Dynamic Interactive Scenario Creation: a method for extending Participatory Design to large system development projects

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ABSTRACT

Basing our findings on experience from a participatory system development process in the Swedish project Distance Supported Learning for Local Knowledge Needs (DLK) we present and discuss the DISC-method for participatory scenario creation. We argue that, in large and distributed Participatory Design projects, the method can be suitable to aid participant selection and create a shared understanding of the current situation while preserving the democratic and multi-disciplinary character of Participatory Design.

Keywords

Participatory Design, Scenarios, Methods, Organisation analysis

INTRODUCTION

In large projects involving complex organisations, user acceptance of the final system design is often the critical factor for system success. In order to develop a computer system that is efficient, it is today therefore widely accepted that it is necessary to perform a thorough analysis of users, tasks, infrastructure and interaction within the organisation when the system is designed. From this perspective, Participatory Design (PD) methods appear as suitable for creating a successful design solution also in these settings. From the late seventies a number of specific design methods based on involvement of participants from the goal organisation in a small-group process have been created. The design activities can range from organisation and task analyses in the early phases, through different methods for cooperative prototyping, to the late phases of evaluation and customisation. Because the suitability of the various methods differs according to for instance, user characteristics or the type and size of organisation and project, it has been found beneficial to have a toolbox of methods to choose from. This stance is used in Action Design [9] for instance.

Problem formulation

As is the case with most PD methods, Action Design was originally adapted to projects where the intended user group is relatively small and geographically concentrated, e.g. at hospitals or in school districts. This was known when the method was introduced in a project where the goal was to design a system that would primarily suit 225,000 users, spread over 18 different affiliations in a nation-wide third sector organisation. Some of the twelve members of the basic PD-group lived and worked more than 200 km away from the venue for the group meeting. To reduce travel time, fewer and longer meetings were scheduled, four- or five-hours long, instead of the two-hour meetings suggested by the Action Design method.

During the project, the majority of the participants were also working at least part time in their ordinary work beside their organisational assignments, which meant that synchronisation of the design group meetings was complicated and group meeting attendance suffered.

A relatively long period of group work combined with the turnover in assignment was another complicating factor because some group members left the PD group early and replacements entered a group where the rules and knowledge had to be re-established.

Combined with the problem of geographical separation, the size and diversity of the intended user group lead to a problem with group member representativeness and selection. The number of different affiliations and

assignments made it impossible for every stakeholder to participate. In the project, participation by those who were active in the region and were members of the most active affiliations was prioritised. Furthermore, project management members were prioritised for power reasons, as were members with key competence, such as Human-Computer Interaction, pedagogy, and system development.

The approach selected for the project was to form a design group with the prioritised users and using survey methods to gather information about users outside the design group thereby bringing the perspectives of external users into the discussions [8]. Based on the findings in the project, the Dynamic Interactive Scenario Creation-method (DISC) was designed as a means to overcome the aforementioned difficulties and to create a closer connection between meetings and the day to day work activities.

Study aim

The aim of this study is to describe a method for scenario creation that can act as a design memory in large PD projects. The intention is that the method should facilitate extra-meeting interaction between geographically dispersed group members, while preserving the democratic and multi-disciplinary character of PD. The method is mainly to be used early in a project to create scenarios on which to base design work but also the method should be used for the evaluation of prototypes.

Theoretical background

In most design projects, a comprehensive knowledge of the users, context and tasks, is of key importance for a successful design. As an aid to better understand use environments, scenarios reflecting the current conditions have been used for various purposes throughout the design cycle. It is claimed that these scenarios make users tasks and the situation of use more concrete, i.e. they are supposed to "help developers and users pose new questions, question new answers, open up possibilities" [2]. The scenarios can be based on multiple sources, such as interviews, observations, and methods for diary keeping. Scenario development can be employed in the early stages of a project for task- and requirements analysis and functions as a means to create a shared understanding of the present and intended use between participants in a design group. In the later phases, scenarios can be useful tools for structuring the functionality provided in the system and for evaluating prototype solutions [2]. For a long time now, scenarios have also been used in combination with prototypes to make concrete the present or future situation of use.

