

Using artifacts as triggers for participatory analysis

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Abstract

Based on a study of a three-day workshop between users and developers, we show how artifacts like computer prototypes can be used to trigger productive discussions. We demonstrate how clashes between contextualized artifacts and the practitioners' (users) conceptions and experiences of their work practices trigger new understandings of current practice as well as possible futures. In this way, artifacts support the work of participatory *analysis* as well as participatory design.

Keywords

Participatory design, participatory analysis, prototypes, triggering, artifacts, understanding work practice.

1. Introduction

Interest in participatory design (PD) is shared by an increasing number of system developers the world over. Involving users crucially in the process of designing and developing new technologies and work practices is seen as enabling various ends such as product quality enhancement, work democratization, mutual learning, improved work practices, etc.

In recent years, there have been a number of proposals concerning the forms such increased participation might take. On the one hand, techniques like future workshops attempt to engage users in discussions of possible futures by starting from problems in current practice they themselves identify (Jungk & Müllert 1987). On the other hand, the use of mock-ups and prototypes is meant to trigger discussion from concrete, but at best partially implemented, possible future technologies (Kyng 1991).

In all cases, participatory design can only succeed if it is firmly grounded in the work practices of those the design is meant to support. But can the *analysis* of work practice also be participatory, that is, conducted in active collaboration among users and developers as proposed, for example, by Suchman & Trigg (1991)? Although analysis is usually seen as the activity in a development project involving users the most, the role of the practitioners (users) is often rather passive. Most analysis involves the developers interviewing, describing, observing, surveying, and the like, with the aim of transferring knowledge and understanding of the practice in question to the system developer. Often, these approaches to analysis have the system developers as active subjects setting the stage, and the practitioners and their practice as passive objects to be investigated.

In participatory analysis as understood in this paper, the developers and practitioners are seen as active cooperating subjects investigating current practice. Early steps toward such a participatory analysis can already be seen for example, in the critique phase of future workshops (Kensing 1987, Kensing & Madsen 1991), and in the discussions of current practice that sometimes occur in cooperative prototyping sessions (Trigg et al 1991).

Suchman and Trigg (1991) formulate a joint enterprise linking three perspectives (depicted as three vertices in a triangle): research, design, and practice. They argue that currently at best pairwise collaborations are supported, and conclude with the challenge:

What we now hope to foster are collaborations among all three perspectives simultaneously, that is, activity occurring in the center of the triangle. (Suchman and Trigg, 1991)

In order to underscore the relevance of the challenge for system development, we have replaced 'research' with 'analysis' in Figure 1. Whether it's called analysis or research, however, we see the activity primarily as involving reflection on practice, either one's own or

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another's. Our response to this challenge is that simultaneous changes in all three can be triggered through the use of concrete artifacts in workshops between developers and users (see Figure 1).

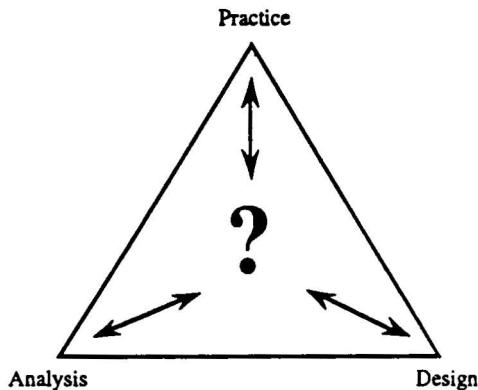


Figure 1: The challenge

Following Mogensen (1992), we see a prototype, for example, as not only triggering discussions of future technologies and practices represented or suggested by the artifact, but also as triggering penetrating discussions of current practice.

We use the term *artifact* here to denote two different kinds of objects, prototypes and situation cards (explained in the next section). The term is chosen because it identifies two central aspects of both. On the one hand, the physical nature of an artifact implies *persistence*, something concrete lasting over time. At the same time, the term artifact suggests deliberate and purposeful creation by human hands. For the artifacts discussed here, both aspects were crucial: the persistent nature of the artifacts' forms, and the appropriate, appropriate, and provocative nature of their contents.

Looking in detail at the role of artifacts in a single extended meeting between developers and users, we first consider how the artifact is appropriated by participants through the gradual acquisition of particulars from their practice. We then inspect clashes between this now contextualized artifact and their current practice, to see how these lead to new understandings (and critiques) of both the practice and possible futures. Finally, we argue that such meetings provide one means of triggering a three-way interplay among the perspectives of practice, analysis and design.

