

Socio-Technical Experiments – a New Approach on the Design Process

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ABSTRACT

The design of pervasive interactive systems is an increasingly complex task. If interactive systems are going to be a pervasive part of our everyday lives it is important to bring the technical and the social together in the design process. Doing socio-technical experiments is a suggested method to achieve this.

The notion of socio-technical network will be used to identify three design challenges directed at integrating the technical and the social in the design process. *The socio-technical challenge, the multidisciplinary challenge and the translating challenge.* These challenges will be discussed and socio-technical experiments will be presented as an approach that addresses these challenge.

Keywords

Participatory design, multidisciplinary cooperation, translating socio-technical network, boundary zones, socio-technical experiments

INTRODUCTION

The design of pervasive interactive systems is an increasingly complex task. There are a demand for new methods, models and techniques for coping with these new challenges [21, 35]. The success or failure of modern IT-systems are not only about good, technical sound systems, but it is as much about how these new systems fit in with the human users and the organization in which they are going to be a part of.

At the Centre for Pervasive Healthcare at Aarhus University [9] we have been working in multidisciplinary teams with pervasive technology in the medical sector for a while [2, 3, 5, 10]. In our research, we have encountered many challenges related to the development of pervasive technology in complex organizational settings like the hospital. Some of our approaches and experiences are presented in this paper.

In this paper *socio-technical experiments* are presented as a new approach to the design process. Socio-technical experiments remove the distinction between the technical and the social use context within the design process. This new approach will be able to provide valuable input to the design process by bringing considerations about the future use situation into the design process.

To achieve this, a number of challenges are first identified that design techniques and models have to address when the social and the technical is going to be merged together in the design process. Based on a discussion of existing design models *socio-technical experiments* will be presented as an approach that addresses these challenges.

Aspects of socio-technical experiments will be explored in a more general model of the design process that focuses on reusability amongst different design activities and some of the aspects of *socio-technical experiments* will be discussed in details in relation to a project done at the Centre for Pervasive Healthcare. A central term identified during this discussion is the idea about *boundary zones*, which is a flexible zone existing between different professions where knowledge can be exchanged.

FRAMING THE SOCIO-TECHNICAL DESIGN CHALLENGE

One of the new challenges when designing pervasive system is to break with the dichotomy between designing the technology and implementing the technology in use in an organizational setting. To elaborate on this point I will introduce the terms *socio-technical network* and *translated socio-technical network*.

A socio-technical network is a term explored by authors like Latour [29], Callon [7], Law [30], Haraway [20] and describes the relationship between the social and the technical. Within this frame the social and technical is not seen as separate entities, but they try to use the term socio-technical network to dissolve this distinction between the social on one side and the technical on the other. When a field study is conducted during a design process, what is studied is how previous designs are interwoven in the socio-technical network.

Another aspect of the network metaphor is to pinpoint that change in one part of the network will affect other parts of the network because of its connectedness. Whenever a new design is introduced into an organization or some organizational changes are made the socio-technical network is going to change into some new form. This new form is in this paper called the *translating socio-technical network*. The focus is here not on the current socio-technical network, but on a network that is changed due to the introduction of a new design. This new change network might be more stable, but will still be translating. A big challenge for designers is to come up with a design that works not in relation to the existing socio-technical network, but within the translating socio-technical network.

The socio-technical perspective points out the weakness in the approach where new technology is designed separated from the use context and the organization subsequent are changed to adapt to the technology through means of e-learning, organizational change etc. This approach is called “fallacy of the empty vessel” by Jordan and Suchman [35]. They criticize the approach for watching the users of a system as empty vessel just waiting to be filled with the knowledge associated with the new technology. Bruno Latour calls this approach the model of diffusion [28]. In this view new technology diffuses out into the organization and changes the social sphere whereas the technology is kept stable. A focal point of critic is that the success or failure of a system is not only depending on how the system is designed, but on how it is grasped by the users and this is far from stable [32].