In participatory design, the experts on context, users and tasks are in the design team. Their knowledge however, is often fragmentary since the division of work as well as different work roles make each user an expert on a subset of the activities within the organisation. Users' knowledge can be divided into four types: Declarative, semantic, procedural and episodic [6]. To some extent, the knowledge is tacit since *acting in* the role does not always imply *reflecting about* the role. In participatory design projects, "high level"-scenarios, spanning over different users and focusing on the relations between users, goals, procedures, and tools can act as concrete descriptions that form a baseline for further design. It has been argued that participatory design projects tend to focus on the system development process rather than on the earlier and more analytical understanding of the current situation [3].

METHODS

Action-research methods were used for the study that was performed in the Swedish Distance Supported Learning for Local Knowledge Needs (DLK) project, which started in 1997 with the aim of supporting shop-stewards in their roles as union representatives. As a part of the project, a design group was formed in 1999 to investigate how IT-solutions may provide support for shop-stewards' needs for education, information, and communication among shop-stewards themselves as well as between shop-stewards and higher levels of the organisation. The work was led by members of the MDA research-group (*People, Computers and Work*) at Linköping University, and was based on a set of participatory methods and tools in the Action-Design method developed within the research group. Apart from members of *MDA,* the group consisted of local representatives from different unions in Linköping, members of the DLK-project management group and one educationalist from the VuxCen group at Linköping University. In all, 20 four- or five-hour long design meetings were held between October 1999 and October 2001, when the work was concluded. Between six and twelve members were actively engaged in the group work during this period.

During the design meetings, all participants were actively engaged in open and constructive discussions. Between the meetings, the group was scattered and responsibility for the group work was tacitly given to the members of *MDA.* Despite our best efforts to break this pattern by giving group members "homework", the issue of between-meeting passivity was not satisfactorily resolved.

The Action Design group worked with scenarios that were initially created from replies to a questionnaire based on the Critical Incident Method [5]. These scenarios were used for the evaluation of a mock-up prototype. Based on the results of the evaluation, the scenario format was revised and used when a Future Workshop, spanning over three consecutive meetings, was organised within the design group. The scenarios were used for input into the design process. Finally, following another revision, the scenario format was used to assess the design to see whether the system would provide support in highly

demanding situations, as a contrast to the mainstream use situations that was the focus of the Future workshop.

RESULTS

The aim of the DISC-method is to be a tool that can be used in early phases of a PD-project as a means to generate and structure knowledge about tasks and cooperation in an organisation. The scenarios are intended to be lightweight in the sense that the descriptions may not be complete and elaborated. We consider it more important to have a broad set of less elaborated scenarios than fewer and more comprehensive ones. If entering scenarios is laborious, users will hesitate to take that extra time, especially in a stressful situation. We would thereby run the risk of missing some of the most critical situations of use.

Purpose

The purpose of the method is to assemble and analyse, in a PD group, knowledge about the day-to-day information flow and tasks in a large user organisation.

Prerequisites

The majority of prerequisites that need to be fulfilled in order for the method to work originate in the PD context. Before the DISC-method is used, a group consisting of representatives of known stakeholders in the project has to be formed. They will form the initial group that may later be expanded as the work progresses. The first meetings in the PD group are devoted to group forming and introducing the project. The Action Design method used in the DLK-project prescribes that an *internal group contract* be established and signed by all group members. This contract regulates meeting- and group interaction rules to ensure that everyone has the same possibility to influence the work and to prevent the possibility of later conflicts. In our experience, the creation of an internal group contract is valuable to later group work. When using the DISC-method, it is also important to stress that the scenarios written down will not be disclosed to persons outside the group. The method is presented and exemplified at one of the early meetings and users may enter test scenarios and ask questions to get used to the technique.

Participant instruction

Each participant in a DISC group is given the task of observing their work. They are instructed to observe their daily work practices that require communication either with present computer systems or colleagues and report on situations that are particular, problematic, stressful or time consuming. Based on the fact that the work context provides memory cues, the tasks the user currently works with will sometimes remind them of previous problematic tasks. If the participants regarded these tasks important in their work, they are encouraged to create scenario descriptions also for those earlier events. They are instructed to keep scenario descriptions brief initially in order for them not to interfere too much with their ordinary work.

