

Partial Success and Partial Failure in a Commercial Development Project

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ABSTRACT

This paper reports on partial success and partial failure in introducing participatory design principles and practices into a commercial development context. The dimensions of participatory design proposed by Clement and Van den Besselaar (1993) are first used to provide a framework for discussing the notion of success. A case study is then presented which details the design activities undertaken in a small commercial development project, and the way in which the process and outcomes of the project can be considered as both partial success and partial failure. Three possible explanations for the negative outcomes are suggested. The interpretive analysis of the outcomes has implications in terms of the management and conduct of participatory design projects in a commercial context, and suggests additional directions for analysis of why participatory design projects may be more or less successful.

Keywords

success and failure, interpretation, commercial project

INTRODUCTION

In this paper I discuss the partial success and partial failure of introducing participatory design principles and practices within a commercial development project. The dimensions of participatory design proposed by Clement and Van den Besselaar (1993) are used initially to qualify the notion of success. A case study is then presented which details the design activities undertaken in a particular project, and the way in which the outcomes can be considered as both success and failure. There appear to be few studies of partial failures in the use of participatory design, and I feel that a discussion of this can also be of scientific and practical value. There is also relatively little discussion in the literature on participatory design of its potential in commercial development projects, and particularly those

carried out by small development companies (which are responsible for much of the off-the-shelf software¹). The report highlights potential design dynamics in this context. A question is also put of why the negative outcomes were observed. Three analytical perspectives are proposed as means of helping to make sense of the observations. The discussion has implications in terms of the management and conduct of participatory design projects in a commercial context, and suggests the need for further qualitative research into why projects may be more or less successful.

The notion of success in participatory design is itself problematic. One way to address success would be to ask to what extent practices commonly associated with participatory design (PD) were actually carried out in a project. The authors of a retrospective study of participatory design projects (Clement and Van den Besselaar, 1993, 31), suggest that a project can be characterized as participatory design according to its conformity to five key criteria (and characterize several projects according to their presence or absence): access to relevant information, independent voice in decision-making, user-controlled development resources, appropriate development methods, and organizational/technical flexibility. Later in the paper, these authors further specify two additional criteria which pertain to the use of appropriate development methods: active involvement of users, and increased learning and communications (p. 35). These could be viewed as criteria which address the *process* of design.

Although these criteria are certainly a useful starting point for the assessment of projects, one may wonder whether these fully reflect the goals and motivations of all those who choose a PD approach to system design. Indeed, Clement and Van den Besselaar add an outcome dimension to their discussion --whether a project did or did not lead to more effective, better-adapted systems. One could presume that the authors do not just mean systems which are more ergonomic (which could potentially be produced through usability testing), but systems which actually support organizational and occupational work processes, and enhance workers' skills, autonomy and control.

¹ See, however, Blomberg et al. (1995) and Grudin (1993).

In PDC'96 *Proceedings of the Participatory Design Conference*. J. Blomberg, F. Kensing, and E.A. Dykstra-Erickson (Eds.). Cambridge, MA USA, 13-15 November 1996. Computer Professionals for Social Responsibility, P.O. Box 717, Palo Alto CA 94302-0717 USA, cpsr@cpsr.org.

Fundamentally, one could ask whether the design approach actually results in the satisfaction of stakeholder concerns in relation to the new computer tools. In the case of the commercial development of a new application, this issue becomes highly problematic, in that one is more likely to be unsure of who the eventual users may be, and unsure of who may be affected by it.

Even after one has established perspectives from which to judge the extent to which a project is successful, a second question arises as to *why* a project may be only partially successful. Several directions for reflection are possible. First, certain pre-requisites associated with PD may not be attained, as suggested by the criteria noted above. In a similar vein, design techniques associated with PD may be incorrectly or inadequately applied. Second, one could invoke the role of psychological or psychoanalytical dynamics: designers may ignore or reformulate the statements of users (Bowers and Pycock, 1994), "fixate" on certain design concepts (Jansson and Smith, 1991), adhere resolutely to learned (but perhaps ineffective) design methodologies (Wastel, 1993), or withdraw from the design work (Epstein and Yakura, 1992). Third, the local organizational and historical context of a given project can mitigate against the realization of a facilitator's, manager's, or developer's planned scope or sequence of activities (Grudin, 1993; Suchman, 1988; Hales, 1995). Finally, overt and subtle political forces may shape participatory design projects, and effective action may depend on one's ability to align with at least some of these (Bannon, 1995; Gärtner and Wagner, 1994). In particular, Barki and Hartwick (1994) observe that the attainment of the objectives of participatory design depends on the degree of influence that participants are given or able to muster. These hypotheses are noted as possible directions that an analysis of failure might take (and there may be others).

These then are the twin questions taken up in this paper: how one may characterize -- from a perspective of PD -- success and failure in a commercial development project, and the possible reasons for the observed outcomes. The structure of the first part of the paper is straightforward. The general context of the development project is presented, followed by a brief outline of the design activities, research methodology, and outcomes. This is followed by a discussion of why the project could be qualified as partial success and partial failure. Next, three particular lines of analysis of certain negative outcomes are suggested, along with observations to support each of these. Finally, in the conclusion, I summarize the analysis, draw out the implications of the study for the practice of participatory design, and reflect on the heterogeneity of the analysis.

