The User Paradox in Technology Testing

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English abstract

Technology testing provides arenas for interaction between users and producers. In the experiments potential user needs and user-values regarding new technology are communicated to facilitate invention and diffuse innovation. This article provides a framework for discussing how users contribute to both the knowledge and policy construction processes when participating in technology testing.

Keywords: Quasi-experiments, technology testing, users, participation.

Introduction

The sociology of testing has identified a paradox; even if users are paramount for performing the tests, their contributions are often "black boxed" (Hetland, 1996; Pinch, 1993; Woolgar, 1991). In the early 1990s, Ann Brown and Alan Collins introduced "design experiments" as a new approach for studying learning phenomena in quasi-experimental settings (Brown, 1992; Collins, 1992). I will claim that, in spite of this very important turn in the sociology of testing, the user paradox is still unresolved. In this article, I will therefore examine some experimental approaches studying learning phenomena when information and communication technology (ICT) is introduced, my aim being to contribute to an opening of the black box. Much of the experimental activity has had a quasi-experimental design since its aim has been to evaluate the effectiveness or impact of learning interventions, to design innovative learning environments, or to evaluate technology policy changes. The different experimental approaches are closely linked to the idea of the social laboratory. Callon et al. claim that laboratories may be understood as a process of translation in three stages: 1) in the first stage, the complex world is translated into the laboratory, reducing the world's complexity to a manageable scale; 2) in the second translation, the laboratory is transformed into a machine for producing inscriptions, making possible their discussion, interpretation, and mobilization in learned controversies; 3) in the third translation, the laboratory results are transported back into the complex world (Callon, Lascoumes, & Barthe, 2009). In a quasi-experimental design, the distinction between the three stages may be more blurred. Three interrelated questions are asked in this article. The first is how are users understood in different quasi-experimental traditions when it comes to user participation in the knowledge construction process? The second is how are users understood in different quasi-experimental traditions when it comes to user participation in the policy construction process? And the third is how do these understandings influence how the experimental lessons are transformed into policy and practice?

Methods

Interestingly, many relevant journal contributions have little, if anything, on the methodological issues that concern the paradox studied. Furberg formulates the problem as follows: "A negative aspect of writing articles for journals is that most journals have a very strict word limit. This often implies that the restricted amount of words is more likely to be used on the actual analyses of data instead of reflecting on the applied methods" (Furberg, 2010:64-65). Since this article aims at reflecting on the experimental method, I have partly tried to identify methodological reflections in the literature and partly applied my own framework to restudy some significant activities and approaches.

Experiments and user participation

In my own research, I have followed experimental activities for close to thirty years. In the first period, I was surprised by the willingness to invest in large-scale policy experiments, without really trying to analyze what one really learned from them. I therefore set out to analyze why many of the experiments gave such a modest return (Hetland, 1996). Learning is an important part of quasi-experiments. It may seem unnecessary and tautological to stress this point. However, as I will return to later, opportunities to profit from the learning process are often misused or neglected. What is usually the problem with many quasi-experiments is not necessarily the failure of a specific technological design or solution, but rather that the focus shifts from the learning process to a more blurred vision of new inventions and a superficial application of the diffusion of innovation

perspective. This is a problem for both researchers, who do not learn how the framing of research limits the possibilities for efficient policy measures, and for the users since one of the lessons that they may derive from the project is not to participate in this kind of project again. Increasingly, public engagement with science and shaping policy is perceived as important for the knowledge and policy construction process as such, and for the dissemination and implementation activities thereafter. In Norway, the participation principle has lately become part of Norwegian science and technology policy (Hetland, 2010).

However, tests do not simply report on pre-existing facts, but, more importantly, are also mechanisms for defining and producing the traits and capacities that the tests supposedly measure. Technology testing has revealed some of the potential of new communication systems but has also illustrated that users tend to prefer the medium that experimenters suggest would be most effective for the purpose in question. We therefore experience that technology testing is an important part of the shaping of technology, making our images into reality. This may partly be understood as what Rosenthal has called the "experimenter expectancy effect" (Rosenthal, 1963). This means that the results of experiments tend to come out in a way that favours the experimenter's expectation of how they ought to come out however much he or she tries to avoid bias.

