Contingency and Stabilization: The evolution of a prototype

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ABSTRACT

This poster and artifact illustrate an approach to combining work practice studies with participatory design and cooperative prototyping. The setting is our collaboration with a workgroup of engineers designing a bridge. Along with a poster describing our work with the engineers and the evolution of our "case-based" prototype, we will demonstrate the running prototype through a web-based interface. Our poster/artifact is intended to promote discussion with interested conference participants regarding the value of case-based prototypes as well as the issues and tradeoffs in their design and use.

Keywords

Work practice studies, case-based prototyping, ethnographic methods, information retrieval

THE SETTING

For over a decade we have been developing an approach to work-oriented design where participation of work site partners and knowledge of work site activities inform the design of an evolving prototype (Blomberg, Giacomi, Mosher, & Swenton-Wall, 1993; Blomberg, Suchman, & Trigg, 1996). An ethnographically-grounded view of the work and development of case-based prototypes that incorporate materials and methods from the work site are central to our approach. The most recent example of this approach is a collaborative research project with the California Department of Transportation (Caltrans). In this context we have been following the work of a team of civil engineers engaged in a bridge replacement project, exploring with them the possibility that electronic access to paper documents would enhance the performance of their work.

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Our project has focused on a collection of paper documents known as project files, that record the unfolding history of the project (e.g. decisions made, permits filed, groups consulted, etc.). These documents are currently organized according to a standardized categorization scheme (the Caltrans Uniform Filing System) and stored in three-ring binders where they are accessed throughout the course of the project by members of the engineering team. With engineering team members we have designed, built and installed a case-based prototype that provides web-based access to project file documents that have been scanned into an electronic repository.

LIVING WITH CONTINGENCIES / ACHIEVING FLEXIBLE STABILITY

Case-based prototyping requires an active, ongoing connection between technology design and a site of work. Maintaining this connection means, among other things, responding to a diverse set of contingencies arising at the site for which we are designing and within our own work setting in a corporate research lab.

Prototypes have traditionally been thought of as "one-offs," as opportunities to build a system meant from the start to be thrown away. Our case-based prototypes share this light-weight quality insofar as radical reconceptualizations and redesigns are to be expected. At the same time, the prototype plays a crucial role in our longer term relationship to the work setting. We rely on its evolving longevity in our site-based experiments and discussions around present and future technology options, and we hope to leave behind some form of a working system for use by our collaborators at the project's end.

Sustaining our project and our prototype in relation to continually changing organizational and technological contingencies has required achieving a kind of flexible stability. The following strategies have helped us to navigate these shifting landscapes:

1) *Building on past work.* With each new project, we work to maintain some lines of continuity between our current prototype and earlier implementations, incorporating

lessons learned from previous projects. In particular our prototyping efforts have been focussed on providing electronic access to a class of documents, *working document collections*, that we have found to be common across work sites. That commonality allows us to draw on our previous work, while particularizing and expanding to accomodate site-specific practices.

2) *Drawing manageable boundaries*. Inside the large and complex organizations with whom we collaborate, we attempt to circumscribe our projects in a way that makes them manageable, while remaining open to changes and new connections that may emerge. In the case of our current project, our principal collaboration is with one team of engineers assigned to a bridge design project. At the same time, the work of the project team is embedded in and connects to a more extended set of relationships. This includes the fact that the design team with whom we are working will soon hand off selected documents from their project files to a group in construction. To follow the work then implies, to the extent that our resources allow, expanding our prototype to incorporate this new site.

3) *Forming alliances and maintaining working relationships*. While projects delimit the boundaries of our efforts, the foundations of our collaboration are the personal alliances and working relations that we establish with particular individuals (Suchman, 1994). Our current project is based in an ongoing partnership with key members of the bridge design team. As the composition of the team changes over the life of a project, it is these members who provide continuity not only for our work but for the team as well.

4) *Designing modifiable and differentially usable prototypes*. We recognize that the artifacts we build must also manifest a kind of flexible stability if they are to survive both revisions to our understanding of the work and unanticipated changes in how the work is accomplished. For example, the design of our prototype incorporates the Caltrans Uniform Filing System, which we have discovered represents not only standardization but flexible interpretation and even modification by its users.