CONTEXT OF THE DEVELOPMENT PROJECT

A developer, who was president of a small software development company (3 employees in all), approached a potential sponsor with the idea of developing a multi-media e-mail application that could be used to report on distant work. The proposed application would allow voice annotation of camera images and screen captures from any

of the applications that the worker used. The developer also noted that it would be valuable to have moving video images of the person who had prepared the report. The application rationale (documented in a product specification), was that remote workers or teleworkers could create detailed reports of work-in-progress, and that managers could use these reports to have better understanding of problems encountered, the work accomplished to date, and workers' reactions to the work (through the voice and video). A manager could collect the reports and later use them for evaluation purposes. The developer believed that the information provided by the application would lessen managers' concerns about distant work, and in general render distance work more efficient and acceptable to managers and organizations.

The application was to be a commercial one, in the sense that a large number of copies would have to be sold in order for the company to make a profit from it. The developer also stated that office workers would be able to use the application with little or no training. No particular client was sponsoring the development, no organization had agreed to purchase the product, and the project did not involve re-design or re-use of an existing product.

During the project formulation and the early phases of the project, a manager in the sponsor organization argued that such a product would need to take into account the organizational and work practices of the eventual users. The manager suggested that an application which managed to do so would be more attractive to organizations and gain a better reputation. An iterative design approach was discussed, involving prototypes and their assessments within field settings. The developer indicated interest in experimenting with this design approach and with other design activities which might be suggested in the research project. The extent to which this perspective was actually written into the agreement between the developer and sponsor organization is not known (the agreement was not available). In retrospect, the developer had not committed himself to a PD design approach per se, but had agreed to engage in evolving design activities with actual end-users in organizations that might purchase the application.

The senior management of the sponsor organization decided to fund the R&D activities of the development company for two years. This and various other elements created a project context quite different from that of a recent project which also adopted a cooperative approach to system development within a partially² commercial project (Blomberg, Suchman, and Trigg, 1995). For example, our project had a medium term development horizon with no threat of cancellation (for 2 years), there were no ongoing measurements of progress (other than expectations of prototypes), and the prototypes could potentially be used in an actual work context (developed on an IBM PC). As well, the researcher in this project was independent of the

² I have used partial in the sense that the potential commercialization of an application did not appear to be as much of an immediate objective as it was in this project.

development company, and this company was a tiny organization, whereas Blomberg, Suchman, and Trigg were part of a large, segmented organization. Thus, in some ways, the project discussed here may have been more conducive to a participatory design approach.

The sponsor decided to retain the services of a social scientist to facilitate and document the design process. The project would be a cooperative R&D project in that the social scientist would provide both suggestions as to a possible design process, and observations of end-users which would be taken into account in the application design³. I then became associated with the project, and had four main objectives: 1) to introduce actual end-users into the development process, and to introduce participatory design techniques, 2) to attempt to improve the product, in case it did go on the market and anyone wanted or was required to use it, 3) to document the design process and outcomes, and 4) to add nuances to key assumptions that the developer had made about the application, and to highlight confirming or disconfirming evidence, especially as this could relate to the success of the application. Although there was a tacit mandate from the manager to pursue these objectives, I had no formal authority relative to the developer. In retrospect, I wanted to steer the project, in real time and with a weak mandate, in a PD direction⁴.

The developer entered into the project with the understanding that he would be supporting and working with end-users. Indeed, almost all of the design activities that I proposed were accepted. It is also worthwhile noting that the developer was based in a city some 1000 miles from myself. We frequently used the telephone and fax to communicate, on a near weekly basis, and had four face-to-face visits during the two years. One of the eventual field participants lived in the same city as the developer.

METHODOLOGY

Two streams of methodology were used in the project. First -- consistent with a participatory and action research approach to design -- was a set of activities which were progressively identified and carried out in order to strengthen the developer's knowledge of people's work, participants' understanding of the application, and to "allow people to have an effect on each other" (Kensing and Munk-Madsen, 1993)⁵. These activities were: a mock-up

³ A broader discussion of cooperative design can be found in Greenbaum and Kyng (1991).

⁴ For a discussion of a similar real-time intervention in a more complex environment, see Hales, 1995.

⁵ I recognize two tendencies in participatory design: the use of various techniques, such as joint mock-ups, future scenarios, and prototypes, conducted primarily with end-users, and another of efforts undertaken to include key organizational actors in decisions regarding a computer system. The eventual field site participants made comments directly to the developer, but had no decision-making role.

of the application and presentation to focus groups (a non-functional computer presentation of the concept), the inclusion of two different organizations in the design and testing process (which turned out to be four individuals, two each in two different organizations), the testing of a paper prototype with field site participants, and the early installation of two prototypes with the participants. It was also hoped that managers and workers at the field sites would have a formal decision role, perhaps in the form of an advisory committee⁶. Another design technique, borrowed from the HCI field of research, consisted of usability tests with ad hoc users and interface experts (for the two functional prototypes).

