SHAPING INTERACTIVE COMMUNICATION TECHNOLOGIES: TEXT AND CONTEXT

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Hetland emphasises an actor and process-oriented approach to technology. New technologies are inscripts readable as ‘texts’ which will transform their social contexts. In the course of any innovation, crises arise in the relations between users and machines. New technological objects or procedures become manifest and the subject of debate or rivalry. These crises are central to the analysis and evaluation of how technological innovations (objects) get their form. Specific networks of actors lead to a black-boxing of the technology. Interpretative flexibility and group-related differences are essential in this process. Social experiments using a qualitative approach to ‘text-context’ dynamics can contribute to constructive technology assessment that is useful in practice.

1 Introduction

According to Meyrowitz we are the hunters and gatherers of an Information Age, creating a subsistence information economy (1985). Interactive communication technologies are no longer simply channels for conveying information between two or more environments, but rather environments in and of themselves. By means of this transition, interactive communication technologies create new placeless situations which have no traditional patterns of behaviour and which also affect social roles because they bypass the communication networks that once made particular places unique. Communities may therefore
be defined as social networks, not as places. Consequently “we will be
able to forge our own places from among the many that exist, not by
creating new places but simply by choosing from the menu of those
available” (Jones 1995 p. 11). Communication technologies are there­
fore advanced machinery for time and space manipulations.

Communication-technological mediation involves representation
and inscription in the world. Callon describes how engineers become
sociologists through their development of hypotheses about what other
people want and need (Callon 1987). As a result a large part of the
work of innovators becomes the writing of user-values into the technical
content of new objects and then the enrolling of other actors in
support of these inscriptions. These inscriptions, however, do not only
apply to the artefacts as such but also to the situations in which they
are used. In this way mediation translates and converts. To study com­
munication-technological mediation Rasmussen suggests “a fourfold
methodological strategy, focusing on analysis of text, ethnography of
contexts (including social experiments), the political economy of so­
cial systems and, lastly, inter-institutional analysis of information and
communication flow” (Rasmussen 1996 p. 77).

This chapter focuses on some of the interactive aspects in the pro­
cess of shaping communication technology. Recent work in interactive
communication technologies has argued that the same technologies
cannot be understood apart from the situation in which they are used.
However, the use of technology no longer merely takes place in con­
texts; technologies create contexts. This chapter elaborates on this claim
and distinguishes some variants in the relationship between the mes­
 sage and the context, or text and context, in the shaping of new inter­
active communication technologies. The analysis takes as its starting
point two important characteristics of the emergence of new commu­
nication technology: (a) the highly developed capability of the mod­
ern economy to produce and diffuse user-values with new characteris­
tics and (b) “hybrid communities”1 as quasi-experiments2 creating an
arena for interaction between users and producers. In hybrid commu­
nities or social experiments, potential user needs for and potential user-

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1 The use of such terms as “hybrid communities” or “social experiments”, “field
trials”, “social laboratories” etc. has been discussed in Hetland (1996).

2 Cook and Campbell use the notion of “quasi-experiment” for experimental situ­
ations in which the experimenter cannot manipulate human behaviour. See Cook
and Campbell (1979).
shaping interactive communication technologies

values of new technology and new services are communicated between users and producers to facilitate invention and diffuse innovations. Social experiments therefore represent a hybrid composition of technological and social innovation processes. In what follows I shall concentrate on the first two points in the fourfold methodological strategy.

In terms of method and as questions of science these issues have attracted the attention of researchers in many countries, and good surveys of this field of study are to be found in JasAnOFF et al. (1995) and Rip et al. (1995). To illustrate the methodological points I have used examples from two social experiments in which I have participated: (a) the adaptation of the internet to the dissemination of public information to users with visual impairments, and (b) the shaping of technology for distance education (HETLAND 1995, 1996). These two projects also illustrate important dilemmas when full liberalisation on the telecommunications market is introduced in Europe on 1 January 1998. The policy-makers have created what they call the Universal Service Obligation to solve two problems that are not easily solved on the free market: the problems of non-profitable users and non-profitable regions. Finally I thus wish to consider some implications for the development of new interactive communications technologies.

2 Technology assessment

Rapid technological development and an increasing understanding of the social and societal significance of technology have brought about an interest in various forms of technology assessment. We find different approaches within technology assessment. In brief we have three main approaches (Remmen 1991:188):

(1) Consequence assessment. This form of technology assessment is reactive in relation to the decisions that have been taken. Its purpose is to limit various kinds of negative effects.

(2) Comprehensive assessment. This form of technology assessment is proactive and often oriented towards technology in the melting pot. Its purpose is to stimulate the development of "advantageous" solutions.