2. The setting

Our study is a part of the AT project. AT stands for "Arbejdstilsynet," the Danish national labor inspection service, a branch of the government which monitors worksites and work conditions. In this project, we have been working together with the local branch in Århus, acting as consultants, developers, and sounding boards during the last two years' technological and

organizational upheavals.¹ Research in our project has ranged from participant observation and situated interviewing to active involvement of practitioners in technology analysis and design meetings.² This paper focuses on a three-day seminar involving 11 participants from AT and 5 participants from Aarhus University. The seminar was held 5 months into the project in a town outside Århus away from the participants' everyday work environments. The goal of the seminar was to foster discussion of current and future work practices, including computer support, within the context of decentralization directives originating at AT headquarters.

The seminar was in part structured as an Organizational Game (Ehn et al 1990). As its inventors explain:

For all participants in a design group [the organizational game] serves as a means to create a common language, to discuss existing reality, to investigate future visions, and to make requirement specifications on aspects of work organization, technology, and education. (Ehn & Sjøgren 1991, p. 252)

For our purposes here, we consider only the game's use of "situation cards." Each card contains a few sentences describing a realistic, problematic situation that could arise at the AT workplace. The idea is that these discussions should lead to concrete proposals for and commitments to changed practice by participants. At the seminar, we used approximately 40 situation cards, some designed by us ahead of time and others by the participants during the seminar. The examples in this paper are taken from a 10 minute discussion around situation card #8 (SC8) which reads as follows:³

SC8: An inspector has begun work on a case regarding a chemical factory. The case started because of an accident and is still not concluded. A call comes from the police: There's a new accident at the company. The inspector is on vacation. Where is the material?

The Organizational Game was complemented by discussions conducted around cardboard mock-ups (of, for example, electronic mail) and computer-based prototypes (of, for example, registration of work). Our second source of examples comes from a 20 minute session with one of the prototypes. Participating in this session were one developer and three participants from AT, an inspector, a lawyer, and a secretary. As we hope to show, the parallels between these two activities are striking, especially with respect to the way each type of

¹For more on the history and cultural context of the AT, especially with respect to technology development, see Markussen (1992).

²For a description of the project and our dual role as consultants and researchers, see Bødker, Grønåbæk & Kyng (forthcoming).

³The text of the situation card is translated from Danish as are the quotes and transcript segments appearing later in the paper. The original Danish texts are available from the authors on request.

artifact (situation cards and prototypes) engendered discussions of practice.

The following analysis and discussion is divided into three parts. The first, appropriation, is concerned with the process of how the artifact is transformed from "something standing in the corner" with (for its designers) an *intended* use, to an artifact-that-matters with a concrete and meaningful use context. The second part, transformation, is concerned with what happens when the participants appropriate or adopt the artifact and *on their own* transform its use context. The third part, confrontation, involves clashes between the transformed context and their current practice. These usually lead to the artifact or current practice being questioned.

3. Appropriation

Each of the participants in the seminar "brought" something to the occasion. The people from AT primarily brought experiences from their overlapping work practices and an interest in finding alternative ways of conducting this work. The people from Aarhus University brought experiences in facilitating organizational and technological change, and an understanding of AT's work practice gained from interviews, observations, and discussions with AT workers. In addition, they brought prototypes and situation cards whose designs were based on a sense of what was problematic in AT's work practices and what might constitute reasonable alternatives.

Before the prototypes and situation cards could become artifacts-that-matter rather than isolated, largely irrelevant entities, they had to first be provided with a concrete and relevant use context. In what follows, we identify three aspects of this process and for each we give examples from the SC8 discussion and the prototyping session:

- *seeing* what is and is not important in the artifact,
- *recognizing* the artifact as potentially or imaginably relevant for one's practice, and
- coming to "*own*" the artifact.

Note that these are not meant to occur as "phases" in some appropriation process. Rather, they are activities intertwined over time, together comprising the participants' appropriation of artifacts and their evolving use contexts.

Seeing

Given a physical artifact, how does one come to see that which is important? In the case of SC8 and the other situation cards, the participants already knew how to "see" the material. They knew, for example, that the kind of paper was irrelevant as were any coffee smudges on the back. They knew (after hearing the seminar introduction on the first day) that the text written on the card was to be read aloud and interpreted as a problematic scenario.

