudshoorn et al., forthcoming). Thus, the notion of the implicated actor was introduced to avoid silencing invisible actors and actants and to include power relations explicitly in the analysis of user-expert relations.[13]

Another important word in the feminist vocabulary is "cyborg." Donna Haraway was the first to use this word to describe how by the late twentieth century humans had become so thoroughly and radically merged and fused with technologies that the boundaries between the human and the technological are no longer impermeable. The cyborg implies a very specific configuration of user-technology relations in which the user emerges as a hybrid of machine and organisms in fiction and as lived experience. Most important, Haraway introduced the cyborg figure as a politicized entity. Cyborg analyses aim to go beyond the deconstruction of technological discourses. On page 149 of her "Cyborg Manifesto" (1985), Haraway invites us to "question that which is taken as 'natural' and 'normal' in hierarchic social relations." Haraway writes of cyborgs not to celebrate the fusion of humans and technology, but to subvert and displace meanings in order to create alternative views, languages, and practices of technosciences and hybrid subjects.[14] In the 1990s, the concept of the cyborg resulted in an extensive body of literature that described the constitution and transformation of physical bodies and identities through technological practices.[15]

Semiotic Approaches to Users: Configuration and Script

An important new approach to user-technology relations was introduced by STS scholars who extended semiotics, the study of how meanings are built, from signs to things. The concept of "configuring the

user" is central to this approach. Exploring the metaphor of machine as text, Steve Woolgar (1991: 60) introduced the notion of the user as reader to emphasize the interpretive flexibility of technological objects and the processes that delimit this flexibility. Although the interpretative flexibility of technologies and questions concerning the closure or stabilization of technology had already been addressed in the SCOT approach, Woolgar focused on the design processes that delimit the flexibility of machines rather than on the negotiations between relevant social groups. He suggested that how users "read" machines is constrained because the design and the production of machines entails a process of configuring the user. For Woolgar, "configuring" is the process of "defining the identity of putative users, and setting constraints upon their likely future actions" (ibid.: 59). He describes the testing of a new range of microcomputers as "a struggle to configure (that is to define, enable, and constrain) the user," a struggle that results in "a machine that encourages only specific forms of access and use" (ibid.: 69, 89). In this approach, the testing phase of a technology is portrayed as an important location in which to study the co-construction of technologies and users. In contrast to the approaches discussed thus far, this semiotic approach draws attention to users as represented by designers rather than to users as individuals or groups involved or implicated in technological innovation.

In recent debates, the notion of the configuration of users by designers has been extended to better capture the complexities of designer-user relations. Several authors criticized Woolgar for describing configuration as a one-way process in which the power to shape technological development is attributed only to experts in design organizations. For example, Mackay et al. (2000: 752) suggested that "designers configure users, but designers in turn, are configured by both users and their own organizations," and that this is increasingly the case in situations where designer-user relations are formalized by contractual arrangements (ibid.: 744). The capacity of designers to configure users can be further constrained by powerful groups within organizations that direct design projects. In large organizations, designers usually have to follow specific organizational methods or procedures that constrain design practices (ibid.: 741, 742, 744; Oudshoorn et al. 2003). In many companies in the information and communication technologies sector, for example, designers are allowed to test prototypes of new products only among people who work in the organization. In this highly competitive sector, companies are reluctant to test new products among

wider groups of users for fear that other firms will become aware of their plans at an early phase of product development (European Commission 1998: 22; Oudshoorn et al. 2003).

Another criticism and extension of the configuration approach was introduced by scholars who questioned who was doing the configuration work. In Woolgar's studies, configuration work was restricted to the activities of actors within the company who produced the computers. Several authors broadened this rather narrow view of configuration to include other actors and to draw attention to the configuration work carried out by journalists, public-sector agencies, policy makers, and social movements acting as spokespersons for users (van Kammen 2000a; van Kammen, this volume; Epstein, this volume; Parthasarathy, this volume; Oudshoorn 1999; Rommes 2002). Other scholars attempted to broaden the scope of the analysis by including the agency of users. Whereas Woolgar explored the metaphor of machine and text to highlight "encoding," thus focusing attention on the work performed by the producers of texts and machines, a more symmetrical use of the metaphor requires that we also focus on the processes of "decoding," the work done by readers and users to interpret texts and machines (Mackay et al. 2000: 739, 750, 752). A similar criticism of the asymmetry of Woolgar's work was voiced by scholars who had adopted domestication approaches to technology.

