An Investigation of Participatory Design with Children – Informant, Balanced and Facilitated Design

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Abstract. This paper describes WeDD (Web Site Design Day), a project which brought university staff, parent helpers and school children together to design a school web site. The design process, which was modelled on participatory design, is described with reference to other work that has used a similar approach. The methods that were used to evaluate the process are described, and some general conclusions about the efficacy of the approach are presented. Difficulties with trying to work in a participatory way with children are examined. A participatory design model - the IBF model - is proposed; this defines terms for the different balances of participation. This is followed by a discussion of the variables that affect, both before and during the participatory process, the level of participation of the various categories of participant. The project environment and the skills of the participants are identified as being important in the initial positioning of a design project on the IBF model. Subject knowledge and personal security are considered to cause fluctuations within the project. The importance of controlling and monitoring these variables is discussed and further work in this area is described.

1   Introduction

1.1   Background

There are several processes associated with the design of usable interfaces; these include user analysis, task analysis, and iterative design based on the users and their tasks (Dumas & Redish, 1993). Traditional 'user centred design' typically positions users solely as testers and evaluators of a system (Rubenstein & Hersh, 1984), but there is evidence that users find applications easier to use when they are engaged in the both the design and the construction of the application (Papert, 1980).

One method of engaging users is the participatory design approach, in which the users and designers act as partners in the design process (Bjerknes, Ehn, & Kyng, 1987, Greenbaum & Kyng, 1991, Schuler & Namioka, 1993). The ethos for participatory design is that the users should be actively and directly involved in design. In general, the participatory process involves the use of brainstorming and low-tech prototyping tools to capture and demonstrate the ideas of the participants.

Researchers and developers have used this approach with children in a number of design projects. Muller developed the PICTIVE approach that used paper and pencil technology to facilitate the direct involvement of non computer literate users (Muller, 1991). This approach is particularly suited to children, as they are unlikely to have access to, or skills for, more sophisticated prototyping tools. Druin and Solomon used a similar approach in their early work with children at the ChiKids events (Druin & Solomon, 1996). In a later work, Druin gives some practical advice for developers working with children (Druin, 1999). This advice includes wearing informal clothing, sitting rather than standing, asking the children for their opinions and giving them time to articulate them, using informal language, and taking notes discreetly. In particular, for participatory design, children aged between 7 and 10 are considered

ideal, due to their emerging capacity for reflection and abstraction, and their lack of preconceptions about the design domain.

Alborzi *et al* found that a period of time allowing expectations to be set at the start of the project or design session aided in the teams' getting to know each other better, and therefore being more able to work together (Alborzi et al, 2000). Druin *et al* used brainstorming as an initial part of the design process, to encourage a 'feeling that anything was possible' (Druin et al., 2001).

Previous projects that have used participatory design with children have found it to be a worthwhile although difficult process. Research by Kafai, Ching, & Marshall, (1997) has suggested that for children to participate in the design process effectively, they have to have information about what constitutes good interface design. Alborzi *et al* and Taxen *et al* both noted that the power structure between adults and children was difficult to change in a school environment (Alborzi et al., 2000, Taxen, Druin, Fast, & Kjellin, 2001). They also noted that children were unused to providing critical feedback, and that some researchers were uncomfortable working with children. Taxen *et al* also indicates the problem of researchers not being used to children (Taxen et al., 2001).

In 'informant design' (Scaife, Rogers, Aldrich, & Davies, 1997), designers build the prototype for the users. This approach has been used with children, who provide insight on the design of the interface, explain their own difficulties with existing materials, and evaluate the interactivity and designs. User needs and desires can also be elicited using a co-operative enquiry, which endeavours to establish what the children want from the technology (Druin, 1999). This results in a list of likes and dislikes from the children about the interface that is presented to them.

In the light of the experiences outlined above, participatory design with children was considered to be an interesting area to investigate further. In addition, a school had approached the Department of Computing with an idea for web site design, and it was decided to apply a participatory approach to this. It is this project, termed the WeDD (Web Design Day) project, that is described in the remainder of this paper.