In contrast to this approach Latour suggest a model of translation [28]. The socio-technical network is not a stable entity in this model, but the network is seen as constantly developing and adapting to changes [28]. When new technologies are introduced this network will get unstable and change, develop and try to evade the designer until the socio-technical network again gets more stable in some new form. In this new form, the design might be used quite different from what the designer intended with the system. An important point is that you cannot separate the technology from the socio-technical network and evaluate it isolated.

One observed example is at a nurse office in a hospital ward. Here four pc's provided access to the electronic patient record. One of the problems with the system was that it was cumbersome to log in, find the right patient and scroll to the relevant information. The job of the nurse however involved being mobile and before she could finish her entry into the system she often had to move around the ward to get extra information. To support this kind of behavior the system had a ‘lock the screen’ feature that the nurses used. The only problem was, that they were around twenty nurses sharing the same four computers and within half an hour all the computers were locked and other nurses

that needed to get to the medical information was not able to do there tasks [3].

Seen in isolation the technology worked as stated in the requirement specification, but within the socio-technical network there was a bad fit and the nurses had to change their behavior and do all kinds of workarounds to get their job done.

The translation model tries to capture the translation that a socio-technical network undergo when a new design or technology is introduced into an organization. In this model a design is a dynamic entity that changes as it is implemented in the organization.

The translation model provides a good tool to describe the challenges a designer is going to meet. The designer is not supposed to design an isolated product, neither a product for an existing socio-technical network, but the designer has to design a product, that will fit into the translating socio-technical network.

It is impossible to foresee which translation the network is going to make. However the design team has to come up with a concrete design. The question is that even though it is impossible to predict the outcome of the translations, how can the understanding gained from the translation model, be used to make better designs? And which concepts and techniques can help the designer in this process? The translation model gives no hints on how to approach these questions.

In this paper three socio-technical design challenges will be suggested that addresses the above mentioned question.

The socio-technical challenge: First of all the design focus has to be on how to do socio-technical design. It is a wrong approach to develop the technology and the social organization separate and then try to make a fit between the two. Instead the design process should from the beginning focus on the socio-technical network.

The multidisciplinary challenge: Secondly doing socio-technical design is a highly complex task and it is required that the design team matches this complexity. One way to address this issue is to use multidisciplinary teams or a set of multidisciplinary teams.

The translating challenge: Finally it is important that it is a translating socio-technical network that the design is going to be a part of. This means that somehow the design team has to take into account that it is not the current situation, but a future highly unpredictable situation they are designing for.

Participatory design

Within the participatory design tradition the focus has been on how to involve the end users in the design process and many of the techniques within the participatory design field address some of the issues around *the socio-technical challenge* and *the translating challenge*.

Different techniques have been developed and explored like the use of scenarios [8], video prototypes [34], mockups [26], future workshop [24], design games [23], user characters [12], thinking hats [31], design collaboratorium [6] etc. Many of these approaches describe a single technique or a single concept that a designer can use as a kind of tool from a tool box.

A toolbox is good because it provides a set of flexible tools a designer can adjust to the current situation. However the different tools or techniques are often focused on a single design activity within the design process and to address the socio-technical design challenges there are a need for more general design models. Several design process model are suggested within participatory design [18].

One model is presented by Buur and Bødker [6]. They have, inspired by the spiral model suggested by Boehm [4] and in cooperation with the Danish company Danfoss, developed a participatory spiral model, where a design process is seen as a set of iterations. In each iteration some part of the design is done with the users through for instance field studies and workshops and some part of the design is done without user involvement. The spiral aims at the development of a concrete product.

This is however only a rough frame for describing the design process and it does not go into details with the three suggested socio-technical design challenges. Another shortcoming is that the design events are part of the design process of a concrete product. This might not appear as a shortcoming, but it makes it difficult to reuse and pass on the knowledge gained from the design process. It also makes it difficult to work in several teams, because even though it is a spiral model it is still linear. There are no possibilities in the model for splitting the design events up amongst different design teams.