A second central notion in the semiotic approaches to user-technology relations is the concept of script. Madeleine Akrich and Bruno Latour, in theorizing relationships between users and technology, use this term to describe the obduracy of objects. The concept of script tries to capture how technological objects enable or constrain human relations as well as relationships between people and things. Comparing technologies to film, Akrich (1992: 208) suggested that "like a film script, technical objects define a framework of action together with the actors and the space in which they are supposed to act." To explain how scripts of technological objects emerge, she drew attention to the design of technologies. Akrich suggested that in the design phase technologists anticipate the interests, skills, motives, and behavior of future users. Subsequently, these representations of users become materialized into the design of the new product. As a result, technologies contain a script (or scenario): they attribute and delegate specific competencies, actions, and responsibilities to users and technological artifacts. Technological objects may thus create new "geographies of responsibilities" or transform or reinforce existing ones (ibid.: 207, 208). Rooted in actor-network theory, Akrich and Latour's work challenges social constructivist approaches in which

only people are given the status of actors.[16] The script approach aims to describe how technical objects "participate in building heterogeneous networks that bring together actants of all types and sizes, whether humans or nonhumans" (ibid.: 206).

In the 1990s, feminist scholars extended the script approach to include the gender aspects of technological innovation. Adopting the view that technological innovation requires a renegotiation of gender relations and an articulation and performance of gender identities, Dutch and Norwegian feminists introduced the concept of genderscript to capture all the work involved in the inscription and de-inscription of representations of masculinities and femininities in technological artifacts (Berg and Lie 1993; Hubak 1996; van Oost 1995; van Oost, this volume; Oudshoorn 1996; Oudshoorn et al. 2003; Oudshoorn et al., forthcoming; Rommes et al. 1999; Spilkner and Sørensen 2000). This scholarship emphasizes the importance of studying the inscription of gender into artifacts to improve our understanding of how technologies invite or inhibit specific performances of gender identities and relations. Technologies are represented as objects of identity projects—objects that may stabilize or de-stabilize hegemonic representations of gender (Oudshoorn, this volume; Saetnan et al. 2000). Equally important, the genderscript approach drastically redefines the exclusion of specific groups of people from technological domains and activities. Whereas policy makers and researchers have defined the problem largely in terms of deficiencies of users, genderscript studies draw attention to the design of technologies (Oudshoorn 1996; Oudshoorn et al., forthcoming; Rommes et al. 1999; Rommes 2002). These studies make visible how specific practices of configuring the user may lead to the exclusion of specific users.[17]

At first glance, the script approach seems to be very similar to Woolgar's approach of configuring the user, since both approaches are concerned with understanding how designers inscribe their views of users and use in technological objects. A closer look, however, reveals important differences. Although both approaches deal with technological objects and designers, the script approach makes users more visible as active participants in technological development. Akrich in particular is very much aware that a focus on how technological objects constrain the ways in which people relate to things and to one another can be easily misunderstood as a technological determinist view that represents designers as active and users as passive. To avoid this misreading, she emphasizes the reciprocal relationship between objects and subjects and explicitly addresses the question of the agency of users (Akrich 1992: 207). Although technological objects can define the relationships between human and nonhuman actors, Akrich suggests that "this geography is open to question and may be resisted" (ibid.). To avoid technological determinism, Akrich urges us to analyze the negotiations between designers and users and concludes that "we cannot be satisfied methodologically with the designer's or user's point of view alone. Instead we have to go back and forth continually between the designer and the user, between the designer's projected users and the real users, between the world inscribed in the object and the world described by its displacement" (ibid.: 209).

To further capture the active role of users in shaping their relationships to technical objects, Akrich and Latour have introduced the concepts of subscription, de-inscription, and antiprogram. "Antiprogram" refers to the users' program of action that is in conflict with the designers' program (or vice versa). "Subscription" or "de-inscription" is used to describe the reactions of human (and nonhuman) actors to "what is prescribed and proscribed to them" and refers respectively to the extent to which they underwrite or reject and renegotiate the prescriptions (Akrich and Latour 1992: 261). In contrast to Woolgar's work on configuring the user, script analyses thus conceptualize both designers and users as active agents in the development of technology. However, compared to domestication theory, the script approach gives more weight to the world of designers and technological objects. The world of users, particularly the cultural and social processes that facilitate or constrain the emergence of users' antiprograms, remains largely unexplored by actor-network approaches. More recently, this imbalance has been repaired to an extent by the work of scholars who have extended actor-network theory to include the study of "subject networks." These studies aim to understand the "attachment" between people and things, particularly but not exclusively between disabled people and assistive technologies, and to explore how technologies work to articulate subjectivities (Callon and Rabeharisoa 1999; Moser 2000; Moser and Law 1998, 2001).[18] This scholarship conceptualizes subjects in the same way as actor-network theorists previously approached objects. Subject positions such as disability and ability are constituted as effects of actor networks and hybrid collectives.[19]

Cultural and Media Studies: Consumption and Domestication

In contrast to the approaches to user-technology relations we have discussed thus far, scholars in the fields of cultural and media studies acknowledged the importance of studying users from the very beginning.