1.2 Terminology

A difficulty with the literature on participatory design and related topics is the lack of clarity and consistency in the terminology used. For this reason we present here some definitions of the terms we use in this paper.

'Design' in computing normally refers to the stage of development that follows analysis and precedes implementation. In participatory design projects, activities often include parts of the analysis and implementation processes. We use the word 'design' loosely, in this context, to cover all of the processes in which all of the participants are involved.

'User-centred design' is a process in which users are consulted in the course of the design, normally as evaluators. In this paper, we use the phrase 'collaborative design' to describe a situation in which more than one person is involved in the design part of the process. 'Participatory design' is a subset of this; it covers situations where there is more than one category of individual involved in the collaboration. The different categories of participant will be contributing to the process in different ways. We identify three different modes of participation, 'informant design', 'balanced design', and 'facilitated design'; these are defined and contrasted later in the paper.

Similarly, it is helpful to be consistent about the nomenclature for the different categories of person participating. In some situations it is possible to describe them as 'designers' and 'users'. In the project we describe here, these labels are unhelpful; the adults involved were not all professional designers, and the aim was to design a web site of which the children were only one group of the potential users. Indeed the adults were themselves also potential users. We have decided to name the three categories of participants 'academics' (the authors of the paper, who brought with them knowledge of design and implementation of web sites), 'adult helpers' (who brought knowledge of the domain, and very variable levels of web site design and implementation skill), and 'children' (who brought enthusiasm, a knowledge of the domain, and very little web development knowledge). In general where participatory design involving children is concerned, it seems clearest to call the groups involved 'adults' and 'children' rather than seeking to impose titles implying specific roles. In the more general case where the categories of participant can't be classified by age, the terms 'design expert' and 'domain expert' are useful.

1.3 The structure of the paper

The structure of the rest of the paper is as follows. In Section 2, we provide a description of the WeDD Project Day. In Section 3, we describe the evaluation methods used for the project and discuss the quantitative and qualitative feedback from the process. In Section 4, we introduce and discuss our model of Participatory Design. We also introduce and discuss the forces that affect the position of a project on the model. Finally, in Section 5 we draw conclusions and make suggestions for further work.

2 The WeDD Project

A small village school was identified as being suitable for this project and a dialogue was established between the school and the University. The design activity started with a participatory design day in the school. On this day, six academics, seven parent helpers, a university technician and 50 children aged between 8 and 10 were involved. The day began with a short orientation session for the academics and adult helpers, during which the outline of the day was presented. Discussion took place as to how the process was to be managed, particularly with respect to our interactions with the children. The particular points emphasised were that the adults were to act as facilitators and were not to impose their own ideas on the children.

Figure 1. A group of children working on the WeDD project

The working day began with one of the academics explaining to the children what the day was about. Part of this introduction included an explanation of some of features that web sites have – for example text, pictures, sound, and video – with an emphasis on the fact that different people have different opinions and preferences. The schoolteachers (who were not themselves involved in the design process) had already separated the children into eight groups of about five children. These groups were not mixed according to ability or age, but appeared to be put like with like. For instance, there was one group of quiet and compliant girls and another group of noisy boys, although not all the groups were segregated by gender. On the day, the number of groups formed by the schoolteachers did not match evenly with the number of academics and adult helpers present, which forced an *ad hoc* rearrangement of groups before the sessions could start. As a result of this, the group sizes were not all uniform; the final configuration produced 6 groups with group sizes ranging from 5 to 11 children. With each group, there was one academic and one or two adult helpers.

The day's activities took place in the school hall with each group working around a table. Figure 1 shows a group working together. Materials such as paper, pencils, pens, scissors were provided and were stacked up on a separate table. The technician set up a video camera so that he could move around the groups to film the activities. In addition, he took still pictures with a digital camera. Although the hall was big enough, and was a suitable area for managing such a large number of children, it did become very noisy when all the groups were working.

There were four activity sessions based around the structure of the school day. After the introductory talk, each group ran an icebreaking session and a brainstorming session about what they wanted on the web site.