(3) Constructive assessment. This form of technology assessment is interactive. Its purpose is to influence technological change and thereby the future "technological space".
In many ways one can say that constructive technology assessment is part of an historical continuum from the Luddites up to the technology criticism of today. The importance of dialogue is emphasised by the fact that a number of countries have established institutions with this as a particular area of responsibility. Denmark and the Netherlands are used as models in this connection. Experimentation in hybrid communities may also be perceived as a specific version of Constructive Technology Assessment. Callon defines constructive technology assessment as “aiming at broadening the design and implementation of technological systems in order to stimulate the integration of social criteria into the technological development” (Callon 1955). An important element in the work of developing constructive technology assessment as a method is the understanding of the dynamic processes that characterise the process of designing and implementing new technology. With such a starting point one may elucidate the following analytic questions:

(a) How can we identify the players who participate in the process of designing and implementing new technology?

(b) How are we to explain how technological options disappear (or what we may call reduction of technological variation)?

(c) How can we include in the elaboration the growth of dead-locked or irreversible situations?

### 3 Hard relationships and soft machines

Donna Haraway proposes the term “cyborg” to describe the ongoing connection between man and machine (Haraway 1991). The extension of the human sensory apparatus with the aid of new communication technology, for example, is creating new hybrids or cyborgs. A new understanding of the dividing line between nature and culture is thus developing. The French social anthropologist and philosopher, Bruno Latour, has called this on-going connection between man in action and our technological solutions a process of hybridisation (Latour 1993). We may for example say that communication technology has given us a sixth and a half sense, which increases the possibilities of communicating in time and space. This conceptualisation may be used descriptively: we can describe how modern technology is changing our notions of the nature-culture dichotomy. This understanding can
however also be used normatively: we may wish to experiment with new technology to extend our limits to human experience and knowledge. In this connection it is important to understand how the users are enrolled in support of new technology or possibly overlooked or ruled out as an appropriate user group. In *Science in Action* (1987) Bruno Latour argues that we must resurrect the symmetry between nature and culture, and that we can best understand scientific and technological development by regarding it as a process of negotiation in which alliances are built up by recruiting external interests from the cultural field and new allies in the fields of nature or technology.

The model for which Latour makes himself the spokesman is often called the translation model, or more generally actor network theory. This model does not distinguish *a priori* between content and context. The point of departure adopted by Latour is that it is impossible to determine beforehand whether new technology will catch on or end up on the scrap-heap of history. What is decisive for the result is whether the actors participating in the process of designing and introducing, manage to build a stable network around the new technology. The actors thus build networks consisting of a number of different elements that together keep the technology in place. The network may consist of technical, economic, personal, social, legal or cultural elements. In this way the content of new technology is formed at the same time the context into which this technology is to fit is established. When the network has been built around new technology, this technology becomes stabilised in relation to notions about what are the possibilities and consequences of the technology. At this stage Latour claims that the technology has become a "black box". There is no longer anybody who is worried about what is inside it or what it can be used for. When technology is not black-boxed and thus becomes a fiasco, this is due to the fact that the actors did not manage to build up a sufficiently solid and comprehensive network to be able to keep the different elements in place.

3 I have used actor network theory (ANT) as the theoretical framework of this chapter. However I have eclectically borrowed elements from the school of thought known as the Social Construction of Technology or SCOT. Those who want a more methodological introduction to ANT are referred to Latour 1987, in particular his methodological rules in the Appendix, Akrich and Latour 1992 and Callon 1986. Those who wish to know more about SCOT are referred to Bijker 1995. Otherwise good survey articles are to be found in Jasanoff et al. 1995.
Not until somebody questions the established truths are the black boxes opened again. To understand how technology gets its design one must therefore understand the process that leads to the establishment of black boxes, whether it be cars, TV sets or keyboards. There is therefore a limited purpose in searching for the intrinsic properties of technology as does, for example, McLuhan with his media laws (McLuhan and Powers 1989). In other words one must understand the actor networks that lead to the black-boxing of technology. Through such a research strategy one will more easily be able to understand why ostensibly “bad” solutions succeed while “good” solutions fail.

It is in no way the case that technological solutions succeed because they are the “best”. A classical example of this is the QWERTY keyboard, called after the top six keys on the dominant keyboard today. This keyboard has survived since 1873 and is still in use with the most advanced computers. The inventor, Christopher Latham Sholes, designed his keyboard in such a way as to reduce typing speed and thus minimise the problem of collisions between the type-bars on the old typewriters. This inefficient keyboard, which is no longer necessary, was improved on by Professor Dvorak in 1932. However it has proved impossible to introduce this new keyboard, which is both more efficient and simpler to learn and also less likely to lead to so many stress injuries.

