



Ethnography as Design Provocation

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In this paper, we present our experience in sharing ethnographic material with engineers that have a very different perception of technology and the role of its users. Rather than convey 'findings' in a rational argument, we have experimented with formats where the role of the ethnography is to provoke engineers to reframe their perception of new designs. Based on four design encounters (workshops) from two different design projects completed in industry, this paper looks at the ways in which the ethnographic material provokes design. We use video transcripts and conversation analysis to learn more about this mechanism of provocation.

INTRODUCTION

Researchers have advocated the use of ethnography in technology development for the detailed information and insights about users it provides (Bentley, 1992) (Hughes, 1997). Later studies have, however, pointed out that this view mainly sees ethnography as a data collection tool, and essentially limits the way the designer understands field studies to finding problems to be solved or gathering requirements for new designs. Ethnography as a data collection tool is problematic since it isolates the researchers from design (Anderson, 1994) and limits the ways in which practice and technology can evolve together (Dourish 2006). In this study we would like to take a closer look at the role ethnography may take in provoking new perspectives in a design organisation. We take as a starting point Anderson's claim that

"...the contribution that ethnography may make is to enable designers to question the taken-for-granted assumptions embedded in the conventional problem-solution design framework." (Anderson, 1994)

We will offer two project cases that show such questioning of conventional understandings of problems and solutions and discuss how ethnographic material provoked this. In relation to the conference theme 'Being Heard', our focus is – at least at a first glance – on how ethnographers or (more broadly) design researchers may be heard in the organisation they work for. But on another level it is as much about the participants, the 'users', being heard in the design process, for we believe that provocation through well-crafted ethnographic material can instigate, and at the same time provide framing for, an ongoing dialog between organisation, participants, and design team.

ACTION RESEARCH

This work originated with the Danfoss User-Centred Design Group that up through the 90's – after realizing that user interaction design is more of a social challenge than a technical one (Bødker & Buur 2002) – strove to develop new participatory design (PD) methods for product development in industry. The base was approaches from PD and computer-supported cooperative work (CSCW) that originated in IT (office) work settings. When the Danfoss Group expanded into the Mads Clausen Institute in 2000 and became a 'university', we maintained the practice of regarding every new design encounter as an action research experiment, in terms of video documentation, reflection on learning etc. Sometimes – as in this case – it has taken years to realise that experiments across several projects may form a new line of investigation and argumentation. In this instance we have gone back to 1999 tapes and analysed one project from the perspective of 'provocation' in order to stage the activities in a second project in 2006. For the analysis we solicited the help of conversation analysis colleagues to get a basic understanding of the socially constructed nature of the dialogues on which we wanted to focus.

Both projects included similar types of field observations: Shadowing of professional technicians at work in plant environments with one or more video cameras. The studies were counted in days (rather than weeks), and subsequently the technicians were involved in sense-making workshops and PD activities around design concepts. Both projects had some measure of text work theorizing about the observed work practices and what they meant. To talk of these as 'ethnographies' might be overstating the fact, but they certainly had qualities beyond mere requirements gathering. One point we will make in the discussion, though, is that the theoretical understanding only came about gradually *through* the engagement with engineers in the organisation and the realization that some findings seemed to thoroughly provoke them.

THE WATER VISION PROJECT

The Water Vision Project was initiated by the Danfoss User Centered Design Group to investigate opportunities for novel products to control wastewater treatment processes. It included field studies at six wastewater plants in Denmark and Sweden. Along with researchers from Aarhus University and Malmö University, we shadowed plant managers, process operators, technicians, and electricians through an ordinary working day and videotaped what we saw - typically with three camera teams working in parallel.

The project was a 'vision project' (as opposed to a development project) initiated in corporate research. It had budget support from R&D directors of three business units, but the innovation horizon was set so distant (8-10 years) that we had the freedom to explore without immediate client accountability. The first episode took place soon after the field study, when the team of design anthropologists, interaction designers, and user-centered engineers started discussing design opportunities based on field study findings. With half of the ten-member team being interns and visiting researchers, the team was still forming at this

stage. The episode shows a clash of opinions between the team and a marketing representative, in discussing automation at wastewater plants.

The designers had seen operators quite naturally move around the plant to feel, smell, and observe the process, whereas the marketing representative was convinced that automation technology is about shifting work into the comfort of a control room. And, clearly, the designers lost this first duel on rational arguments.