5) *Selectively appropriating relevant technologies*. Our prototype design has relied on the strategy of incorporating off-the-shelf technologies, Xerox product offerings and emergent PARC technologies. This has required that we assume the responsibility for establishing and maintaining alliances with technology vendors, product developers and fellow researchers (Blomberg, Suchman, & Trigg, 1997). For example, we have recently developed working relations with another group of researchers building an architecture for web-based document services. This collaboration has resulted in a customized set of services that allow us to maintain the project files repository remotely at PARC. New documents are scanned onsite at the Oakland headquarters, and then uploaded, processed, and stored at PARC.

6) *Orienting to possible futures and technology trajectories*. Realizing that organizational and technological change is a component of most work places, including our own, we have attempted to maintain an ongoing orientation to possible and probable future directions. This has required staying informed about technology developments both at the work site and at our own organization. For example, we knew from our previous project that there was a need for shared access to our prototype. When the World-Wide Web arrived, we redesigned the prototype as a series of script-generated web pages and were thus immediately able to demonstrate the potential benefits of cross-platform simultaneous access.

7) *Constructing closure*. Finally, as with all research projects and particularly those that require the active participation of work site confederates, ongoing consideration must be given to how the project will end. How should expectations be managed? What technologies will be left behind? Who will support them? What continuing relations might be possible, and what continuing life might the technology have outside the organization in which it was developed, and beyond the project's end? Answering these questions involves constructing closure for the current project in a way that opens up new lines of inquiry for the next.

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Design for Safety: Working with Residents to Enhance Community Livability

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ABSTRACT
Crime, and the fear of crime, are often cited as two of the most important factors that determine quality of life. Traditionally, increasing law enforcement or attacking long-entrenched systemic problems have been ways of combating crime. A complementary method, however, is the Design for Safety program developed by the Neighborhood Design Center in Baltimore (USA). This program recognizes that the physical environment can have an impact on crime and fear, and involves residents in a community design process that addresses both community safety and livability. This poster describes the Design for Safety program, in particular documenting its application as a series of participatory design workshops in a community drug and crime prevention program.

Keywords
Safety, community design, neighborhood planning

COMMUNITY DESIGN AND SAFETY
All of us want to live in safe communities. However, over the last several decades crime, and the fear of crime, has eroded many neighborhoods. Traditionally, two approaches have been used to control crime: increasing law enforcement and attacking the systemic root causes of poverty and racism (Wekerle 1995, Crowe 1991). Although these measures can be successful, too often they are large scale, policy driven initiatives that do not take into account problems (or people) at a local grassroots level, nor do they address the role that the physical environment plays in the prevention of crime.

In 1968, a group of architects and planners in Baltimore founded the non-profit Neighborhood Design Center (NDC). The original intent of this group was to provide community design and planning assistance to low-income communities in the city. Using participatory design methods, NDC has evolved from providing primarily technical assistance to include community-building capacities that address political, social, and economic, as well as physical, factors. Recently, the Neighborhood Design Center has experienced an increase in communities that are looking for assistance in dealing with problems of drug trafficking, unsafe parks, and trash and vandalism: all problems that negatively impact residents' personal sense of safety as well as overall community livability.

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DESIGN FOR SAFETY
As a means of addressing community safety and livability, the Neighborhood Design Center (with the author as a consultant) developed a program known as *Design for Safety*. The program synthesizes NDC's community design emphasis with crime prevention through environmental design (CPTED) strategies such as defensible space and Safe Cities initiatives (Wekerle 1995, Crowe 1991, Newman 1972). Although the Design for Safety program focuses on physical design and planning issues, it takes at its heart four principles. First, there needs to be a partnership between residents, law enforcement officers, and government officials. Each alone is not effective. Second, residents are most knowledgeable not only about crime in their communities but in particular about those areas where they feel unsafe. Third, involving residents draws on their collective creativity and problem solving abilities. Finally, this type of participatory process develops the sense of resident ownership and commitment needed in order to implement and sustain community crime prevention and safety initiatives.

To facilitate the above mentioned items, a participatory workshop was developed in which residents have an active role both in identifying community safety issues and in developing responses to them. The workshop was first tested as part of the state and federally supported crime prevention effort known as the Comprehensive Communities Program (CCP).

Begun in 1995, CCP is a network of partnerships among government agencies, law enforcement groups, non-profits, and community organizations that takes public safety as a starting point for comprehensive community building. In addition to focusing on the social, economic, and legal aspects of public safety, CCP's efforts also address physical planning and design strategies.