The experimenter's expectation bias also influences the explanation of failures. One way, which is usually taken by scientists who have come up with negative results, is to say that negative results illustrate that it is necessary to change how we framed the test, not necessarily what we tested. Failures, therefore, do not necessarily tell us anything about the technology, but primarily something about the test. When one discusses the long range of quasi-experiments, it is important to bear this in mind. With technology testing, the experimenters strive to make the technology comply with their expectations embedded in the tests as to how the technology should and should not perform. When the technology does not perform according to the experimenters' expectations, the experimenters often look for external reasons for the failures, not explaining the problematic construction of their own images.

Inspired by what Callon et al. (Callon, 1999; Callon, et al., 2009) call the double delegation, and Bucchi's (Bucchi, 2009) aim to map public participation in science and technology, I will offer a map of how to understand participation in different experimental traditions. The first delegation, according to Callon et al., implies secluded research, and the second delegation delegative democracy. To open up both science and democracy, Callon et al. call for experimental activity in hybrid fora. The different experimental approaches are not necessarily hybrid fora; however, I find it useful to view them with respect to the double delegation. The first axis of the diagram (see Figure 1), therefore, plots the extent to which participants in the experiments contribute to the knowledge construction process; while the second axis of the diagram plots the extent to which participants in the experiments contribute to the policy construction process. The mapping does not indicate intrinsic qualities of the different methodological traditions, but rather my interpretation of how some key authors perceive these approaches. This is important since, where end-users have an active role to play, their function is usually, according to Hartley, one or more of the following: to act as "guinea pigs"; to perform research and development (R&D) and undertake innovation; to become informed about IT; to be the primary subject(s) under study (Hartley, 1987). Similarly, Brown states that, in strictly controlled laboratory settings, the learned theorist is prepared to work with "subjects" (like rats or children!) (Brown, 1992:141). This is a shortcoming that design experiments are designed to overcome; she, therefore, contrasts laboratory contexts with classrooms. Rasmussen has a slightly different approach to participation and shows how the pupils took part in the activities

and how "teachers authored the pupils' locus of agency to pursue their interest and to redefine the task" (Rasmussen, 2005:182). She describes and analyzes participation with three concepts: authoring, positionality, and improvisation. The three concepts are of central importance; "otherwise participation as a metaphor for learning can easily become the same as 'going with the flow', and empty jargon that offers little insight into the selections that individuals make, what they do, the dynamics that people in interactions create and how paths are formed" (op. cit. 225). According to Rasmussen, authoring shows how social practice is constructed and maintained; positionality shows the dynamic of social interactions and how this relates to participants' joint construction of knowledge and understanding; and finally, improvisations increase analytical sensitivity toward change (op. cit. 224). The freer the participants are to play out authoring, positionality, and improvisation, the stronger their participation in the knowledge and policy construction processes.