After the morning break, the groups took their ideas and developed them further, doing some research by looking at documents that were available such as the school brochure. There were two computers available during the day for the participants to use to look at some web sites that had been identified as useful. Because the children went to view the computers in groups of three or four, not every child got an opportunity to navigate the web site, although they could all see the screen. During this session, most of the groups also started developing paper prototypes.

After lunch, paper prototyping started in earnest and continued up until the afternoon break. The final session involved finishing off and displaying the work on the tables. During the last quarter of an hour, all the children and adults looked at the work that the groups had produced in the day.

At the end of the day, each group had produced a paper prototype of their web site. Figure 2 shows a part of one of the paper prototypes. The prototypes were varied both in presentation style and content, but typically included a front page and a number of related pages. As part of another project, the prototypes were later used to implement a web site for the school.

Figure 2. One of the finished web site designs from the WeDD project

3   Evaluation of the WeDD project

The project was evaluated using evidence from questionnaires, video recordings and observations made by the academics.

Children were asked to complete questionnaires both before and, immediately after the exercise. There was a 100% completion rate of the questionnaires. The earlier questionnaire was handed out two days before the event and was intended to elicit information relating to the children's expectations of the event. The second questionnaire was circulated at the end of the web design day and included general questions together with a Likert-type smiley face scale (Risden, Hanna, & Kanerva, 1997). These satisfaction metrics were modelled on previous work developed by Read (Read, MacFarlane, & Casey, 2001a, 2001b).

It was evident from the pre-event questionnaire that the children were looking forward to the event. They had quite high expectations. The expectations of the children were realised, with the majority of the children recording that the event was as good as, or better than, they expected at the completion of the WeDD day. Some questions had been designed to measure the perception of the children of the 'participatory' nature of the event. The majority thought they had had good ideas and that their group had used their ideas well.

A debriefing session for the academics and adult helpers was held at the end of the design day with notes being taken by a team member for further reflection at a later date. This approach is in line with Alborzi *et al* who also used 'adult debriefing' after their design sessions to facilitate reflection on the design process (Alborzi et al, 2000). Together with the verbal debriefing, the academics wrote up their perceptions of the design activity. These free-form notes varied in detail, reflection, scope, and precision, and were useful for both anecdotal evidence and to build a post-event questionnaire that was given to the academics a few days after the project.

Observations by the academics about how the children appeared to experience the day were varied. It became clear during discussions that the different groups had responded quite differently to the day. The academics involved with the two younger groups (aged 8-9) reported that the groups were well motivated and kept busy throughout the day. With these groups it was sometimes difficult for the academics and adult helpers to keep up with the pace the children wanted to work at, and the number of ideas that emanated from the groups exceeded the amount of time available to prototype them. Academics working with the older groups (aged 9-10) reported that the children were more reticent. One group in particular was very difficult to motivate.

From the point of view of the academic participants, one of the most notable features of the day had been the difference between the actual experience and what had been planned. In preparation for the day the academics had anticipated that they would be able to maintain a 'hands off' approach to the design activities, where their role would be as facilitators for the children's ideas. In practice, however, the process had been much more interactive, with the children needing and expecting more active intervention from the adults. This effect is discussed in more detail in the following section.

Anecdotal evidence about the academics' experiences of the day suggested that they had found it better than had been anticipated. This was also the finding of the teachers and parent helpers. The fact that different groups behaved differently meant that each academic had a slightly different perception of the process. The academics working with more enthusiastic groups perceived the children to have participated to a greater extent than those academics who had worked with less enthusiastic groups.

In the questionnaire, academics were asked for their opinions on the environment, the children and the design process, together with their own overall impressions. A 1-5 Likert scale and space for comments were available to record responses. It was interesting to note that the overall impressions of the day changed a little from slightly negative before the event to slightly positive after the event. The preparation for the day was felt to be positive, in terms of the School and materials provided, but the environment was felt to be inhibiting to the design process. The children were less familiar than we had expected with the web, web-media, and hyperlinks, and as a result of this, they did not use them well in their designs. There was a general consensus that note taking was very difficult. Some academic participants reported that they had tried to take notes but had been forced to stop because the children found it distracting.