Another model that tries to address this problem is called Cooperative Experimental System Development (CESD) and is presented by Grønnebæk et al. [18] One of the main contributions of this model is to separate product development concerns and design activities. With this separation it is possible to view design activities as contributing to several of the product development phases such as analysis, design or realisation.

The CESD model couples the different user centred design techniques to a system development process. It does indirectly address *the socio-technical challenge* and *the translating challenge* through some of the suggested user event, but it does not address the issue about how to design in one or more interdisciplinary teams.

BACKGROUND

The background for addressing the suggested socio-technical challenges is the work done at Centre for Pervasive Healthcare [9]. Center for Pervasive Healthcare is an interdisciplinary research centre dedicated to design,

develop, and evaluate pervasive computer technologies for clinicians to use in hospitals and for helping citizens to participate closely in taking care of their own health. We are working in interdisciplinary groups with members from different disciplines such as computer science, civil engineering, information studies, ethnography and we have doctors and nurses associated as well.

The main focus of the Centre is on how to support mobile, distributed and collaborative work amongst clinicians and patients. The Centre has several ongoing projects within this area. One of the projects related to this paper was the design of an *'AwarePhone'* [19]. The main focus in this project was on how to support social awareness and initiate cooperation amongst clinicians. During this project field studies and several workshops were conducted and prototypes of interactive systems were developed running on mobile phones.

Based on some of the practical and theoretical experience gained the AwarePhone project and other related project at the Centre for Pervasive Healthcare a new approach on how to make socio-technical design is presented. The main inspirational question is whenever it is possible to address the socio-technical design challenges by making socio-technical experiments?

SOCIO-TECHNICAL EXPERIMENTS

With the introduction of a *socio-technical experiment* a set of design activities is collected into an experimental inspired approach. A socio-technical experiment tries to investigate properties of a translating socio-technical network by experimenting with it. It is not the design as isolate entity that is tested but it is the combination of the design and its users that is tested.

A socio-technical experiment is inspired by classical experiments. At the beginning of an experiment a set of hypotheses is formulated that addresses some issues around the socio-technical design that could provide valuable input to the design process.

These hypotheses are evaluated through a *socio-technical test* and are subsequently evaluated.

The outcome of the socio-technical experiment is however not an acceptance or disposal of the hypotheses, but a new set of *reflected hypotheses* and sometimes complete new hypotheses not accounted for before the experiment. These new hypotheses can then again be explored through new experiments.

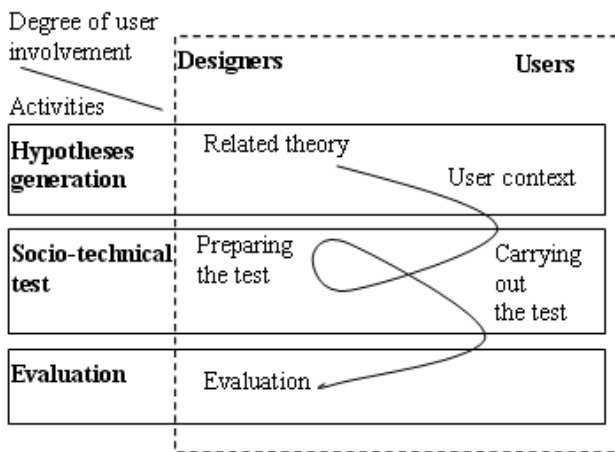


Figure 1: A socio-technical experiment

Figure 1 sketches a graphical view of a socio-technical experiment. The socio-technical experiment is divided into three main activities: The hypotheses generating activity, the socio-technical test and finally an evaluation.

Within these three activities five tasks are identified and placed according to the level of typical user participation.

Related theory: The goal of the first activity is to come up with a set of hypotheses for the test. A good place to start getting inspiration is through related theories and projects.

User context: Another source of inspiration for the hypotheses is within the use context. Suggested design techniques during this task: field studies, work shops or user dialogs.

Preparing the test: The next activity is to test the suggested hypotheses. This is done by letting the user play out some socio-technical scenarios. This task is concerned with preparing the test. Suggested design techniques: scenario-writing, mock-up or prototype developing.