According to the translation model a good deal of the innovators’ effort consists in stamping new technology with their interpretations of user possibilities and subsequently working to make the users support these interpretations by using the technology. This model supposes that one has hypotheses about what the users need and do not need. This way of viewing technology implies that technology is “stiffened” relations, i.e. a packed bundle of actions, suppositions and notions about relationships. We can therefore, purely methodologically, regard technology as “text”; written into the technology there are a number of messages about future use and users. This is a clear parallel to at any rate a couple of possible interpretations of McLuhan’s dictum “The medium is the message” (Bakke 1996). The players act within frameworks of action which are partly constituted by the media, at the same time as the media are not neutral tools, they colour and shape actions. Without falling into technology determinism one can thus state that it is interesting to study the coming into existence of technologies, because the resulting technology has significance and it is interesting to study use and to insist on the variety of ways in which the same technology is used, since both technology and the way it is used have
significance. In other words new technology does not have unambigu­ous consequences, and it can often be exploited in various ways with different results. Therefore it is necessary to analyse technology as a process in which a number of choices are made rather than observe the choice that has been made when a given technology has been made available.

4 Technology as text

In terms of method in qualitative technology studies we shall find the metaphor “machines as ‘text’ in a changing context” very useful indeed. We can start off with the hypothesis that machines display, at least in principle, interpretative flexibility. This opens the way for a study of the construction process (as a process of inscribing or writing) and of use (as a reading process). The relationship between the reader and the writer may be understood as being mediated by the machine and the interpretations of what the machine is, what it exists for, and what it can do (WOOLGAR 1991). Notions of future use and users of technology are in other words an important element in technological development. Suppositions about gender, competence, job performance and working environment in the relevant target group become an important part of technological design and become firmly anchored together with this. In other words, we meet technological objects not only as tools but also as bearers of meaning and of the interpretation of social and societal relations. These are properties that do not however prevent the users from re-interpreting these objects. It is therefore important to make technological problems comprehensible on the basis of the context in which the technology is placed. An obvious starting point in order to achieve this aim is to have a closer look at how technology constantly undergoes changes.

One way of illustrating this is to have a look at the very first word­processing programmes. The different strategies for interface design between users, the programme and the digital machine from menus to function keys and interactive graphic objects, reflect the degree of competence and control that one assumes the user has or must have. Hofmann describes how the first word-processing systems were based on dedicated applications which must really be called advanced type­writers (HOFMANN 1995). The target group they had in mind were female secretaries. The first machines at the end of the 1970s and the
beginning of the 1980s (IBM’s Displaywriter and WangWriter) were
based on hierarchical menus that provided few opportunities for mis-
understandings. These machines were made for users (women) who
were presumed not to have any understanding of technology. In other
words it was assumed that the user lacked both competence and the
ability to learn when it came to computers.

A completely different notion of women and secretaries was built
into the next generation of computer-assisted writing programmes. Word
Star and WordPerfect belong to the first commercially successful writ-
ing programmes for micro-machines. To take WordPerfect as an ex-
ample, the programme ascribed to the user great independence and
high competence (within the production of text), something that is
expressed by the fact that the programme meets the user with an al-
most completely blank screen. This programme was created for the
professional secretary who wrote regularly and therefore had no prob-
lem remembering the programme-specific language once it had first
been learnt. Surviving as a secretary became a question of learning to
use the programme.

The contrast between these programmes and the next “generation”
of writing programmes became clear when the first writing programme
for men came on the market. In 1981 Xerox launched its Star ma-
chine, which was a market fiasco but at the same time a model for the
future user interface – the graphic user interface. Star was the first
computer on the market to organise text production by means of pic-
tures, or icons, in a visual language. Furthermore the machine made
possible direct manipulation of graphic symbols by means of a mouse.
The successor to Star, Apple, further developed the graphic user inter-
face which has become dominant for all machines/programmes in the
course of the 1990s. This user interface was developed for the male
knowledge worker, who no longer had a secretary. This group was a
difficult target group because of its varied work situation. The Star
designer assumed that what the knowledge worker learnt about the
use of computers was just as quickly forgotten as it had been learnt,
because these people were not regular users of the technology. It was
this large new group of part-time writers that now became the interest-
ing target group for new word-processing programmes. The knowl-
dge worker as a “dilettante” at the computer was now the user who
was written into the programmes. The needs and the competence that
the knowledge worker has, have since laid the foundation for a univer-
sal standard for user interfaces.
“Text” or script is in other words the scheme of events that, consciously or unconsciously, is written into the technology. It is thus the social scientist’s task to decipher this script in order to increase our insight into why technology functions as it does. A central methodological angle of approach to describe this type of script is the study of crises in the confrontation between technology and user.