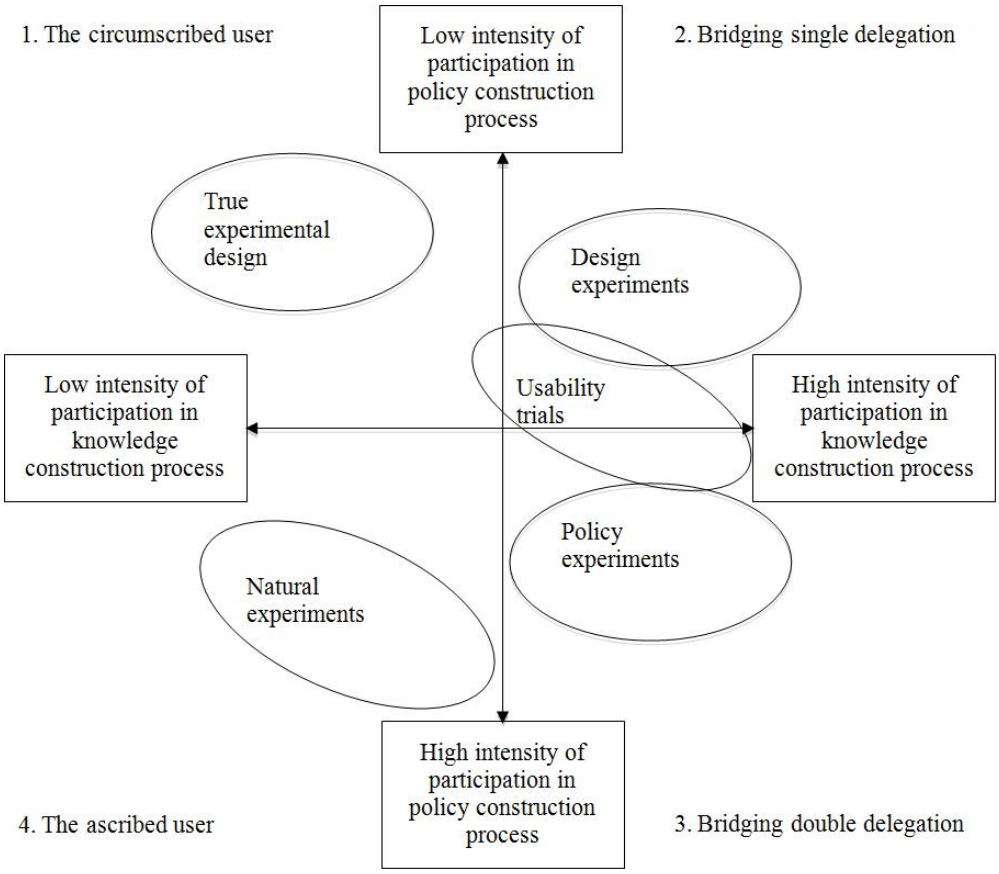

Figure 1. A map of user participation in experimental activity

In the upper left quadrant, titled "the circumscribed user" (Akrich & Latour, 1992), one finds true experimental design, with strict limitations for the participant to play out authoring, positionality, and improvisation. The researcher or experimenter controls the knowledge construction process, and the distance between research results and policy and practice is possibly never overcome. In the upper right quadrant, titled "bridging single delegation," the participants are increasingly involved in the knowledge construction process; however, they are, to a very limited degree, involved in the policy construction process (at least not in the context of the experiment). With this, the participants are given opportunities to handle the first delegation. In the lower right quadrant, titled "bridging double delegation," the participants are increasingly involved in the knowledge construction process

and in the process of policy construction. With this, the participants are given opportunities to handle the first and second delegation. In the lower left quadrant, titled "the ascribed user" (Akrich & Latour, 1992), there is no planned experimental activity; however, users partake in the activity of the setting through an attribution process whose origin is in the setting itself (the ascribed user may take an active part in the policy construction processes later on).

1. The circumscribed user

True experimental design in the social sciences is in many respects similar to laboratory traditions in the natural sciences. When Callon et al. claim that laboratories may be understood as a process of translation in three stages, the authors refer to laboratories working in a true experimental design tradition. We already know from more anthropological studies of laboratory life that research within this tradition may be messier than was thought at the outset (Knorr-Cetina, 1981; Latour & Woolgar, 1979; Law, 1994). In an informative article about the relationship between experiments and laboratories in science, Knorr-Cetina emphasizes that there are at least three features of natural objects that a laboratory science does not need to accommodate. Firstly, it does not need to put up with the objects as they are; it can substitute all of its less literal or partial versions. Secondly, it does not need to accommodate the natural object where it is, anchored in a natural environment. Laboratory sciences bring objects home and manipulate them on their own terms in the laboratory. Thirdly, a laboratory science does not need to accommodate an event when it happens; a laboratory science does not need to put up with natural cycles of occurrence but can try to make them happen frequently enough for continuous study (Knorr-Cetina, 1992:117). With this "liberation" from nature, laboratories are able to create their own world, and thereby enhance the symbolic value of the laboratory.

The laboratory as a symbol is recognized not only by social scientists but also by the politicians who promote technology testing. In the way in which technology testing is set up, the tests involve negotiations and translations of interests of political as well as cultural relevance. Because of this heterogeneous mixing network of humans and non-humans, facts and artefacts, fiction and reality, technology testing is an analytical challenge to social science. Testing is, therefore, an important area upon which to focus because testing can be seen as the attempt to specify formally and identify how the technology will perform, is performing, or has performed. Thus, testing is a test case of the new sociology of technology (Pinch, 1993). True experimental design is commonly used in the physical sciences; for the social sciences, experimental designs can be more difficult to set up. However, they are used extensively in some disciplines or traditions.