"Seeing" the prototype, however, required guidance for most of the meeting's participants. For the non-experienced user, the prototype first appeared as a piece of hardware having colour, shape, etc. In order to be seen as a potential instrument in everyday practice, the prototype's meaning and use needed to be brought into focus. Such guided seeing was especially evident at those points in the session where the prototype was explicitly demonstrated by the developer.

Especially important was the use-driven nature of these demonstrations. Rather than simply saying, "look at the contents of this window" or "that menu is irrelevant," the prototype was *used* according to continually evolving scenarios. In this way, the relevant parts of the artifact were made to stand out from the background. In the following example, note the way a use scenario helped developer D explicate the prototype.⁴

(PS 1)

D: Uhhm, and what we were thinking of was that (.) we make a list down here where for each inspection, one makes an entry like this here for each inspection one has been on (.) for example, here was a little elevator follow-up call the twenty-second in ten-ninety. So you just click on this. So then we come up to this inspection overview. (.) There, he can type in [keyboard typing] the required information.

Recognizing

In order for the artifacts to be seen as artifacts-that-matter, they had to be *recognized* as potentially or imaginably relevant for the practice. The situation cards ideally identified realistic (though fictive) situations which were problematic in some way. In the case of SC8, it should have been the case that material might indeed be missing in the way described and that in such cases, the problem of finding it was both non-trivial and worth confronting. The prototype, on the other hand, had to be recognized as supporting certain AT work practices which in turn were seen as requiring machine support.

That such recognition is underway was indicated, for example, when participants felt moved to tell stories from their work. For example, during the first six minutes of discussion of SC8: a manager told the story of a case folder that was taken out of the office by an inspector who moved to a branch of AT in another city; an inspector recalled a lost case which was eventually found with the secretaries; and a secretary told of a case that sat on a lawyer's desk for six months (this in response to the lawyer's claim that cases moved quickly through his hands). Each of these examples indicated that

⁴All examples used in this paper are taken from approximately 20 hours of videotape recorded at the workshop. In the transcripts, parenthesized periods "(.)" indicate small gaps of no more than a few tenths of a second. The ellipses "..." correspond to inaudible or unclear portions of the talk. Double slashes "//" indicate overlapping talk while equal-signs "=" indicate that the subsequent utterance follows directly without a break from the current one.

the story-teller "recognized" the situation depicted by SC8 in his or her work.⁵

In the following example from the prototyping session, C realizes the potential of the system to retrieve an inspector's earlier directives to a company from the computer files. Note the way that A, a practitioner, joins system developer D in confirming that the prototype can indeed meet C's needs.

(PS 2)

C: That is, if one then, uh, knew that there had perhaps earlier been issued a directive on that which I now myself want to (...) someone has been out and appraised, right? So it would be neat if one could just call it, the directive up.

A: That would of course be // there ... //

D: // You can do it // =

C: It ... =

D: That's what you do.

C: That's // what one does //

D: // Because, eh, // you've of course got the list,

A: Right?

D: over all different inspections here.

In each of the above cases, recognition was *implicit* in the participants' talk. Rather than saying, "Yes, the situation on SC8 could/does happen at AT", an inspector told a story indicating her or his recognition of relevance. At other times, however, the recognition was explicit. In SC8, for example, a discussion concerning the appropriateness of the card resurfaces several times. At one point, the lawyer comments: "It's actually a dumb question. [laughter] That's because it just says where's the material, not what one should do if one can't find it." Recognition of the artifact's relevance and utility whether explicit or implicit, is a crucial feature of the appropriation that leads to fruitful discussions of current and future practice.

Owning

An artifact that is considered relevant to the practice for a participant can be *appropriated* or "owned" by that participant. We took appropriation to be indicated, for example, when one participant "defended" the artifact (say, its relevance or utility) to another, or when the participants used the artifact for their own purposes, describing it in their own terms.

During the SC8 discussion, an inspector, after re-inspecting the text on the card, claimed, "But even if we can't find the material, we can still investigate the accident." As she said this, she waved the situation card and put it back in the center of the table. In this way, she called into question not the card's relevance, but rather the degree to which its situation was problematic.

⁵For more on the importance of narratives in prototyping sessions, see Trigg, Bødker, and Grønbeek (1991).

The manager responded by defending the card ("It is actually reasonable enough") with a story about a case that couldn't be found. Amid the ensuing discussion, the inspector too admitted that the situation depicted by SC8 really was problematic.