5 The significance of crises

The different problems the user faces are an important source for the description of how solutions are designed in relation to the users. Experiencing crisis also allows the setting to be described; “if everything runs smoothly, even the very distinction between prescription and what the actor subscribes to is invisible because there is no gap, hence no crisis and no possible description” (Akrich and Latour 1992). The ethnomethodologist Harold Garfinkel similarly considers crises as fundamental sources of knowledge and has developed a method of making situational conventions visible by breaking the rules of situations and then observing the resulting confusion and the process of reconstruction that follows (Garfinkel 1967). Crises and problems are therefore our most important gateways to understanding what is happening. A blind person’s meeting with the automated post office illustrates this point:

“In the past you could simply queue up and you were served when it was your turn. Now you are marginalised by having first to find the machine that dispenses queue numbers and then press the button for a ticket. Then you must get somebody to read aloud for you what number you have been given and which number is now being served. You then try to count the pips until they reach your number, and if there is only one queue, you count correctly, but if, for example, there is one queue for ordinary services and one queue for foreign exchange, so that you cannot keep track of the pips, you must get somebody to tell you when it is your turn. If that is not enough, you must also get somebody to tell you which till you will be served at and then you must get somebody to take you to that till”.

At an early stage it had been thought that the queue number system could create problems for the blind. In an early system that was installed in some places in Sweden, when the customers came in, they broke the beam of light of a photo-electric cell. When the beam was
interrupted, a machine with stored speech was actuated and it told the
customer that this was a post office with a queue number system. The
customer was referred to a service button on the queue number dis­
penser and if one pressed it, the number one had been given was read
aloud. When it was the one’s turn, this number would automatically be
read aloud over the loudspeaker system at the same time as a buzzer
would be actuated at the till with the number in question. In this way
the blind customer was guided to the correct till. The solution that was
tried out in Sweden thus illustrates the fact that it was not the technol­
gy that made necessary the exclusion of the blind.

The Norwegian version of the queue number system involves a
number of changes. Among other things it involves a redefinition of
what a queue jumper is. This is no longer a person who has been wait­
ing for a shorter period of time than you have, but also a person who
lacks a queue number and who either believes it is his turn or chooses
to challenge the user representations that lie in the queue number sys­
tem. Some blind people therefore choose to invoke their “blindness”,
or to protest against this “blinding”, by going straight to the till and
asking for service. Since those serving find it difficult to dismiss this
strategy, these people will as a rule be served at once. The disadvan­tage
of such a strategy is of course that the blind person is thus forced
to confirm that he is disabled in relation to the user representation that
lies in the queue number system. The whole apparatus of technology
and service producers all the way to the end user in other words con­
tributes to a definition of the user and thereby also establishes param­
eters for the user’s actions.

The special properties of a special screen image, or of the queue
number system at a post office, must be understood on the basis of the
cultural values and notions that precede design and the process of in­
troduction - not as a reflection of specific technological possibilities.
Script is an important type of cognitive structure. There are several
definitions. Abelson defines script as schemes of events that describe
the general series of events in social encounters (ABELSON 1981). We
have scripts for how plays are performed at the theatre, for ceremonies
and also for daily phenomena such as visits to the post office. It is
common for scripts to include remedies (queue numbers and screen
images), roles (customer, fellow customer and person serving) and rules
for the sequence of events (taking a queue number, waiting in the queue,
going to the right till and being served). Akrich and Latour see script
as a series of actions inscribed in the technology by the engineer, in­
vientor, manufacturer or designer (AKRICH and LATOUR 1992).
One of the most important sub-scripts that is placed in a lot of new technology is connected with the phenomenon of visualising. Here, one may also say that the script is connected with the general process of automation in which personal contact is replaced by machine contact. Automation has so far and to an increasing extent presupposed that the users act on the basis of visual impressions. The sense of sight is thus made one of the technology developer’s most important frames of reference in development work. The sociologist Todd Gitlin defines frames of reference as an established pattern of understanding, interpretation and presentation formed as a result of selection, emphasising and exclusion (Gitlin 1980). Established frames of reference can therefore easily have an excluding function in respect of new knowledge and in the same way problematising the frames of reference can give new insight. An amusing example of the latter is provided by David Lodge in his book Small World (1984). Here the new-comer to academic life, Persse, is confronted with the ambitions and disappointments of the academic world. At his first conference he meets Felix Skinner, who represents a publishing house. When asked by Skinner what he is working on, he realises that it is totally uninteresting. His original thesis was on how Shakespeare’s writings had influenced T.S. Eliot, an altogether extremely traditional frame for the discussion of a problem. With the inspiration of the moment he replies that his thesis deals with T.S. Eliot’s influence on Shakespeare. This way of bursting out of frames and thus turning the problem around arouses the publisher’s interest and his colleagues envy. Instead of bursting through open doors, it instantly becomes possible to acquire new insight.

