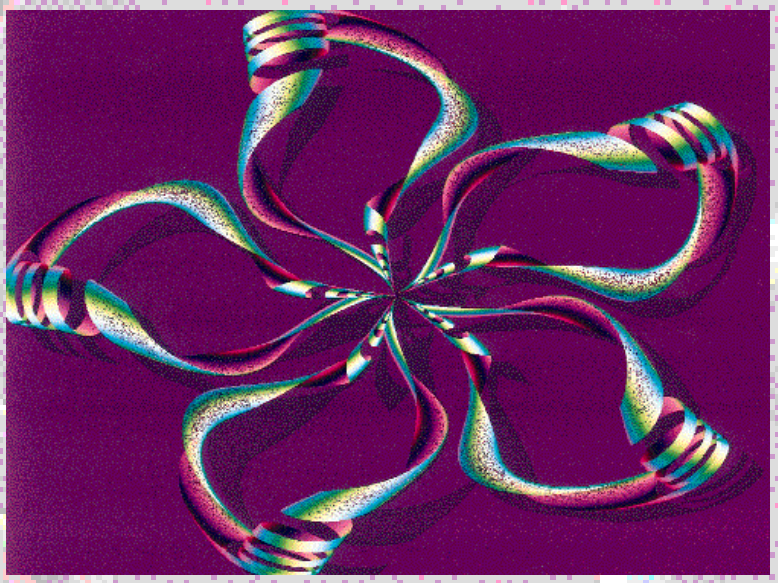
Field Work: Is It Product Work?



In the past few years, much has been said about the value of using ethnographic methods, that is, the study of actual practice in context, to inform the development of computer technologies [2,4,5,7]. There is no question that such methods provide a closer look at user activity and the ways in which technologies fit into those activities. But are such methods part of the product work cycle? Known to be time consuming, effort intensive, and cumbersome in transferring learning from the field workers to the developers, field studies often seem more the purview of the research world than the product world.

Field Studies for Design

By *field work,* I mean the use of qualitative methods (interviews, observations, videotaping, interactive analysis) to study the everyday setting and activities of the user's environment. The intent is that the user's attention be on the activity, rather than on the tool, and that the context of the activity is in place. The goal for field studies in supporting technology design is to find opportunities and breakdowns, as well as to counter assumptions or endorse intuitions. Whenever possible I involve several of the project team members, as well as users, to bring different perspectives to the data. More specifically, I look for the following elements:

- **Context for use of new technologies** (how work is accomplished now). People's work activity is driven by and depends on more than the demands of a single ongoing task at any one time. Understanding the context in which a technology is being used can inform the requirements of that technology, the opportunities for the technology, and the introduction of that technology into the work activity.
- **Breakdowns** (how technology intrudes on work). Tools are designed primarily to serve some activity. The intent of a tool is that the user's attention be on the activity rather than on the tool. Observing the tool in use is a means of finding places where the technology intrudes on the work activity. Such information can often complement that of traditional usability studies and user feedback.
- **Assumptions** (what we expect to be important). Often our knowledge of an activity, an environment, or a task leads to assumptions about how technologies can support those endeavors. Observing the actual activity and setting is a means of forcing attention on what really happens rather than on what is assumed or obvious.
- **Intuitions** (what we believe might be important). Good designers and evaluators bring a wealth of valuable experience and expertise. Observations can confirm those intuitions and often provide a base for innovation.
- **Codevelopment** (how the technology and the work activity evolve together). For tools representing a new genre of computing and communication, the technology will affect the work practice and the work activity will affect the use of the technology. Codeveloping the technology and the work activity using iterative design is effective in designing a successful technology. Codevelopment depends on an iterative design method, relying heavily on understanding the work activity and the technology and making changes in each in response to the other.
- **Opportunities** (what new or unanticipated work activity takes place). We all know that people appropriate technologies for their own uses. Such behaviors are difficult to predict and often difficult to allow for in laboratory settings. Observing users in the context of their own work environments, using technologies as they have become accustomed to using them, can reveal new uses of the technology.

Following are four examples of how field studies can be used in product design and development: (1) identifying opportunities for new technologies, (2) determining requirements for design, (3) facilitating introduction of technology, and (4) evaluating design of technology. Using ongoing work activity in the context of the user's environment often points out ways in which the work can be supported (i.e., opportunities). At the same time, such field studies point out critical aspects of the work activity that suggest requirements for design. Nevertheless, any new technology will change the work activity by its very introduction, and the coevolution of the technology design and the work practice are worth studying. Finally, the ways in which the technology is used provides a strong basis for evaluating that technology as well as input for the next iteration of design.