Primary scenarios

When important events occur, the participant uses a special Scenario Form to create a *primary scenario description*. The Scenario Form contains fields to fill out descriptions on:

- What action the scenario addresses, e.g. to look for specific information or write a protocol.

- When these kind of activities are performed. Evenly spread out over the day/week/month/year or more often at some specific time.

- The event that triggered the need for the user to act.

- How often these activities are performed and how long time they take. What percentage of the total work hours these actions do consume.

- Where and in what situations these actions are performed.

- What results are sought, and when the results need to be achieved.

- Who and what the subjects are dependent on in order to fulfil their goals. With whom they need to communicate and what kind of information they need.

- What information is communicated to colleagues and what information is expected in return.

- Which media that are used to communicate with colleagues.

- How important it is that the task is completed.

- How often the initial attempt to solve the problem fails and if there are alternative strategies.

- If the user could wish for an ideal solution to the problems he or she faces, what would that be?

Secondary scenarios

A secondary scenario is the result of a design group member creating a scenario that at some stage involves another member of the design group. The member can be mentioned in the primary scenario form either as a trigger of the action in the primary scenario or as a result of the action in the scenario. If, for instance a group member (B) gets a mail from a person (A) asking for information or requires an action of a person (C), the scenario can be traced backwards (What triggered A to send the mail to B?) and forwards (What is needed from C to make it possible for B to act on A's request?). The primary scenario descriptions will thus be forwarded to A and C who add *secondary scenario descriptions* and thereby add and connect descriptions of their actions to the primary description. This action is recursive in the sense that the secondary scenario descriptions may in turn

reveal involvement from other persons who might expand the scenario descriptions further. The scenario descriptions are linked to each other rather than directly attached. When C receives the scenario description from B, A may already have entered a secondary description that is thus accessible through a link.

Design group restructuring

The Scenario Form is submitted to a design-coordinating group. This group consists of members from the Action Design group. They gather and analyse the cases to see how information and collaboration in the organisation is distributed. When scenario descriptions contain information saying that their peers are to be contacted for information or action, the description is transferred to them if they are members of the design group. Otherwise, Action Design-group members with similar roles in the organisation receive the message. As the process evolves and more scenario descriptions are submitted, it might be obvious that important roles in the organisation are not represented in the Action Design group. The group may then be extended and cases which had previously not been sent on, may now be transferred to the new group member.

It is likely that an uneven distribution of cases will be sent to different members of the Action Design group. For group members with the highest amount of traffic, the design-coordinating group may then limit the number of cases received by that person, to the most important cases. Members who seldom partake in scenario creation or refinement could be encouraged to write more.

Meeting located activities

The design group meets and analyses on a regular basis what way in which the present practices and tools may be improved to better fulfil the aims of the organisation. At meetings, members of the design group can analyse and group the created scenarios. Related scenarios can be linked together. Lo-Fi prototypes can be designed and later be implemented as web-based prototypes for the participants to use in cases where the computer has a central role in the interaction.

Paper-based variation

In some projects, the participants may not yet have access to a computer system and a simpler method with paper based forms for entering the scenario descriptions has to be used. The user provides the same information as in the computerised version but the scenarios have to be exchanged manually between users. That makes the paper-based variation inconvenient for use with distributed work groups. Linking and viewing different scenario descriptions is also rather more difficult than in the computerised version. The general idea is, however, still to dynamically create and expand scenarios in order to obtain a shared understanding of the current practice and aid the prototype design.

Method suitability for projects

As the DISC-method is based on our findings in the DLK-project it is primarily suited for projects similar to this one. It is thus designed to be used in projects where group members are geographically separated to an extent that makes frequent meetings and observer based scenario capture cumbersome.

The method is probably best suited for large and complex organisations where a structured method for scenario creation can motivate the overhead effort of a formalised method.

Although Participatory Design can be used to create a wide variety of artefacts, the DISC-method is designed mainly for the creation of multi-user computer systems to aid cooperation and communication in professional organisations.

With the computer-based method it is a clear advantage if group members already have easy access to computers where the resulting system is intended to be used.

