Dynamics of Type-based Scenarios of Use: Opening Processes in Early Phases of Interactive Television and Electronic Marketplaces

Kornelia Konrad

Designers' representations of how and by whom a technological system will be used play an important role in the shaping of technologies. Conceptually, this article presents an analytical concept of scenarios of use that is based on the notion of script by Akrich, but adds insights from the interactionist theory of Alfred Schutz. In so doing, we are able to trace how these scenarios for new technologies build on previously established and widespread typified conceptions of technologies and related scenarios of use. Empirically, drawing on case studies in the field of e-commerce and interactive television, this article examines the formation and evolution of scenarios of use across multiple design phases as a result of processes at the level of design projects as well as technological fields. The dynamic patterns observed in the case studies are then discussed. In contrast to the focus on closure of socio-technical variants given in many technology studies, in the present cases we instead observe opening processes, that is, the generation of new variants.

Keywords: user representations, technology design, information and communication technologies, Schutz, script, co-evolution

Technology designers' representations of how and by whom a technological system will be used influence how such a system will be ultimately shaped. Designers make assumptions about user groups, their preferences and competencies, their ways of using and the context of use. These assumptions—often built into what will from now on be referred to as scenarios of use—influence decisions on functionalities, interface design and the design of supporting material such as manuals and help functions. They influence where and how a technology can be accessed and which complementary technologies and skills are presumed to be present in the use context (Akrich, 1992a,b; 1995; Carlson, 1992; Callon, 1993; Hofmann, 1997; Jelsma, 2003; Oudshoorn et al., 2004). The final shape of a technology sets a certain range for use, optimising some uses and excluding others. It creates a realm of possibilities, some of which might not have been considered in the design phase and which are only discovered by

the users themselves. Hence, scenarios of use do not determine the future users and uses, but they play an important role in delineating the realm of possibilities for users.

Scenarios of use are important, but also problematic. The history of many technologies shows that compared to actual users and ways of use, former assumptions have often proved to be misconceptions (Carlson, 1992; Heintz, 1993; Akrich, 1998). Users turned out not to be the ones expected and technologies were mainly used in ways which were not foreseen in the design phase. As a typical pitfall, early assumptions about future users and uses concerning novel technologies often too narrowly reproduce concepts related to well-known technologies, while more innovative uses are difficult to imagine (Carlson, 1992; Heintz, 1993: 231; Sawhney, 1996). Furthermore, designers often know too little about the specific conditions of the context of use and the practices of the users (Suchman and Trigg, 1991; Berg, 1998).

If scenarios of use guiding technology design are often inadequate, the question arises, how scenarios of use are generated and 'shaped', that is, why specific scenarios are envisaged by innovation actors rather than others. Akrich (1995) and Woolgar (1991) have described a number of explicit as well as implicit methods by which designers develop user representations, such as market surveys, usability testing or the so-called 'I-methodology', a generalisation of personal interests and preferences by designers. Furthermore, Hyysalo (2006) has shown that representations of use are shaped by the scientific and engineering practices prevailing among designers. In this article, we complement insights on the more implicit 'methods', that is, 'socio-cognitive' rules or regularities explaining why scenarios of use take on a specific form. We draw on the theory of Alfred Schutz in order to examine how more or less innovative scenarios of use are built based on the knowledge and priorities of specific actors or communities. More precisely, we consider how these scenarios for new technology build on previously established and widespread types of technologies and related scenarios of use.

As we know from technology and innovation studies, technology design is a highly distributed and interactive process and expands over time and often various phases. This is even more pronounced if we consider the whole innovation process including the establishment of use practices (Silverstone and Hirsch, 1992; Egyedi et al., 2001) and the societal institutionalization of certain use forms (Kubicek and Schmid, 1996). This has two implications for the focus chosen in this article. Firstly, we trace the formation and evolution of scenarios across multiple design phases. Second, we examine how particular local development projects relate to generic field-specific scenarios of use.

Research on the role of user representations has drawn largely on the concept of a script or socio-technical scenario as an analytical 'tool' for comparing designer's conceptions, technology design and actual user behaviour. This concept has been developed by Akrich, Latour and Callon (Akrich, 1992a, 1992b; Callon, 1993; Latour, 1992) and taken up rather widely (e.g., Gjøen and Hård, 2002; Jelsma, 2003; Oudshoorn et al., 2004; Rommes, 2005). These studies have centred on the shaping of technologies by scenarios of use, as well as the matches and mismatches of scenarios compared to actual users. With some exceptions

(Callon, 1993; Lindsay, 2003; Williams et al., 2005; Hyysalo, forthcoming), the temporal evolution of scenarios of use has not received as much attention. Moreover, while some have studied the evolution of scenarios at the micro level, sources of dynamics beyond the project level have generally been neglected.

Therefore, in what follows, a modified concept of scenarios of use is presented which draws on the concept of script, but adds insights from the interactionist theory of Alfred Schutz. Then we examine scenarios guiding the design and partly the application of a number of projects in emerging applications of information and communication technologies. To do this, we focus on the scenarios related to a German project on interactive television and the scenarios related to the products of two companies producing software for electronic marketplaces. Following the presentation of the case studies, I discuss in more detail the dynamic patterns observed in the case studies. In contrast to the focus on closure of socio-technical variants given in many technology studies, in the present cases we rather observed opening processes, that is, the generation of new variants.

Interactive television and electronic marketplaces are both particularly appropriate technology fields for examining the generation and evolution of scenarios guiding design. At the time the empirical analysis was conducted (1996-2000), they were still emerging technologies and it was highly uncertain what exactly interactive television or electronic marketplaces could mean and what technologies and uses would eventually become established. Furthermore, information and communication technologies in general are comparably flexible technologies, at least as long as they are not socially stabilised. Thus, dynamics are observable even within relatively short periods of time.

The data presented result from a study on scenarios of use and expectation dynamics in interactive television and electronic commerce. It is based on semi-structured, fully transcribed interviews, mostly between one and two hours in length, and document analysis. All interview partners were involved in decisions regarding the shaping of the systems and services; in some cases only one person within a company was involved in the relevant project, in other cases two or three people from the same company with different tasks related to the relevant project were interviewed. This allowed information to be cross-validated and different viewpoints to be captured. The scenario dynamics were traced by interviewing the same people twice, by retrospective accounts of interviewees and by document analysis. The case studies are largely presented in an illustrative manner. A more elaborate account is given in Konrad (2004). It should be noted that it was neither possible nor intended to actually follow and observe the *processes* of scenario generation and negotiation, since the study is not based on extensive participant observation and there has been only partial access to process documentation besides the accounts of interviewees.

Type-based scenarios

According to Akrich (1992a, 1992b) and Callon (1993), designers of a new socio-technical system conceive a 'vision', a 'scenario', 'script' or a 'socio-technical network', which describes a role-based programme of action that is partly delegated to humans, e.g., users, and partly to non-humans, e.g., technological

components. It comprises assumptions about motives and competencies of the users. Furthermore the scenario describes a space where the programme of action is supposed to take place. Space refers to elements which do not fulfil specific courses of action, but which are either necessary preconditions for the programme of action to be realised or which have to be by-passed. A similar distinction between users as role-takers and roles as detailed descriptions of the way a technology is used and for which goals, is used within interaction design (Cooper, 2004; Preece et al., 2002). Here, role-takers are shrunk to one or multiple typified, but very specifically described, 'personas', and are expected to be sufficiently representative for the expected user groups. The description of the course of usage within a specific context is referred to as a scenario. The scenario concept of Akrich and others is somewhat broader, since, in addition to user roles, roles and elements can be defined which are necessary for the functioning of the programme of action, e.g., distribution networks, maintenance or energy infrastructure or assumptions about relevant societal trends (Akrich, 1992a: 208; 1992b: 174; Callon, 1991: 136; Callon, 1993: 251f.). The scenario may be negotiated between different actors participating in the innovation network and it is eventually inscribed into the technical artefact.