Whereas historians and sociologists of technology have chosen technology as their major topic of analysis, those who do cultural and media studies have focused primarily on users and consumers. Their central thesis is that technologies must be culturally appropriated to become functional.[20] This scholarship draws inspiration from Bourdieu's (1984) suggestion that consumption has become more important in the political economy of late modernity. Consequently, human relations and identities are increasingly defined in relation to consumption rather than production. In his study of differences in consumption patterns among social classes, Bourdieu defined consumption as a cultural and material activity and argued that the cultural appropriation of consumer goods depends on the "cultural capital" of people (ibid.).[21] This view can be traced back to the tradition of the anthropological study of material culture, most notably the work of Mary Douglas and Baron Isherwood (1979). Among the first to criticize the view (then dominant among consumption theorists) that consumption is merely an economic activity, they suggested that consumption is always a cultural as well as an economic phenomenon (Lury 1996: 10). Describing the use of consumer goods in ritual processes, they defined consumer culture as a specific form of material culture, and they conceptualized the circulation of material things as a system of symbolic exchange. This scholarship articulates the importance of the sign value rather than the utility value of things. From this perspective, material things can act as sources and markers of social relations and can shape and create social identities (Lury 1996: 10, 12, 14; Douglas and Isherwood 1979; McKracken 1988; Appadurai 1986).

Feminist historians have also been important actors in signaling the relevance of studying consumption rather than production (McGaw 1982). Feminists have long been aware of the conventional association and structural relations of women with consumption as a consequence of their role in the household and as objects in the commodity-exchange system (de Grazia 1996: 7).[22] Whereas early feminist studies focused on the (negative) consequences of mass consumption for women, more recent studies address the question of whether women have been empowered by access to consumer goods. They conceptualize consumption as a site for the performance of gender and other identities.[23] The notion of consumption as a status and identity project was elaborated further by Jean Baudrillard (1988), who criticizes the view that the needs of consumers are dictated, manipulated, and fully controlled by the modern capitalist marketplace and by producers. Theodor

Adorno, Herbert Marcuse, and Max Horkheimer of the Frankfurt School had argued that the expansion of the production of consumer goods throughout the twentieth century had resulted in an increase in ideological control and manipulation by the "culture industries" (Adorno 1991; Horkheimer and Adorno 1979; Marcuse 1964).[24] Since the 1970s, this view of consumption as manipulation had resulted in a literature dominated by studies oriented toward production and marketing—studies that highlighted big companies and advertising agencies as the forces driving consumption. In these studies, consumption was characterized as a passive and adaptive process and consumers are represented as the anonymous buyers and victims of mass production.[25] In contrast, Baudrillard emphasized the mutual dependencies between production and consumption and suggested that consumers are not passive victims but active agents in shaping consumption, social relations, and identities.

Cultural and media studies also emphasize the creative freedom of users to "make culture" in the practice of consumption as well as their dependence on the cultural industries, not because they control consumers but because they provide the means and the conditions of cultural creativity (Storey 1999: xi). This scholarship portrays consumers as "cultural experts" who appropriate consumer goods to perform identities, which may transgress established social divisions (du Gay et al. 1997: 104; Chambers 1985).

Semiotic approaches to analyzing user-technology relations also came to the fore in cultural and media studies. Stuart Hall, one of the leading scholars in this field, introduced the "encoding/decoding" model of media consumption (Hall 1973), which aims to capture both the structuring role of the media in "setting agendas and providing cultural categories and frameworks" and the notion of the "active viewer, who makes meaning from signs and symbols that the media provide" (Morley 1995: 300). Since the 1980s, the symbolic and communicative character of consumption has been studied extensively by scholars in the fields of cultural and media studies. Consumption fulfills a wide range of social and personal aims and serves to articulate who we are or who we would like to be; it may provide symbolic means of creating and establishing friendship and celebrating success; it may serve to produce certain lifestyles; it may provide the material for daydreams; it may be used to articulate social difference and social distinctions (Bocock 1993; du Gay et al. 1997; Lie and Sørensen 1996; Mackay 1997; Miller 1995; Storey 1999). Cultural and media studies thus articulate a perspective on user-technology relations

that emphasizes the role of technological objects in creating and shaping social identities, social life, and culture at large.[26]

