PARTICIPANT STAKEHOLDER EVALUATION AS A DESIGN METHOD: A REPORT ON WORK IN PROGRESS

Richard Giordano
Center for Innovation in Product Development
Massachusetts Institute of Technology
Cambridge, MA 02139
+1 617 258 0760
richardg@mit.edu

David Bell
XeroxPARC
3333 Coyote Hill Road
Palo Alto, CA 94304
+1 650 8124364
dbell@parc.xerox.com

ABSTRACT
This paper discusses participant stakeholder evaluation and its use in designing an evaluative protocol for inter-firm development and sharing of web-based learning modules. Participant stakeholder evaluation involves participants as researchers who design and evaluate evaluative protocols. It has a strong link with participatory action research and collaborative inquiry methods where the line is blurred between "the researcher" and "the researched."

Participatory evaluation methods were used as a method in support of system design to help define features of learning modules, define content, and to enhance usability and effectiveness in work contexts. Preliminary results strongly suggest that these techniques were instrumental in helping define an architecture for learning modules that otherwise may have been lost.. Most important, it allowed expectations among role groups to be explicit, and afford subsequent work the ability to address their differences in views and orientations.

Keywords
Evaluation, stakeholder evaluation, participatory design, action research, collaborative inquiry, distance learning design, learning module design, learning object design.

INTRODUCTION
Our work explores how different role groups across organizations can evaluate web-based systems that support inter-firm sharing of knowledge and use the results of the evaluation to inform the design and content of such systems. We are concerned with the content and design of learning modules, and their appropriateness with respect to expectations and interpretations of potential users. This approach differs from existing research on distance learning in that they are focused generally on the mass marketing of university curricula. We are instead addressing the issue of distributed sharing of knowledge expertise among companies, and the co-design of such modules for use in work contexts. Moreover, because learning generally takes place among rank-and-file practitioners, we were especially mindful that any web-based learning system should be appropriate to their work contexts, and should represent and respond to local, contextual issues.

Learning modules present a special problem in that both the content of the module and its delivery need to be designed. This if often accomplished through evaluative methods that use *post-hoc* questionnaires or interviews. Because such measures are done *post hoc*, they have little influence on changing the existing structures of learning. Moreover, some argue that a post hoc evaluation tends to reinforce existing processes and underlying power relationships. [3]

Evaluation protocols are rarely used to gain insights that inform the design of electronically-supported learning modules, build a collaborative ethos in the process of design, or to support participatory design. Our work centered on using a participant-driven evaluative protocol to inform design decisions.

THE PROBLEM OF EVALUATION.
Traditionally, the uses of evaluation in educational and organizational settings are often divided into five general areas:

Feedback—linking learning outcomes to objectives, and providing a form of quality control for learning modules. Feedback information is generally collected either *after* the module is completed by participants, or very near completion.

Control—using evaluation information to make links from training to organizational activities and in support of analyzing cost-effectiveness. Such information considers the real, perceived or potential return on investment for an individual or a group in training activities.

Research—determining relationships among learning, training and transfer of learned skills to practice. Such

In *PDC 2000 Proceedings of the Participatory Design Conference*. T. Cherkasky, J. Greenbaum, P. Mambrey, J. K. Pors (Eds.) New York, NY, USA, 28 November - 1 December 2000. CPSR, P.O. Box 717, Palo Alto, CA 94302 cpsr@cpsr.org ISBN 0-9667818-1-3

This research was supported (in part) by the MIT Center for Innovation in Product Development under the NSF Cooperative Agreement Number EEC-9529140

evaluation compares the effect on practice between a population introduced to training and some control group.

Intervention—in which the *results* of the evaluation influence the context in which the intervention occurs, such as determining professional development policies or opportunities; and,

Power and control—manipulating evaluative data to reinforce existing power relationships within an organization.

These uses do not address the problem of understanding the appropriateness of the learning module in context, nor do they seek to understand or capture interactions between users and modules that may shape and re-shape those modules. Moreover, because evaluations are most often done after a module is in place, they do not address ways by which evaluation can shape design, particularly participant-driven design. Finally, by gathering evaluative information on a module that already exists, instead of gathering information on the expectations of participants, one evaluates *what is* instead of seeking *what ought to be.* [1, 2, 4]

Participatory Stakeholder Evaluation: Aims, Objectives and Methodological Orientation

Our aim was to use the process of evaluation as a means of participatory design, and to build the capacity for participants to design learning environments appropriate to their work contexts. We therefore aimed to engender a design environment that encouraged participants to be reflexive in the work that they do, to ask research-related questions based on observations that they themselves make, and to apply this to the evaluation and shaping of web-based learning modules. This, in turn, would support ways for participants to shape and re-shape both technologies and processes, and not to accept them as givens or black boxes. The evaluative process was meant to heighten critical awareness of existing technologies by users with the intention of re-designing those technologies. That participants should critically evaluate and re-design existing technologies was an important aspect of this because, as we shall see in the following section, participants were to start from existing web-based learning modules and move on from there.