Episode 1 – A Clash of Opinions. The design team is visiting one of the business units (the Flow Meter Division), to learn more about the products and company concerns. A marketing representative presents the product line and how it is applied, and then the team splits into small groups to sketch out future scenarios of use based on knowledge from the field. Joining one of the groups, the marketing representative presents a scenario of an operator in a control room. The following conversation unfolds (simplified transcript):



FIGURE 1 Heated discussion between design team and marketing representative on the necessity of operators 'walking the plant'

Team member 1: 'This I'm a bit sceptical about. Everything we have seen about the way water treatment people work, right, they walk out in the environment all the time, and I don't think that's something we neither, you know, they feel like stopping doing or they *can* stop doing.'

Marketing: 'Well, they are allowed to walk out there in those facilities; we don't mind that. If he has to sweep (the floor), then he has to sweep it.'

Team: (uneasy laughter)

Team member 2: 'They do walk out there, right?'

Marketing: 'They are walking out there, yeah'

Team member 2: 'So therefore I really think that it must be nice if one can see that there is an error on one (component) out there, not necessarily how one can solve it.'

Marketing: 'That's what I say one can then do on the computer, it is if uh at the time when this system is technologically so developed that all the parts function'

Team: (shuffling, laughter)

Marketing: 'Then uh its actually uninteresting that it is signalling, because he will anyway see it on his monitor; because that's where he gets his information inside; in an easily understandable way.'

The conversation is about where an operator will find out if a flow meter has a defect. When presented with a scenario, where the operator handles everything from inside a control room, one team member objects that in her understanding the operators seem to walk the plant at all times; and that they neither 'feel like' nor 'can' stop doing this. The marketing employee counters that it is only necessary to enter the (dirty, noisy, smelly) facility to 'sweep the floor', i.e. that the *real work* takes place in a control room.



FIGURE 2 *The Bioscope; an information display at the basin's edge*

A second team member steps in to support the observation that operators walk the plant, and it must be 'nice' to see error messages on the component itself. The marketing employee distances himself by stating that he is talking about a future 'when technology is so developed' that parts don't break down. Then it's 'uninteresting' to visit the plant, because all necessary information is provided 'inside' in the control room. Basically, here is a breach in understanding of what work is about at a wastewater plant, and what role technology can play, but it is expressed in a design decision about whether or not a flow meter should have a local alarm display.

Having observed operators at work, our team in this session came to realize that 'walking the plant' may be a really important characteristic of operator practice. That

Do You Hear Them Working?

operators actually performed ‘control work’ on location was not common knowledge in the business units, and it seemed to upset employees and their understanding of their product and what automation is about. It was also very distressing that the team – even being ten to one – was not able to win the argument in a rational manner. In fact the ‘us’ versus ‘them’ perception was amplified throughout the session, and this contributed to a confrontational atmosphere.

In the course of the next 3 months we struggled to come to grips with the field observations and how they might ‘inform’ new product opportunities. The design process involved scenario sessions, operator workshops, design games in the company and in plants, and many other participatory activities. One of the design concepts that emerged, we called ‘The Bioscope’, a screen placed out in the plant facility. This concept focused on precisely the issue described above: On whether operators in the future will be based in a control room or ‘walk the plant’. The second episode shows how ethnographic knowledge, reified in a product mock-up, provokes a debate directly between operators and product engineers, with the design team acting merely in the role of ‘go-between’.

Episode 2 – Design Mock-up as Provocation. The design team has invited six operators and ten experts from the business units to a final workshop for evaluating the outcome of the 6-month vision project. In mixed groups, participants discuss how various design concepts will change work practices. Then during the presentations, when an operator praises The Bioscope, the following conversation takes place:

Engineer: ‘Wouldn’t it be just as clever to see it (the information) inside from an office chair rather than at the basin’s edge in 10 degrees frost?’

Operator: ‘But maybe there is nobody inside.’

Engineer: ‘Okay?’

Operator: ‘He may be only inside for a quarter or half an hour a day. He doesn’t stand around looking at the screen all the time.’

One of the business unit engineers challenges the very idea of The Bioscope; wouldn’t the operator prefer to be inside in an office? I.e., isn’t the ‘clever’ work happening inside? The operator responds that they do not actually man a control room, but only check the control computer occasionally – *because* work is located outside in the plant. To him ‘inside’ is not an option, nor a desire. In fact, the same question is repeated three times by various engineers during the next 20 minutes, with the weather conditions becoming worse and worse (rain, frost, snow), but the operators never give in; to them work is about ‘walking the plant’, and a computer screen in an office cannot substitute for that.

THE CONFIGURATION PROJECT

The USEC (User Supportive Embedded Configuration) research consortium is a joint effort between industries and universities in Denmark. It explores opportunities to apply configuration technologies in the industrial field. The consortium is divided into three research areas: software algorithms, product logistics, and user studies. As the user studies group, we collaborate with Danfoss on configuration technologies for refrigeration systems in supermarkets and industrial kitchens.