Roger Silverstone coined the term "domestication" to describe how the integration of technological objects into daily life involves "a taming of the wild and a cultivation of the tame." New technologies have to be transformed from "unfamiliar, exciting, and possible threatening things" into familiar objects embedded in the culture of society and the practices and routines of everyday life (Silverstone and Hirsch 1992; Lie and Sørensen 1996). Domestication processes include symbolic work, in which people create symbolic meanings of artifacts and adopt or transform the meanings inscribed in the technology; practical work, in which users develop a pattern of use to integrate artifacts into their daily routines; and cognitive work, which includes learning about artifacts (Lie and Sørensen 1996: 10; Sørensen et al. 2000). In this approach, domestication is defined as a dual process in which both technical objects and people may change. The use of technological objects may change the form and the practical and symbolic functions of artifacts, and it may enable or constrain performances of identities and negotiations of status and social positions (Silverstone et al. 1989; Lie and Sørensen 1996).[27] The notion of domestication also reflects a preference for studying the use of technology in a specific location: the home. British scholars in this tradition have largely restricted their analyses to the household and the politics of family life (Silverstone 1989, 1992). In their work, processes of domestication are understood in terms of the "dynamics of the household's moral economy" (Silverstone, Hirsch, and Morley 1992). More recently, Norwegian scholars have extended the scope of research to other domains. Merete Lie and Knut Sørensen (1996: 13, 17) argue that the domestication of technical objects has been too easily associated with the "private sector" (meaning the home).[28] Various chapters in the volume edited by Lie and Sørensen show how similar processes are taking place in work, in leisure, and within subcultures.

Domestication approaches have enriched our understanding of user-technology relations by elaborating the processes involved in consumption. In *Consuming Technologies*, Roger Silverstone and his colleagues specify four phases of domestication: appropriation, objectification, incorporation, and conversion. Appropriation occurs when a technical product or service is sold and individuals or households become its owners (Silverstone et al. 1992: 21). In objectification, processes of display reveal the norms and principles of the "household's sense of itself and its place in the world" (ibid.: 22). Incorporation occurs when technological

objects are used in and incorporated into the routines of daily life. "Conversion" is used to describe the processes in which the use of technological objects shape relationships between users and people outside the household (ibid.: 25). In this process, artifacts become tools for making status claims and for expressing a specific lifestyle to neighbors, colleagues, family, and friends (Silverstone and Haddon 1996: 46).

Although at first sight "domestication" and "decoding" or "de-inscription" may seem synonymous, there is an important difference. By specifying the processes involved in the diffusion and the use of technology, domestication approaches take the dynamics of the world of users as their point of departure. The concepts of decoding and de-inscription, on the other hand, give priority to the design context in order to understand the emergence of user-technology relations. Domestication approaches thus emphasize the complex cultural dynamics in which users appropriate technologies (ibid.: 52). This contrasts with semiotic approaches that tend to define the user as an isolated individual whose relationship to technology is restricted to technical interactions with artifacts.[29] As Silverstone and Haddon suggest, a focus on how designers configure the user runs the risk of reifying the innovator's conceptions of users. In contrast, domestication approaches conceptualize the user as a part of a much broader set of relations than user-machine interactions, including social, cultural, and economic aspects. By employing cultural approaches to understand user-technology relations, this scholarship aims to go beyond a rhetoric of designers' being in control. Semiotic approaches tend to reinforce the view that technological innovation and diffusion are successful only if designers are able to control the future actions of users. Although semiotic approaches have introduced notions that are useful in understanding the worlds of designers and users, "script" and "configuring the user" conceptualize the successes and failures of technologies mainly in terms of the extent to which designers adequately anticipate users' skills and behavior. In this view, users tend to be degraded to objects of innovators' strategies. The semiotic approaches have therefore been criticized for staying too close to the old linear model of technological innovation[30] and diffusion, which prioritizes the agency of designers and producers over the agency of users[31] and other actors involved in technological innovation (Oudshoorn 1999). Even the concept of antiprogram, introduced by Akrich and Latour to describe how users may try to counter the original intentions of the design of the artifact, remains within the rhetoric of designer's control (Sørensen 1994: 5). The only option available to the user seems

to be to adopt or to reject the designers' intended use and meaning of technological objects. These approaches are inadequate to understand the full dynamics of technological innovation where users invent completely new uses and meanings of technologies or where users are actively involved in the design of technologies.

Most important, cultural and media studies inspire us to transcend the artificial divide between design and use. This scholarship has drastically reconceptualized the traditional distinction between production and consumption by re-introducing Karl Marx's claim that the process of production is not complete until users have defined the uses, meanings, and significance of the technology: "Consumption is production."[32] They describe design and domestication as "the two sides of the innovation coin" (Lie and Sørensen 1996: 10).