Identifying Opportunities for New Technologies

Identifying opportunities for new technologies is perhaps one of the strongest and most common motivations for conducting field

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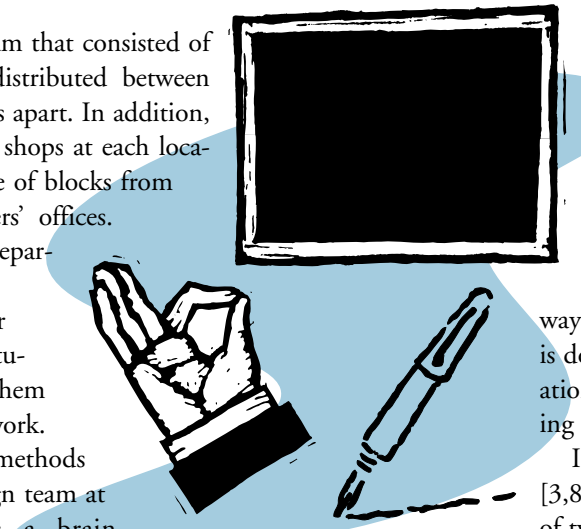
work. For a business that knows its general area of interest but has flexibility in its product range, field studies can be an excellent method of eliciting opportunities for designing new products. Seeing how people are working, observing where their current work activity is not well supported, finding unexpected aspects of the work all provide a basis for pointing to new technologies.

Bellotti and Bly [1] describe a field work project at Apple Computer, Inc. Our initial motivation was to identify product opportunities in design teams that work across multiple sites. We were particularly interested in how the teams collaborated with each other—sharing information, staying aware of each other's work, and planning mutual deliverables.

We chose a team that consisted of seven members distributed between two sites, 20 miles apart. In addition, there were model shops at each location, one a couple of blocks from the team members' offices. The team was preparing a major presentation to their client, an opportunity for us to see them coordinate their work.



We used four methods to study the design team at their workplace: a brainstorming meeting, interviews, meeting attendance, and observations of daily work activity. Our data included notes, transcripts, videotapes, audio tapes, photographs, and occasional artifacts from the designers.

Our initial focus was issues of communication and coordination to suggest concepts for supporting distance collaboration. However, our analysis revealed the almost constant mobility of all the individuals in the team. The interviews, and most certainly the observations, provided strong evidence that team members were often not at their desks. They were talking to each other in the halls, working in the labs, going to and from the model shops. Unlike telecommuting, their mobility was local mobility, simply walking between rooms or buildings at a local site.

The immediate implications for technology opportunities are twofold. One is that the potential exists for a range of mobile computing devices. The second is that mobility made distance collaboration even more difficult, so that applications to enhance existing desktop workstations are likely to be ignored by those rarely at their desks.

Determining Requirements for Design

Often a development team knows the direction that it needs to take but wants both verification and requirements from existing work practice. Being part of a distributed project team, we knew that we needed to design and develop technologies that would support the kind of drawing and shared brainstorming that occur at a whiteboard or over a large piece of paper on a table. Along with many colleagues, we set out to look at the ways in which actual work is done in face-to-face situations using shared drawing surfaces.

In several related studies [3,8,9], we observed teams of two or more people who were working together on design problems themselves. In some cases, the teams shared a whiteboard; in others, they worked around tables with large pieces of paper. We used videotaped sessions and interaction analysis to search for and uncover aspects of the work that would need to be supported in sharing a drawing surface across geographic distance. We found that in working together, participants

- Regularly combine marking activities with talk;
- Rapidly move among drawing, writing, and gesturing;
- Interact on the same drawing marks; and
- Use marks and gestures to illustrate and reference ideas.

These four observations translated into requirements for shared drawing technologies:

- Marks and gestures need to be made visible without significant delay.
- Rapid switching among drawing, writing, and gesturing can occur.
- Users can mark and gesture in the same space simultaneously.
- Familiar mechanisms for drawing space activity are maintained (writing tool, horizontal surface, pen and surface the same, etc.).

Subsequent development of prototype technologies verified that meeting the requirements produced technologies that were straightforward and appropriate to use [6]. Both the MeetingBoard on LiveBoard from LiveWorks and ShowMe Whiteboard from Sun Microsystems are products whose designs incorporate these findings.

Facilitating Introduction of Technology

There are often times when the technology being developed represents a new product market for which there is no current work practice. Although previous field work may have identified both the opportunity and some requirements, the introduction of the technology itself is likely to produce a radical change in how people work. In such a case, field work methods can be helpful in identifying problems in introducing the technology and needed modifications to the design.