In the spring of 1997 CCP asked the Neighborhood Design Center to assist six Southwest Baltimore communities in identifying defensible space projects as part of their overall crime prevention program. Understanding that this endeavor would require broad community involvement, a series of three Saturday workshops was developed to occur over a four-month period. In conjunction with the workshops a manual was developed that outlined the workshop process as well as included information on legal, policy, and granting resources. Participants, who included NDC volunteers, community members, city planners, public agency representatives, and police officers, worked in teams representing each neighborhood. Although the workshop format was the same for all of the groups, each team identified issues and provided recommendations that best fit their particular neighborhood.

The first workshop introduced the participants to the principles of crime prevention through environmental design (CPTED). Using large maps of the neighborhood, each team identified good and bad areas with regard to crime, fear, incompatible land use, and trash. They then analyzed these areas relative to the CPTED principles in order to understand the relationship between fear, crime, and the physical environment. In the weeks between the first and second workshop, residents presented this information at community association meetings. The purpose of this was three-fold: 1) to inform residents who could not attend the workshop, 2) to gain more input from a wider number of people, and 3) to develop additional support for implementing priority safety projects.

The second workshop reviewed the information from the first and adjusted it based on comments from the community association meetings. The main goal of the second workshop, however, was to identify a series of priority projects, such as adding new lighting, reclaiming vacant lots and buildings, and changing traffic patterns, as a means for addressing the safety issues identified for each neighborhood. In order to facilitate the discussion, slides of community open space and defensible space projects were shown. Again, the recommendations were taken back to the community meetings for review and discussion.

The final workshop reviewed the list of priority projects and made modifications as necessary. Each team then developed an action plan for implementing the different projects. During the final workshop public agencies and community assistance groups also discussed how they might be resources for realizing the various action plans.

The main reason for preparing the action plan was to move the responsibility for implementation to the communities themselves. Although the Neighborhood Design Center continues to provide support and guidance to the projects, the intent was that communities would adopt the process as a means for making neighborhood improvements as well as for developing community control and involvement.

REFLECTIONS ON DESIGN FOR SAFETY

Community design, as a form of participatory design, designs with people, not for people (Hester 1990). This is especially important in addressing community safety, which is often a racially and politically charged subject. One of the successful aspects of the Design for Safety workshop is that it provided a forum for a diverse group of people to productively discuss common problems and work through shared solutions and consensus. The workshops also showed that crime and safety were not solely the responsibility of the police, but that public works employees, traffic engineers, and especially residents must work together to envision as well as carry out the plans.

The workshop format allowed for different levels of participation, from information sharing to consultation to delegated power (Arnstein 1969). Requiring that residents share the workshop information at community association meetings further assisted the transfer of responsibility from the workshop into the neighborhood.

Although several of the priority projects are in progress (supported by nearly $60,000 in grants), many others have succumbed to shifted community priorities. This latter item, I believe, has to do more with community organization than community participation (although the two are related). Better facilitation of the organization of community groups, and the dedication of more NDC volunteer and staff resources to the implementation of projects, are future goals of the Design for Safety program.

While there was general satisfaction from participants of the CCP workshops, an important measure of success is that the Governor's Office of Crime Control and Prevention asked NDC to organize a series of statewide Design for Safety workshops as part of the Maryland HotSpot Communities Initiative. Other communities in and around Baltimore are also asking for Design for Safety workshops as part of their community planning initiatives.

Making communities safe and livable is a responsibility that we all share. Participatory design efforts like Design for Safety are effective tools for assisting residents in establishing control of their neighborhoods while also creating places that are open, supportive, and beautiful.

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LCD-Projection, Facilitation, and Participatory Design

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ABSTRACT
A huge amount of literature concerns Group Decision Support Systems (GDSS) and Group Support Systems (GSS). Nevertheless, their diffusion is low. This paper exploits a less developed technology for participatory design (PD), namely LCD-projectors. A high number of concrete projects – in which this technology was used on a professional basis – allow for a comparison of LCD-projection with GSS and with classical facilitation. As it is shown, participatory work in groups can be supported strongly by the usage of this technology.

Keywords
GDSS, electronic meeting rooms, participatory design, LCD-projection

INTRODUCTION

In spite of the importance of temporally and spatially distributed work, face-to-face meetings of project teams stay important (compare also [1]). For a long time, GDSS and GSS were the major approaches in designing computer support for such meetings. With a few exceptions these approaches rely on a shared whiteboard and computers for each participant.

These approaches of computer supported face-to-face meetings have three crucial drawbacks. First, such rooms are not broadly available and not easily transferred from one place to another. Participants need to travel – which is expensive and time consuming. Second, electronic meeting rooms are expensive (both in building and in maintaining them). Given their costs, they are hardly used for "ordinary" employees for "normal" meetings. Third, as all participants have to use a computer, a relatively high and homogeneous level of qualification is needed. This can not be assumed in general.