We observed the ownership process again during the prototyping session, but in a slightly different form. In the following example, notice how A and C jointly "take over" the job of explaining the prototype's functioning. Notice also the level of their engagement as indicated by the amount of overlapping talk. Here D drives the prototype, but provides no explanations.

(PS 3)

C: // Would that then say // [A reaches over C to point at screen] // here I've got myself the directive.//

A: // so here I've got the directive // No, so there

C: Yeah, there. And then it comes // out //

A: // And so // the directive comes

C: And then it is, you know, the whole, // who- //

A: // So // it is // directive over there //

C: // all the // text, that's given, that is the directive ... once,

Such engagement indicated that the artifact and its intended use context was being appropriated as an artifact-that-matters with respect to their work practice.

Appropriation thus involved the participants' acceptance of the artifacts and their intended use contexts as relevant to current practice, and worth further work (some situation cards failed in this respect, and were consequently dropped). In what follows we shift the focus toward what happens when the artifacts and their use context have been appropriated and are subsequently used in further discussions and experimentation.

4. Transformation

Our artifacts were never appropriated exactly as is or as intended by their designers. Over time, they were transformed so as to gain new contexts of plausible use. At the AT seminar, we observed two kinds of transformations. First, experience with the artifact led to an extension of its context with new plausible situations. At the same time, this led to the artifact being used to (re-)ground this evolving context, transforming the artifact itself or the understanding of it.

Extending the context

At the same time the artifact and its intended use were being appropriated, an extension of the artifact's initial context took place. Situation cards, for example, started out representing isolated problematic situations. Once appropriated, the participants reformulated and transformed them with, for example: relevant concrete experiences, plausible consequences, other closely related and perhaps more appropriate situations and problems.

etc. In this way, the situation card acquired new concrete contexts.

At one point in the SC8 discussion, for example, an inspector suggested that the case might be with the lawyers. In this way it would be "out of the loop" and thus lost to the inspectors for an extended period of time. For the next minute or so, SC8 was discussed *as though* the card had originally specified this legal "phase."⁶

In the prototyping session, we saw a similar phenomenon. Contexts were developed and transformed by the participants in ways that were not part of the demonstrator's planned scenario, but which were then incorporated and treated *as though* they were part of the prototype's original expected use. Often, this involved "holes" or missing parts of the demo which the participants used their imaginations to fill in. In the following example, however, B suggests an entirely new means for the prototype to keep track of activity on a daily basis.

(PS 4)

B: Yes, then you should make= what one perhaps needs,

C: No, but I don't think that was that, I thought it was just the number of hours=

B: what's it called, besides that, is to make a daily code, a daily list, what I've done that day=

D: // yeah //

A: [to C] // No but // that's of course what we should have, how many hours, we're out that is, we should of course know how many hours we have

B: Yeah, right? So you haven't made a weekly accounting, you have a day, then you've ... visited the company some hours ... altogether so much time, so much office time, so many kilometers, spent so many hours outside, right?

Their discussion continued in this way further exploring B's idea of creating a daily form. Later, when demonstrating the automatic creation of a weekly account:

(PS 5)

D: Uh but we can try something else (.) we can try to make a new one. We can for example, uh, sorry (.) That's right ... We can try to make a new weekly account uh for example for week forty-three [typing]

B: I wouldn't have it for a week I'd have it for a day

D: // Right, right //

A: // yeah but it is of course // a weekly account

B: it is automatically created from that

D: yeah yeah, it's just a step along the way

Notice that the daily form is now being treated as though it is part of the prototype. Moreover, the weekly account which *is* supported by the current prototype is assumed to have been created on the basis of these new daily forms. Here we see not just an elaboration of the new use context, but a transformation of the original intended use of the prototype.

(Re-)grounding discussion

As we have seen, the appropriated artifacts gradually acquired contexts of use. At the same time, the physical, persistent nature of the artifacts helped re-ground discussions. In this way, the connection between the artifact and its imagined use situation was maintained and reiterated over time.

In the case of the situation cards, this was usually accomplished by rereading the card to see what was literally written there. In the case of SC8, the easy answer, "The material is in the company folder, of course!" led to their presumption that the company folder itself had vanished. Later, the discussion turned to the question of how much material is in fact worth saving in the folder, given that (as an inspector pointed out), the accident could be investigated using only the new directive. At this point, one of the participants retrieved the card, read it to himself, and stated, "It's not necessarily the whole folder that's gone." As it turned out, this regrouping (after suggestions of various other literal readings of the card) led to a summing up and conclusion of the entire SC8 discussion.