Carrying out the test: The test is carried out by inviting a number of users to participate in a workshop. During a workshop a set of scenarios are acted act together with with some kind of prototype. Suggested design techniques: Scenario acting and playing

Evaluation: Finally the experiment is evaluated and the results are summarised in a set of reflected hypotheses.

These five tasks will be discussed in relationship with the socio-technical challenges and the AwarePhone project in the next section.

Main outcome of a socio-technical experiment are however a set of reflected hypotheses about some aspects of the socio-technical network.

During a design workshop at the Centre focusing on electronic patient record system there were for instance a couple of discussions about how to support mobility. One hypothesis was that tablet PCs were great tools for supporting mobile nurses. This hypothesis was tested

during a socio-technical experiment and the outcome was the following reflected hypothesis:

“It is possible to support mobility with a tablet pc but there are a lot of things to consider. A tablet pc is at the moment to heavy to carry during a whole workday, they are easy to steal, and can maybe not be properly cleaned. They might not be robust enough to handle a fall to the floor. And if there is a heart attack alarm, how can the technology be put down fast without breaking it? “

This example shows how a socio-technical experiment does not accept or reject a hypothesis, but is able to unfolded the hypotheses and show some aspect of the translating socio-technical network the designer have to bear in mind.

Socio-technical experiment can be motivated by the development of one or more concrete product or by a wish to explore a new technology in a socio-technical setting, but an important point is, that they are separated design activity.

This implies several advantages. It is with this separation possible to use the results of the socio-technical network, in many different settings. The reflected hypotheses can for instance be used in the design of one or more specific product or they can be published in scientific journals. It also makes it possible to have many socio-technical experiments running in parallel investigating different properties of the design. And it is possible to have several multidisciplinary teams working on input to the same design process.

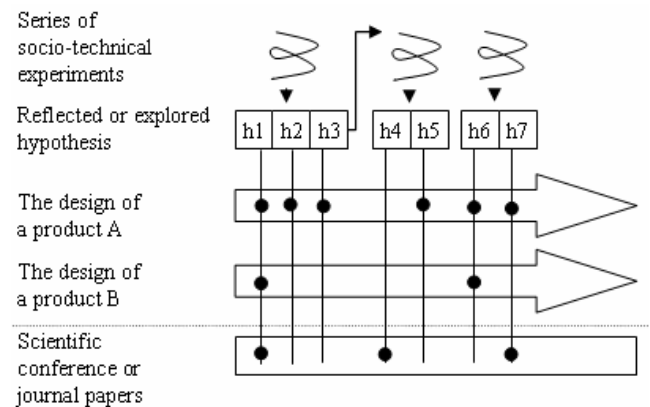


Figure 2: The Experimental Model

Figure 2 shows an overview of the suggested experimental based model. The basis of the model is a set of socio-technical experiments. The results of these experiments are a set of reflected hypotheses. These hypotheses can be used in the design of one or more products or they can be published in scientific journals or passed on in technical reports. They can also be used to generate new socio-technical experiments.

In one of the design project focusing on the future infrastructure for hospital done at the Centre [Christensen], one design team investigated how to log-on to a system [3], another design team investigated social-awareness [19] and another team investigated properties of mobility [5]. All separate design activities done by people with different background, but contributing to the same project. At the same time the results were published and some of the results were used together with IBM in the design of a mobile Electronic Patient Record Solution [2].

The suggested experimental design process model addresses *the multidisciplinary challenge* by separating the socio-technical experiments from the design of a product. This division allows several different multidisciplinary teams to work together in parallel on different issues concerning a design.

In the rest of this paper the different activities within a socio-technical experiment will be discussed based on the work done on the AwarePhone project [19] and finally it will be related to the socio-technical design challenges.

THE HYPOTHESES GENERATING ACTIVITY

The first mentioned activity is the hypotheses generating activity. The purpose of this activity is to come up and formulate relevant hypotheses about the socio-technical network that can be used as the base for socio-technical tests. To help the designer in doing this two tasks are suggested: Looking up related work and examining the user context.