In order to build a collaborative, inquiry-driven research environment between the Center for Innovation in Product Development at MIT (CIPD) and three industry partners, we relied on a participatory action research (PAR) and a collaborative inquiry framework to guide the identification of goals, indicators methods and measures. Although there are many forms and variants Action Research [5], all hold a core belief in a highly collaborative ethos where practitioners define the primary research questions, and results serve as a way of defining new research questions. The role of academic researchers is to facilitate, not direct, the research work by assisting in methodological design, data collection, analysis, critical discussion and reflection, a process that tends to blur the distinction between the "researcher" and the "researched". [9] A critical objective of action research is to build the capacity at the local level for practitioners to influence the shaping of their own work environments. That is, action research is an instrument for change. [3, 4]

METHODOLOGY

The research team consisted of engineers from three large engineering-based organizations, their supervisors, human resource managers, and MIT researchers. The team thus consisted of different role groups that collaboratively identified the supply and demand for such modules, the definition of the research question, methodologies, and implementation issues. MIT researchers facilitated but did not lead this process.

The modules chosen concerned problem solving, experimental design, and failure modes effects analysis. They were developed by one of the companies, and were in a packaged web-based and CD-ROM format. The courses were composed of online learning sessions, followed by an interactive virtual face-to-face session (supported by videoconference facilities) lead by the course organizer. The modules were keyed to printed course materials, and followed in linear fashion the textual material.

Engineers who evaluated the modules, their supervisors, and human resource managers were interviewed by telephone both before and after being exposed to the module. Participants in the modules themselves were to be videotaped during a face-to-face videoconference session with a course organizer. The results of the interviews were shared with the team, and are now being used by the team to develop a prototype. An MIT researcher conducted interviews and observations, but the team developed the protocol itself.

The first step in the evaluation plan was to establish a baseline of stakeholder expectations before the course began so that we could eventually measure the extent to which modules met those expectations. We were interested in ascertaining expectations before the module began so that responses would not be affected by the module experience itself—we wanted a clean slate regarding participants' expectations.

The deliberate process of asking questions before their encounters with modules encouraged participants to approach the modules critically. That is, the process of interviewing participants in this way not only elucidated expectations, but also heightened them. [8] Moreover, by raising the question of expectations and co-design based on expectations before the modules began, we helped to create a language for them that would be further articulated in the second round of interviews. [12]

The interviews were open-ended but covered five general datapoints:

- Goals of the modules.

- Content of the modules.
- Process of Teaching and Learning.
- Logistics (the process of managing the modules).
- Outcomes of the modules.

For each of these datapoints, we wanted to know:

- Why respondents hold the views they do. For example, why was this goal was identified instead of, for instance, some other one?
- What should the indicators be?
- What metrics can we use?

This process elucidated (for the purposes of this paper):

- The baseline expectations of stakeholders.
- Where there is alignment among the expectations across the participating industrial partners.
- How the content, process and outcomes themselves align with the expected goals of the course.
- If there is alignment of expectations across the stakeholders.
- Identification of features and characteristics of a new system.

The second round of interviews, which were conducted after the modules were completed, then discussed the extent to which the modules met those expectations, and how the modules (both the content and the web-based delivery) should be changed to suit participants' learning styles and strategies, as well as the contexts in which they work.

Thirty-five engineers, supervisors and human resource managers were interviewed at eight locations across the United States.

For the purposes of this paper, we will discuss preliminary results from interviews conducted with participants, their supervisors and the managers from interviews conducted both before and after the course modules were taken.

Limits

Some comments on the validity of the methodology are appropriate, as the authors are aware of what may be seen to be shortcomings. Because participants responded to questions meant to elicit specific data, we cannot look to the evidence itself as "raw" interactions containing unconstrained speech acts that intrinsically suggest patterns and their relationships. While these interviews were open-ended and loosely structured, respondents were in fact responding to questions. Even with supreme skill and sensitivity on the part of the interviewer, the posing of questions naturally restricts and influences both the content and form of the respondents' speech. Having said this, their responses begin to suggest (1) why respondents hold the views that they do; (2) emerging patterns in their responses; and (3) relationships among those patterns. That is, the responses suggest information that was not explicitly asked.