This concept has two important advantages as a tool for analysing user-related conceptions of designers and further actors involved in the design and the implementation of new technologies compared to more general concepts such as user representations. Firstly, the concept of roles and role-takers, e.g., user roles and user groups supposed to occupy these roles, allows the differentiation of use- and user-related assumptions. This distinction is important because designers may have rather elaborate conceptions of how a technology will be used, yet only diffuse ideas of who will be the users. In addition, a specific role may be associated with different actor groups, or a specific group of actors may be associated with different roles. Secondly, it is a broader concept taking into account more elements than conceptions of future user groups. Conceptions of further actors and actants, meaning those responsible for the operation, maintenance and distribution of a system, and the behaviour of their real-life counterparts are generally just as important for the realisation of a technological system as end users. Moreover, as will be shown, assumptions about the use and users of a socio-technical system may be closely linked to the roles and role-takers foreseen for distribution or maintenance. This is not to say that designers always develop such comprehensive scenarios. But if not, the concept helps to determine blind spots which may be as problematic as wrong assumptions about future users.

However, the concept shows three shortcomings: a) the designers' representations and constraints on user behaviour resulting from the final shape of a socio-technical system are insufficiently differentiated; b) the generation and c) the co-evolutionary dynamics of scenarios are not sufficiently considered.

In the remainder of the article, 'scenario' refers to the conceptual or fictive scenarios as imagined by designers, users or other actors involved in the development, production and diffusion of a new socio-technical system. In contrast to this, Akrich makes no clear distinction between a script or scenario as

"dreamed up by those who conceive" a new system and a script as the "end product" of "'inscribing' this vision of (or prediction about) the world in the technical content of the new object" (Akrich, 1992a: 208f.).

I propose a modified scenario concept in order to overcome the remaining two shortcomings. For conceptualising the elements of a scenario, I draw on the theory of typification introduced by Schutz (1962a). This concept provides a comprehensive and differentiated tool that will help us to analyse the conceptions on which the scenarios are built. These conceptions may be specific for individual actors, small actor groups or they may be part of the social repertoires of larger communities of actors, e.g., within a technological field. Furthermore, the concept helps us to follow and explain the evolution of scenarios at the specific as well as the collective level.

According to Schutz, our knowledge and our interpretation of the world is structured as a system of constructs of the typicality of the respective elements. The typicality of an object, a person or a course of action refers to the characteristics it has in common with a specific group of elements. Individual, specific characteristics of the particular element are not part of its typicality. All elements of our stock of knowledge are typified, e.g., objects, people, elements of action and courses of action or typical situations. What is considered to be the typical characteristics of an element depends on the context in which it appears; in one case it is taken as an element of group A, in another as an element of group B. Thus, different aspects of the same element may be highlighted, while others are neglected.

Which aspects are highlighted depends on the current system of relevances of an actor. Schutz (1966) describes a system of relevances as the pragmatic interests of a person defined by the specific situation, the specific purpose of the actor in this situation and his or her biographical background. Moreover, different actors and different actor groups may draw on different types for developing scenarios of use for the same socio-technical system. Therefore, the specific repertoires of types actors draw on and their specific system of relevances may explain the variety of scenarios different actors and different actor groups develop in relation to a certain socio-technical system. A particular variety of scenarios produced by different actors and actor groups can be regarded as a specific form of interpretative flexibility of technology (Pinch and Bijker, 1987). However, in contrast to the concept of Pinch and Bijker, here interpretations differ by more than the social groups as defined by their relation to, respectively interpretation of, the technology at hand. In very early stages of technology development, the activated repertoires of types will not even be intrinsically linked to the technology at hand. Technology-specific types or a common repertoire of types related to a technology emerge only gradually when experience is gained and a community has been formed around the technology (Hasu, 2000; Hyysalo, 2003).

The specific system of relevances used by the actors also determines which elements of a scenario are anticipated at all. Actors anticipate as far as it seems necessary for *their* pragmatic needs and requirements, other elements may remain rather vague (Schutz, 1962c). As shown in the following section, due to diverging repertoires of types and systems of

relevances, scenarios of various actors may differ substantially, even if a group of actors takes the same well-known technology as an analogy for building a new scenario. Different typicalities, i.e., scenario elements, are highlighted and transferred while others are neglected.

Following Schutz, we discern assumptions about typical users or user groups and assumptions of typical uses of a socio-technical system. Assumptions about typical users, in the following called user models, refer to typified groups of actors. Categories applied to characterise these groups are independent of the socio-technical system to be designed. Assumptions of typical uses or use models refer to typified ways of using. Here, categories refer to courses of action related to the socio-technical system. This differentiation between typified actor groups and typified courses of action corresponds to the differentiation between roles and role-takers within Akrich's concept of a script. Similarly, roles and role-takers referring to further actors and actants related to the socio-technical system (operation, maintenance and distribution) can be described.

Accordingly, a type-based scenario is a projection of a network of interrelated typified roles or positions and role-takers, partly occupied by human actors and partly by technical elements. Comparable to the concepts of Akrich and Callon, it includes the following elements:

Use models: in line with the differentiation of roles and role-takers, use models denote a typified conception of one or more user roles. It should be noted that often scenarios - particularly those related to complex socio-technical systems - comprise not only one user role, but a number of differentiated user roles which may also be associated with different role-takers (user models). Drawing on one of the case studies described below, the scenario of an electronic marketplace comprises at least the use models suppliers and buyers. Furthermore, a specific position in a scenario may be associated with different *submodels of use*. These refer to different typified ways of using, e.g., different types of buyers in an electronic marketplace with different interests and competencies. Still, these are described by categories referring to the 'programme of action', not to assumptions about different personality types.

User models denote assumptions about the expected role-takers. Parallel to the submodels of use, differentiated submodels of users may be conceived. Designers often call these submodels of users user profiles (Preece et al., 2002).

The object of use describes the anticipated functionalities of the technical or socio-technical system as it presents itself to the users.

Operating, distribution and maintenance model: for complex socio-technical systems often a continuous process is necessary to keep the system usable. Therefore, an operating scenario defines what must be done to keep the system working, e.g., actualising contents, and who is supposed to assume these tasks. The maintenance scenario describes role-takers and the roles of those who control the system and restore functions in case of breakdown.

The prospected context refers to a typified conception of complementary artefacts, infrastructures, associated activities and the spatial surroundings, where the scenario is supposed to take place.

The theory of Schutz can now be applied to understand how scenarios are conceived by different actors, and to un-

derstand the processes that lead to novel and technology-specific scenarios. As stated in the introduction, early conceptions of possible uses and users of innovative technologies, e.g., the computer, the telephone or motion pictures, have often reproduced use models of established technologies or established, not necessarily technology-based courses of action. However, the success of these technologies was often based on other use models.