Related work

One way to investigate a new area is to get inspiration from what is written and done elsewhere. It does not necessarily have to be academic work and projects, but also for instance different types of experimental art projects can provide rewarding insight. Artistic project can be used to explore our attitudes towards things that might come but are not yet realized. Technical, context specific or CSCW literature can provide good descriptions and discussions about different aspects of the area to be investigated.

Overall many kinds of literature might be used to contribute to the creative process of generating hypotheses. Because many different kinds of literature can be used, it is also a task where a group of multidisciplinary people cooperating in this task, will be able to generate interesting hypotheses that are inspired by the different approaches.

For instance in the AwarePhone project we started out with a vague idea about how social awareness could help reduce the number of interruptions between clinical staff on a hospital. Our first approach was to search for literature about awareness and looked at all different types of awareness from artistic awareness projects [16] to more concrete technical solution on awareness problems [13].

User Context

Studying the literature will generate a lot of ideas, but it is seldom enough [33]. There is a general need for getting to know the domain and work situation [27]. The people who have the best experience with the current socio-technical network are the intended users. There are numerous techniques in which users are involved in trying to identify aspects of either the current socio-technical network or the translating socio-technical network.

One of the techniques we often use at the Centre for Pervasive Healthcare is to conduct quick and dirty field studies [21]. The purpose of the field studies is to get inspiration to the hypotheses and to identify some of the obvious design constraints within the use context. Having conducted field studies also greatly helps in asking relevant and provoking questions in subsequent workshops. Another advantage of conducting field studies is that people studying the user context without any previous knowledge about the context is able to question basic assumptions that is taking for granted by members of the user context.

The different results accumulated from the user context are summarized in a report document. Several different approaches at structuring this report for a design context are discussed by for instance Hughes [21] and Bardram [1]. This report is an important design document and is used to pass on some of the constraints and possibilities from the user context to the design teams. Another import role of the report is as input to different kind of workshops and confrontation with the users.

Doing field studies can be supplemented with different kinds of exploratory workshops and user confrontation. They are great tools to pass some of the observation from the field studies back to the users and get their reflected view on these observations [24]. One of the big challenges is to move the focus of the user from the current work situation or socio-technical network to a new and maybe complete transformed socio-technical network. Several techniques and techniques have been developed to address this task, for instance future workshops [24], design games [23] and thinking hats [31].

Another great resource during this task is to involve some of the users more closely in the design process or just to have regular conversation with the users. Simple conversation with the coming users is a cheap way to bring valuable feedback to the design process.

In the AwarePhone project we carried out a quick and dirty field study for two weeks at a local hospital. As supplement to this work we held a three days workshop where one of the topics was on how to reduce the number of unintended interruptions. The outcome of the first activity was four hypotheses about how to initiate cooperation between clinicians. One of them was that distributed awareness

would be able to reduce the number of ill-timed interruptions.

The hypotheses generating process is as pointed out a creative activity where multidisciplinary teams have a strong advantage, because they can bring more perspectives and angles on the current design challenges. The outcome of the analytic activity is as mentioned a set of hypotheses about some aspect of the translating socio-technical network that could be relevant for the design team's choices of design solution.

These hypotheses are then going to make the base for the next activity, where a test is prepared that will explore some properties about the suggested hypotheses.

THE SOCIO-TECHNICAL TEST AND EVALUATION ACTIVITY

The purpose of the constructive activity is to put up a *socio-technical test* that will explore some of the properties of the translating socio-technical network. A socio-technical test is focusing on testing the social and the technical part together and not just the technical or the social part. One of the important things in socio-technical tests is to incorporate the hypotheses in the test so that the basic assumptions in the hypotheses are challenged. The suggested technique to do socio-technical test is to use socio-technical scenarios and to let the user play the scenarios during one or more workshops.

The constructive activity is divided up into two tasks. The first task is to prepare and plan the socio-technical test and the second task is to carry out the test. Finally a last task is to evaluate the test and the whole experiment which is placed in its own activity.