2. Bridging single delegation

Callon claims that there is a great divide between specialist and non-specialist, and that it is important to find a way to bridge this gap (Callon, 1999). Ann Brown was trained as a "classic learning theorist prepared to work with 'subjects' (rats, children, sophomores), in strictly controlled laboratory settings," however exploring innovative alternatives to this classical approach circumscribing the user (Brown, 1992:141). At the same time, Collins identified a need "for approaches to the study of learning phenomena in the real world rather than the laboratory" (Collins, Joseph, & Bielaczyc, 2004:16). Therefore, feeling the need for a new approach, Ann Brown (1992) and Allan Collins (1992) coined the term "design experiments". In relation to educational research, Brown understands design experiments as an "attempt to engineer innovative educational environments and simultaneously conduct experimental studies of those innovations" (Brown, 1992:141). In other

words, they contrast design experiments with true experimental design. Design experiments have some fundamental limitations, since "they are carried out in the messy situations of actual learning environments, such as classrooms or afterschool settings, there are many variables that affect the success of the design, and many of these variables cannot be controlled" (Collins, et al., 2004:19). According to Collins et al., "design research should always have the dual goals of refining both theory and practice" (op. cit. 19). They also underline that they use design experiments to get the detailed picture needed to guide the refinement of a design. Large-scale studies of educational interventions (often policy experiments) are interesting but are seldom tied to any particular design, according to Collins et al. (op. cit. 21). Some authors recognize that design experiments draw upon traditions such as action research, however, claiming that design experiments do so while "retaining the benefits and minimizing the drawbacks of an experimental approach to educational research" (Gorard, Roberts, & Taylor, 2004:580). Krange and Ludvigsen call Brown's (1992) interpretation of design experiments the 'mainstream interpretation' (Krange & Ludvigsen, 2009). They "argue that this line of interpretation is similar to laboratory-oriented experiments, in that …, the context is taken into account without actually being included as part of the unit of analysis" (op. cit. 269). They propose building the context into the premises of the analysis and argue "the importance of considering design experiments, at least on some occasions, as historical and situated" (op. cit. 276). Krange, in her PhD dissertation, states that, if necessary, she will go "beyond the borders of the design experiment and include the longer historical lines in which this is a part" (Krange, 2008:68-69), and claims that "neither the processual orientation nor the situation-specific interactions is sufficiently elaborated within the design experiment tradition" (op. cit. 70).

Several of the design experiments are influenced by Vygotsky and his ideas about double stimulation as a basis for formative interventions. Engeström argues that "double stimulation is radically different from such intervention approaches as the *design experiments* currently discussed in educational research. Double stimulation is, above all, aimed at eliciting new, expansive forms of agency in subjects. In other words, double stimulation is focused on making subjects masters of their own life" (Engeström, 2007:363). He criticizes the mainstream interpretation of the methodology of design experiments as "basically a linear progression of six steps" (op. cit. 368), and in response to these limitations, he proposes the change laboratory as an application of double stimulation. In line with this proposal, the researcher also becomes an interventionist. The study of interventions is, therefore, important, strongly influenced by the socio-cultural perspective on learning, cognition, and development. This shift of focus, from design experiments at large to interventions, is interesting. On the one hand, authors often discuss design experiments in general; on the other, interventions are in focus when being more specific. I understand this shift as an expression of the dual role of the researcher and interventionist, and the need to delimit the research activity. One may say that interventions have acquired the same crucial role in this approach as crises have acquired in the actor-network approach. Experiencing crisis, according to Akrich and Latour, 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 & Latour, 1992:261). Crises and problems are, therefore, our most important gateways to understanding what is going on. While Akrich and Latour perceive crises as happening more or less haphazardly, formative interventions are planned crises to spur subjects to master their own lives. However, the strong focus on more specific interventions may lead to the neglect of some important features of the overall experimental setting and later limit the transformation of experimental lessons into policy and practice. One may claim that the 'design experiment' tradition, be it mainstream interpretations or alternative interpretations, includes the participants in the knowledge

construction process; however, understanding how experimental lessons are transformed into policy and practice is still a challenge.