There is a simple, but little explored alternative: LCD-projection. An LCD-projection system can be transported easily. It is much cheaper and only one person has to be able to use the software - the facilitator or a member of the group. Therefore, it can be used in more areas and with more people.

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We used LCD as consultants over a period of three years. Most of the projects undertaken (about 50) were in the area of computer supported shift scheduling. The "Arbeitszeitlabor" group developed the system Shift-Plan-Assistant (SPA) to ease the design of shift-rotas (examples of such design problems are given in [2]). The system SPA is highly interactive in order to foster interactive scheduling in working groups. Typically, one to four days were needed in each project. Another domain was the design of reward systems (4 projects). Again, this was mainly done in workshops with projects running from two to ten days. In between workshops smaller system development was necessary to adapt the software. Third, it was used in systems design (5 projects). The development ranges from small applications (a few days of development) to medium systems (up to 10 month). Drawing on these experiences, we compare LCD-projection with GSS and with classical facilitation.

Customers were mostly managers from very small to very large companies, mainly from the production industry and a few from the service industry. A smaller part of the customers were shop stewards or trade unions. In nearly all the projects, we worked in working groups of 5 to 10 persons. A typical working group in shift scheduling consisted of the plant manager, the personnel manager, two foremen/forewomen, and two shop stewards. In designing reward systems, workgroups had a similar structure. In systems design there were members of the development team, two to three representatives of the customer and two to five potential users. Projects were undertaken mainly in rooms at the customer's sites.

The facilitation techniques used were practically the same in all cases. We used standard facilitation techniques as described in [3]. Such facilitation strongly shapes the course of action within the meetings, but has to be considered as a quite usual form to run such meetings. This holds especially true for projects involving external consultants.

Crucial to this approach of facilitation is the neutral position of the facilitator concerning content. As we serve both as facilitator and as expert this contains the risk of role conflicts. In our approach we restricted our expert role to input concerning technical alternatives and information about consequences of decisions but tried not to prescribe the decisions of the workgroups.

Figure 1: Comparison of GSS Facilitation with LCD and Classical Facilitation

ASPECT	GSS	FACILITATION & LCD	FACILITATION
Costs for 10 participants	10 + 1 PCs, LCD, Special Software1 facilitator	1 PC, LCD, normal Software 1 facilitator	1 facilitator
Selection of participants	Computer literacy	No restriction	No restriction
Group size limited by	technical issues	-	-
Room requirements	High	Medium	Medium
Simultaneous data entry	Easy – time for discussion is bottleneck	Quite easy with cards – time for discussion is bottleneck	Quite easy with cards – time for discussion is bottleneck
Introducing technique	Takes a lot of time	Takes little time	Takes little time
Setting up the agenda	preparation by 1 person & computer mediated	preparation by 1 person & classical facilitation	preparation by 1 person & classical facilitation
Displaying protocol & references to earlier notes	Sometimes confusing by jumping between screens	Sometimes confusing by jumping between screens	Sometimes confusing by flipping between flip charts
Protocol	Partially in the course of the meeting. Honing possible by group or by facilitator.	Partially in the course of the meeting. Honing possible by group or by facilitator.	Either low quality or much work for facilitator.
Brain storming & other idea generation techniques; anonymous input	Simple & anonymous; Time for discussion needed afterwards. Problems with anonymity if things have to be explained.	Not very difficult; anonymity can be reached with high effort. Experience: Explanations often are more important than anonymity.	Not very difficult; anonymity can be reached with high effort. Experience: Explanations often are more important than anonymity.
Voting	Easily done & Easily done anonymous Experiences: Given close voting's, discussions remain important.	With & without anonymity feasible. Experience: Voting helps to find out whether there is opposition and if so to discuss issues again.	With & without anonymity feasible. Experience: Voting helps to find out whether there is opposition and if so to discuss issues again.
Participation of participants	Depends strongly on facilitation style.	Depends strongly on facilitation style.	Depends strongly on facilitation style.
Working with subgroups	Simple but time consuming (to bring it back into group).	Simple but time consuming (to bring it back into group).	Simple but time consuming (to bring it back into group).
Structure of software	Complex	Simple	-
Discussion of prototypes & documentation	Supported Easy documentation	Supported Easy documentation	Hardly supported
Simulation	Easy	Difficult	Difficult

CONCLUSION:

Coming from a practical side, it can be stated that LCD-projection goes fine with normal facilitation. LCD & facilitation is better than or equal to classical facilitation in next to all cases. On the other side, the high costs for GSS only pay off under very specific circumstances. In contrast to GSS, LCD does not support anonymous input, simulation games, and simultaneous data entry. However, these drawbacks were of little relevance in the projects undertaken.