Whereas the debate in the first Water Vision encounter came as an unplanned surprise to the design team, the third encounter shows an organised debate between engineers and designers in a large, on-going interface design project. By carefully crafting the ethnographic



FIGURE 3 Engineers discuss what configuration means to service technicians based on video and storyboards

material into videos and storyboards, we aimed to stage a provocative debate similar to the unplanned one in Episode 1.

Episode 3 – A Staged Provocation. The half-yearly USEC workshops bring researchers from the various university and industry partners together to share results and coordinate progress. The third one took place at Microsoft Business Solutions. For this workshop, we have prepared a group activity for all participants to discuss different perspectives of configuration. This activity was intended to provoke disciplinary understandings while basing the discussion on real and concrete configuration scenarios. By doing this, we were hoping that the various groups would have the opportunity to learn from each other.

In the first part of the activity, the participants watch video stories of configuration practices from three different field sites. Each video is introduced with a brief overview about the location, the technicians and the purpose of the configuration. Then the participants work in groups of two. Each group analyzes a storyboard of one of the videos. We ask them to describe the scenario from their point of view and to identify any configuration issues. We also ask them to describe possible problems and solutions. Finally, participants present their storyboards for general discussion in the large group. The following is a discussion that takes place between several engineers and a designer:

Engineer 1: 'So, at the end we reject the question and say that this is not configuration. From what we see, it is a natural language problem.'

This is a problem of logic, which is not a problem in our field. So I wouldn't describe this one (as configuration).'

Engineer 2: 'Yeah, well if we were to say that this is configuration, or to support this by configuration, then we would need some more information on this....'

Engineer 3: 'But could you explain to us that this is not a kind of configuration problem? Because to me this definitely describes some...'

Engineer 1: 'Well, it is. But it is not the problem that we're interested in. I wouldn't really describe this as a configuration problem. I would describe this as a natural language problem.'

Designer 1: 'So you wouldn't see it as a configuration problem, because it doesn't say configuration?'

Engineer 1: 'Well...I would describe this as a natural language. That's as far as I know.'

Engineer 3: 'That's interesting. Because for me, I could see how they would need to configure the system somehow to optimize it. Maybe in a way it is actually a de-configuration example.'

Engineer 4: 'Well, we had a similar discussion here. We thought that optimization is not a configuration. But we have to do re-configuration to get an optimal condition. So there is a purpose, which is optimization. But it is not the reconfiguration.'

Engineer 3: 'So reconfiguration is actually the means to optimize such a system.'

This discussion is clearly about understandings of configuration. One of the engineers (Engineer 1) refuses to consider the tightening of bolts and screws on pumps as configuration. He argues that the manual practice is not a configuration problem – to him, configuration is a complex mathematical challenge that can be solved by advanced computer algorithms. After some discussion, other engineers (Engineer 3 and 4), who also worked on the similar material, offer a different view on the manual practice. They consider that such manual work is part of configuration work, as it aims to optimize the system.

In this case, the video and the storyboards helped us provoke engineers to discuss fundamental and important issues which otherwise would not come to the surface. We had learned from field studies, that technicians configure a refrigeration system not only through computer settings, but also by sensing the plant and doing physical manipulations. Configuration involves a process of making sense of how the system is put together and exploring the various configuration possibilities (checking the history of the previous configurations) (Sitorus & Buur, 2007).

The most commonly proposed solution to configuration problems is to hide the complexity from the users and introduce computer technology that can automatically work without too much user intervention. However, we have learned from our studies that it is

important for the technicians to be able to deal with the complexity, rather than to lose their grip on for what they are responsible. They rely on the physical setup of the plant to help them orientate and develop a better strategy to control and configure the various parameters.

Episode 4 – Design Mock-up as Provocation II. The fourth episode was another experiment of reifying ethnographic concepts in a simple design mock-up. It provoked the engineers to reconsider their preference for screen and button solutions, as the mock-up moved the issue of hidden parameters out into the open. The design concept “The Compass” allowed technicians to manipulate relevant parameters by means of configuring the shape and physical structure of the interface, rather than hiding the parameters in screen menu hierarchies.



FIGURE 4 Technicians discuss how they see configuration parameters triggered by an imaginative design mock-up.

We brought the Compass to the technicians on site at a refrigeration plant (Figure 4). Provoked by the large size of the Compass and its simplicity, the technicians asked whether the Compass should be used as a dedicated interface to control specific things in the system. They explain that often configuration involves copying one setting from site to site, with small tuning and tweaking. The challenge for them is when they have to tweak settings from scratch.

When discussing the tangible mock-up with the engineers at a later workshop, we asked them to briefly imagine and describe a model of a system that would support the Compass. At first it was difficult for them to do, since the system is much more complex than what the interface visualizes. The physicality of the mock-up provokes them to question their software solutions and to think about the relationship between the technology and the technicians’ bodily practice. Through discussions, the engineers have come to understand that the system should be structured carefully using the technician’s point-of-view.