Parallel to design experiments, usability trials were performed by technology and service providers. Usability trials were favoured for a number of reasons: they were cheap and easy to manage, and growing privatization and the entry of a competitive market made secrecy more important and made it necessary to focus on specific design issues (Hetland, 1996; Pinch, 1993; Woolgar, 1991). I have first-hand knowledge of two examples, a usability trial with distance education in rural Norway (Hetland, 1999) conducted by Norwegian Telecom and a usability trial to aid the visually impaired to communicate using the Internet (Hetland, 2002) conducted by the Norwegian Central Information Service. In the first trial, it became clear that metaphors are important framing devices. If you frame distance education as 'the virtual classroom,' this will guide what is tested and what is not. The metaphor 'the virtual classroom' is from the same field as the solutions with which one is working; the metaphor, therefore, leads to a concentration on incremental innovations. Norwegian Telecom argued that it was necessary to focus on incremental innovations since the users would not buy a product that they did not recognize. In the second trial, one experienced the difference between hot and cold situations (Callon, 1998). In cold situations, it is easy to identify actors, interests, preferences, and responsibilities. In hot situations, most things are subjects of controversies, and these controversies are an expression of the fact that the participants have no stable basis of common knowledge and insight upon which to agree. Quasi-experiments in hot situations are, therefore, demanding activities for experimenters and participants, and the lessons learned from these situations are perhaps best understood as a contribution to a more informed policy discussion between different stakeholders. With the above-mentioned experiment as a starting point, the Norwegian Central Information Service managed to embark on an important policy process concerning universal design. However, as Woolgar illustrates, usability trials may also configure and thereby shape the user whom they need for the test (Woolgar, 1991). Usability trials may, therefore, also be looked upon as tests in which not only the technology but also the inscribed users are tested. This is because the manufacturers cannot be sure that the users will be able to do what is required of them. So "what is at issue in such tests is not so much the projection from 'test' to 'actual use' of the machine, but the projection from test to actual use of the user!" (Pinch, 1993:36). Or, one might add, "The manufacturers' perception of users as consumers" (Mallard, 2007). My claim is that usability trials may give the users possibilities similar to design experiments; however, the tradition is less rigorous and does not have the same aspiration to refine theory.

3. Bridging double delegation

Callon claims that the double delegation experiences crises. We therefore need strategies to bridge the double delegation. During the 1980s, an important methodological concept was 'field trials' (Mathisen, 1987). Since several of the field trials were large undertakings involving a heterogeneous set of activities with the aim of shaping technology policy, many of the field trials were actually 'policy experiments' (Rondinelli, 1993). Rondinelli understands policy experiments as a "messy" undertaking that shall "facilitate continuous learning and interaction, allowing policy-makers and managers to readjust and modify programs and projects as more is learned about the conditions with which they are trying to cope" (Rondinelli, 1993:18-19). Policy experiments are usually perceived as playing four different roles in the innovation process (Hetland, 1996; Miles, Rush, Turner, & Bessant, 1988; Rondinelli, 1993):

1. They can be *explorative experiments*. Their most important benefits derive from the acquisition of knowledge. They help the researchers define problems, or more useful ways of coping with the problem of "needs," exploring different possibilities for interventions, and, finally, showing how experiments at a later stage should be operated. The most characteristic feature of explorative experiments is, therefore, their usefulness at a very early stage of learning: when we know the least about all the possible implications and by experimentation enhance our knowledge and thereby lower the risk of innovating.
2. They can be *pilot experiments*, raising public and industrial awareness, stimulating debate and open policy-making. Thus, pilot experiments can perform important functions (Rondinelli, 1993:99): they can test the applicability of innovations in places with conditions similar to those under which the more explorative experiments were performed, they can test the feasibility and acceptability of innovations in new environments, and they can extend an innovation's range of proven feasibility beyond the experimental stage.
3. They can be important *demonstration experiments* in the dissemination and diffusion of the uses and implications of information and communication technologies. The main purpose of demonstration experiments is to show potential adopters how they may benefit from the innovations. Thus, although demonstration projects may evolve from explorative experiments and pilot projects, these experiments might also be designed especially to promote the adoption of a specific innovation.
4. They can be typical *replication or dissemination experiments* to disseminate tested methods, techniques, or models through replication, or full-scale implementation of a specific technological solution.