In the prototyping session, regrouping also involved redirecting discussion to the artifact. This was sometimes accomplished by the system developer drawing the users' attention to some feature of the prototype as in the following example. Here, D argues that the prototype's representation of driving time is a result of the way it organizes information by company instead of by inspector.

(PS 6)

A: that's irrelevant for company, yeah

B: the time at the company is relevant, // but the driving time to the company is not so relevant, because it, you can't divide it up among ten different companies [pointing at screen]

D: Now, // now // look at this.

A: [to B] // No. //

D: Okay, look. [Points at screen.] What we were in here, that was the company registry, that's something, what should we say, information belonging to a company.

A: ah

D: The day thing we're talking about, that doesn't belong to companies, that belongs to you. Right?

But this grounding is just as likely to be prompted by a non-developer. In the following example, B argues for

⁶ Interestingly, SC8's authors did not have such case handling delays in mind when they designed the card.

the daily form idea. When the discussion turns to the relation between B's idea and the current practice of weekly accounting, A asks what actually is on the prototype's weekly form (which shows the information currently recorded every week). This regrouping prompts D to show an example of the prototype's weekly reporting facility.

(PS 7)

B: A whole daily accounting for what // one // has done on one day.

A: // Yeah. //

D: Yes.

A: And yeah that's a part of weekly accounting.

B: Right, but uh it could be combined together at the end. // There's lots you do in a day that doesn't wind up in the weekly account. //

A: // What's in the weekly accounting is it that ... [pointing at screen?] //

D: We can of course try to find one that's been created.

5. Confrontation

The discussion up to this point has concentrated on the appropriation of the artifact and the interplay between the artifact and its evolving use context that led to transformations of both. The evolving contextualization of the artifact suggested a new practice - a new way of conducting work. As the contextualized artifact became more concrete for the participants through their experiences with it and their reinterpretations of it, the suggested new practice became an increasingly plausible alternative. In this section, we consider confrontations or "clashes" between the new practice and the current one, usually resulting in questioning either the contextualized artifact (and thus the suggested new practice) or their current practice. Our focus is on an extended example from the prototyping session involving two clashes. The first led to a proposal for redesigning the artifact, and thus "redesigning" the suggested new practice. The second led to revealing discussions of current practice.

Questioning the new practice

The first clash was between system developer D's proposal for a new way of registering mileage driven and the AT workers' current practice. The example starts with D introducing the idea of registering the amount of kilometers driven from one company to another, instead of the current practice of registering kilometers driven per day. This led to a protest from B based on their current practice.

(PS 8)

D: //that's easily done because// (.) we just have to add on kilometers, you always write kilometers don't you

A: yes and time, yes, of course driving time, and then we have five hours away from home=

B: you can't do that for every single company=

A: no you haven't driven=

B: you are not allowed to go out to a single company and come straight home again, so that's no good.

After rephrasing (and to some degree agreeing to) the idea of registering kilometers per company, B began to formulate a redesign of the prototype based on a new day-calendar "card" (see PS 4 in Section 4). Several aspects of the situation contributed to B's turn toward design:

- the prototype had been appropriated and recognized as relevant, and thus worth redesigning,
- evidence of the mismatch between prototype and practice was clearly visible on the screen,
- all were aware that this was a prototyping session, and thus that suggesting changes was fair game, and finally,
- the context of the session made it clear that the goal was understanding and supporting their work practice, not just demonstrating predesigned "solutions."

In this case the clash between the contextualized artifact and current practice was addressed by reconsidering and redesigning the contextualized artifact.

Questioning current practice

The second clash occurred when the new idea of making daily reports was related to current practice, in particular the practice of making weekly reports. In the following, B notes that daily forms could be automatically incorporated in the weekly report, but acknowledges (having seen what is *not* included in the prototype's automatic generation of the weekly report) that the daily report information must still be typed in.

(PS 9)

B: just as one should if one does it right and that is that you uh make your own daily calendar, right. It would then automatically be transferred

D: yes

B: but of course it requires that I have done it

The discussion then turns to three subtopics: the "invisibility" of office work, management's demand for accountability, and the overhead of registration work. B argues that certain forms of work (e.g. meetings) go unreported today, and that such records might someday be useful as justification to the directorate. A on the other hand, expresses concern over the extra work required.