A second set of research activities included common social science observation and interview techniques. The developer was interviewed periodically. The dates and content of telephone discussions with the developer and field participants were noted in a logbook. Similarly, notes were made after management review meetings. Telephone and on-site interviews were carried out with field site participants. The installation and use of prototypes were videotaped and reviewed (and if the developer was absent, a copy was sent to him). In parallel with these activities, I reviewed research into the management of telework, and developed a critical analysis of the application's assumptions.

OBSERVATIONS AND DISCUSSION OF THE DESIGN PROCESS

Partial Success

Table 1 summarizes the way in which the various design activities contributed to the development process. However, the most influential activity turned out to be the activities associated with the evaluation of the first prototype. Three sub-activities were part of this evaluation: 1) installation of the prototype with the four field site participants, trial use, and interviews with the participants, 2) usability evaluation, and 3) a report sent to the developer which discussed design and other potential communication and organizational issues. When the developer installed the first prototype at the field sites, there was only sufficient time to show participants how to use it, and thus we had limited observation of any difficulties the participants might have experienced as they were learning to use it. This was the reason that usability evaluation was also carried out. The report indicated that difficulties existed with respect to learning to use and in using the prototype, and noted what these were. The report also noted field participants' concern with security issues, and their interest

⁶ Such a committee was not formed. At one field site, an executive assistant dropped out of the project because of time pressures, and there were similar constraints on her manager. Two distributed managers/engineers participated at the other site, and since they interacted directly with the developer, a formal design committee appeared redundant. This was another case of "plans" adapting to local circumstances (Suchman, 1988).

Summary of Design Activities, Time Requirements, and Outcomes

Activities (in chronological order)	Time Requirements (approximate)	Results
Concept Prototype* (Computer Simulation)	3 months	- helped to explain application to field sites - familiarization with technical issues - initial outline of interface
Focus Groups with potential organizations	4 days	- suggestions re real-time interaction; document tracking - some managers want to maintain face-to-face management styles
Finding 2 Field Sites	1.5 months	- provided work contexts for application
Creation of 1st Functional Prototype* Assessing 1st prototype	6 months	- provided concrete prototype that people could interact with, use, test
Usab. Testing (experts)	1 day	- analysis of strengths and weaknesses
Usab. Testing (novices)	2 weeks	- indicated difficulties with the prototypes - helped developer to acknowledge problems
Observations of, and Interviews with field participants; report	2 weeks	- several suggestions of how to improve prototype - identification of confidentiality concerns - identification of sending and storage issues - summary report to developer, eventually lead to re-design of prototype
Construction of Paper Prototype*	2 weeks	- way to change, visualize remodelled application
Testing of Paper Prototype with a field site	3 days	- helped to identify areas where design not explicit, lead to some changes
Summary of Organizational Issues	1 week	- report on organizational issues that had appeared
Creation of 2nd Functional Prototype with moving video*	10 months	- remodelled interface - other functions, including moving video, snapshot, editors...
Joint Usability Testing* (at developer's office)	1 week	- developer felt re-design substantiated - developer identified needed changes; felt it worthwhile
Installation of 2nd Prototype; Interviews with field site participants; Report	2 weeks	- several suggestions of how to improve prototype - identification of storage issues - identification of lack of interest in video - issues appeared of how to effectively create report, manage appearances - analysis of issues related to the video
Usab. Testing (expert)	1 day	- analysis of strengths and weaknesses
Brainstorming with soc. sc.	3 days	- identification of additional organizational issues

* Activities carried out by the development company

Table 1

in additional functions: real-time interactive communication (as opposed to the asynchronous nature of the prototype), a means to add other files, and a concern with the file size of reports. The developer reluctantly decided to re-design the interface of the prototype. A year into the project, the developer carried out paper prototyping, and tested it with two of the most accessible field participants. This activity helped to construct a different application structure. Twenty months into the twenty-four month project, a second functional prototype was installed with the field participants (which now included a small moving video window of the person who created the report, a means to control image quality [frames per second], and a function for capturing still images). The field site participants commented that this prototype had significantly improved in comparison with the first one. Certain functions suggested by the participants had also been included: the possible attachment of complete files, better control over snapshots of screens, a window for ordinary text, and a way of adding new parts to an existing report. Thus, the presentation and discussion of the conceptual and paper prototypes, along with the installation of the first functional prototype, made a positive contribution to the improvement of the application.

Some of the objectives of participatory design, in terms of design *process*, were also at least partially met. The field participants had access to relevant information about the nature and characteristics of the application. Appropriate development methods were used in that conceptual, paper, and evolutionary functional prototypes were used to communicate the developer's application concepts. Reciprocally, field participants were able to communicate their concerns about the application directly to the developer, and make suggestions of how it could be improved. As well, through visits to the participants' work sites, the developer gained some familiarity with the participants' computer and work environment.