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CoOl Studio: On-line Environment for Collaboration and Participation in Architecture.

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ABSTRACT

This poster presents a recent exercise in architectural collaboration. It was set up in an academic environment which used a new web-based collaborative tool. It made interaction possible between architecture students and geographically scattered reviewers. This has resulted in a multitude of research issues such as on-line protocol and etiquette, software capability vs. user friendliness, screen presentation techniques for architectural collaboration, ownership of domain, security of information etc.

Keywords

World Wide Web, Collaboration Tools, Collaborative Website, Architectural Design, On-line Review, *Swiki.*

INTRODUCTION

The challenge of designing any collaborative tool is that it has to be powerful enough to enable interaction through various media and yet be simple and intuitive enough so that users with only basic computer competence and ordinary equipment may use it.

In this paper we will describe such a tool which runs on the World Wide Web. It is a 'Collaborative Website' called *Swiki.* This computer tool easily permits 'open authoring' on the web; therefore the participants with knowledge of *only four commands* can successfully interact through this media. This was tested in the Winter quarter of 1998, where a graduate architecture design class of Georgia Institute of Technology and a group of allied professionals and stake holders scattered in distant locations came together to participate in an academic design of a federal courthouse in Atlanta.

PARTICIPATION IN ARCHITECTURE

The inherent social responsibility in architecture and the nature of its practice requires extensive need for interaction. This starts with that between the designers and the stakeholders and continues to that between its various allied disciplines. Throughout the design process too, within group interaction i.e. that between different architects and others in the team is also a very important issue. Compounded with this is the vehicle of communication. Architects use sketches, diagrams, drawings, and pictures. Text is important but drawings are essential.

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THE TOOL

A collaborative website is that which supports 'open authoring' on the web, i.e. here, an user is also an author and designer of the page[1]. The basic idea behind this kind of web page is that once set up, it is directly editable by any reader of that page using his/her browser, and through this editing, new pages can be created.

This concept was developed by Ward Cunningham[2]. Mark Guzdail of GeorgiaTech created his own version using a web-server and a tool-kit that he called a 'Pluggable Web Server'. This was based on the work of Georg Gollman and written in Squeak[3], a version of the Smalltalk programming language. This collaborative web is called *Swiki*. It is highly portable and runs on Macintosh, Windows (95 and NT), Linux and SunOS. A version of it named 'Collaborative On-line Studio' or 'CoOl Studio' was used in the project that is presented here.

In the display mode, a *Swiki* page looks and acts just like any other web page. It can contain any media or formatting that a traditional web page can have. An essential difference is a link saying 'edit this page'. When a reader chooses to 'edit this page' s/he is taken to 'edit mode' of the same page, which appears as a scrollable page of unformatted text. The reader can change text as desired and then click the 'save' button which will update the page and reflect the changes in the display mode.

Commands are typed in this edit mode. The four basic functions that was mentioned before are : 1. If any text string is put between asterisks (for example, *ABC*), a new page will be created on the server with that name (for example, a page called "ABC"). Subsequently, a link to that page will also be inserted into the current page. 2. To create a link without creating a new page, a complete URL should be put between asterisks. This will create a new link to appear in blue on the current page. 3. If a URL ending in .jpg, .gif, or .jpeg i.e. a link to a picture in the www, is placed between asterisks, then instead of a link, the referenced image will be fetched and displayed on the current page. In the same manner, animations can also be displayed in a *Swiki* page. 4. If four underscore marks are typed in a row, they will be interpreted as a rule extending across the page. *Swiki* pages also accept all HTML tags. As users gain more familiarity they may start putting in their own codes. Alternatively, they may use any HTML editing program (like Microsoft Word) and cut and paste into their pages. As more and more pages are created and edited by a group, a collaborative web transforms into an open ended user-structured collection of web pages.

Although these commands are enough to use *Swiki*, the need for sharing drawings, images and animations demanded that the students learn additional techniques of scanning, retouching, making animations and uploading them to a regular web server.

DISCUSSION

The fascinating part about review of CoOl Studio is not what was intended, but what grew out of all these efforts.