Drawing on Schutz we may explain these empirical findings. The possibly problematic strong resemblance of scenarios for innovative technologies to well-known concepts should not be considered as a personal weakness of the actors involved in the design process. It is rather a necessary step on the way to more innovative scenarios. According to Schutz, new concepts and patterns of action are built on the basis of existing type-based concepts and patterns of action. The new concepts or types will then be a specification or modification of an existing type, a differentiation into subtypes or a new type which emerges as a synthesis of multiple types (Schutz, 1962a). Furthermore, new types may result from what is not specified by a certain type. A type describes certain features of a concept, leaving others or more concrete specifications open (Schutz, 1962b; 1964). These non-specified elements of a type, e.g., a use model, are easily neglected at first glance. However, if a use model is transferred to a new technology, these elements may differ significantly from the former technology. New use options may result from these differences. Yet these will easily be overseen in early design phases. New concepts will emerge only if there is a problematic situation which cannot be dealt with by drawing on the existing repertoire of types. The concrete form of the new concept is constructed in interaction with the specific circumstances of the problematic situation (Schutz, 1962c). For new technologies, appropriation processes of users form an important source of problematic situations which then enable the formation of novel scenarios of use and use patterns. Similarly, the confrontation between diverging conceptions of the heterogeneous actors involved in a design project may result in novel scenarios.

In line with what has been stated above, the concrete shape of the new concept depends on the repertoire of the actors involved and on the specific features of the problematic situation that led to the emergence of the new concept. Finally, it is the system of relevances of the specific actors, particularly their biographical background and their purposes in the specific situation that guide the activation of certain typical characteristics rather than others.

So far, we have highlighted how the Schutzian theory may serve to explain the variety of scenarios of use as well as the emergence of novelty with a focus on the micro level of individual actors or small actor groups. However, some repertoires of types are not only part of the specific stock of knowledge of certain actors and actor groups, but also part of a larger societal stock of knowledge (Schütz and Luckmann, 1975). Hence, scenarios of use are also not necessarily part of the specific repertoires of individual actors or small groups of actors, e.g., a design team. They may just as well circulate in broader communities. Moreover, some scenarios may even become institutionalised in the sense that actors assume that other actors are aware of and refer to them as well (Berg-

er and Luckmann, 1966). They may even become part of a generalised and taken-for-granted social repertoire. This will largely be the result of the exchange and mediation of scenarios within specific communities: either public discourse represented in mass media or discourses within specific technological fields.

If and when scenarios of use and their evolution are not restricted to processes at the micro level of, for example, a technology design project, we must be aware of processes at the meso level of a technological field or the macro level of various communities in society. Therefore, in the empirical analysis the interplay between processes at the project level and the meso level will be explicitly taken into account.

Scenario variation in the field of interactive television

In the middle of the 1990s interactive television received substantial attention as one of the promising applications of new digital information and communication technologies. Interactive TV was mostly interpreted as television enhanced by a backchannel. This configuration was supposed to enable new services such as video on demand (retrieval of videos from a server) or teleshopping, telelearning and telegames. The announcement of the "Full Service Network" by the large media corporation Time Warner in 1993 was the starting point for a wave of test and demonstration projects on interactive television. As part of these, German Telekom was involved in five projects in Germany. The one in the city of Stuttgart forms the focus of this section.

The project was set up in 1994, by German Telekom, the Ministry of Economic Affairs of Baden-Württemberg, one of the German federal states, and a couple of hardware producers. The project was supposed to test different multimedia services and a specific technical infrastructure. Telekom, owner of the national telephone system and the major part of the national cable television network, provided the basic telecommunications network. Envisaged services were video on demand, teleshopping, telelearning, information services and telegames. Computer hardware and telecommunication corporations—Alcatel-SEL, Bosch-Telecom, Hewlett-Packard and IBM—located in the region formed a consortium to develop the necessary components for the technical system. Four thousand private households in the city of Stuttgart were to test the system and the services. This would have made the project one of the largest pilot projects on interactive television in Europe and in the United States at the time. The envisaged technical system was based on the cable network of Telekom and a fiber optical network, which would allow for a backchannel going back from the connected households to a server, where multimedia content was to be stored. This 'content' was supposed to be provided by a variety of interested firms and organisations who, however, were not to be part of the project members. Thus, they were neither eligible for the subsidies provided by the Ministry of Economic Affairs nor supposed to participate in decisions regarding the system. Users of the system would order and display the digitally stored contents via a regular TV-set, a set-top-unit and a special remote control. In 1996, after the start of the project had been postponed a couple of times due to technical problems and problems among the project partners, the project was stopped, just before the first households were to be connected.

In the following, we examine the scenarios guiding the design of the system as well as those guiding a selection of content providers. The analysis proceeds in three steps. Firstly, we ask why the specific set of services was chosen for the project. Then, we compare the scenarios of use of the different actors involved in the project and analyse how these scenarios build on various types related to common technologies and practices. Finally, we follow two of the envisaged applications beyond the project context and see how the scenarios have evolved in the longer term within different contexts.

In 1996, a series of 12 qualitative interviews was conducted, the majority before the project was cancelled and some shortly after it (see Table 1). For the Ministry of Economic Affairs, which could not be approached by interviewers, publications and journal articles served as the main sources for the analysis. In addition, a press review on the project, project meeting protocols, conference presentations of project participants, some company internal documents and the internal company review of Telekom complemented the empirical basis of the study. As a follow-up, three years later in 1999, a small series of five interviews was conducted with a subset of the content providers interviewed in 1996. Again, interviews were complemented with additional sources, partly provided by the interviewees, e.g., internal use studies, project documentation, and, in one case, also by observations of implemented systems and users. Thus,

German Telekom	▪ technical coordinator of the Stuttgart project (1996) ▪ coordinator of service providers in the Stuttgart project (1996) ▪ coordinator of service providers in all German interactive television projects (1996)
leader of industrial consortium (SEL-Alcatel)	▪ coordinator of the Stuttgart project (1996) ▪ coordinator of services (1996)
Content Providers	*video on demand* · popular science magazine (chief editor) (1996, 1999) · public TV station (assistant of technical director) (1996) · tv production firm (head of new media department) (1996) *teleshopping* ▪ warehouse company (director of innovation management (1996, 1999) / project leader (1999)) ▪ automobile company (head of new media in sales) (1996) *telelearning* ▪ textbook publisher (manager of international projects (1996, 1999) / project leader) (1996, 1999))

Table 1: Interview partners case study 'Interactive Television'.

we are able to trace the development of scenarios and applications over a longer time frame.

Defining the portfolio of services: interplay between discourses and project structures

The basic set of scenarios of use which was chosen to be realised in the pilot project—video on demand, teleshopping, telelearning, information services and telegames—was not specific to the project actors. Similar services were to be tested in other pilot projects on interactive television all over the world which had been announced in 1993 and 1994. At the time, these services were considered as highly promising within the telecom, information technology and media industry. Using a term which was introduced by van Lente and Rip, these scenarios were part of a shared 'agenda' – a list of priorities and issues that require attention (van Lente and Rip, 1998). These scenarios of use caught most attention in the public discourse on interactive television at the time. This is indicated by an analysis of a German news service on interactive television—"TV interaktiv"—which was published between 1993 and 1997. Video on demand and teleshopping were mentioned most often. Telelearning, telegames and information services were among the very often mentioned.

Moreover, these scenarios of use have a rather long history. As the concept of interactive television in general, scenarios of use such as teleshopping, telelearning were already part of the debates on videotext, analog versions of cable TV enhanced by backchannel or ISDN in the sixties to eighties (Schneider, 1989: 80; Dutton, 1997: 134; Kubicek et al., 2001: 12).