An Overview of the Book

One of the aims of this volume is to bridge the approaches to users that have been developed in technology studies, in feminist scholarship, and in cultural and media studies. The scholarship presented in this book acknowledges the creative capacity of users to shape technological development in all phases of technological innovation. The authors are interested in and sensitive to the multiplicity and diversity of users, spokespersons for users, and other actors involved in socio-technical change. This approach makes visible how the co-construction of users and technologies may involve tensions, conflicts, and disparities in power and resources among the different actors involved. By doing this, we aim to avoid the pitfall of what David Morley (1992) has called the "don't worry, be happy" approach. A neglect of differences among and between producers and users may result in a romantic voluntarism that celebrates the creative agency of users, leaving no room for any form of critical understanding of the social and cultural constraints on user-technology relations.

Part I focuses on the active role of users and non-users in shaping socio-technical change during the domestication of technologies. Christina Lindsay tells the story of the TRS-80 personal computer, a technology that is kept alive and fully functional by users almost 25 years after its introduction and long after the original designers, producers, and marketers moved on. She describes the changing roles of users during the TRS-80's life history. The users in this story begin as somewhat stereotypically gendered representations constructed by the designers of

the computer and end up as designers, producers, retailers, and technical support for the technology. They take responsibility for the further development of the TRS-80, and in the process they rework their own identities as computer users in relation to this technology. Lindsay shows how the co-construction of users, user representations, and technology was not a static, one-time exercise by the designers of the TRS-80, but was a dynamic ongoing process through the whole life history of the technology in which many different groups, including the users, participated. The important insight to be gained from this chapter is that users can have multiple identities. In addition to being users, they can perform activities and identities traditionally ascribed to designers.

The other three chapters in part I highlight two aspects of the agency of potential users of technology that have largely remained unexplored in domestication approaches: resistance and non-use. Ronald Kline challenges common perceptions and theoretical understandings of resistance, which view resistance to technology as irrational or heroic. Instead, he suggests resistance can be considered as a common feature of the processes underlying socio-technical change. Acts considered as resistance by promoters, mediators, and users are crucial aspects of the creation of new technologies and social relations. Adopting SCOT as an analytical framework, Kline describes how farm people domesticated the telephone and electrification into their daily life in the early twentieth century. Most important, this detailed and fascinating account of the domestication of these technologies is not restricted to the users. Kline shows the usefulness of a methodology that does not focus only on use but which also includes the interplay of the actions and reactions of both producers and users. Producers responded to users' resistance and created new techniques, hardware, and mediating organizations to adapt the new technologies to fit the social patterns of rural life. This chapter is not only a story about the contested aspects of a modernization process. Inspired by feminist approaches to user-technology relations, Kline elaborates the theme of diversity of users by showing how the production, use, and interpretation of new technologies can only be understood in the context of a gendered system of social relations.

Sally Wyatt provides an interesting new understanding of the non-use of technologies. Beginning with an analysis of the use of Internet, she questions the assumptions—dominant in many policy documents and in much of the academic literature—that non-use of a technology always and necessarily involves inequality and deprivation. Producers and policy makers usually promote the Internet as a universal medium whose users

will have a better socio-economic position than its non-users. In this modernist discourse, non-use is portrayed as a deficiency and an involuntary act. Challenging this view, Wyatt introduces a reconceptualization of the category of non-use that includes the voluntary and the involuntary aspects. This preliminary taxonomy identifies four different types of non-users: "resisters" (people who have never used the technology because they do not want to), "rejectors" (people who no longer use the technology, because they find it boring or expensive or because they have alternatives), "the excluded" (people who have never used the technology, because they cannot get access for a variety of reasons), and "the expelled" (people who have stopped using the technology involuntarily because of cost or loss of institutional access). Wyatt's study warns us to avoid the pitfalls of implicitly accepting the rhetoric of technological progress, including a worldview in which adoption of new technologies is the norm. She urges us to take non-users and former users seriously as relevant social groups in shaping socio-technical change.

Anne Sofie Laegran explores patterns of use and non-use in a comparative study of the appropriation of the Internet and automobiles among young people in rural Norway. Adopting a revised concept of domestication that extends the analysis to settings other than the household, she focuses on differences between two youth cultures to understand how both technologies are reinterpreted and gain different symbolic and utility values. In contrast with the preceding two chapters, which follow a SCOT approach and emphasize the importance of use and non-use in understanding the design of technologies, this chapter relates use and non-use to the construction of symbolic meanings of the technology and the articulation of identities among users. Laegran describes how the youths who construct their identity in relation to the urban culture interpret the Internet as a medium enabling communication in a global context. In contrast, the rural youths totally reject this symbolic meaning of the Internet. They use the automobile, interpreted as a local means of transportation and as an icon, for building their identities. This construction of symbolic meanings and identities has important consequences for the adoption or rejection of both technologies in the two youth cultures. Laegran's study nicely illustrates how a focus on the construction of identities enables us to understand how people eventually become users or non-users of a technology.