As mentioned earlier, Krange and Ludvigsen (2009) criticized design experiments for not including the context as part of the unit of analysis. Studies of policy experiments face a similar challenge. I will propose frame analysis as one possible strategy (Goffman, 1986). Actors do not act in a vacuum; they act in a context. Frames are, therefore, the context that one applies to organize involvement as well as meaning: any frame imparts not only "a sense of what is going on" but also "expectations of a normative kind as to how deeply and fully the individual is to be carried into the activity organized by the frame" (op. cit. 345). The frame represents clusters of rules that help to constitute and regulate activities, defining them as activities of a certain sort and as subject to a given range of sanctions. Perception is organized, he claims, into natural and social frameworks. The natural frameworks identify occurrences seen as undirected, inanimate, and unguided. The social frameworks provide the background for understanding events that incorporate the will, aim, and controlling effort of intelligence, a live agency, the chief one being the human being (Bateson, 1973). Goffman, therefore, includes the inanimate and the animate, the natural and the social in the creation of frames.

A frame thereby provides the rules and principles that guide our understanding of meaning in experienced events. Framing as constitutive of, and constricted by, encounters therefore "makes sense" of the activities in which participants engage, both for themselves and for others. The framing of a test setting implies a selection of some aspects of a perceived situation to make them more salient in a test, in such a way as to promote a particular problem definition, causal interpretation, moral evaluation, and/or policy measures for the problem described, and thereby organize involvement in the inscription-translation-reinterpretation of technology. During the activity, participants will not only obtain a sense of what is going on but will also be engrossed, caught up, enthralled, or disappointed. These feelings and experiences will be transmitted to other actors. However,

"Involvement is an interlocking obligation. Should one participant fail to maintain the prescribed attention, other participants are likely to become alive to this fact and perforce involved in considering what the delict means and what should be done about it – and this involvement necessarily removes them from what they themselves should be involved in" (Goffman, 1986:346).

When it comes to the framing of test settings, we may experience multiple sets of frames during the process. However, to facilitate and simplify the discussion, I will concentrate on the problem of divergent framing – be it conflicting, competing, incompatible, or compatible framing. In a study of four large policy experiments from the 1980s and early 1990s, Hetland concluded that "the framing of tests is essential to the understanding of how tests are constituted, the framing of actors is essential to the understanding of how actors are introduced to tests, participate in tests and finally mediate their experience" (Hetland, 1996:184). Since these policy experiments include experimenters and participants with not necessarily shared frames of reference (op. cit. 195), Hetland, therefore, looks into the issue of divergent framing and argues that divergent framing influences how actors are enrolled in tests (op. cit. 191-193) and how tests find their resolution and closure (op. cit. 199-201). The issue of divergent framing and the following negotiation and interpretation processes led Hetland to call the policy experiments hybrid communities; hybrid because the groups involved were heterogeneous, including experimenters, participators, politicians, technicians, and other internal and external actors. The experiments were also hybrid because they involved a heterogeneous set of problems and solutions in a variety of domains. The term communities was used because the experiments entangled a diverse set of actors and technology in a web of activities with changing involvement. Hetland claims, "Experiences with hybrid communities during the past 30 years have led to two fundamental discoveries. Firstly, that the anticipated results from hybrid communities were difficult to achieve. Secondly, that technology policy is not primarily founded on experience with hybrid communities, but is experimental in its very nature, and hybrid communities should thereby be looked upon as an active part of technology policy" (op. cit. 201).

Graphically, the results of a successful innovation process in the classical diffusion of the innovation model are presented as an S-shaped diffusion curve, and the adopter categories encompass the innovators, the early adopters, the early majority, the late majority, and, finally, the laggard (Rogers, 2003). The crucial issue for anyone who wishes to promote an innovation is, according to this theory, to activate the early adopters and early majority. The S-shaped diffusion curve illustrates this by "taking off" at about 10 to 25 percent adoption. However, the quasi-experiments here described are situated along the whole spectrum of the S-shaped curve. As the S-shaped diffusion curve also illustrates the increase of knowledge about an innovation, the chosen quasi-experiments apparently embody decreasing uncertainty. See Figure 2.