However, the level of discourses and agendas alone does not explain why exactly this portfolio of services was chosen for the Stuttgart pilot project. The interplay of the level of discourses and the structure and power relations between project participants must be taken into account as well. The agenda on interactive television was not the only one guiding actors in the project. At the beginning, the project was announced more generally as a project on multimedia applications. Members of the Ministry of Economic Affairs and the industrial consortium would have preferred different scenarios, e.g., business applications or PC-based applications. Members of the Ministry were mainly referring to expectations and service concepts as they were presented in the public debate triggered by the National Information Infrastructure—also called Information Superhighway—Initiative of the US administration. This was strongly influenced by concepts related to the then emerging internet (Konrad, 2004). However, the position of Telekom as contracting body in the pilot project allowed it to push its preferred concepts through. The decision on which scenarios of use would be tested in the pilot project was mainly taken by Telekom. Telekom had a strong interest in testing new applications for its cable network, because this was not yet sufficiently exploited. This suggested strongly focusing on applications for private households, since these were the only ones connected to the cable network thus far.

As seen in the following, the scenarios guiding the different actors involved in the project differed substantially, also on a more specific level. The scenario guiding the design of the system did not match many of the scenarios proposed by those who were to provide the services. However, because of the project structures the scenarios of many potential service providers were marginalised

as compared to the dominant scenarios advocated by Telekom employees.

Local variations: interpretative flexibility of scenarios

While the basic set of scenarios presented by Deutsche Telekom was part of the international agenda on interactive television, the more concrete scenarios described by various actors involved in the project varied significantly. These scenarios, that is, the specific interpretations of video on demand, teleshopping or telelearning, varied with the individual background of knowledge and experience and the specific system of relevances of the actors.

Quite strikingly, central actors on the project, members of Deutsche Telekom and the Ministry of Economic Affairs, developed the least concrete and the most conservative scenarios compared to the scenarios presented by the content providers and by actors from the industrial consortium. They reproduced the scenarios as far as they had been specified in the public discourse, yet did not add any specific interpretations and variants. This can be explained by considering the system of relevances of the actors. All interviewees of Telekom regarded themselves as responsible for providing the technical platform and—as the project leader—for deciding on the basic set of services, yet not for the concrete design of the services. As for the user models, the target group was defined as private households (see above). No further specifications were made.

When the Minister of Economic Affairs and the employee of the Ministry responsible for the pilot project referred to applications to be realised within the project, they reproduced the concepts presented by Telekom, without adding any further specifications. In general, staying with the main rationale of its department, documents by the Ministry elaborated mainly on potential benefits the project would have for the regional economy, not on benefits for users.

Video on Demand

All interviewees agreed on the basic structure of a video on demand service: it allows users to order video films or video sequences from a server at any time and the operator of the system to charge for each of the video films. The access of video sequences was supposed to function just as a video cassette recorder (VCR), enabling start, stop, pause, forward and rewind functionalities. While the scenario was strongly influenced by the conventional VCR, the types related to a conventional VCR were activated only selectively: not all *use models* of the VCR were transferred to the video on demand scenario, but merely the option to rent and play back commercially produced films, thus far realised by the video rental system via video stores. Other *use models* of the VCR, e.g., recording of TV shows or play back of home-produced video films were not considered.

Whilst there was broad consent concerning the basic structure of the service, the actors disagreed as to what would be promising contents for a video on demand service. Telekom employees presented movies as possible contents, that is, the type of films typical for rented videos. Accordingly, the service was also called ‘movie on demand’. In addition to the explicit transfer of certain elements of the VCR analogy—the basic functionalities—implicitly the content type, which was part of one VCR use model, was also transferred. This transfer was implicit since, according to

one Telekom interviewee, other content types were not considered at the beginning. However, this type of content did not match a number of proposals of potential service providers. Three potential service providers, a German TV station, a media agency and a popular science magazine proposed a content type reflecting specific characteristics of the new system. In contrast to a video store the new system would provide immediate access; in contrast to television a personalised programme was possible. Thus, the type of content considered most appropriate was that which caught the interest of specific groups of users and what they would like to see immediately and at particular times. These criteria applied to informative contents, e.g., leisure time information, excursion tips or health information. Special interest programmes were also mentioned. So, a second use model emerged alongside 'movie on demand', namely the use model of a 'reference book'. The integration of both types of contents in the navigation system, which was originally designed only for the 'movie on demand' model, created substantial problems according to one of the Telekom interviewees.

To summarise, all actors drew on the VCR-analogy for constructing scenarios of use, but not all actors drew on the same set of types related to it. All actors referred to the *object of use*—the VCR—and the *use model* in the sense of basic functionalities and ways of using – rewind or interrupt a video film. Yet one of the more complex, institutionalised *use models*—rent a movie in a video store—and its *production and distribution scenario* was a central guiding element only for the new use model 'movie on demand'.

Teleshopping

Two Telekom interviewees advocated the teleshopping scenario of a video-based version of a mail order or travel catalogue. Products which so far had been distributed by catalogues and standardised products in general were regarded as appropriate goods to be distributed via such a teleshopping service. This scenario matched the proposals of a number of potential content providers, e.g., large German mail order companies or travel agencies.

Yet not all teleshopping scenarios proposed by potential content providers fit into this basic concept. The director of innovation management of a large German warehouse company proposed a teleshopping scenario reflecting the specific background of experiences and priorities of his business field. He wasn't interested in an order service, but wanted to provide a multimedia information service which had been installed in a similar form in several warehouses. Here, in contrast to the video catalogue variant, explanation-intensive products were considered the most appropriate.

Telelearning

A Telekom employee, the coordinator of service providers in all projects, put forward a scenario according to which educational TV programmes so far distributed via conventional TV programmes would be provided via the video on demand service.

A large textbook publisher developed a telelearning application specifically for use in the pilot project. After the pilot project was cancelled, the application was realised on a CD-ROM. At the time of the break-up of the pilot project, the design of the application had mostly been defined and the design character-

istics as structured by the expected infrastructure—the *prospected context*—were largely kept. The content and the media design of the application reflected the professional background of the producers as well as the specific conditions of the pilot project. The application was aimed to be and designed as a didactical and learning product. Furthermore, the design was guided by the expected infrastructure and its specific restrictions and options. The graphical design was shaped in a way to be displayed on a TV set and differed from what would have been chosen for a PC screen. Since a remote control served for navigation as compared to a keyboard, the menu-based navigation was kept rather simple. Finally, a highly asymmetric bandwidth – a broad bandwidth from the server to the users and a narrow bandwidth of the backchannel – led to a media design relying predominantly on video sequences as opposed to a more text- and picture-oriented CD-ROM design.

It is noteworthy that all these envisaged applications are variants of existing, stabilized major types of technology and associated scenarios of use. They are clearly not specified very far, but variety resulted mainly from the specific interpretations of the different actors. As a number of content providers stated in 1996, although they were striving to develop technology, respectively media-specific applications and content, they did not know how to and had not found appropriate points of orientation. That is, in this early innovation phase a social interaction and learning process had not yet formed around interactive television. When the same people were interviewed a few years later, this situation was reported to have changed significantly with respect to media such as CD-ROM or the internet.