In summary, all the chapters in part I show how users and non-users matter in the stabilization and de-stabilization of technologies. Whereas the first chapter demonstrates the multiple identities and roles of users,

the other chapters show how an adequate understanding of socio-technical change should include an analysis of resistance and non-use. Most important, the chapters in this part introduce a new conceptualization of these phenomena. Instead of representing resistance and non-use as irrational, heroic, or involuntary, they argue that these reactions to technology should be considered as rational choices shaping the design and (de)stabilization of technologies. Moreover, Kline and Laegran in particular provide important insights into how people eventually become non-users or resisters of technologies. They suggest that resistance and non-use are most likely to occur in situations in which the prescribed uses and the symbolic meanings attached to the technology by its producers and its promoters do not correspond to the gender relations, the cultural values, and the identities of specific groups of people.

Part II further elaborates the themes of agency, multiplicity, and diversity by focusing on the multiple collectives who speak for users and the ways in which they represent the diversity of users. The chapters in this part develop a perspective that goes beyond a conceptualization of user-technology relations in which the configuration work is solely in the hands of experts and users are categorized as a singular group. Dale Rose and Stuart Blume explore the theme of multiple spokespersons by focusing on the state. Their chapter encourages us to rethink the ways in which we conceptualize users. Instead of looking at users merely as consumers, Rose and Blume extend the analysis to include users as citizens of states. Most important, they address the theoretical problem of how to conceptually link the notion of individuals as users of technologies, that of individuals as consumers of commodities, and that of individuals as citizens of states. Based on an analysis of the development and provision of vaccines against human infectious diseases, they reject the consumer/citizen distinction. They describe how, in most Western industrialized nations, the state configures two types of vaccine users: the consumer of a commodity and a more passive public citizen whose actions as a user of these technologies defines that person as fulfilling a civic responsibility to be a good citizen. This configuration of users has important consequences for citizens. Citizens who reject technologies developed by the state for a common public good (in this case, vaccines for the prevention of diseases), or who fail to use them in the prescribed way, not only become inappropriate users of technologies but also fail in their civic responsibilities and eventually are deemed "bad" citizens. The structure in which vaccines are developed thus erases the distinction between users as consumers and users as citizens. States configure consumers ultimately as passive citizens.

Shobita Parthasarathy also focuses on the state. Instead of analyzing the state as a spokesperson for users, she addresses the question of how national political cultures shape the multiple and differing representation strategies of advocacy groups who speak for users. Her comparative study of the development of genetic testing for breast cancer in the United States and Britain shows how cultural norms and values influence the identities of and negotiations among a variety of different actors who want to influence the testing. Parthasarathy, like Rose and Blume, argues that the current conceptualization of individuals as users is inadequate if we want to take into account the structural constraints of state regulations. She uses the term "civic individual" instead of "user" in order to capture the broader political and cultural dimensions suggested by the normative language of rights and responsibilities. The chapter thus adds an important cultural dimension to our understanding of the role of user-technology relations. In exploring the different political cultures, Parthasarathy problematizes the relationship between activists and the civic individual. She describes how, while many advocacy groups claim to speak for and empower the individual, this relationship is made much more complex by the cultural contingencies embedded in activist identities and definitions of the "empowered" civic individual. Patient advocacy groups, which appear superficially similar, construct very different identities and definitions of the "empowered" civic individual. These divergent politics lead to the co-production of unique technologies and "empowered" civic individuals in the United States and Britain.

Jessika van Kammen similarly problematizes the relationship between advocacy groups who speak for users and the actual users. She analyzes the configuration work of experts as well as political representatives who speak on behalf of users. This chapter reveals the complexities that emerge when representations of users articulated by user interest groups do not correspond with the user representations of scientists. Based on a study of the development of anti-fertility vaccines, van Kammen shows how the attempts by scientists to align the multiple user representations and incorporate them into the artifact eventually resulted in a "technological monster," a sophisticated artifact that was unable to attract any users. The multiplicity and diversity of user representations not only constrained the design of the new contraceptive, it also shaped the strategies of the advocacy groups. Instead of trying to represent the enormous social, cultural, and individual diversity of women using contraceptives and to speak on behalf of the needs of women, the women's health advocates gave voice to "users' perspectives." They profiled themselves as

political representatives of users and mobilized their experiences of working on women's health and rights issues in the political arena to acquire credibility in the eyes of scientists. Crucially, this strategy enabled them to relate to contraceptive technologies in capacities other than that of potential future users: as researchers or as advocates. Room was created for women's health advocates to introduce different frames of meaning, such as the kind of social relations that one or another technology might constitute. Speaking from users' perspectives also reinforced their position as partners in a dialogue with the contraceptive developers.