Partial Failure

The development project was also a partial failure in that at the end of the two years, suggestions for other functions had not been implemented, the level of usability appeared problematic, and questions about potential organizational issues had not been addressed. During group presentations of the conceptual prototype, suggestions had been made to allow real-time interaction, but this had not been addressed. Field participants had explicit concerns about how difficult or cumbersome it might be to transfer reports: it became clear that users would have to use regular postal mail to send removable support media, attach large files (2-50 MB) to conventional e-mail, or use some other file transfer mechanism (such as FTP). In terms of the application's usability, it was not clear how much experimentation or training would be needed before someone would be able to produce a report. It seemed unlikely that anyone would be able to just sit down and start creating a report, as the developer had originally

hoped⁷. Time was needed before one could check a report that had just been created, or play back someone else's report (this could take 30 seconds or more). It would not be easy to reply to someone else's report, and to include elements of that report in one's reply (a suggestion made by a participant). The creation of a report was likely to be time-consuming and perhaps frustrating, particularly if any edition was necessary.

The field participants had a minor influence in the design process, particularly in relation to decision-making. They were primarily seen as a source of ideas, suggestions, and critiques, but not as authorities in relation to the design concept or the interface. The project was also unsuccessful in that relatively little information was obtained about how work actually changed along with the introduction and use of the application (the participants did not use the prototypes in their work), and so a mass of empirical information could not be considered while the design was still taking shape.

Questions about how the application would be used in a real work context were identified, but received little response. Some of these surfaced during the author's critical analysis of the application, and some through participants' comments⁸. These were communicated to the developer both orally and in a written document. For example:

- It appeared unlikely that the small moving video window would communicate important new information through "body language" [from critical analysis].
- The moving video might not be desirable in all situations, and there could be concerns about privacy issues, such as dress at home [from a participant]
- Was it possible to lock a report so that pictures and one's words would not be misused? [from participants]
- The audio-video files tended to be large (10 MB for a one-minute report with video, about 1 MB for a minute of sound and image only). Files would have to be stored somewhere.
- Because of the file size issue, reports would be short. Would reports of a few minutes duration be worthwhile? [from analysis]
- The hardware that had been selected for digitization of images and moving video was costly, approximately \$2,000 U.S.
- People may dislike making reports, and managers may not receive the information they are looking for [from analysis].

⁷ This assessment is based on an inspection of the second prototype by myself, the project manager, and an expert on interfaces.

⁸ Some additional issues were identified by a group of social scientists, late in the project.

The developer decided to continue the development of the moving video function, postpone his⁹ original objective of including an integrated report transfer mechanism, and to provide consultation services to help organizations to learn to use the application in an effective way.

It would appear that partial failure was experienced during the project, in that the last prototype appeared to have significant usability problems, functions which might have improved the prototype were not added, the participants had a minor decision-making role, and the organizational issues noted above did not appear to be given serious consideration.

POSSIBLE EXPLANATIONS OF THE PARTIAL FAILURE

After this brief overview of the design project, it is worthwhile to ask, in concert with Näslund (1995), why the project resulted in a partial failure. This type of exploration may provide useful suggestions of how it may be possible to improve on participatory design projects, or better understanding of the difficulties that may be met in such projects. Three avenues of analysis will be explored here: 1) possible inadequacies in following participatory design methods, 2) psychological dynamics, and 3) the background of the development company and the context of the project.

Possible Inadequacies in Following Participatory Design Methods

One reason for partial failure in the project may have been an inadequate or inappropriate use of participatory design methods. For example, there may have been insufficient opportunity for discussion between field participants and the developer (an activity emphasized by Kensing and Munk-Madsen, 1993, and others). In effect, about 1,000 miles separated the developer and some of the field participants, and they were able to meet only four times. Still, as noted above, several suggestions were implemented, and various organizational issues were identified. Limited as it may have been, the communication still resulted in an excess of design ideas and considerations.

More to the point would be the timing of the opportunities for communication between developer and participants. It was difficult to find field sites interested in testing the application, thus the first meetings did not occur until seven months after the project had begun. At that point the developer had already committed much effort to the creation of a first prototype. A frank discussion of the issues raised by the application may have been more effective at the very beginning of the project, or even prior to the sponsor's acceptance of the project.

It is also possible that the developer was not a firm adherent to the principles of PD. In most PD projects that have been reported in the scientific literature, the technology developers are generally researchers who have chosen to adopt a PD design approach. Authors of PD

⁹ The male pronoun is used to simplify the text.

reports seem to provide little theoretical or practical advice about how to assess "PD readiness" or whether some PD experience in the development team should be part of the selection criteria for a cooperative project with a commercial developer. In this project, although the developer indicated an interest in obtaining feedback on prototypes from field participants, apparently no effort was made to characterize the developer's or researcher's background in relation to PD.

An attempt was made to reinforce the developer's interest in a cooperative design process by providing articles which discussed the use and benefits of contextual and participatory design methods. This interest appeared to wane, however, under the pressure of development deadlines. In retrospect, it may have been useful mid way through the project to have devoted a day to the presentation and discussion of participatory design methods, and to an examination of outcomes from projects which use the approach.

Finally, this was my first experience with a PD design project. It is possible that the facilitation activities and the ways of communicating observations were not effective. Thus, even though apparently appropriate design activities were employed, there may still be a need for some form of training of PD facilitators.