Co-evolution of scenarios, artefacts and use

Since the Stuttgart project was cancelled shortly before it was put into practice, the period we are able to observe is relatively short and restricted to the design phase. Thus, with exception of the short excursion on the history of the basic concepts, we can compare scenarios which largely 'co-existed' at a certain time, but can hardly observe any dynamics. However, the Stuttgart project was only one step within the development trajectory of part of the envisaged applications. After the end of the project, some of them continued within different contexts and different media. This development was reconstructed for three of the service providers interviewed in the context of the pilot project. Two cases are presented here.

The breadth of the scenario concept will prove particularly useful, because it reveals how user roles and the supposed role-takers are coupled to roles and role-takers foreseen for further scenario elements. Hence, scenarios of use change not only because users show unexpected behaviour, preferences and competencies, but also because other role-takers as part of the operation, maintenance and distribution models may exhibit unexpected behaviour. The same holds for changes within the object of use and the prospected context. That is, changes in one element of the scenario may induce further changes in the whole scenario, thereby inducing a co-evolutionary dynamic.

The teleshopping service proposed by the warehouse company mentioned above was based on one of a group of multimedia applications installed in several warehouses. The applications provided information on certain product types, e.g., sports equipment or food,

or products simulated in a future use environment, e.g., curtains, bathroom textiles or clothes. The scenarios guiding the design of the multimedia systems were often modified during the design and implementation phase. Partly this was due to feedback from users showing different preferences than those expected; partly the roles foreseen for the *operation scenario* could not be fulfilled. For certain information systems it was necessary to provide regular, up-to-date information. The warehouse team expected producers of the products to provide the necessary material. However, these often did not behave as expected and the role had to be delegated to other role-takers, e.g., a marketing company, wholesalers or the team itself. In some cases this led to the modification of *use and user models*. For example, one system was planned to provide information on computer novelties. Since information could not be provided sufficiently and in time, the system was then supposed to provide information on less time-critical products and mainly to support the sales personnel, not the customers.

The scenario guiding the design of the telelearning application of the textbook publisher had to be modified several times. After the pilot project was cancelled the application—a learning tool on physics of the sun, targeted at adults who wanted to educate themselves in their leisure time—was realised as a CD-ROM and as a server-based version. Following the technical infrastructure the *use model* was also modified. The possibility for several users to communicate, either via a local network (server based version) or the internet (CD-ROM), was added. This change was not a technical necessity; rather the change of infrastructure led to the consideration of possibilities that the former infrastructure would not have provided, but which by now were considered to be typical use options for the new infrastructure.

The scenario was modified again when the project changed its status from an EU-funded project to a commercial CD-ROM product to be distributed by the publisher. Firstly, the *user model* was changed. Whilst at the beginning expected users were defined as adult learners interested in further education, now teachers and their pupils were regarded as the relevant user group. This was due to the new *distribution model*: teachers could easily be reached by the textbook publisher via its regular distribution channels, whereas the general public was not. Secondly, the *use model* was changed: the communication module was no longer part of it, because the maintenance work necessary was considered to be too time-consuming.

Scenario evolution in the field of e-commerce

In contrast to the scenarios on interactive television, which remained rather static over decades, scenarios guiding the design of e-commerce software about half a decade later changed rapidly and radically. Iterative development steps did not generate incremental improvements or specifications alone while preserving the overall scenario, but led to radical changes as well. Similar to the development of the applications beyond the interactive television project, but more pronounced, these changes included (ex)changes of the user model as well as of the use model and the expected context of use. Scenarios changed within months, as did the developed software and, in part, the users and users' interests and requirements.

In 2000, two case studies were conducted which focused on two German firms developing software applications for business-to-business electronic marketplaces, as well as two firms which made use of these software applications. Alphacom (name changed) was founded in 1997. It developed software for electronic marketplaces. BetaMarket (name changed) was founded in 1998. The company developed software for electronic marketplaces targeted at specific branches of industry such as packaging, pulp-and-paper or telematics. In addition, they operated marketplaces based on this software in co-operation with different partners. The case studies are based on qualitative interviews with nine employees of these firms who were all involved in the development or the application of the e-commerce software applications (see table 2). Publicly available documents, mainly firm and product presentations, complemented the material. In addition, the public discourse on e-commerce as represented in newspapers, studies of consulting firms etc. were analysed.

Scenarios in flux

Alphacom started the development of the first software version in 1997/1998 following the scenario of a shopping mall targeted at consumers. This shopping mall scenario—a website bringing together a number of suppliers in contrast to shop scenarios with only one supplier—was inspired by a group of closely related types, such as department stores, marketplaces and shopping malls.

> ... the first idea was to build a department store for the internet, [...] right from the beginning we decided, no shop solution, we want to build a marketplace solution, so we are able to concentrate purchasing power and to generate more purchasing power on the system. We wanted to reproduce the shopping experience, the shopping spree, for business-to-con-

Case study Alphacom	*Case study BetaMarket*
Alphacom ▪ product manager ▪ project leader of builder's merchant e-commerce system	*BetaMarket* ▪ head of development *advertising agency operating the packaging marketplace* ▪ managing director
Alphabuild: builder's merchant ▪ Chief Technical Officer ▪ coordinator e-commerce project ▪ customer advisor at one of the branches	*Betamachines: manufacturer of packaging machines* ▪ manager of public relations (responsible for e-commerce project) ▪ manager of service department

Table 2: Interview partners case studies 'E-Commerce'.

> sumer-sites, shopping malls you are walking through ..." (product manager, Alphacom, 7/2000)

In the follow-up version a new, media-specific approach to the problem of getting offers to the customers was developed. One shop and its products could be presented in different, but interlinked e-marketplaces, thus multiplying the number of potential customers with little effort. The scenario was not a straightforward analogy to a conventional trading concept, but reflected specific characteristics of the software and the specific character of virtual shops of being duplicable or 'mobile'.

> First we had the marketplace. Then we had the idea, since we had a distributed software architecture, which easily made it possible to draw connections and combinations of one marketplace with another, that we could represent shops from one marketplace in another marketplace [...] Thereby we could multiply the purchasing power by simply taking the products to the customers instead of waiting or trying to get the people to the products. (product manager, Alphacom, 7/2000)

As in the former section, we see that scenarios do not shape technologies in a unilateral way, but scenarios and technology are mutually shaped as part of a co-evolutionary dynamic between scenarios, artefacts and use.

About the time when the second software version was put on the market the envisaged scenarios were complemented by a set of scenarios targeted at a different user model: a number of business-to-business (B2B) scenarios, in contrast to the aforementioned business-to-consumer (B2C) scenarios, which had so far not been considered. A number of variants developed was supposed to reproduce common trading concepts in the business-to-business field (see Figure 1). This bundle of scenarios was integrated into the third software version. Each scenario implied different *use* and *user*

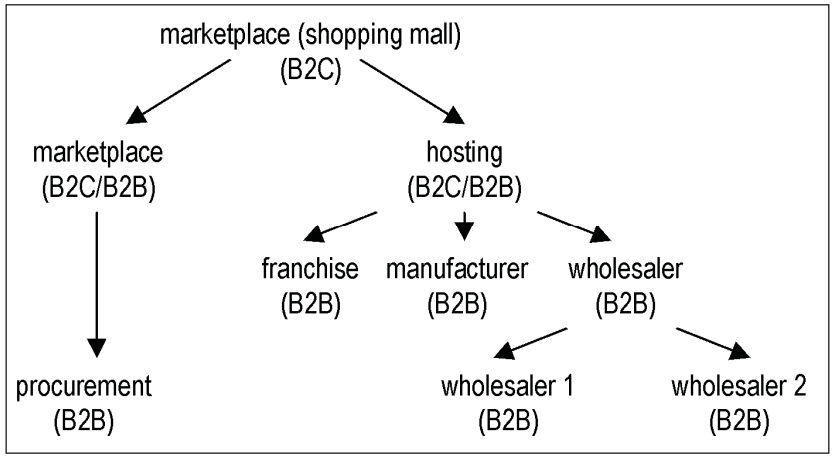

Figure 1: Diversification of scenarios of use and software versions.

models. The shopping mall scenario, for example, described the interactions between operators of marketplaces, operators of shops and buyers. A wholesale scenario described the interactions between wholesaler staff, suppliers, retailers, business and private customers. The role-takers envisaged for these user roles were different for each scenario. Yet the software core for these highly diverging scenarios was the same, complemented only by specific additional modules. Thus, this type of evolution may be best described as a diversification of variants.