4   Discussion

4.1   The IBF Participatory Continuum Model

Participatory design can describe a range of approaches within collaborative design. The amount of participation by the design experts and domain experts is not static. Figure 3 illustrates participatory design as a continuum along which there are identifiable, but not discrete, modes. These modes are delineated by the amount of domain expert (in our case - child) contribution to the design. We call these modes Informant, Balanced, and Facilitated.
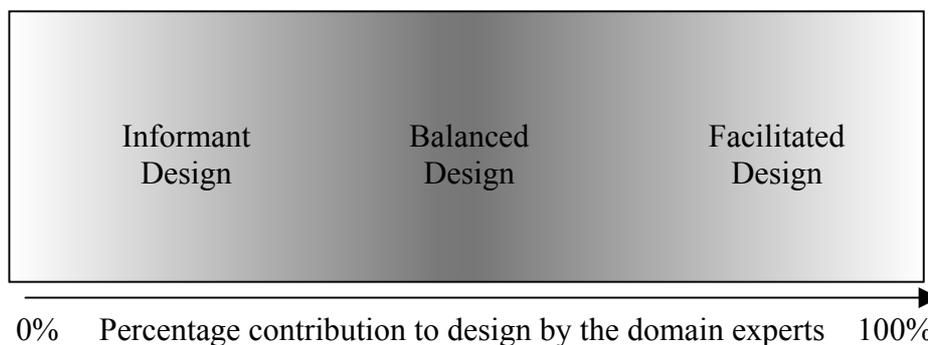

| | | |
| Informant
Design | Balanced
Design | Facilitated
Design |

0%   Percentage contribution to design by the domain experts   100%

Figure 3. The IBF Participatory Continuum Model

'Informant design' assumes that the domain expert's contribution is largely limited to informing the design experts, and that the design is mostly realised by the design experts.

'Balanced design' assumes an equal partnership between the two categories of participant, both engaged in informing and realising the ideas.

'Facilitated design' puts the emphasis onto the domain expert both to initiate ideas and to take the lead in realising the design, with the design expert being in a facilitating role.

In the WeDD project, the intention at the start of the day had been to do the process using facilitated design. We had, perhaps naïvely, assumed that we could control this positioning of the process both across the groups and during the day. However with hindsight, it became clear that not only had each group begun in a different location on the IBF model, there had also been transitions throughout the day.

4.2 Variables that affect the IBF Model

There are many variables that affect the position of any group on the IBF model both at the beginning of the process, and also during the activity. We have identified four classes of variable. These are:

- Environment
- Knowledge
- Skills
- Security

4.2.1 Environment

The cultural and physical environment in which a participatory design activity takes place will affect the activity. Aspects of the physical environment that may be influential include the room, lighting, access to equipment, seating arrangements and heights and sizes of furniture. Features of the cultural environment such as the prevailing culture of the organisation, the structure of the organisation and the relative status of the individuals involved in the activity may have a powerful effect on how people behave.

The WeDD project was sited in a small village school. This had the effect that all the children knew each other; they all had similar aspirations and were a fairly homogenous group. The educational environment contributed to many of the expectations of the children and the adults; expectations about adults being in charge, about acceptable behaviour and about the type of activities that would occur. It was noted that the children expected to be told what to do by the adults, and it was felt that this was exacerbated because the event was held in school, during a school day. A number of academics also reported that the children found group discussion and decision-making sessions quite hard, but that they were keen to get to the writing and drawing tasks, perhaps because these activities tied in with their expectations of normal school life.

4.2.2 Knowledge

Each participant will bring to the design activity his or her own general knowledge, subject knowledge, and technical knowledge. This access to knowledge will affect how the participants view both their own ability to contribute to the design, and that of others in the group. When working with children, there is a tendency for children to demur to adults, even if it is the case that the children know more about a particular subject area than the adults involved.