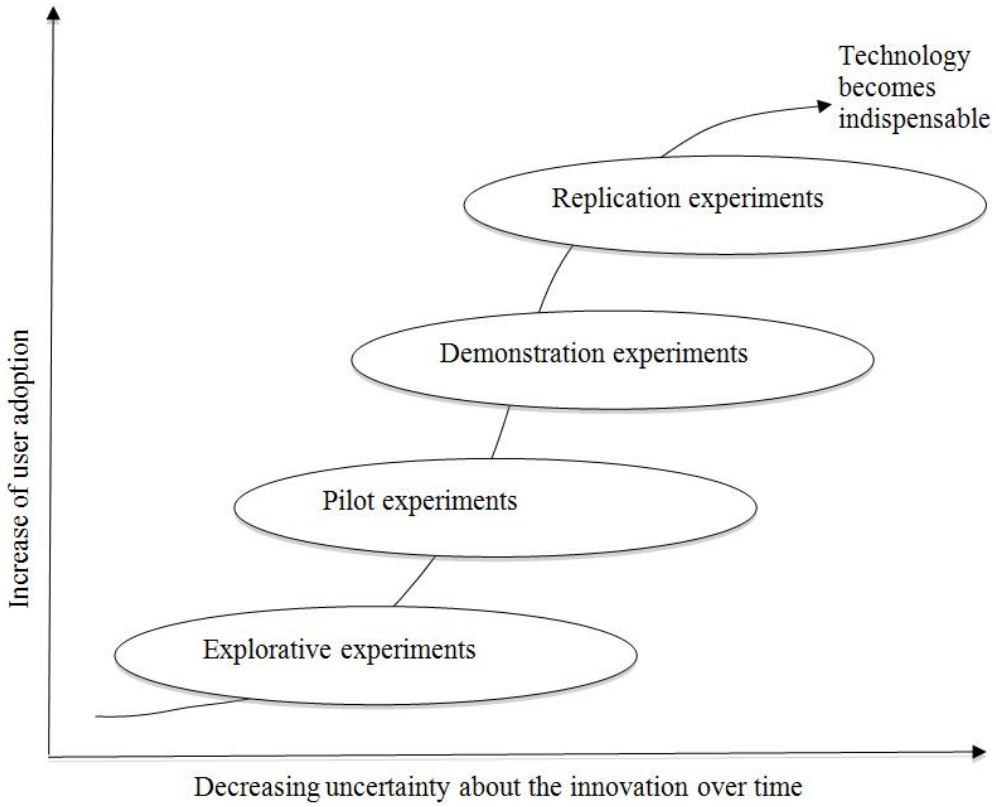

Figure 2. The arrangement of experiments (Hetland 1996:16)

Hetland concludes that not only are the artefacts translated but also the experiments. "This implies that there is a strong 'push' towards the end of the diffusion curve where technology becomes indispensable. By this 'push' the logic of the different experimental stages is easily corrupted" (Hetland, 1996:210). This push is partly a consequence of divergent framing, since the participants and the experimenters may have conflicting interpretations of what the experiments are aiming for and how to interpret the lessons learned. This leads also to a counterintuitive claim: technology push-strategies are the strategies "least" concerned with technology as such. Furthermore, when one sets out to test technology within a strategy of demand-pull, one ends up testing the ability for "inside" recruitment of new allies. The next counterintuitive claim is, therefore, that demand-pull strategies are the strategies "most" concerned with technology as such (op. cit. 226).

Possibly the largest policy experiment introducing new information and communication technology into Norwegian schools is Project Innovation in Learning, Organization and Technology (PILOT). One hundred and twenty schools were involved in the project between 1999 and 2003. This project was initiated by the Ministry of Education and Research, and the research activities were coordinated by the National Network of IT-Research and Competence in Education (ITU). (As of 2010, the ITU is part of the National Centre for ICT in Education.) This large project was originally framed as action research; however, the main aim was to encourage the participating schools to develop pedagogical and organizational approaches to the use of ICT in learning, and to participate in the dissemination of the experience gained. Innovation, diffusion, and the development of policy were important dimensions (Erstad, 2004). The summative report provides policy recommendations in general, at the national level, and concerning school development at the local level. In the book *Digital Literacy in the School* (Erstad, 2005), Erstad provides an introduction aimed at students, teachers, and school leaders. What makes PILOT extremely complex is its aim of compiling the

exploration, pilot, demonstration and replication experiment into one large policy experiment lasting only four years. Even if the project may be considered as successful within this frame, it is a risky venture. One problematic issue in this policy experiment is the tendency toward a pro-innovative bias. To avoid such a bias, Rogers proposes five research strategies (Rogers, 2003:106-118). However, I will claim that the pro-innovation bias is primarily in the framing of the total activity, not that research does not examine unsuccessful innovations, rejection, or re-invention.