A primary goal of the Distributed Computing Experimental Environments (DCEE) initiative program under the U.S. Department of Energy is to develop plans to enhance collaborations among researchers whose offices and resources are physically distributed. In particular, several scientific research facilities exist at which the cost and size of equipment makes duplication impossible. Thus collaborations have been, for the most part, restricted to scientists who could participate at the facility itself. The notion of collaboratory is a laboratory that spans multiple geographical areas with collaborators interacting via electronic means. Because scientific labs have traditionally not been accessible remotely and because practicing science itself is often steeped in competition for credit, the notion of opening up the environment was anticipated to be a major shift for participants in experiments.

Occasional visits to two of the collaboratory sites (the General Atomics Magnetic Fusion experimental facility and the Berkeley Lab Advanced Light Source spectromicroscopy facility) are being used to provide a check on how the technology introductions are progressing as well as to establish a baseline of observations for later evaluation of the technology use. At one site, several hours of observations of experiments in progress were made. In both cases, interviews with scientists at their work sites formed a primary part of the work. Notes, audio tapes, some videotape, a questionnaire, and heavy reliance on the development team have provided data on the technologies and their introduction into the facility.

The data and summary reports of the field studies describe the environment, the work activity, and the use of the technology that is neither a design focus nor a strict user reaction. I have observed new technologies being used, sometimes even when users are unaware they are doing so. We have confirmed concerns expressed by users and observed by developers. We've helped identify areas in which further design can be done. In one case, we have suggested slowing down on some aspects of introducing the technology.

Evaluating Design of Technology

Usability testing has become a popular and highly useful means of evaluating products or systems by involving representative users to evaluate how well a product meets specific goals. However, there are several additional methods of product evaluation. Field studies for evaluation are especially useful in identifying patterns of use, breakdowns, and general product appropriateness to the existing activities.

A high-tech company recently was preparing to introduce a new application. It wanted to understand how well users liked the product, what difficulties they encountered in using it, and how many of the features were used. The product offered a significant new application for people; therefore, short-term

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usability tests were unlikely to uncover use in actual practice. Fortunately, the company had placed beta test versions in the field so that more than 20 users had several weeks of experience using the product.

The company was interested in quickly uncovering major problems with the product. We used telephone interviews, each lasting no more than 15 minutes, to get users' verbal reactions to their use of the application. Individuals were asked to explain the product, asked if they used it, and if so when and why. This gave us a chance to uncover their perceived model of the application and the features that they found most appealing.

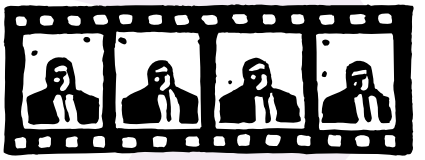
Our follow-up field studies were visits to two of the installations for 1- to 2-hour interviews and observations. We asked to see the application and asked the users to show us how they used it. Two of us visited each user, taking notes and videotaping.

Three main findings were summarized in a report and discussed in a debriefing session with the development team. First, we found that a feature thought to be relatively inconsequential was highly used and enjoyed by almost everyone (the observations confirmed the statements of the telephone interviews). Second, the observations pointed out confusion about the user model of a particular feature. Although people said that they were using the feature, observations showed that they were confused and perhaps even misled by the lack of significant data for the feature in early releases. Third, we found unanticipated uses of features that offered opportunities for enhancing the product.

Issues

Although field studies in a realistic setting offer considerable value in the development process, they also raise issues of when and how best to take advantage of these methods. They are appropriate when an understanding of the actual activity, the context of that activity, and the relationship of new technologies to ongoing activity are needed. Field studies are generally not used when a product prototype is first available and requires constant technical support or when particular elements of the design need rigorous test measurements.

Issues to consider in planning field studies include how the development team will be involved, what questions are being addressed by the study, how much the activity under study is a long-term and/or implicit activity, what time is involved to get results, what domains are most appropriate, how to choose users, how to visit at times in users' lives that will be productive for design. The study questions must be clearly articulated in choosing methods that will uncover the phenomena in which you are interested. For example, if the phenomena are based on infrequent occurrences, interviews directed at them may exaggerate their apparent importance and short-term observations may miss them altogether. At the same time, be prepared to recognize patterns and events you were not expecting but that may be important.



Conducting the field study is only half the work. It is important to reflect on and understand the data, gathering a sense of the activity, the patterns, and the interactions of people, places, and things. The design and development team must be involved. They must get to experience the data and be convinced by the insights. These data are resources that must be used as a basis for problem exploration, brainstorming, innovation, design discussions, and functionality requirements.

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