Steven Epstein explores the role of patient advocacy groups and other heterogeneous sets of actors in representing the user by examining the reform in US policies that included women, minorities and children in biomedical research and in drug development. Focusing on what he calls the "multiple politics of representation," Epstein analyzes the different representational strategies of women's health advocates, women politicians and professionals, scientists, clinicians, and representatives of the pharmaceutical industry. In order to call for the greater representation of previously underrepresented groups as subjects in biomedical research, various actors had to position themselves successfully as legitimate representatives of social interests and collectivities, invoking the needs, wishes, and interests of groups such as "women" and "African Americans." At the same time, these representatives speaking for the group had to frame their demands by making claims about the nature of the group—that is, they had to claim to offer a symbolic depiction of fundamental group characteristics. This chapter makes an important contribution to our understanding of how categories of ethnicity, gender, and age are used to depict users in ensuring "fair representation" in clinical research. Epstein reveals the complex configurations of power and knowledge that are involved in configuring user identities. The heterogeneous set of actors involved in this case competed and collaborated to speak on behalf of socio-demographic categories that do not speak in a single voice.

The chapters in part II nicely illustrate how a methodology that focuses on the multiple groups who try to represent the user, including both experts and advocacy groups, reveals the cultural contingencies and the politics involved in the co-construction of users and technologies. It enriches our understanding of how the politics of users become manifest in today's technologically mediated state.

In part III, the focus shifts to the multiple locations that are important in understanding the configuring of users in the development of

technology. In line with semiotic approaches to user-technology relations, Ellen van Oost draws attention to the design phase of technology. Inspired by feminist scholarship, she carefully avoids the trap of analyzing users as a monolithic category by showing how designers differentiate between male and female users and eventually between "male" and "female" artifacts. Van Oost presents a fascinating account of the history of the development of Philips electric shavers. Adopting a genderscript approach, she describes how a single artifact, first designed to be used by both women and men, gradually developed into two different design trajectories and separate products: the Philishave for men and the Ladyshave for women. She analyzes the design strategies used to construct a "female" shaver as distinct from a "male" one and shows how the design trajectory of the Ladyshave was characterized by masking technology. This resulted in a product that users could not open and repair. In contrast, the shavers for men were designed to display and emphasize the technology inside, and they could be opened and repaired. Van Oost concludes that Philips produced not only shavers but also gender. Whereas the genderscript of the Ladyshave "told" women that they ought to dislike technology, the script of the Philishave invited men to see themselves as technologically competent users. The designs of these shavers thus constructed and reinforced dominant views of gender identities that emphasized the bond between masculinity and technology. The chapter illustrates the power of the genderscript approach as a tool to account for the diversity of users.

Nelly Oudshoorn further explores how gender matters in configuring the user and shifts the analysis to the testing phase of technologies. Whereas the previous chapter described a technology that created strong links between artifacts and dominant notions of masculinity, this chapter describes a technology with a weak alignment with male identities that constitutes a major barrier for technological innovation. Oudshoorn challenges conceptualizations of users underlying semiotic approaches by arguing that the narrow focus on users' competence fails to take into account the articulation and performance of subject identities as crucial aspects of technological innovation. Based on an analysis of the clinical testing of hormonal contraceptives for men, she describes how technological innovation requires the mutual adjustment of technologies and gender identities. Innovation in contraceptives for men involved a de-stabilization of conventionalized performances of gender identities in which contraceptive use was excluded from hegemonic forms of masculinity. Oudshoorn adds a new aspect to our understanding of the co-

construction of users and technologies by conceptualizing clinical trials as a cultural niche in which experts and potential users articulate and perform alternative gender identities to create and produce the cultural feasibility of the technology.