Preparing and planning a socio-technical test

To do socio-technical test, scenarios are suggested as a fruitful technique. As pointed out by Carroll scenario-based design techniques belong to "a complementary tradition that seeks to exploit the complexity and fluidity of design by trying to learn more about the structure and dynamics of the problem domain, trying to see the situation in many different ways, and interacting intimately with the concrete elements of the situation"[8]. It is the same purpose socio-technical tests wants to address. Their purpose is also to reveal more about the structure and dynamics of the problem domain or more specific the translating socio-technical network.

A starting point for doing scenarios is to get inspiration from the field studies and user involvement [8]. To do this it is important that the reports from the field studies are available and written in a structured way. This allows the design team in an easy way to take some of the described episodes and use them in the creation of socio-technical scenarios. This transaction where a field study report is taken from an ethnographic tradition and transformed into

a set of socio-technical scenarios in a design tradition is called a *boundary zone*.

The boundary zone term is inspired by Star and Grisham's term boundary objects. Boundary objects are objects used by different parties in different localities, they are robust enough to maintain identity across heterogeneous use, but plastic enough to adapt to the constraints and needs of the different parties working with them [36].

Where boundary objects are plastic objects are boundary zones plastic zones shared by different professions. Within a boundary zone different representational objects of similar knowledge exist, but the representation is formed by different professionals. The representation objects will however still be mutually understandable amongst the different professions.

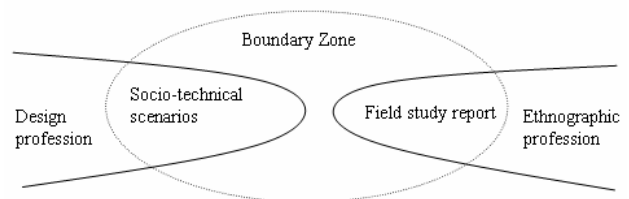


Figure 3: Boundary zone between the design and the ethnographic profession

Figure 3 illustrates the notion of boundary zones. The socio-technical scenarios and the field study reports are within the boundary zone. The socio-technical scenarios are inspired from the field study report and adapted to the design process at hand, but they are not the same representation. However the socio-technical scenarios are also understandable for the ethnographer who will be able to review and comment on the scenarios. The boundary zone can be seen as a transformation zone where representations are negotiated and handed over between different professionalisms.

A boundary zone is also a way of addressing *the multidisciplinary challenge*.

The following example is from the field rapport in the AwarePhone project.

"A young doctor is treating a patients wound. He has to cover the wound with some transplanted skin. The wound is however not looking nice and the young doctor do not know whenever he should proceed and cover the wound or if he should wait. He runs around the ward to find a more experienced doctor. He finally finds a free doctor one floor up and together they go down to se the wound" (field report day 6)"

This episode was used as inspiration to a socio-technical scenario that starts:

“1) A patient at the ward is feeling ill and is contacting the nurse. The nurse finds a doctor that does not seem to be busy and calls this person”.

The field episode and the scenarios are grounded in the same episode, they are in a boundary zone, but they are still different representation. At the same time the socio-technical scenario tries to address the hypothesis about distributed social awareness with the task: “find a doctor that is not to busy”.

Designing prototypes

Within the preparation task it is also necessary to develop some kind of representation of the technology in the socio-technical scenario. Depending on the specific scenarios a set of mock-ups [26] or prototypes [14, 17] will have to be prepared. Using mock-ups is to prefer if the scenarios are very exploratory and creative ideas about the translating socio-technical network is the goal. Is the goal however to explore more specific aspects of the socio-technical network, prototypes are to be preferred. I will focus on the development of interactive prototypes here and some of the points going to be made will have to be slightly adjusted to cover mock-ups and other kinds of technical representation.

Design prototypes are one common way to represent the technology in the socio-technical scenarios. In many cases it is people with technical competences that develop the prototypes. Another boundary zone can be seen here between the design profession and the technical profession.