Telephone interviews are poor at building trust between the respondent and interviewer because the respondent cannot see the interviewer and decide, based on body language, physical behavior, etc., whether the interviewer is to be trusted. Further, the first encounter between interviewer and respondent occurs at the time of the interview, and trust is built as a result of the interactions during the interview. Finally, respondents may be reluctant, either consciously or unconsciously, to articulate their beliefs when their comments are being recorded. This is especially true when the object of the interview is an employee and the subject of the interview concerns the employee's work. The reliability and validity of responses are at least partially tested by the interviewer's revisiting sections of the interview as trust is built during the process. This often involves asking the same question in a slightly different way or querying a response to a question posed earlier in the interview. In addition, central and outlying responses were tested in the second set of interviews. [8]

The process of collaborative enquiry and participatory action research carries with it great epistemological and methodological risks. By having participants shape evaluation, what may emerge as evidence and theory is only what the participants themselves see, or choose to see. That is to say, there is a risk that *what you get is what you see*. This places great demands on the part of the facilitator of the research process to be reflective on the process itself, and to discern patterns and their relationships. The questions that are asked, the evidence being collected, the evaluation of that evidence—these become data for further analysis. [5, 7, 10]

Finally, the preliminary results presented here are based on a single "reading" of the two sets of interviews using open and axial coding. Although codes emerged from the text, the slant of the resulting codes was on the design of the modules in work contexts. It is a given that there is far more information contained in the interviews than this preliminary analysis suggests. For example, left unexamined was the influence that the process of interviewing respondents had on their expectations.

PRELIMINARY RESULTS

Four themes emerged from both sets of interviews that affect the design of share learning modules across firms. These are:

- Learning from use in other contexts is important.
- Pedagogy must support multiple learning styles.
- Learning on demand in support of task related problem solving is crucial.
- Learning as a social activity must be supported.

Although there was overlap between the responses of the practitioners compared to those of supervisors and managers, overall, their outlooks were focused on managing the system and its underlying economics. [6, 13] Supervisors in particular initially saw web-based learning as based on modules, a

unit that can understood in terms of payments, time allocated to completing it, and other resources. To that end, five themes emerged from the interviews with supervisors and managers. These are:

- Emphasis on group learning.
- The potential of web-based modules to reduce costs.
- Identification of problems with sharing expertise across firms.
- Need for equitable compensation across firms.
- Issues related to the scaling-up the learning infrastructure.

When both groups examined the results of the interviews, however, they re-defined what was meant by a 'learning module', but kept considerations such as time, cost, management of intellectual property, etc. central to the design.

DISCUSSION

The co-design of technology

The modules encountered by the participants were designed to support training and were, as we noted, the electronic equivalent to a book or chalk-and-talk module. Before encountering these modules, stakeholders expressed expectations that web-based learning created by firms other than their own would supply process knowledge derived from other contexts (such 'external' knowledge is seen to be a valuable marketing resource), and that the process of learning would be on demand, experiential, practical and related to work. Finally, participants expressed the need to have access to co-learners in group settings.

After exposure to the modules, many of the initial views held by participants were reinforced but new ones emerged from the process of criticism. The focus on getting to knowledge fast and applying it to real problems encountered in the workplace loomed large. In addition, participants expressed the need to have access to peers or experts to test ideas, deepen understanding, and master the subject through practice.

The participants' reinterpretation and reconfiguration of learning modules resulted in artifacts much different from the modules presented to them. For example, several respondents said that while they worked they would like to have access to modeling and simulation data to test behaviors of different materials used in the design, and then test their thinking with peers or experts. These comments brought on the question, "What's the difference between using simulations as part of a course and as part of your work when you're trying to solve a problem? Why couldn't course materials such as simulations and models be made available generally while I work?"

Engineering involves problem solving characterized by tight deadlines. Engineers are often challenged by problems where they have only surface expertise. Our respondents initially seek a deeper, but not expert, knowledge that they can apply quickly, and they want to test their understanding and application of knowledge with peers or experts. That is, they want access to gain a familiarity with the subject, and they master it through practice guided by expert knowledge.