A similar evolution of scenarios and software versions took place at BetaMarket. Founded about one year after Alphacom, they followed a business-to-business approach from the beginning, since at that time a large number of forecasts predicted a large growth market in this sector and business-to-consumer (B2C) scenarios were no longer considered highly promising in public debate. The first software version was targeted at the scenario of an information marketplace, where firms in a certain branch of business could present themselves or easily access sector-specific information. Online transactions were not part of the concept. The specific form of the scenario was strongly influenced by the experience and know-how of the parent enterprise of BetaMarket, which developed software for the administration of document archives. Furthermore, the designers drew on a number of types as part of 'real-life' analogies such as an industrial park, yellow pages, the organisation in sectoral associations or the marketplace itself. In 2000, a new version of the marketplaces was developed and partly implemented. The new concept comprised a number of trading scenarios, which in part also allowed for online transactions. These included three types of auctions reproducing typical forms of auctions in the industry field, requests for proposals and a multi-vendor catalogue.

Finally, user's scenarios evolved, too. Betamachines, a medium-sized company producing packaging machines, was an early user of the first marketplace operated by BetaMarket. At the beginning, Betamachines was mainly interested in the scenario of the information marketplace, while online transactions were not considered relevant to their activities. However, at a later stage, online transactions were implemented and, in a second interview, the head of public relations stated that the general trend was moving in this direction. Neglecting this would be the same "as if one wanted to abolish the car". Alphabuild, the customer of Alphacom, did not actually change its scenario within the duration of the study, but changes were envisaged for the future, even if it was not clear how exactly they should look.

Processes underlying the evolution of scenarios

Local processes of variation

An important element of the local processes of definition and development of scenarios was—just as in the case of the pilot project on interactive television—the specification, differentiation and modification of existing types of trading, architectural and other concepts, which gradually led to new variants. The concrete form resulted from the specific knowledge and experience of the actors or experience from the preceding version, thereby leading to locally specific interpretations of more general scenarios. Analogies and metaphors were an important element, either as a 'creative

tool' that was interpreted rather freely, or as a more rigorous guiding line, when 'real life' business processes were to be reproduced or supported.

Furthermore, interaction between designers, customers and users played an important role as well. Scenarios incorporated elements proposed by customers, for example new scenarios of use for existing e-marketplace variants or new modes of use for specific software tools.

Scenario evolution on the societal level

Dynamics on a societal level contributed to the scenario evolution as well. Scenarios presented as highly promising in the societal discourse on e-commerce—scenarios that were part of the actual e-commerce agenda—were taken up by the local actors. Partly this resulted in rather radical re-orientations of the guiding scenarios, for example the change from business-to-consumer to business-to-business scenarios. A scenario which is part of a relevant agenda will most probably be taken into account by designers and potential users, either because the scenario as such is convincing or because the scenario has become self-evident, exactly because it is promoted by many others (Konrad, 2006). This holds not only for designers, but also for users, as is apparent in the case of Betamachine. Thus, the alignment of scenarios of users and designers resulted mainly from a common orientation on the current agenda, and not necessarily from direct interaction between users and designers—which, according to the interviewees, was not very intense. On the other hand, if a scenario is no longer part of an agenda, it will easily be abandoned. This happened to the 'shopping mall' scenario targeted at diffuse consumer groups, which guided the first design phase of Alphacom in 1998. In 2000, 'shopping malls' were considered an economically disappointing intermediate step on the way to the really profitable e-commerce concepts. Following the latest trends in the USA, now marketplaces were regarded as promising only if targeted at specific consumer groups or branches of industry (Product Manager, Alphacom, 12/2000; Marketing brochure 2000).

The social expectations represented in an agenda also exerted a social pressure to meet those expectations. Designers or customers developed or offered certain features because of the expectations of others, even if they personally were not convinced that these features would be used very much. BetaMarket developed a software module permitting auctions at the e-marketplaces. Whilst the head of the development department showed a firm conviction concerning the overall potential of e-marketplaces, he did not hold auctions to be a particularly promising feature of e-marketplaces in the business-to-business environment in the near future.

> Apart from the fact that they are part of it [our portfolio] and we hold them to be an interesting feature, our surveys showed that auctions are something which does not work very well online. It makes no profit. It's a business model which will take some more time. (Head of Development, BetaMarket, 10/2000)

Nevertheless, in 2000 auctions as a scenario of use were part of the agenda for electronic marketplaces. Those wanting to comply with external expectations had to offer this feature. Other actors, for example customers or shareholders, would doubt the competence of an actor who did not support the latest technology considered promising by many, or who did not have a feature which had

become a self-evident part in the ideal image of a new technology. Consequently, the actors had to include these new trends which were sometimes as unpredictable as the above-mentioned processes on a local level.

Stabilisation or generation of variety?

Now we will take a more general view on the dynamic patterns observed in the case studies. We discuss how the interplay of design, scenarios and use can be conceptualized and under which circumstances the generation of either variety or stabilisation—respectively 'opening' or 'closure'—is likely to be the result.

Design and use phases revisited

A number of authors, some of them using the script concept, proposed (co)evolutionary models of technology development and use (Callon, 1993; Akrich, 1998; Rip and Schot, 1999; Rammert, 2002). According to these models, scenarios and use practices evolve via recursive learning processes in a succession of design and use phases. These are mostly supposed to result in convergence and stabilisation of scenarios and practices, while the model of Callon also provides for the possibility of generating variety and the reorientation of trajectories.

However, our case studies show that the model of *alternating, separate* design and use phases is not always appropriate; partly development cycles and phases of use proceeded side by side. Designers, particularly in the dynamic technology field of electronic marketplaces, did not pause while waiting for potential users to adopt the latest version and establish new use practices. We rather see a development similar to the continuous and parallel co-evolution of technologies, applications and use patterns, as described by Kubicek and Schmid (1996) or Williams et al. (2005: 71). In parallel to the design of a specific software version, the realisation of a number of e-marketplaces took place based on former software versions. User groups and user practices were established as well, however, had not yet stabilised. Thus, designers could not rely on stable user groups, demands and user practices. At the same time, users did not face a stable object of use, since the concrete form of a specific e-marketplace as it presented itself to the users was affected by the changing behaviour of other users or on changing content. Going beyond the continuous development by Williams et al., we furthermore observed radical reorientations including (ex)changes of user and use models as well as the context of use.