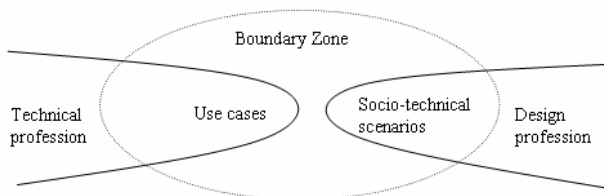


Figure 4: Boundary zone between the technical and the design profession

Before the prototype system can be created some kind of requirements for the system’s behaviour have to be identified. A widespread technique is the use cases technique [11, 15]. Use cases are scenarios that describe the user’s interaction with an interactive system in some level of details. The use cases are determined by the socio-technical scenarios, but where scenarios are open use cases have to be specific and address different kind of alternative behaviour the system has to react to. Figure 4 illustrates this new boundary zone. Socio-technical scenarios are used to determine the use cases and the use cases can be discussed and evaluated by design professionals.

In the AwarePhone project we implemented a prototype system running on mobile phones and with a central server. We used use cases to specify the requirements to the system.

One use case that supported the above mentioned socio-technical scenario was:

Use case x: Check other persons status

Main Actor: Doctor or Nurse (D/N)

Situation: A D/N wishes to get information about another doctor’s or nurse’s current activity.

...

Main Scenario:

1. *D/N activates a list of all personal on the ward*
2. *D/N finds the relevant person by scrolling the list*
3. *D/N reads the relevant information of the display*

Extension:

1a: The phone is off.

...

The above use case is grounded in the socio-technical scenario but they are still different representation and with different purposes. They are within the boundary zone between the technical profession and design.

The outcome of the planning and preparing task is a script for a socio-technical test containing a set of socio-technical scenarios based on the hypotheses put forward in the previous activity and a prototype able of supporting the technical part of the scenarios.

Carrying out the test

The test is carried out by holding a workshop where the users are invited to act out some of the written socio-technical scenarios.

In the AwarePhone project we invited a number of doctors and nurses to act out the scenario in our hospital lab.

From the test in the AwarePhone project and from other tests we have been carrying out at the Centre a lot of experience has been gathered. Based on these we have identified a set of challenges that meets the designer when a socio-technical test is carried out.

The good test person: The first challenge is called the good test person. The problem this challenge addresses is how to pass on the purpose or the scope of the test to the participating users. The test setup only covers a little part of the total systems functionality and the user context might only be roughly modelled. Sometimes the participating users are able to point out some weaknesses with the setup that can be fruitful, but in other cases some of the users have problem accepting these fictive terms. The good test person tries to address this challenge. The good test person is not a person that blindly does what the designer wants them to do, but persons that accepts the test frame and challenges some of its assumptions.

The skilled user: This challenge addresses the problem about how to learn to use the system. The main focus of the test is not to test the usability of the product or to see how difficult it is to learn, but to get an idea about how the design is going to be used in the translating socio-technical

network where the users use the system everyday. To somehow solve this problem is a real challenge. One suggestion that came up at a workshop was to let one of the designer acts as the skilled users. Following this the participating users can ask the skilled user when they encountered any problem with the system without breaking with the scenario frame. However it is not a perfect solution and other solutions are to be found.

Carrying out collaborative socio-technical scenarios: Many of the tests we have had experience with, have been collaborative scenarios and some of them have tested distributed collaboration. In one test we had two doctors, two nurses, a set of servers and four mobile phones that had to collaborate distributed in one scenario. The challenge is to write scenarios and carry them out when people are distributed and they have to collaborate.

One approach is to write linear scenarios, where each distributed person carry out a task in sequence for instance a doctor call another doctor. This doctor waits until s/he receives the call, then s/he might look up some information, send it to a waiting nurse etc. A clear problem with linear distributed scenarios is that there is some inactive waiting time for the users not currently active.

Another approach is to write non-linear scenarios where a lot of activities might be going on in parallel that sometimes has to be coordinated. This approach will in many cases more accurately reflect the user context, but it is really hard to coordinate from the test designers perspective and we have not tried to carry out these kind of scenarios yet. However it is a big challenge and new techniques and extensive experience could be a way to address this challenge.