When the engineers examined web-based learning modules critically and reflexively, they argued that what they need is access to resources and services that would allow them to solve problems, and to learn through problem solving, on the job. It is important that the resources and services to support this are discrete, rather than bundled into a course, so that they could respond to the demands of the moment.

The implication for learning module design is that the notion of "module" is replaced with "object" or "component". As with any well-designed object-oriented system, the resources and services of learning objects can be reconfigured to support a number of applications and needs—from supporting a linear learning module to providing discrete information and knowledge to help an engineer address a specific problem when it arises.

A further implication is that learning through specific modules and learning through work-practice is blurred. The participants, through their reflexive encounters with learning modules, have effectively re-designed them so that they would support learning through work-practice.

Finally, they have identified strategic issues of importance to any firm: First, that learning and practice are embedded in day-to-day work, and infrastructures should be designed to support learning through work-practice; and, Second, knowledge derived from other companies has a value that goes beyond learning processes to understanding how a potential customer thinks. Such knowledge is critical in forming strategic alliances across firms.

CONCLUSIONS

The process of participant stakeholder evaluation resulted in three insights: First, it allowed practitioners, supervisors and mangers to explicitly state what expectations they had of the technologies before encountering them. This, in turn, made explicit the areas in which there was alignment among role groups, as well as delineating the variances. Instead of discovering mixed expectations once the technology was deployed, they could be identified early in the process. Moreover, through a framework of action research and collaborative inquiry, new research questions emerge from these variations, which will be addressed, in subsequent work.

Second, the appropriateness and usability of linear web-based learning modules is doubtful given the interpretations and re-design of them by our sample of practitioners. Participant stakeholder evaluation appears to hold promise as a method to inform the design process. By asking participants to take an active role in evaluating existing systems, we are in effect asking them to re-design and re-configure such technologies to their specific work contexts. Through a

process of interview and reflection, our group of practitioners re-designed the idea of web-based learning modules to be systems that provide resources and services much like a digital library in support of daily problem solving. We also were able to gain active buy-in, interest and support of potential users. The process, moreover, yielded deep and rich insights into engineers' learning styles, and the application of learning in the workplace.

Finally, the process went beyond the immediate problem at hand, and can inform company strategy. This was evident when practitioners identified the possibility of deep inter-firm learning through an understanding of external processes. In sum, this case example of this design process promises a whole, which is greater than the sum of the parts.

NEXT STEPS

The team is now collaboratively building a prototype of the system and its content. Moreover, the firms are engaged in a process of building a prototypical market mechanism for the equitable sharing of knowledge and expertise. These activities will be reported in subsequent papers.

ACKNOWLEDGMENTS

We thank Meredith Aronson, Roscoe Nash, Jr., Dick Ullman, Thomas Wheeler and Gregory Zack for their assistance.

REFERENCES

1. Abernathy, D.J. Thinking outside the evaluation box. Training & Development. 53, 2 (1999), 7-18.
2. Ayers,T.D. Stakeholders as partners in Evaluation: A stakeholder-collaborative Approach. Evaluation-and-program-planning. 10, 3 (1987), 263-271.
3. Crawford, J.C. The Stakeholder approach to the construction of performance measures. (Rockville, MD: WeStat, 1995).
4. Friend, J.K. Participatory action research and social change. Systemic practice and action research. 12, 6 (1999) 655-658.
5. Giddens, A. New rules of sociological method: A positive critique of interpretative sociologies. (Cambridge: Polity Press, 1993).
6. Markus, M. L. & Bjørn-Anderson. Power over users: its exercise by system professionals. Communications of the ACM, 30, 6 (1987).
7. Mercier, C. Participation in Stakeholder-Based Evaluation: A Case Study. Evaluation and Program Planning. 20, 4 (1997, 467-75.
8. Misher, E.G. Research interviewing: Context and narrative. (Cambridge: Harvard, 1986).
9. Stokes, D. Pasteur's quadrant: Basic science and technological innovation. (Washington, DC: Brookings, 1997.)
10. Strauss, A and Corbin, J. Grounded theory methodology: An overview. in N.K. Denzin and Y.S. Lincoln, eds., (1999) The Handbook of Qualitative research (Thousand Oaks: sage, 1999).
11. Wastell, D.G. The fetish of technique: methodology as a social defence. Information System Journal, 6, 1 (1996).

Woolgar, S. Reflexivity is the ethnographer of the text, in S. Woolgar, ed., Knowledge and reflexivity: New frontiers in the sociology of knowledge. (London: Sage, 1988)