(PS 10)

B: yes yes, but when you [points at C] sit there and make these // doctors

C: //planning meetings//

- B: or sorting these work related diseases that come in, these you do not write down anywhere.
- A: no, now we have to be careful that it all, you know, it does not become registrations, because, uh
- B: the day they demand
- A: listen, it takes time to sit and do that
- B: yes, but, the day they [the directorate] demand that you have to account for what you've been doing. Then you'll need it [pointing at screen].
- A: //I'll go back then//
- C: //..// all the letters all the stuff I'm engaged with
- B: yes
- A: now you've also got to take care, kids, we also have to//
- B: //I agree with you on that//
- A: do something, don't we?

Here, the prototype triggered a clash between A and B's different experiences and perspectives on their work practices. As a lawyer responsible for justifying decisions and practices at AT, A emphasizes the usefulness of record keeping. As an inspector already burdened with "overhead" work, B underscores the implications extra reporting would have for their day-to-day workloads. In contrast to the first clash, the result here was an elaboration and reconsideration of current practice rather than the new practice suggested by the prototype.

6. Toward participatory analysis

We've seen how encounters between evolving contextualized artifacts and current practice can lead to:

- re-experiencing the details of current practice,
- reflecting on and questioning current practice, and
- proposing new future practices.

These correspond to the three corners of the interplay triangle shown in Figure 1: practice, analysis, and design, respectively. Indeed, we suggest that the ideas presented in this paper can be seen as one response to Suchman and Trigg's call for a new three-way collaboration. Figure 2 represents the idea that contextualized artifacts can lead to just such an interplay.

In particular, we believe our study leads to implications for the use of artifacts not just for participatory *design* of technology and practice, but also to trigger new understandings of current practice, that is, participatory *analysis*.

The first concerns preparing the artifact. Because technology is a part of practice and impossible to analyze in isolation, activities in participatory analysis and design sessions should be deeply grounded in use. By grounding the artifact's design and intended use in current practice, the participants' appropriation of the artifact is

enabled. This requires a significant effort on the developer's part to understand the use setting *before* the session.

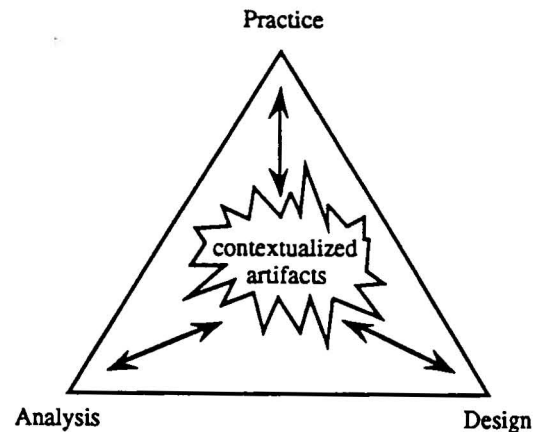


Figure 2: Artifacts supporting a three-way interplay

The second involves the use of the artifact during the session. Sessions should be organized so as to anticipate *and* promote discussion of experiences from current practice, general reflections on practice, and "design" of future practice (and technological possibilities).

For example, when a clash between the contextualized artifact and current practice occurs, the discussion may turn toward practice and away from strict "design" issues (such as those arising when practitioners are encouraged to test or otherwise appraise the artifact). As we have seen, practice-oriented discussions should also be cultivated and encouraged as instances of participatory analysis.

But preparing and using artifacts as triggers for participatory analysis is no easy task. The developer must continually walk a fine line between adhering to (e.g. designing and implementing in a prototype) one's best understanding of a work practice, and building in differences that transcend that practice. Getting the balance right is crucial if the three processes of appropriation, transformation and confrontation are to succeed.

Moreover, one's understanding of the use setting and visions of possible futures are always incomplete and speculative. For this reason, both the artifacts and one's application of them during a session should be characterized by as great a degree of openness as possible. The artifacts' designs should be open so as to support unforeseen interpretations by the session's participants. In using the artifact in the session, developers should be open to new insights triggered by the artifact.

At the time of this writing, it has been a year and a half since the participatory analysis and design session discussed in this paper. Much has changed at AT in terms of technological and organizational developments, and on the project in terms of new forms of involvement and new obligations for us. Recently we held a second

seminar with a focus on potential uses for the new technologies that had recently been installed. Again, artifacts played a key role in triggering fruitful discussions not just of possible technological configurations, but also of the implications of these technologies for the organization of everyday work at AT.

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