Dynamics

What could be the outcome of this kind of development process? We may expect a convergence and stabilisation of scenarios and use practices, if one element in the process remains rather stable or changes comparatively slowly, e.g., if at least the use context remains the same and, thus, central features of the scenario. Then, technological variants and use practices may converge step by step. However, as far as the process was observed in the case studies on electronic marketplaces, the creation of new technological variants, new scenarios of use and new modes of use prevailed over the abandonment of former ones. Stabilisation was not yet in sight. If both sides—designers and users—adapt or react to new elements, ideas and experiences, processes of stabilisation compete with the formation of new scenarios, technical elements and user patterns. Any

new technology variant may provoke new patterns of use or new scenarios, and new use patterns may lead to new scenarios and technologies. New use patterns may be a result of emerging or changing routines of users, or new user groups enter the stage. In addition, new promising scenarios circulating in the technology field constitute a further source of reorientation. The outcome then is an opening process rather than closure and stabilisation. This most likely happens once a dynamic has started that is not limited to incremental modifications of the scenarios, but is rather of the radical, non-continuous type. Then reactions and adaptations of users to new technological options as well as reactions and adaptations of designers to new user practices may provide stimuli for new scenarios and user practices again and again (for a similar argument see Callon, 1993).

The dynamics likely to appear are also dependent on the character of the technology and the strength of established routines by designers and users. Software-based technologies are, of course, particularly easy to re-interpret, modify and 're-use'. E-commerce, at the time of our study, is an emerging, not yet stabilised field. Finally, the software companies were only recently founded and, thus, still in search of markets and customers. So, all three aspects are susceptible to re-orientations.

Conclusion

In this article we approached the dynamics of scenarios from two sides. On the one hand, we took a project level perspective by tracing the specific interpretations of scenarios by various innovation actors, examining how these emerged from familiar concepts and how they gradually departed from these initial concepts as a result of a co-evolution of scenarios, artefacts and use. Thus, scenarios do not unilaterally shape the design, but the relationship is more complex and dynamic.

On the other hand we were able to show that, notwithstanding the importance of local interpretations of scenarios, basic scenarios were often chosen as a reflection of social dynamics within the technological field and that these significantly affected the dynamics of scenarios at the local level. More generally, we may deduce that the typical micro lens of Science and Technology Studies can be fruitfully combined with the more meso level oriented approaches typical for innovation studies.

By following the dynamics of scenarios and applications we furthermore went beyond the confines of a clearly circumscribed design project. This relativised to some extent the success or failure of certain scenarios within one project, since these turned out to be one step within a trajectory of scenarios, design variants and use forms. These trajectories were partly subject to radical reorientations and social learning processes, the outcome of both being difficult to anticipate. Thus, it is difficult to judge from the outset which are the successful or at least promising routes to follow. There is probably no real shortcut for these social learning processes. User involvement can only partly be of help if user models and use practices have not yet stabilized. As a result, as has been pointed out before, keeping technologies flexible and 'open' for further evolution may be just as important to obtain technologies that may eventually fit with users' emerging practices as user involvement itself (Williams et al, 2005; Konrad, 2005; Redström, 2006). This

is arguably not the case for all design projects, but holds true for emerging technologies, and is therefore no general dismissal of the involvement of user or other role takers within a scenario.

Notwithstanding these caveats, the scenario concept and our findings on how scenarios evolve suggest a strategy which might be useful in exploring the promising, innovative scenarios in the short or long term more broadly than the often problematic reliance on implicit designer models. Innovative scenarios of use departing from familiar concepts are of course no guarantee for successful application. However, in our related work (Konrad et al., 2006b) we have found that a systematic exploration of a range of possible scenarios could be a useful tool to explore potential innovative applications for a new technology.

Acknowledgements

I want to thank Mikael Hård, Sampsa Hyysalo, Jochen Markard, and four anonymous referees for their valuable contributions to this paper. I also gratefully acknowledge financial support from the German Research Foundation (DFG).

References

Akrich, Madeleine (1992a) 'The De-Scription of Technical Objects', in W. Bijker & J. Law (eds), *Shaping Technology/ Building Society* (Cambridge/MA: MIT Press): 205-24.

Akrich, Madeleine (1992b) 'Beyond social construction of technology: The shaping of people and things in the innovation process', in M. Dierkes & U. Hoffmann (eds), *New Technology at the Outset* (Frankfurt/Main: Campus): 173-90.

Akrich, Madeleine (1995) 'User Representations: Practices, Methods and Sociology', in A. Rip, T.J. Misa & J. Schot (eds), *Managing Technology in Society - The Approach of Constructive Technology Assessment* (London: Pinter Publishers): 167-84.

Akrich, Madeleine (1998) 'Les utilisateurs, acteurs de l'innovation', *Education Permanente* 134/1: 79-89.

Berg, Marc (1998) 'The Politics of Technology: On Bringing Social Theory into Technological Design.' *Science, Technology and Human Values* 23(4): 456-490.

Berger, Peter L. & Thomas Luckmann (1966) *The Social Construction of Reality* (New York: Doubleday).

Callon, Michel (1991) 'Techno-economic networks and irreversibility', in J. Law (ed), *A Sociology of Monsters: Essays on Technology and Domination* (London: Routledge): 132-161.

Callon, Michel (1993) 'Variety and irreversibility in networks of technique conception and adoption', in D. Foray & C. Freeman (eds), *Technology and the Wealth of Nations - The Dynamics of Constructed Advantage* (London: Pinter Publishers): 232-68.

Carlson, W. Bernard (1992) 'Artifacts and Frames of Meaning: Thomas A. Edison, His Managers, and the Cultural Construction of Motion Pictures', in W.E. Bijker & J. Law (eds), *Shaping Technology/Building Society* (Cambridge/MA: MIT Press): 175-98.

Cooper, Alan (2004) *The Inmates are Running the Asylum'* (Indianapolis: Sams Publishing).

Dutton, William H. (1997) 'Multimedia Visions and Realities', in H. Kubicek, W. Dutton & R. Williams (eds), *The Social Shaping of Information Superhighways - European and American Roads to the Information Society* (Frankfurt/Main, New York: Campus): 133-155.

Egyedi, Tineke, Marc van Lieshout & Wiebe E. Bijker (2001) 'Multimedia Innofusion', in M. van Lieshout, T. Egyedi & W.E. Bijker (eds), *Social Learning Technologies: The Introduction of Multimedia in Education* (Aldershot: Ashgate): 264-80.

Gjøen, Heidi & Hård, Mikael (2002) 'Cultural Politics in Action: Developing User Scripts in Relation to the Electric Vehicle', *Science, Technology & Human Values* 27: 262-81.

Hasu, Mervi (2000) 'Constructing Clinical use: An Activity-Theoretical Perspective on Implementing New Technology', *Technology Analysis & Strategic Management* 12: 369-82.

Heintz, Bettina (1993) *Die Herrschaft der Regel - Zur Grundlagengeschichte des Computers* (Frankfurt/Main: Campus).

Hofmann, Jeanette (1997) 'Über Nutzerbilder in Textverarbeitungsprogrammen - Drei Fallbeispiele', in M. Dierkes (ed), Technikgenese Befunde aus einem Forschungsprogramm (Berlin: Edition Sigma).

Hyysalo, Sampsa (2003) 'Some Problems in the Traditional Approaches to Predicting the Use of a Technology-Driven Invention', *Innovation* 16: 117-37.

Hyysalo, Sampsa (2006) 'Representations of Use and Practice-Bound Imaginaries in Automating the Safety of the Elderly', *Social Studies of Science* 36(4): 599–626.