Notions about the future use and users of technology are in other words an important element in the development of software and in technological development generally. This leads to the next methodological point, the identification of who form the relevant social groups as seen from different vantage points.

6 Relevant social groups

An important theoretical tradition within technology studies takes as its point of departure that those decisions that have already been taken greatly affect our freedom of action in the future. In this theory these are called path-dependencies. To put it briefly: both the possibility of participating in the decision-making process and future possibilities of alternative options are marked by path-dependencies. A clas-
sical example of path-dependency is the previously mentioned QWERTY keyboard. It has proved to be virtually impossible to introduce a new keyboard that is more efficient, easier to learn and less likely to lead to so many stress injuries. Actor network theory, however, provides us with the possibility of using the same categories to analyse both the process of design and the process of introduction. If two actors negotiate a particular technological solution, they will very often feel under pressure to reach a compromise between the ideal options. Their concepts, interests and projects will change when they abandon their original standpoints in order to accommodate the opposite party’s standpoint as well. In this way both actors and solutions change - one can thus speak of a parallel and dependent development of both technology and actors. The problem of path-dependencies can therefore also be linked to actor network theory, through closer studies of how the first user groups are defined through the process of design and introduction. Mangematin and Callon show in their studies what significance the first users may have, since the recruitment of the first users automatically ensures support from the user group they represent (MANGEMATIN and CALLON 1995). This recruitment has its counterpart in the fact that others are thus not included in the forming of technological development - something which can mean that irreversible standards are established, which again makes technological solutions less appropriate for other user groups.

How the same technological object or the same user interface is understood by different relevant social groups thus becomes of special interest. According to Bijker a “relevant social group” is both an actor and an analytical category. When one follows the actors in their identifications, definitions and delimitations it is the relevant social groups that are being described. In addition “relevant social group” is also important for the person doing the analysis. Thus “relevant social group” is also an analytical concept (BIJKER 1995).

Relevant social groups are defined both by how they understand themselves and by how their surroundings understand them. At the same time as technology opens up the door to some ways to act, the possibilities of application are also interpreted differently by different users and user groups. Variation in interpretations of this type will always be greatest when the technological object is in its infancy. Bijker demonstrates this well in his description of the development of the bicycle. The development of computer-assisted writing programmes illustrates how important it is to be defined as a dominant user group.
at an early stage of the development process. As the development process brings the technological objects into daily life or out onto the conveyor belt, a sort of agreement arises among large user groups about how the objects and their application are to be understood. Increasing agreement on the interpretations means that the technology becomes stabilised in relation to ideas about what are the possibilities and consequences of technology. The network that leads on to black boxes is established through a process of interpretation in four stages (Callon 1986).

Callon sketches the path that the translation may pass along into four stages, during which the identities of actors, the possibility of interaction and the margins for manoeuvre are negotiated and delimited:

1. The problematisation of how to become indispensable
   a. The interdefinition of the actors
   b. The definitions of obligatory passage points
2. The devices of “interessement” or how the allies are locked into place
3. How to define and coordinate the roles: enrolment
4. The mobilisation of allies: the spokespersons as representatives.

To follow this process Callon decided to obey faithfully the following three methodological principles. The first principle extends the agnosticism of the observer to include the social sciences as well. He thereby refrains from judging the way in which the actors analyse the society that surrounds them. The second principle is one of generalised symmetry. Natural “actants” as well as human actors are to be treated symmetrically. The third principle concerns free association. The observer must abandon all a priori distinctions between natural and social events.

In an earlier study of social experiments with new technology I have discussed the use of the interpretation model and I show that one of the weaknesses of the interpretation model lies in an apparent supposition that there are easily identifiable and uniform “spokespersons” (Hetland 1996). Spokespersons or enthusiastic supporters may vary and the competition to define what is problematic can be great. Correspondingly Law shows that faithful translation may be impossible, which stresses the fact that all representation also betrays its object (Law 1995). At the same time as technology opens the door to some ways to act, it will also be interpreted differently by different user
groups. Bijker discusses this "interpretative flexibility" in the development process and shows how the frame for "interpretative flexibility" is limited when the technology reaches "closure" or "stabilisation" (Bijker 1995).

7 Interpretative flexibility

It is often claimed that when a particular technological solution fails, it is because it does not meet the real needs of the users. This type of statement illustrates a superficial understanding of the concept of need. When it comes to new technology one must very often see the solutions before one can formulate the needs. The concept of need in our context is thus relative and not absolute. Furthermore we can distinguish between two different contexts for the use of the concept of need, need as 1) a logical necessity in the sense that in order to talk to a person in another town in real time I have a need for a telephone, and 2) experienced needs or wants. Need is often treated as if it were stable over time, although few phenomena undergo so many changes over time and between different actors. Experienced needs may, incidentally, also be "substitutes" for other types of need.