To summarize, this first line of analysis has explored whether something was lacking in terms of method or approach. Although the activities carried out were consistent with PD practice, a design response to the knowledge that resulted may have been inhibited by its appearance mid-way through the project¹⁰. Other related explanations may be that the developer may not have been adequately informed of the potential benefits of the design approach, and that the facilitator may not have had certain necessary skills.

Psychological Dynamics

The second type of interpretation which will be explored is that of psychological dynamics which may have played a role in the design process. In particular, Bowers and Pycock (1994) coin the expression of "gradient of resistance" to identify the difficulty that designers may have in acknowledging and integrating comments provided by application users. Certain activities and comments could be noted which tend to substantiate this notion. For example, time elapsed before the developer read the two reports on the testing of the functional prototypes. A field participant had been absent when the first prototype was installed, although a videotape was later made of the introduction of this participant to the prototype. This tape was not reviewed (although other recordings of usability tests were reviewed). In relation to the report on the first prototype, the developer indicated that he was aware of the problems that had been identified

¹⁰ The developer knew from the beginning of the project that the video would produce large files. What he did not know was that this could be bothersome.

and that little new information had been revealed. He later added that he found the prototype easy to use, and that he would instead rely on his own perceptions of any difficulties. When the second prototype was installed on the computers of the field site participants, the developer indicated that he was particularly interested in the participants' reactions to the moving video image. All participants stated that, most of the time, they would find little value from it. A week later, when asked what he thought of the participants' comments about the video, the developer indicated that he did not remember anything in particular.

Another way of approaching the phenomenon noted above is to suggest that it was an example of selective perception and memory. This appeared linked to the developer's beliefs of what he felt needed to be achieved¹¹. It appeared difficult for the developer to acknowledge and remember that participants had difficulty in navigating through the application, wanted or did not want certain functions, and had opinions on the moving video image. After the day of joint usability testing, though mostly absent, the developer commented that he had been looking for confirmation of the suitability of the changes he had made in the second prototype, and felt that this had been obtained. The notion of selective perception could also be applied to the avoidance of discussion of the possible need for an interactive component to the application (which appeared both 7 months into the project, and again when the second prototype was installed after 20 months), and an integrated send mechanism. Suggestions of minor improvements to the developer's definition of current functions were "admissible" (for example, easier integration of single images, some editing capability), since these changes were "attached" to what the developer considered to be core elements of the design (Waltz, Elam, and Curtis, 1993, 71).

These possible psychological dynamics also need to be placed in relation to the developer's certainty that the application, even in its initial form¹², would help with actual problems faced by distributed organizations. The developer had been carrying out contract programming work from a remote location, but had experienced some difficulty in bidding for contracts. When he asked managers responsible for the bids why his company had not been selected, comments were made about the difficulty of managing distant sub-contractors. He had apparently also had difficulty with misunderstandings through problems of coordinating telephone conversations

¹¹ My awareness of what the developer considered to be the "core" achievable functions developed after key tacit decisions had been made (i.e. without any discussion of the sort "How would it be if this major function were added or deleted?").

¹² A little over one year into the project, after the first prototype had been developed, some initial effort was undertaken to find customers for the prototype.

with particular wording in written documents. Thus he indicated that the design concept and rationale had directly grown out of his own, authentic experience with distributed work, and thus was a pertinent solution to others in a similar situation. In retrospect, this confidence in the need for the application as he had defined it, could be considered to have been a barrier to a re-evaluation of its features.

Jansson and Smith (1991, 4) suggest the existence of a phenomenon that they call "design fixation." This refers to "a blind, and sometimes counterproductive, adherence to a limited set of ideas in the design process." This seems to be a useful concept for characterizing the adherence to most of the original design concept. Although some functions were added to the report application, and the structure of operation and interface improved, the development company appeared to be avoiding various organizational and usage realities. In a similar vein, Wastel (1993), citing Hirschhorn (1988), notes that "... when people feel at risk, they set up psychological boundaries to create womb-like areas of security. Set up to contain anxiety, these psychological boundaries often violate 'pragmatic boundaries' based on tasks and real exigencies." The maintenance of the belief in the need for the application as the developer had defined it appeared to be one such psychological boundary.

It is also worthwhile noting the developer's view on the extent to which the field participants were or were not representative of his target market. Before the project began, an application specification document had noted that the application could be used to aid in the management of distant workers or teleworkers. During presentations of the conceptual prototype to potential field users, he noted that it could be used to communicate technical information, such as might be contained in photos or diagrams, between a remote specialist and a manager or colleague. Two of the eventual participants in the project were indeed project managers/engineers who needed to collaborate at a distance with respect to common documents. In the other organization that participated in the field trials, a teleworker hoped to use the application to communicate with his manager or administrative assistant. A year into the project, the developer indicated that he considered that these participants were not representative of the people who would be using the application. The reasons that the developer gave were that the participants were government employees (and not the private sector), and that they did not have an urgent need to communicate the type of information that the application was capable of transmitting¹³.

¹³ Although the participants created one or two reports, they did not actually exchange these reports (although they tried to). The participants noted that there were technical problems which prevented them from exchanging the reports.