DISCUSSION

By comparing the two cases we would like to draw attention to issues that seem crucial to make Anderson's (1994) 'questioning of the taken-for-granted assumptions' come about – at least in engineering organizations like the ones with which we engage. But first, did ethnography make a valid contribution, and if so, what was the nature of the design provocation?

In both cases we struggled with rather fundamental understandings of how technology relates to people's work practice. In the first, the theme was *automation* and how technology shapes or supports work. In the second, it was *adaptation* of technology, and whether configuration is a precondition for work to begin or a core attribute of work. The ways technicians experience their work was in both cases so alien to the engineers that they reacted strongly against it and refused to be persuaded by a mere statement of the technicians' perspective, as this would have severe consequences for the way they regard company products and the role the company plays in the world.

Whereas in Episode 1 the design team was taken by surprise that their knowledge from practice observations could actually have such a strongly provocative effect in the organization, Episode 2, 3 and 4 represent various ways of dealing with this situation through the shaping of ethnographic material. The conflict experienced in Episode 1, however, wasn't all negative. In spite of a human (at least a very Scandinavian) urge to avoid direct confrontation, this clash of opinions had a profound effect on teamwork. The new team seemed to rally around the fact that it shared obviously controversial knowledge, and this provided a strong identity and a driver for the ensuing process.

Ethnography as shared material – The material used to stage discussions in Episode 3 was edited video stories and storyboards. In combination with challenging questions it brought about discussions of deeper issues. Should we think of such material as *empirical* or *analytical* in Dourish's distinction (Dourish, 2006)? To encourage engagement and collaborative sense-making the material did not spell out a particular reading, but it certainly, through its selection and composition, represented an analytic focus and a stance beyond that of naked data. There seems to be a delicate balance here, between theory/analysis and involvement, on the one hand to ensure sufficient depth and precision, and on the other to make a difference with the people involved. Elsewhere we have argued that video can play a special role when regarded as 'design material' in a collaborative process, rather than as objective data (Buur et. al., 2002, Ylirisku & Buur, 2007). While video collages, portraits and stories convey an analytical perspective, they maintain an ambiguity that allows the design team to play with alternative readings. Involving others in analyzing ethnographic material helps them relate their competences to concrete user practices.

Ethnography embodied in design – The design mock-ups in Episode 2 and 4 help focus discussion on particular issues. Rather than prototypes, we should probably regard them as 'provotypes' (Mogensen, 1994) in the sense that they do provoke certain themes to surface in the dialogue (Does work happen inside or outside? Is configuration a precondition or is it core work?). This challenges us to think of ethnography not only as text, but also as physical

form. The product in a sense *embodies* the ethnography. There is still much to be learned about reification of understandings; in particular because this is certainly not part of standard anthropological training.

Ethnography for framing user engagement – The design mock-ups helped stage dialogs in both Episode 2 and 4, but in different ways. In the Water Vision project the mock-up served as a tool to engage R&D engineers and process operators in direct dialogue. In a sense, the design team escaped the unattractive role of interpreter, representer, or go-between. In Episode 4, the engineers were not directly involved with the technicians, but the design mock-up served first to engage technicians in dialog with the design team, then – along with video of the technicians' reactions – to trigger dialog between engineers and the design team. In this way the ethnographic material helps 'frame partnerships between those on different sides of the production/consumption relationship, as in Dourish's reading of Suchman (Dourish, 2006). The material mediates the exchanges of understanding and perspectives of various practitioners. Wynn argues that by creating openings within the boundaries that form such practices, one diminishes the distance between these practices (Wynn, 1991). These openings take place when designers are willing to be more sensitive towards the boundaries (Wynn, 1991). Ethnographic material can help these practitioners expose, exchange and reframe their understandings.

CONCLUSIONS

There are a number of conclusions that we would like to draw from our study. Firstly, to engage the potential of ethnography to provoke organisations to rethink their understandings of problems and solutions, the textual form may not be adequate. Neither are insight bullet points, as they submit to the logics of rational argumentation that hardly provokes questioning and engagement. Instead, we find it paramount to develop ways of engaging the organisation in sense-making through the use of visual and physical ethnographic material.

Secondly, the ethnographic theory building, though crucial to design, cannot progress independently of the prevailing conceptions of (work) practices 'out there' in the organisations – and these may not become clear to us until we confront the organisation with our material. Better sooner than later.

Thirdly, to move collaboration beyond requirements talk among the design team, organisation and participants, needs well-crafted ethnographic material to frame the encounters to focus on fundamental issues and perceptions.

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