In the WeDD project it was found that some children and adult helpers knew a lot about web sites and some knew nothing – this affected their perceptions of what they could contribute to the process. There was an opportunity for all the participants to discuss and look at web sites during the day, so the knowledge base of the participants did change during the design process.

4.2.3 Skills

The skills that will affect the ability of individuals to contribute to a participatory design activity include cognitive skills, motor skills, and articulatory skills. Different participants will bring different skills to any project and it is likely that the balance of skills within a group will affect its functionality.

In the WeDD project there was a 'skills-divide' due to the cognitive inequality of the children and adults. The children had some difficulty expressing their desires and some were hampered by their poor motor skills. In participatory design, group-working skills are particularly important, and it was noted by a number of the adults in the WeDD project that the children often found it hard to work in a group. Maintaining concentration during group discussion, being able to listen to others ideas, and finding effective ways of making group decisions were observed to be difficult for some of the children, particularly the younger ones.

4.2.4 Security

Comfort factors, emotional stability, and stress also have an effect on how people contribute to a group activity. These factors can be quite individual and are difficult to predict. Feelings of security within a group will also be influenced by environment, knowledge, and skills.

In the WeDD project it was noticed that the children reacted to the group dynamics in different ways. Some children wanted to take on leadership roles whereas others felt happier to be led. Seating arrangements and the group makeup were also important for the children. The group dynamics were very fluid and many aspects of it changed during the day.

4.3   The effect of the variables in the WeDD project

One noticeable aspect of the WeDD project was the autonomy of each group to position itself on the IBF model. The fact that there were differences between the groups, even in a single design exercise, illustrates the importance of the different variables as influences on the balance of participation in participatory design activities. Although all the variables affected the initial positioning of the groups on the IBF model, it was found that environment and skills were more static, and exercised a constant effect on the groups throughout the day, whereas knowledge and security were more subject to change, and could affect the balance of the groups during the day.

The environment was fundamentally the same for all groups and had this been the only class of variable it could be assumed that each group would have behaved in a very similar way. The fact that the environment was an educational one probably pushed the process more towards the informant design side of the IBF model. In an educational environment adults are clearly in a position of power and in possession of knowledge, and the structures of interaction are so explicitly defined, that it is difficult to impose a different model of interaction, particularly with such a young group of children. In the WeDD project it was found that this cultural factor exerted a very strong influence that was difficult to overcome.

At the start of the day the pool of knowledge contained within each group was varied, depending upon the individuals in the group. In particular, the grouping had meant that not only were children put into broadly similar age groups, but also there were some single gender groups. In addition the adults had varying knowledge – this was particularly the case with the parent helpers. It is likely that the effect of the knowledge differences was diminished during the day, and that children were empowered as they gained knowledge. This may have influenced a shift towards facilitated design during the day.

There were skill differences; with the most explicit split being between adults and children. Within each group, this skill divide remained the same throughout the day. However, the skill imbalance was possibly different in the different groups, with the older children possessing skills that the younger ones did not have. The general effect of the skill imbalance would have been towards informant design mode.

Security was very difficult to predict or even to measure. Of all the classes of variables security appears to be the most subject to variation both depending on the individuals in the group and the group dynamic that develops during the exercise. With a couple of exceptions, in the WeDD project participants became more secure as the day progressed. In most cases, this moved the balance towards the facilitated design mode.

5   Conclusions

Participatory design with children is both rewarding and difficult. Where large numbers of children are involved and separate groups are created, there is likely to be a range of levels of participation. This paper has presented a model that defines three different modes of participatory design and names them as Informant, Balanced and Facilitated. The model should be useful for researchers in clarifying the aims of

participatory projects, and the appropriate balance of participation, both with children and adult participants.

In addition, four classes of variables, which impact upon the balance of participation, were presented. Project environment and the skills of the participants have been identified as having an effect on the initial balance within a design project. However, these two classes of variable are unlikely to change significantly during the course of a project. The other two classes, knowledge and security, also have an effect on the initial positioning, but they are more dynamic and are likely to cause the balance of participation to fluctuate during the process.

6 Acknowledgements

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