These comments suggest then another working hypothesis: the participants appeared to be discounted as significant sources of information and experience. Attempts to "ground" the project in the work and experience of potential users had run up against perceptions that limited the participants' perceived authority and legitimacy.

To summarize, the discussion here has suggested that the design process may have been subject to psychological processes which hindered the evolution of the design. The developer appeared to have difficulty in acknowledging the potential pertinence of various suggestions. Mechanisms of selective perception and memory seemed to be operating, in that opinions and statements which contradicted the developer's beliefs were frequently downplayed or forgotten. Participants were categorized as an authority or not. There was an unsupported confidence in the need for the application, and in the form defined by the developer.

Some caveats should be noted in relation to the interpretation of psychological dynamics. A complete analysis of the conversations between developer, participants, and facilitator has not been carried out (although detailed analysis such as that by Elam and Walz, 1988, would likely be useful). As well, the developer clearly read or listened to certain comments (witness the incorporation of some of the suggestions). Nor am I attempting to suggest that the developer was insensitive to the participants. What I would underline is that there was a certain degree of difficulty in overtly acknowledging the potential pertinence of participants' comments. This may also be a frequent outcome, if one considers the reports of Bowers and Pycock (1994), and Waltz, Elam, and Curtis (1993, 71).

Such processes may have been more evident in this project because of the predominant role of a single developer. Still, I do not believe that these are best characterized as simply manifestations of the developer's "personality." Each of the mechanisms noted here has been discussed by other authors, based on their observation of other design projects. Given the apparently frequent resistance to incorporating even usability analysis into software design projects, the question at hand is not whether the behaviour observed in this project is uniquely that of a given individual. Indeed, I would suggest that in projects with a larger development and management team, these dynamics may be offset by management and social relations, and may re-emerge in a more political form.

Background of the Development Company and the Project Context

A third and final line of analysis of the process and outcomes of the project takes into account the background of the development company and the project context. It is worthwhile to note that the development company had developed a DOS payroll application for individual workers, which had been sold to about 20 sites. Aside

from this application and other contract programming work, the company had created some Windows based multi-media presentations. The developer had taken a programming course in a particular language in the early part of the project in order to work on this application, and part of the programming work was outsourced to a distant programmer who had particular experience working with images. Initially, the company had limited technical experience in the application area.

The development company also had little experience selling and supporting Windows based commercial applications. They did not have the experience of a product failure. They had not developed any groupware applications. They had no previous prototyping or usability assessment experience. These kinds of experiences may help sensitize a commercial development company to the need to take organizational and usability issues into account in the development process, although little research appears to have been undertaken in this area.

A contextual aspect of the project that clearly affected the design evolution was that the programming work required more time than anticipated. The outsourced programming work, essential for the second prototype, was completed later than expected. Although missed deadlines may be a common occurrence in development projects, this posed a problem for the development company in that the sponsorship of the project was for a fixed amount and for a fixed two years. The small size of the company meant that it did not have extra financial or human resources on which it could fall back. It appeared that the developer saw the design and development work in terms of certain priorities. High on the list was the company's perceived need to include as many of the original planned functions as could be managed, while still having a product that could be marketed early. The developer mentioned that other changes, even though potentially desirable, would have to wait until a second release. Thus there were both real resource constraints (limited term financial backing for a fixed amount, unexpected programming problems), and a hypothesized need to quickly market the product.

One of the sponsor's payments to the development company required the developer to produce a marketing plan for the application. This report was due half way through the second year, which turned out to be about the same time as the company was planning to install the second prototype. This task required several months of work, and necessarily restricted the developer's availability to work on the second prototype. In a sense, the sponsor itself unknowingly contributed to a tightness in the development schedule.

Finally, it should be noted that the sponsor organization built few management or control mechanisms into the project. Only one presentation was given to senior management, and this was early in the project. A middle manager had conveyed questions about the prototypes to the developer, but the sponsor's senior managers did not

appear to have expressed any particular concerns. Relatively little pressure was brought to bear by the sponsor organization which may have reinforced the need to act on the participants' suggestions.

Thus it would appear that the history of the development company and the context of the project also hindered the use of a participatory design approach. Some of the constraints experienced in this project are likely to surface in other software projects carried out in small organizations, and impact in similar ways on a participatory design approach. In a similar vein, Grudin (1993) has argued that the way in which software development has been institutionalized in large commercial organizations has introduced obstacles which prevent user participation. However, in this project, the small size of the company meant that it did not have the extensive division of labour that has been observed in most development companies. The design was not handed off from one functional unit to another. Grudin's analysis of the institutional context is still appropriate, though, in the sense that the "inner" context of the company, in terms of its previous work experience and limited resources, and the "outer" context, comprised of the work packages and diffuse reporting structure created by the sponsor, appeared to limit the design and development work.

CONCLUSION

Relatively few reports on participatory design projects provide appraisals of the ways in which a project may have been partially successful in adapting applications to requirements of workers and organizations. Strong institutional reasons may be behind this: it is sometimes easier and more prudent to avoid discussion of the outcomes of particular projects. Still, I would suggest that self-censure of research observations should be avoided, and exploratory analyses need to be pursued. Such analysis may result in concepts which help to understand the outcomes of development projects, and lead to the identification of methods or management practices which could improve the design process.