Actors and spokespersons consider themselves to varying degrees as representatives of a relevant social group. I found a good example of this in a project in which new technology for distance teaching was to be tried out. The founder of the project declared that "I represent certainly 90% of the users and the users' need".

All in all, who represents the future users is perhaps one of the most exciting questions in constructive technology assessment. The problems in this connection are well known. In most "hybrid communities" users are recruited according to an idea about the future user. However the problems of user studies include situations like the following (Woolgar 1994:202):

- The user doesn’t know his/her requirements.
- The user knows his/her requirements but can’t articulate them.
- The user changes his/her mind.
- Individual users say different things to different people.
- Users disagree as to what their joint requirements are.
- Individual users are not representative of (all) relevant users.
- The user turns out to be a customer rather than just a user.
When the founder of the project believed that she represented 90% of the users, she meant the inexperienced user or non-user. She thus believed that most users lacked more comprehensive experience of technology. Very many needs studies in new technology are of little value precisely because there is no clarification of how different types of need are perceived and of the degree to which the relevant actors represent different relevant social groups. One mistake that is often made is that heterogeneous social groups are categorised and common needs and aims are ascribed to them. The trial of Internet solutions for the visually impaired illustrates how apparently homogeneous groups may interpret technology, needs and goals extremely differently. This project resulted in a thorough debate within the user group, which again revealed three different perceptions of how the user is included, or ought to be included, in the development of technology:

Adaptation to supply

It is difficult to resist development, so we must therefore see what comes and adapt the solutions of those who can see to those who are visually impaired. The adaptation to supply often means that the solution to the problem is localised with the visually impaired person. The communication situation is to a great degree defined by the sender. In the course of the project period there was thus a large group who expressed views in line with the following: “I don’t believe one can count on converting all the Windows programmes to DOS. That would be like believing in Father Christmas. You can’t stop development”. Adaptation to supply finds support in traditional innovation and dissemination theory, presented for instance in both an older and a recent form by Everett Rogers (1995).

User creativity

Technology is both a tool and a life-style. This perception emphasises technology as a liberating force. One sees the user as an active force in the development of technology. The individual has far more opportunities than limitations. Experimental activity requires a wide framework, so one does not want any restriction on the freedom to experiment. As part of this notion great weight is placed on the freedom of the individual to try out and design new solutions. For certain relevant social groups this is in fact the core of the Internet technology or the Internet culture. In the project it was therefore clearly estab-
lished that one would not be limited to “e-mail”-like communication. In more theoretical contributions this notion finds particular support in *The Sources of Innovations* by Eric von Hippel (Hippel 1988). He claims that for important categories of innovation it is the user, and not the producer, who identifies needs, solves problems, and who through “inventions” demonstrates the use of different solutions to problems.

**User-producer dialogue**

Technology is a tool that is to be filled with content. Technology is not interesting in itself, but it is important to focus on the social and societal role of technology. In this connection the dialogue between user and producer is of particular significance. The development of constructive technology assessment is therefore an important “project” in modern society. Important theoretical schools of thought that support this argumentation are to be found in Rip et al. (1995). Those who initiated the project had therefore problematised the development of graphic interfaces in relation to the visually impaired and had the aim of becoming spokespersons for the development of solutions for the visually impaired on the latter’s own premises. They did not receive the necessary support for this problematisation and were among other things met with such statements as “I don’t want to be told what is best for me by people who see worse than me”.

This disagreement about a particular problematisation can be explained in several ways. A likely explanation is that this notion reflects what one believes to be possible. The visually impaired have experienced the fact that communication technology develops on the premises of those who can see. It can therefore be difficult to win support for the needs of the visually impaired. Adaptation to supply may be a natural option in such a context. On the other hand both user creativity and user-producer dialogue signal more active approaches. Carried out in a creative manner social experiments may therefore have an *important agenda function* and be a catalyst to bring forth different problematisations. Thus social experiments show the *variation* in interpretative flexibility. This leads on to a more detailed treatment of social experiments as a method in constructive technology assessment.
8 Social experiments

In traditional innovation theory it has been assumed that the innovators accept innovations with an open mind while those who lag behind are conservative. However it is not a question of to what extent one is conservative when for example a visually impaired person cannot use different solutions, but rather a question of interfaces - just to mention one example. In social experiments potential user needs or use properties can be communicated between users and producers to facilitate the development of technology and to spread new technology. During the past 20 years a number of social experiments with new technology have been set up. These experiments in many ways form "hybrid" communities in which the intention is to investigate how technology can constantly give the acting human new possibilities to transform and develop the social and economic area (HETLAND 1996). Linked to the "diffusion of innovation" model within traditional

![Figure 1 Different stages in the experimental process](image-url)
innovation theory, we find four types of experiment: (1) explorative experiments (2) pilot experiments (3) demonstration experiments and finally 4) replication or dissemination experiments. These four experiments are placed along the S-shaped diffusion curve (see Figure 1).