Debate of the hypotheses: The last challenge that will be discussed here are the debate of the hypotheses. The purpose of the test is to get the hypotheses debated. If a workshop is poorly planned it is possible to get through it without actually getting any feedback on the hypotheses. Therefore it is a challenge to keep the focus of the test in mind and be sure that the hypotheses are debated. Sometimes statements like “this is a good idea” are nice to hear, but it is important to know why it is a good idea. The purpose is not to verify our own ideas, but to get new perspectives on the ideas. A suggested technique is to round the workshop of with a discussion or focus group interview about the hypotheses to get the participating users opinion on the hypotheses after they have tried them out. The challenge is to always have the hypotheses in mind and to be sure during the workshop that the users reflect on all of them.

Evaluation

The final activity of a socio-technical experiment is to evaluate and sum up the conclusions.

First the socio-technical test can generate new hypotheses. During the test new themes can be introduced by the participating users not identified through the analytic activity. These hypotheses can then be further investigated in new socio-technical experiments.

Secondly if the socio-technical test is carried out successfully the assumptions behind the hypotheses put forth have been discussed and reflected upon and the outcome should be a new set of reflected hypotheses.

A reflected hypothesis is not just a proposal or simple statement, but a proposal that incorporate some of the conclusions drawn from the field studies, the design of the prototypes and most important from the socio-technical test. The reflected hypotheses cannot identify how the socio-technical network is going to translate. But because the hypotheses are reflected they can provide valuable insight about the translating socio-technical network to the designers of pervasive interactive systems.

In the AwarePhone project the four original suggested hypotheses were discussed.

For instance was the hypotheses about social distributed awareness discussed and especially the young doctors said it could be a valuable tool in prioritizing amongst more experienced doctors as the following transcript from the test shows:

Young doctor: “I think it would be a clear advantage to be able to see what other doctors are doing. It is also a way of prioritizing. For instance at our ward there are three of the old you can draw on. Then it could be nice from the beginning of the day to be able to see who you can draw on and where they are, are they operating. People in the outpatient department are always easier to interrupt. That is the way it is. It shows a way of prioritizing.” (tape 2, 28:06-)



Figure 5: The patient stress the importance of being part of the interaction with the technology

Two new hypotheses were proposed during the test. One of them was about the importance of considering the patient in the interaction when designing mobile technology for doctor and nurses to carry around. In the workshop the

patient wanted to be a part in the interaction as well. Figure 5 illustrates how the patient is left out of the interaction during the test.

CONCLUSION

One way to address the increasing complexity in the design of pervasive interactive systems is to break with the distinction between technology on the one hand and the use context on the other hand. Instead it is suggested to view them as one socio-technical network. When doing socio-technical design three challenges have been identified.

Socio-technical experiment was suggested as a method that addresses *the socio-technical challenge*. By doing socio-technical experiment it is the socio-technical network that is tested and not the technology or the user. It shows how these test can produce reflected hypotheses that can be valuable input in one or more concrete product development processes.

Another challenge was how to cooperate in one or more multidisciplinary teams. Two different suggestions were discussed. By separating socio-technical experiments from the design of a concrete product it is possible to initiate and delegate different socio-technical experiment to a set of different teams. This enables the possibility for several teams to work on different aspect of a design in parallel. Secondly boundary zones were introduced as a flexible zone where representations from one profession within a design team are passed on and transformed into a representation relevant for another profession within the team. Boundary zones address how different professional traditions can coexist within a design team and how representations can move between them.

The last challenge was how to design for a translating socio-technical network. A socio-technical experiment is addressing the translated and not the current socio-technical network. However how to design for a continually translating network is only slightly discussed and how to make flexible designs that supports continuing translations is a new challenge.

Experimenting with socio-technical network is still relatively new approach and more experiments and work have to be done to investigate properties of this approach.

With the suggestion of socio-technical experiments I have tried to push design and user participation further by suggesting an approach that removes the distinction between the technology and the social use within the design process.

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