The reader may be tempted to ask: Was this in fact a PD project? If we refer to the mainly process oriented framework provided by Clement and Van den Besselaar (1993), then one would have to answer that "yes," a certain number of PD techniques and activities were carried out. In the case study that was presented, the participants had access to relevant information, potential end-users were actively involved, there was direct communication between end-users and the developer, and appropriate development methods were used (in that prototypes were developed, installed in the workplace, discussed, and modified). These techniques did lead to some improvements in a second functional prototype (as judged by participants' comments).

Nevertheless, I would acknowledge that more user participation in the prototype development would have been useful, the critical analysis of the design concept

could have been carried out even before the project began, and only part of the information gained was used. The participants had no control over the development resources or development decisions, and limited design flexibility was observed. As well, although we were somewhat successful in representing the original stakeholders in the process -- unknown teleworkers, their supervisors, and senior managers -- other prospective clients later identified in a marketing plan were not¹⁴.

If one prefers to define PD in terms of the outcomes of the project -- whether a product was created that is useful to people and organizations and empowers them -- then the project appears to have been less successful. Limited observations of a few people who attempted to use the prototypes suggest that significant issues could appear (usability, cost, convenience, value to organizations, possible changes to reporting practices, privacy). I also felt that some teleworkers and managers could have concerns about the application which had not been voiced by the participants, and although I tried to introduce an analysis of these into the project, there was little discussion of this. However, an empirical statement about use issues will have to wait until it is possible to study how people and organizations use a commercial version of the application.

Other PD projects are likely to also result in both partial success and partial failure, although few reports suggest a framework for analysis, and carry it through in the discussion of a given project. The existing literature certainly helps to guide this type of reflection. However, useful as this may be, I feel that the more interesting questions are why are certain outcomes observed, and could discussion of this lead to either more effective PD or to other research? Here, possible explanations of partial failure were sought within the methods and techniques used, psychological processes, and the background of the development company and the project context. In terms of the design process, it is possible that inadequate or inappropriate use was made of participatory design methods. In particular, initial discussions with participants came only after development was already underway. The potential benefits of a participatory design approach may have received insufficient attention. Both the facilitator and developer were inexperienced with this approach to design.

Psychological dynamics seemed to hinder the integration of the information that was generated. The developer appeared to have difficulty acknowledging and responding to problems in the user interface, and was reluctant to discuss which functions were most vital. Mechanisms of selective perception and memory appeared to be operating. There appeared to be strong

¹⁴ Some of the target markets appeared to be more a product of wishful thinking than empirical analysis. Still, it is possible that the application might be used internally in an organization, as a presentation medium, or as a form of "video mail."

adherence to the original design concept. However, some changes were made, and it is difficult to assess the extent to which these psychological dynamics directly affected the outcome. Still, this line of analysis of the project provides some insight into why direct communication may not be sufficient for achieving the objectives of a PD project. A participatory design approach may be hindered at the most primary levels through lack of interest in end-user comments, and cognitive and perceptual distortions. More research would be useful in relation to this hypothesis. While waiting for such an analysis, it may be useful for practitioners of participatory design to explore whether it may be useful to add group management, communication, or facilitation skills to their repertoire of design techniques.

It is also useful to consider the way in which the history of the development company and the project context appeared to contribute to the outcomes. The small size of the company allowed direct communication between field participants, developer, and researcher. However, the small size also meant that the development company had limited resources, and was operating within a short term development time-frame. For its part, the sponsor organization chose the development company, presumably with knowledge of the company's limited development background. As well, the sponsor inadvertently exacerbated the time pressures by requiring that the company carry out the marketing study, which hindered the development work.

In addition, the commercial development context appeared to impact on the project in three ways. First, a background ideology was available (and voiced), according to which the producer was free to provide whatever products or services appeared appropriate, and the consumer was free to buy or not to buy. Potential difficulties of integrating an application into an organization would be resolved by furnishing additional consulting services (revenue generating for the company), and these could be justified through the organization's improved productivity. Second, the ongoing identification of additional market niches during the development process allowed a perception to grow that the participants were not representative of these niches. The target market shifted during the project, and, in the eyes of the developer, the participants lost some of their authority. Third, there was an obvious concern that other companies would "steal" the product concept, which made it more difficult to find field site participants, and partly discouraged the company from seeking development partners. Finally, there was a sense of urgency in being the first company to bring the product type to market, so as to establish product dominance. Confidence in the design concept and a reticence to make changes for this reason, were reinforced by the perception that changes would delay market release. In this area, our observations agree with Hughes et al. (1996), who indicate that a range of rationales can be called on in order to avoid implementing software change suggestions.

This report has suggested that a participatory design approach is possible in a commercial context, although this is potentially more difficult than for a project in which the results will be used within the sponsoring organization, or a project that involves academic designers. Still, I remain optimistic that commercial projects may be undertaken in which project structures give participants a decision-making role.