Hyysalo, Sampsa (forthcoming) 'Figuring technologies, users and designers – Steps towards an adequate vocabulary for design – use relation', in E. Baraldi, H. Håkanson, F. Prenkert & A. Waluszewski (eds), *Economic use of science and technology*.

Jelsma, Jaap (2003) 'Innovating for Sustainability: Involving Users, Politics and Technology', *Innovation* 16/2: 103-16.

Konrad, Kornelia (2004) *Prägende Erwartungen: Szenarien als Schrittmacher der Technikentwicklung* (Berlin: Edition Sigma).

Konrad, Kornelia (2005) 'A Circle of Uncertainties: Dilemmas of User Involvement in Highly Dynamic Innovation Processes', in H. Rohracher (ed), *User Involvement in Innovation Processes: Strategies and Limitations from a Socio-Technical Perspective* (München/Wien: Profil-Verlag): 317-46.

Konrad, Kornelia (2006) 'The Social Dynamics of Expectations: the Interaction of Collective and Actor-Specific Expectations on Electronic Commerce and Interactive Television', *Technology Analysis & Strategic Management* 18/3/4: 429-44.

Konrad, Kornelia, Jochen Markard & Bernhard Truffer (2006b) 'Analysing the interaction of an innovation field and its context for exploring different innovation pathways: the case of Smart Building', in SPRU 40th Anniversary Conference: The Future of Science, Technology & Innovation Policy: Linking Research and Practice, September 11-13, 2006 (Brighton).

Kubicek, Herbert, Bernd Beckert, Andreas Breiter & Martin Hagen (2001) 'Staatliche Initiativen auf dem Weg in die Informationsgesellschaft: Ein Vergleich von Multimedia-Pilotprojekten in ihrem politischen Kontext: Deutschland, EU und USA - Wissenschaftlicher Ergebnisbericht an die Volkswagen-Stiftung, Az II/71906', (Bremen).

Kubicek, Herbert and Ulrich Schmid (1996) 'Alltagsorientierte Informationssysteme als Medieninnovation— Konzeptionelle Überlegungen zur Erklärung der Schwierigkeiten, 'Neue Medien' und 'Multimedia' zu etablieren'. *Verbund Sozialwissenschaftliche*

Technikforschung, Mitteilungsheft 17*: Soziale und organisatorische Entwicklungsprozesse von elektronischen IuK-Systemen*: 6-44.

Latour, Bruno (1992) 'Where Are the Missing Masses? The Sociology of a Few Mundane Artifacts', in W. Bijker & J. Law (eds), *Shaping Technology/ Building Society* (Cambridge/MA: MIT Press): 225-58.

Lindsay, Christina (2003) 'From the Shadows: Users as Designers, Producers, Marketers, Distributors, and Technical Support'. In N. Oudshoorn & T. Pinch (eds) *How Users Matter: The Co-Construction of Users and Technology* (Cambridge, MA: MIT Press): 29-50.

Oudshoorn, Nelly, Els Rommes & Marcelle Stienstra (2004) 'Configuring the User as Everybody: Gender and Design Cultures in Information and Communication Technologies', *Science, Technology and Human Values* 29/1: 30-63.

Pinch, Trevor J. & Wiebe E. Bijker (1987) 'The Social Construction of Facts and Artifacts: Or How the Sociology of Science and the Sociology of Technolgy Might Benefit Each Other', in W.E. Bijker, T.P. Hughes & T.J. Pinch (eds), *The Social Construction of Technological Systems* (Cambrigde: MIT Press): 17-50.

Preece, Jennifer, Yvonne Rogers & Helen Sharp (2002) *Interaction design: beyond human-computer interaction* (New York: Wiley).

Rammert, Werner (2002) 'The Cultural Shaping of Technologies and the Politics of Technodiversity'. In R. Williams, R. & K. H. Sörensen *Shaping Technology, Guiding Policy: Concepts, Spaces & Tools*,. (Cheltenham: Edward Elgar): 173-194.

Redström, Johan (2006) 'Towards user design? On the shift from object to user as the subject of design', *Design Studies* 27, 123-39.

Rip, Arie & Johan Schot (1999) 'Anticipating on Contextualization - Loci for Influencing the Dynamics of Technological Development', in D. Sauer & C. Lang (eds), *Paradoxien der Innovation: Perspektiven sozialwissenschaftlicher Innovationsforschung* (Frankfurt/ Main: Campus): 129-46.

Rommes, Els (2005) 'Taming Technology, Shaping Gender. The Domestication of Amsterdams's Digital City'. In H. Rohracher *User Involvement in Innovation Processes. Strategies and Limitations from a Socio-Technical Perspective,* (München/Wien: Profil): 127-45.

Sawhney, Harmeet (1996) 'Information Superhighway: metaphors as midwives'. *Media, Culture & Society* 18, 291-314.

Schneider, Volker (1989) *Technikentwicklung zwischen Politik und Markt: Der Fall Bildschirmtext* (Frankfurt/Main: Campus).

Schutz, Alfred (1962a) 'Common-sense and scientific interpretation of human action', in A. Schutz (ed), *Collected Papers I - The Problem of Social Reality* (The Hague: Martinus Nijhoff): 3-47.

Schutz, Alfred (1962b) 'Choosing among projects of action', in A. Schutz (ed), *Collected Papers I - The Problem of Social Reality* (The Hague: Martinus Nijhoff).

Schutz, Alfred (1962c) 'On Multiple Realities', in A. Schutz (ed), *Collected Papers I, The Problem of Social Reality* (The Hague: Martinus Nijhoff): 207-59.

Schutz, Alfred (1964) 'Tiresias, or our knowledge of future events', in A. Schutz (ed), *Collected Papers II, Studies in Social Theory* (The Hague: Martinus Nijhoff).

Schutz, Alfred (1966) 'Some structures of the life-world', in A. Schutz (ed), *Collected Papers III - Studies in Phenomenological Philosophy* (The Hague: Martinus Nijhoff).

Schütz, Alfred & Thomas Luckmann (1975) *Strukturen der Lebenswelt* (Neuwied: Luchterhand).

Silverstone, Roger & Eric Hirsch (eds) (1992) *Consuming Technologies. Media and Information in Domestic Spaces* (London: Routledge).

Suchman, Lucy and R. Trigg (1991) 'Understanding Practice: Video as a Medium for Reflection and Design'. In Greenbaum, J. and M. Kyng (eds) *Design at Work: Cooperative Design of Computer Systems*, (Hillsdale: Lawrence Erlbaum Associates): 65-89.

van Lente, Harro & Arie Rip (1998) 'Expectations in Technological Developments: An Example of Prospective Structures to be Filled in by Agency', in C. Disco & B. Van der Meulen (eds), *Getting new technologies together: studies in making sociotechnical order* (Berlin: de Gruyter): 203-29.

Williams, Robin, James Stewart & Robert Slack (2005) *Social Learning in Technological Innovation – Experimenting with Information and Communication Technologies* (Cheltenham: Edward Elgar).

Woolgar, Steve (1991) 'Configuring The User: The Case of Usability Trials'. In J. Law (ed), *A Sociology of Monsters: Essays on Technology and Domination*, (London: Routledge): 57–99.

Kornelia Konrad
Cirus - Innovation Research in Utility Sectors
Eawag - Swiss Federal Institute of Aquatic Science and Technology
kornelia.konrad@eawag.ch