Johan Schot and Adri Albert de la Bruheze introduce yet another set of locations that are relevant to study the co-construction of users and technologies. Inspired by Schumpeterian studies of technological innovation, they draw attention to the mediation process between production and consumption. They characterize this mediation process as a process of mutual articulation and alignment of product characteristics and user requirements. They don't restrict their analysis to the work of producers and users; they also include the work of mediators, such as consumer organizations and women's collectives, who claim to represent the user. This chapter introduces the concept of the mediation junction, "a series of forums and arenas where mediators, consumers, and producers meet and negotiate." Like the chapters in part I, this chapter portrays users and representatives of users as co-designers of new products. Analyzing the mediation work involved in two Dutch consumer products, the disposable milk carton and snacks, Schot and Albert de la Bruheze reveal two different mediation patterns: a mediation process fully controlled by producers and a mediation process not fully controlled by producers in which various mediators play an important role. They suggest that a mediation junction that is located outside the firm, and not fully controlled by producers, seems to create more favorable conditions for user representatives to shape the mediation process. Compared to a mediation junction that is located inside the firm, an "out-house" mediation junction facilitates the matching of projected, represented, and real users. This type of mediation process thus may contribute to the type of technological development that incorporates the interests of producers as well as those of (representatives of) users. Schot and Albert de la Bruheze conclude by suggesting that mediation processes have been constitutive for the shaping of the twentieth-century Dutch consumer society.

In the final chapter, Trevor Pinch also addresses the role of intermediaries in the development of technology. He urges us to pay attention to salespeople, whom he describes as the "true missing masses" in technology studies. Pinch argues that, because salespeople occupy a strategic position between users and designers, studying selling strategies is important to understanding the co-construction of user and technologies. Based on an analysis of the development of the electronic music synthesizer, the chapter shows how frequent interaction with users enables

salespeople to see how users improve technologies and even invent new uses. They often communicate this information to the designers and manufacturers, thus providing important feedback for design. Pinch tells the fascinating story of how David Van Koevering identified a new use and a new group of users for the Minimoog synthesizer. Whereas earlier synthesizers had been designed as studio instruments for composers and elite rock musicians, Van Koevering marketed the Minimoog as a synthesizer that could be used on stage by young rock musicians. Pinch challenges the linear model of production and selling as sequential and distinct activities. He shows how Van Koevering's own experiences as a user played a crucial role in his activities. The chapter thus further contributes to the book's perspective of multiple identities. Whereas Lindsay's chapter describes the multiple identities of users who acted as users, designers, and producers, Pinch shows the conflating identities of users and sellers, thus illustrating the fluidity of boundaries between sales and use.

In summary, our authors argue that a thorough understanding of the role of users in technological development requires a methodology that takes into account the multiplicity and diversity of users, spokespersons for users, and locations where the co-construction of users and technologies takes place. From this perspective, technological development emerges as a culturally contested zone where users, patient advocacy groups, consumer organizations, designers, producers, salespeople, policy makers, and intermediary groups create, negotiate, and give differing and sometimes conflicting forms, meanings, and uses to technologies. The focus on multiplicity and diversity shows how users not only matter once a technology is in use, but also play an important role in the design, the production, and the selling of technologies. Most important, the chapters in this book challenge any a priori distinction between users and technologists. They emphasize the multiple and conflating identities of users, producers, and salespeople.

The focus on multiplicity and diversity also reveals how the work involved in configuring and representing the user is not restricted to technologists but includes the activities of many other groups of actors such as states (Rose and Blume), patient advocacy groups (Epstein, van Kammen, and Parthasarathy), and consumer organizations (Schot and Albert de la Bruheze). In the picture that emerges, states and national political cultures construct differing and often conflicting representations of users that shape and constrain the agency of users as citizens as well as the representation strategies of advocacy groups. The diversity of

users further complicates the work of these advocacy groups. Speaking on behalf of the user is a complicated endeavor now that users no longer speak in a single voice.

The authors note the multiple ways in which identities of users are articulated, performed, and transformed during the development and use of technologies. User identities, including gender, age, race, and ethnicity, become materialized in the design of technological artifacts (van Oost) and biomedical discourses (Epstein). They are articulated and performed during the testing of technologies (Oudshoorn, Schot and Albert de la Bruheze). They play a crucial role in the domestication of technologies (Kline, Laegran). Consumer and medical technologies thus emerge as identity projects with a twofold function: they facilitate and constrain the daily lives of people as well as the design and the (de)stabilization of technologies.

Finally, our authors present stories that go beyond a voluntaristic view of the agency of users. Although they show the creative agency of users in shaping socio-technical change, they also reveal constraints induced by state regulations and national political cultures (Rose and Blume, Parthasarathy), by hegemonic gender relations and youth cultures (Kline, Oudshoorn, van Oost, Laegran), by the boundary work of scientists and technologists (van Kammen, Schot and Albert de la Bruheze), and by costs and skills (Wyatt, Lindsay). Our focus on the agency of users has led us to important insights in the role of non-users and resisters of technologies (Wyatt, Kline, Laegran). Non-users and people who resist technologies can be identified as important actors in shaping technological development. *How Users and Non-Users Matter* therefore might have been a more appropriate title for this collection.