It is also possible to use the experience gained in this project in order to identify measures which may help to increase the positive outcomes in other commercial projects. Several of these have already been identified in other studies, but they are worth reiterating. Early, robust identification of likely users appears key. Participants need to be involved in the early phase of concept definition. It may be useful to carry out early, critical analysis of a product concept, possibly with focus groups or design participants. An advance outline of the likely design methods, and discussion of these, could be used to verify whether a developer sees value in them, and it is likely useful to discuss them again during the project. It may be possible to choose which projects one becomes involved with. It could help to identify potential facilitators who have group building and communication skills, and to "grow" them through apprenticeship in projects. Careful attention can also be given to management structures, and to how participants may be given a decision-making role.

Finally, the analysis has been wide ranging, and has included a range of concepts and perspectives. Each of the three analytical perspectives is substantiated by empirical observations, although by themselves they do not provide a satisfactory account of the outcomes. I felt that multiple interpretations were necessary. Moreover, still other lines of analysis could have been followed, notably of the ideological and cultural backdrop, and of the micro politics (for example, relationships between developer, participants, myself, project manager, and senior managers). Hopefully, though, the analysis here will suggest some directions which may be of use to others in making sense of complex experiences of participatory design projects.

ACKNOWLEDGMENTS

I'd like to thank the project participants and developer for their involvement in the project. Mike Hales, David Tippin, and the anonymous reviewers provided helpful comments.

REFERENCES

- Bannon, L. (1995). The Politics of Design: Representing Work. *Communications of the ACM*, 38, 5, 33-44.
- Barki, H. and Hartwick, J. (1994). User Participation, Conflict, and Conflict Resolution: The Mediating Roles of Influence. *Information Systems Research*, 5, 4, 422-438.
- Blomberg, J., Suchman, L. and Trigg, R. (1995). Back to Work: Renewing Old Agendas for Cooperative

- Design. In *Proceedings of Computers in Context: Joining Forces in Design* (August, Aarhus), 1-9.
- Bowers, J. and Pycock, J. (1994). Talking Through Design: Requirements and Resistance in Cooperative Prototyping. In *Proceedings of CHI '94*, Adelson, B., Dumais, S. and Olson, J. (Eds.) (April, Boston), 299-305.
- Clement, A. and Van den Besselaar, P. (1993). A retrospective look at PD projects. *Communications of the ACM*, 36, 4, 29-37.
- Elam, J. and Walz, D. (1988). A Study of Conflict in Group Design Activities: Implications for computer-supported cooperative work environments. In *Proceedings of the Twenty-first Annual Hawaii International Conference on System Sciences*, Konsynski, B. (Ed.), 247-254.
- Epstein, M. and Yakura, E. (1992). Managing the Stresses of Participatory Design. In *Proceedings of PDC '92*, Muller, M., Kuhn, S. and Meskill, J. (Eds.) (Nov., Cambridge), 103-104.
- Kensing, F. and Munk-Madsen, A. (1993). PD: structure in the toolbox. *Communications of the ACM*, 36, 4, 78-85.
- Gärtner, J. and Wagner, I. (1994). Systems as Intermediaries: Political Frameworks of Design & Participation. In *PDC'94*, Trigg, R., Anderson, S. and Dykstra-Erickson, E. (Eds.) (Oct., Chapel Hill), 37-46.
- Greenbaum, J. and Kyng M. (1991). *Design at Work: Cooperative design of computer systems*. Hillsdale, N.J.: Erlbaum.
- Grudin, J. (1993). Obstacles to Participatory Design in Large Product Development Organizations. In *Participatory Design: Principles and Practices*. Schuler, D. and Namioka, A. (Eds.), Hillsdale N.J.: Lawrence Erlbaum, 99-119.
- Hales, M. (1995). Working with contexts, powers and stakeholders in configuring standard software. In *Proceedings of Computers in Context: Joining Forces in Design* (Aug., Aarhus), 113-125.
- Hirschhorn, L. (1988). *The Workplace Within. Psychodynamics of Organizational Life*. Boston: MIT Press.
- Hughes, J., O'Brien, J, Rouncefield, M. and Rodden, T. (1996). They're supposed to be Fixing It: Requirements and System Re-design. In *CSCW Requirements & Evaluation*, Peter T. (Ed.), London: Springer-Verlag, 21-38.
- Jansson, D. and Smith, S. (1991). Design Fixation. *Design Studies*, 12, 1, 3-11.
- Näslund, T. (1995). Computers in Context -- But in Which Context? In *Proceedings of Computers in Context: Joining Forces in Design* (Aug., Aarhus), 73-82.
- Suchman, L. (1988). *Plans and Situated Actions*. Cambridge, England: Cambridge University Press.
- Wastell, D. (1993). The Social Dynamics of Systems Development: Conflict, Change and Organizational Politics. In *CSCW: Cooperation or Conflict?* Easterbrook, S. (Ed.). London: Springer-Verlag, 69-91.
- Walz, D., Elam, J., and Curtis, B. (1993). Inside a Software Design Team: Knowledge Acquisition, Sharing, and Integration, *Communications of the ACM*, 36, 10, 63-76.