My argument is that the different types of experiment can be better understood by means of the translation model than by the diffusion of innovation model. According to the diffusion of innovation model “laboratory” experiments are experiments at their most explorative stage, at which we can study the social relations that information technology is included in, or at least the relevance of information technology to different user groups. The aim of pilot experiments is to increase the attention focused on new technological possibilities, to stimulate debate and to open the way for the shaping of technology policy. Demonstration experiments are important tools in publicising and spreading information technology. They have often been used to promote special solutions among selected user groups to increase the general level of knowledge and thus also promote a more rapid spreading of new technology. When technology is well known among both technology policy-makers and many user groups, replication or dissemination experiments have been used to disseminate methods that have been tried out, techniques or models and thus give the innovators local experience before full-scale introduction of the technology among new users.

My claim that the different types of experiment can be better understood by means of the translation model than by the diffusion of innovation model is among other things connected with the problem of interpretative flexibility. Different user groups participate in the social experiments and try to shape the results. In addition to negotiating one’s way to desired results and interpreting these in relation to specific interests, one also interprets and negotiates about the “internal logic” in the experiments. Seen from the participants’ point of view a “laboratory” experiment, pilot experiment, demonstration experiment or dissemination experiment does not imply locked roles. One can also negotiate about the role the experiment has been given as a starting point. There is therefore a clear tendency to translate the experiments in the earliest phases of the “diffusion” model in such a way that pressure arises to transform the experiments into later stages of the “diffusion” model. This is because some local groups of participants are first and foremost interested in these experiments resulting in successful and lasting activities.
Not uncommonly; many of these experiments have therefore had controversial frames of reference, with consequences affecting both their development and termination. In the study of the different types of experiment it turns out that when the initiators and/or participants look upon the experiment as technology-driven, they will ascribe the greatest significance to factors outside the experiment. This may be a question of lacking public support, difficult marketing conditions etc. These external factors give both the initiators and participants different negotiating strength and motivation when the fate of the experiment is to be decided. Here lies an important area of controversy that also has its problematic signals with respect to what is later interpreted as unsuccessful experimentation.

The aim of social experiments is therefore twofold:

(1) to reveal problematic scripts inscribed in the technology, the aim is here to alter them or remove them before the technology is ready made.

(2) to reveal the “missing” scripts that the users would like to find in the technology, the aim is here to re-inscribe the technology before it is black-boxed. By applying an anthropological approach we can analyse technology as a product of activities within four different spheres:

(a) understanding problems, invention and design,
(b) marketing,
(c) the users’ application of the technology and
(d) politics and policy
Illustrated in a figure we can show how these spheres are connected.

**Figure 2 The translation model:**

The producers assign technology certain user properties on the basis of ideas about future users. To go back to the electronic post office: the producers presuppose that the users have their sight intact. Furthermore the users interpret user properties that are put into the technology. This may mean that there is correspondence between the user properties that are built into the technology and the users’ interpretations. Just as often the users may reject the built-in properties or add new user properties. The electronic post office illustrates the fact that different user groups experience the same object differently. Technology opens the door to interpretative flexibility. One of the aims of social experiments is to give feedback to the producer, who can build in new or modify previously defined properties. Furthermore, marketing and politics influence both the shaping of technology and our understanding of it. Through marketing one attempts to link the inscribed user properties of technology to future user groups. Through political decisions one tries to safeguard the interests of the public and the rights of the individual, whether it be a question of weak user groups, a need for standardisation or legal principles.
The stages in the figure do not necessarily follow one another, they may take place more or less at the same time. However the figure illustrates central areas for influence. A central methodological approach to increased technology understanding is therefore to follow the process of negotiation which leads on to the technological objects. Then with the focus on the technological object we must identify the interplay between the designer and user, between the producers’ presumed users and the real users. As a starting point it may therefore be useful to look at the user, not only as a passive end-user, but as an active actor in the shaping of new technology - through trial and error. In social experiments the participants are often given different roles, which may be one or a combination of the following (HARTLEY 1987):

1. to act as “guinea pigs”
2. to participate in research and development work to promote innovation
3. to be informed about new technology
4. to be the primary subjects “under the magnifying glass”

Purely methodologically, the participants’ intended roles will have crucial importance with respect to what crises one can expect to experience and thus what scripts one manages to identify. I want to illustrate this with an example from the trial of new distance teaching technology. In this experiment the participants were intended to have roles partly as actors in the process of research and development and partly as primary objects under the magnifying glass. The initiators put their stamp on the experiment through:

1. the scripts they had themselves for teaching and distance teaching,
2. the scripts they consciously tried to avoid, and not least
3. the scripts they believed the users had.