DISCUSSION

The method is called *Dynamic* for two reasons: The scenario creation is dynamic because it begins with one user writing a primary scenario description that is sent on to other users that add descriptions of their own actions, taken earlier or later in the causal chain of events, to the scenario.

The second reason refers to the dynamism regarding what users that participate in the scenario creation. If written scenario descriptions show that information or action is needed from people with a role that is not represented in the design group, their perspective may have significance for the usability of the final design. If that information is of enough importance, they could be enrolled in the group as full members or otherwise may just help the Action Design group complete the scenarios and later evaluate prototypes based on those scenarios. In such a case, it is also important to stress that all descriptions are intended for use exclusively within the design group.

We labelled the method *Interactive* because the creation of scenarios involves a relatively high degree of communication between the members of the design group. Interaction also focuses on how different users interact to fulfil a common goal.

Naturalistic scenarios

The descriptions in the Scenario Forms are likely to provide a more reliable view of the work content and information flow than a description made outside the work context, for instance at a design group meeting. The scenarios are, in a way which is very similar to scenarios created from ethnographically-created video material [1],

320

anchored in current work practices and mediate the exploration of future situations of use.

The method gives clear indications of whether important stakeholders are missing from the design work. When Case Forms state that information is sent to or needed from actors outside of the group, it is easy to temporarily or permanently expand the group that use the DISC-system.

The system automatically provides documentation of relevant scenarios that later can be used in other participatory distance-adapted methods such as TelePICTIVE [7] in the later design and evaluation of the system.

As users in the forwarded scenarios read descriptions created by other group members, their understanding of their own role in the ability of other group members to fulfil their tasks, increases. When participants formulate their scenarios, they are also forced to reflect on how and to what extent they are dependent on the work of other participants. The scenarios can therefore help create a common understanding within the group. In design groups where different members are active at different times, structured scenarios can transfer design knowledge and rationale for design between members and over time[4].

Due to that the participants also can rate the importance of the tasks that they perform, these data can be used for analysing imbalances in the incentives and priorities of stakeholders.

The issue of contextual accuracy is methodologically interesting. To what extent do methods, performed outside the work or use setting, capture the demands and actions performed within the setting? Descriptions taken down "in situ" are likely to be more accurate since the context provides memory cues. Descriptions given during the action also eliminate the risk of hindsight bias. There are thus good reasons to believe that factual information in the scenarios provided by the DISC-method is more precise than corresponding scenarios given through decontextualised methods.

Weaknesses of the method

There is naturally some overhead effort in the method when activities that are of minor relevance to the design of a computer system are thoroughly documented.

Perhaps the most critical drawback is the fact that the extra effort of documenting work tasks is least performed when it is most needed. In periods of stress and for participants with a high workload, the registration of tasks is likely to suffer. There is also a risk that the registration of tasks will miss important activities that are not performed at the computer.

One of the cornerstones of Participatory Design is that all stakeholders should have the same possibility to influence the solutions they are designing. There is, however, always a risk that some perspectives may be lost and others become unduly prominent.

Due to that the method is based on written reports from workplace situations, perspectives from participants who are unsure of spelling and expressing things in writing may be lost. In many blue-collar professions as well as in some non-work settings, project participants may hesitate to enter text that can be kept and later referenced. This is to some extent the case for the shop-stewards in the DLK-project, who work in a culture that is more based on *oral and transitory* rather than *written and permanent* communication. This could possibly affect recruitment to the group and reduce the influence of the hesitant participants' perspectives. Due to that fact, and with a general wish to reduce the amount of text input, our choice is to keep the scenario descriptions brief.

Further studies

Present a method that has not yet been empirically validated can scientifically be seen as questionable. The method is, however, the result of our experience of where the difficulties can be found in running a participatory project with a large and distributed user group. Furthermore, we consider it to be of interest since the proposed method is relevant in the early phases of design projects, which have hitherto attracted less interest than the "downstream" activities: prototype creation, evaluation, and refinement. In other participatory design projects like the DLK-project we would definitely use the DISC-method in the early phases and we invite other researchers to use it as a tool or inspiration in the early phases of similar projects.

ACKNOWLEDGMENTS

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