Building on the experience with PILOT, the Ministry of Education decided in 2004 to establish a national program for school development with ICT called 'Learning Networks' (Erstad, 2009). Until now, about 550 schools have been or are involved. In his discussion of the preliminary findings, Erstad elaborates on two issues: knowledge creation and networking. Central to the idea of knowledge creation or knowledge building is "the creation or modification of public knowledge, knowledge that lives in the world and is available to be worked on and used by other people" (op. cit. 95). A specific methodology called 'dialogue conferences' was used in the former project PILOT. "This was organised as meeting points where teachers from different schools met to present experiences of school development using ICT, reflect on these together by writing and talking, and making strategies for future developments that are brought up again at future meetings face-to-face. In between the meetings they collaborated online. Reports from the participants indicated very positive outcomes of such 'dialogue conferences'" (Lund, 2004 cited in Erstad, 2009:98). In 'Learning Networks,' this was an important tool for allowing the participants to reflect upon their actions.

The strength of policy experiments is their ability to include the participants in knowledge and policy construction. The problematic issues are primarily a tendency to pro-innovation bias and divergent framing. I will return to these issues in the final discussion.

4. The ascribed user

"Natural experiments" occur more haphazardly. That is, the assignments of treatments are made by "nature," not by "experimenters". Some of these natural experiments happen regularly and are, therefore, targets for a regular system of evaluation; for example, air transportation accidents are evaluated by different National Transportation Safety Boards. Other natural experiments have a more irregular occurrence, and if important enough, they are evaluated by the respective authorities. The aim of these evaluations is to improve technological solutions and, if necessary, the relevant policy. In Norway, there are several interesting examples within the field of ICT, studying breakdowns caused by fires or natural catastrophes. Within education, one may claim that natural experiments occur when people respond, for example, to policy interventions, regulations, or socio-economic circumstances. In these kinds of "experiments" the participants may be involved in the policy construction process.

Conclusion

In the previous text, I have outlined how user participation is understood in different experimental approaches. The third question, how these understandings influence how the experimental lessons are transformed into policy and practice, is still unanswered. This question is important, since if anything like a national schoolyard should exist, it is littered with experiments that never found resolution and closure. In this article, I have used a socio-cultural perspective or the translation

model inspired by Callon and Latour. The translation model explains innovations as temporary interpretations of nature, technological potentials, strategies of competitors in the market and of the different interests. I will therefore first conclude that the chosen experimental approach is also an important element in transforming lessons into policy and practice. I will claim that the more opportunities users have to play out authoring, positionality, and improvisation, the more included they are in the transformation process from the experimental phase to policy and practice. In other words, the choice between different experimental traditions is also a choice that influences the diffusion of innovations. This conclusion is in line with Rich's understanding of knowledge utilization (Rich, 1997). Rich argues that utilization "is a process – a series of events which may or may not lead to a specific action by a particular actor at a given point in time" (Rich, 1997:17). Utilization is therefore viewed as a process rather than an outcome. "Use" however, has several connotations as Rich outlined, and he distinguishes between 1) use (information has been received and read), 2) utility (some user's judgment that information could be relevant or of value for some purpose), 3) influence (information has contributed to a decision, an action, or a way of thinking), and 4) impact (information was used and it led directly to a decision or to action) (Rich, 1997:15). These distinctions are of course significant when thinking of utilization as a process as opposed to an outcome. In a study of utilization of Norwegian research, three explanatory factors were prominent. The users had to evaluate the results as compatible with their own experience, they had to trust the quality of the research, and, finally, they had to be active stakeholders in the projects (Brofoss & Wiig, 2006). Henceforth, experimental types of interventions may be a communication strategy for speeding up the diffusion of an innovation. Very often, one perceives the innovation as dropped into a container spreading through certain channels over time among the members of a social system. This epidemic and often pro-innovative approach imagines diffusion as a shift of the demand curves caused by the spread of information from early adopters to late adopters who are made aware of the innovation by the use by early adopters. However, when entities connect to form a chain or network of action or things, they "translate or change it to become part of a collective or network of coordinated things and actions" (Fenwick & Edwards, 2010:9). The experimental activity is therefore best understood as a translation process building networks. The durability and extension of those networks are essential for the success or failure of an experiment and the dissemination process. Durable networks also imply that the actors have compatible framing of what is going on, since divergent framing easily will lead to disintegration. Finally, it is important to bear in mind that experimental activity within technology-push or a pro-innovation-strategy requires strong networks of social actors to facilitate the transformation from the experimental phase to policy and practice.

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