The most important scripts that were put into the distance teaching situation were scripts connected with classroom teaching. This was done partly because it was believed that it would be easier to get acceptance for such a model among the users, and partly because the technological solution could be combined with traditional teaching of other students as well. However the researchers were worried about the scripts many people connect with the television screen, emphasis-
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...ing one-way communication and entertainment. It was thus feared that the students would lean back and relax while the teacher took on the role of the broadcaster. As long as the video screen used did not have television quality, a crisis was expected to arise in relation to picture quality. A great deal was therefore done to reduce expectations as to picture quality. In addition to the video screen the students were to use a PC actively to learn computer-assisted technical drawing. The students thus had two screen images to relate to, the video screen and the PC monitor. In spite of the researchers’ concern, the quality of the video screen turned out to be relatively uninteresting as the students had enough to cope with on the PC monitor. In this respect “communication technologies distinguish themselves from mass media in their a) determinacy from sender to receiver, b) in their bidirectionality and interactivity, c) in their extent and flexibility of time-space distanciation, simultaneity and storing/retrieval abilities, d) in their multi and hyper reception forms, and e) in their diversity which derives from their capacity to combine all these features” (RASMUSSEN 1996:204).

The relationship between the PC image and the video screen in the classroom situation was like the relationship between “text” and “context”. The PC image was on the whole the focus of attention. This being the case, it was first and foremost the PC image that primarily conveyed the “text” or message, while the video image primarily conveyed the “context” i.e. the classroom situation. Only when the video image was the sole picture in the teaching situation is it possible to say that it conveyed both “text” and “context”. The crises in this experiment thus occurred above all in relation to the classroom model. The classroom as a model is linked to the teacher as a “spokesperson”. When the teacher no longer has direct control of the situation in the class, the weaknesses of the classroom model appear as well. The teacher is no longer present to solve problems, be they technical, academic or pedagogical problems. The process of making the participants responsible in relation to distance teaching technology was not successful in the case of all the students. A number of the crises that were experienced in the course of the experiment were therefore linked to frames of reference and scripts for sequences of actions. These crises were not “inside” the technology, but established patterns of action and interpretation were being challenged.
9 Experiments and reality

In carrying over experience from social experiments to reality, it is important to be clear about the fact that experiments are not the same as "reality". In a teaching experiment, for instance, the students may have higher levels of tolerance than otherwise, they may be extra motivated, but they may also have higher expectations than in a normal teaching situation. In the same way the teacher may have a particularly strong desire to succeed and thus be motivated for an effort beyond the normal call of duty. Here I will simply draw attention to the fact that the lesson we can learn from a social experiment first and foremost has validity for the experiment. When experience is to be carried over to "real life", it is therefore important that it is combined with practical knowledge from other situations.

If the social experiment "succeeds" it may thus be difficult to repeat the "success". Here I shall simply stress two important factors that may create problems when experience is to be transferred:

(1) Not only technology but also solutions to problems can be standardised or closed. That is to say that the participants narrow down the limits of interpretative flexibility by establishing "bypass" solutions to technological problems. A common solution is to let the experts solve the problem or for example to ensure that the equipment functions by turning it off and on. The latter has shown itself to be a popular solution in many connections.

(2) The actors' frames of reference are strongly marked by their previous experience. The "classroom model" and the "TV model" illustrate this. Whether one chooses to enlist support by using well known frames of reference or tries to break with the same well known frames of reference, one will in both instances perceive that actors form both "text" and "context".
10 Some methodological rules

In this chapter I have emphasised on an actor and process-oriented approach to technology studies as a basis for the use of qualitative methods. Actor network theory has been introduced as a background to some methodological principles:

(1) There is little point in searching for the intrinsic properties of technology. To understand how technological objects get their form one must identify the networks that lead on to black-boxing of technology.

(2) Technological objects can be read as “text” in a changing context. Understanding crises in the encounter between machine and user becomes central to revealing the text.

(3) Technological objects are understood differently by different relevant social groups. In other words technology exhibits interpretative flexibility. This interpretative flexibility becomes reduced as the technology is black-boxed.

(4) In social experiments both text and context are formed (as in technological development generally), that is to say both the technological objects and the user situations into which the technology is to fit are given form. In the case of transfer of experience from social experiments to “reality” to what extent the context can be reproduced therefore becomes important.

11 References


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