Most users are already familiar with the web and learning three of four additional but easy steps to get to a participatory environment did not seem to be a daunting task. In fact all the external critics, who included senior stakeholders and architects learned it through a single fax which was followed, in some cases, by a phone call. The students too, did not need much help beyond the first few instructions. The flip side of this ease is that Internet access, specially with modems can be excruciatingly slow. More so when high quality images and animations are being downloaded.

Synchronic vs. diachronic interaction

In CoOl Studio students uploaded their concepts and designs in the *Swiki* server and critics responded at a later time when it was suitable for them. They also spent as much time as their schedule allowed. This gave them the possibility to consult relevant materials, talk to colleagues or partners, reflect on issues, and carefully organize their comments before posting them. The critics also had the opportunity to scroll back through previous sections of a presentation and compare the work of multiple students at once.

Of course, this asynchronous format was at the expense of face-to-face interaction. Hence, personality conflicts were not an issue. On the other hand, due to the absence of verbal presentations, the Web pages had to be of sufficient quality to convey all of the designer's intentions. That was not an easy task, especially since preliminary ideas are abstract and typically in need of refinement. On the other hand since architects express best by drawings, this was a very good testing ground.

On-line criticism

On-line criticism was initially envisioned as an ongoing unstructured dialogue between students and critics. Ultimately, this was not achieved due to limitations in both hardware and human interest. Subsequently, structured on-line reviews were held. The tool allowed students and critics to interact despite being separated in space and time. The reviewers also had the unique opportunity to simultaneously address both individuals and the collective by commenting directly on the students pages and on a separate page respectively. Such a dual podium is unique in any setting, but seems especially relevant in the architectural studio because although students are given the same design problem, they each pursue unique design solutions.

Nature of presentations

CoOl studio provided the opportunity of presenting in a hyper-linked manner, and this can utilize both uploaded resources as well as those already in the World Wide Web. Additionally, it supports personalization. Unfortunately, most student work was 'linear' and to the context. Perhaps they were not motivated enough or their involvement in the studio process left little time for more elaborate web pages.

Miscellaneous

A common complaint in architectural interaction is that it requires high resolution images that a computer screen cannot support. Also web pages have their own limitations and the students were forced to undertake a closer and critical look at their design to find those drawings that were most meaningful.

Everyone was aware that these pages were open to the world internet community. The reviews of the designs were mostly positive, clearly worded and insightful. There were no sharp criticisms. They were . An added interest for the critic was to see what the other reviewers said about the same topic. In this manner even the critics benefited from such collaboration.[4]

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ENDNOTES

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[2] http://c2.com/cgi-bin/wiki

[3] http://squeak.cs.uiuc.edu

[4] Craig, D (1998) Supporting Collaborative Design Groups as Design Communities, College of Architecture, Georgia Institute of Technology, *In Preparation.*

Oil Driller's Workstation: Participatory Assessment on Ergonomic Design Requirements for an Oil Rig

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ABSTRACT

This study was designed to cover ergonomic issues relevant to design, and operation of computer-based drilling systems for an offshore oil rig. The main motivation to re-design the existing driller's workstation was the need to introduce information technology and a higher level of mechanisation. Also, it provided the opportunity for workers' participation on introducing new technologies. To examine these aspects it was required the study of the design options, which could be adopted before that the new design and technical resources were implanted.

Keywords
Participatory Design, Ergonomics, Oil industry; Drilling

INTRODUCTION

The focus groups tool (Lydecker, 1986) was applied in this study as exploratory way regarding to generating new ideas and learn how drilling crew members interpret design issues relating to the drill floor. It is very important to involve the operators as end-users in ergonomics assessment. They advised on the details of design solutions from a practical point of view. Initially the drillers were asked to rate the design quality against each ergonomics design characteristics by using a by a Design Attributes Matrix. The criteria was to classify several drillers' workstation design characteristics. An overall evaluation score was produced. Also, interviews were conducted to study the driller's regular working modes, their co-operation with the drilling crew members and to a closer interaction with the individuals for evaluating the usability of the workstation.
Two questionnaire were applied. The first questionnaire based on previous ergonomics drilling work study developed by Silveira (1994) was used in order to assess ergonomic and organisational constraints. The second questionnaire was addressed to driller's cabin layout design (instrumentation panel, information processing, visibility, technical resources) and the subject's perceptions of quality of the work environment.

The question is how does the participation into the ergonomics improvements will influence the acceptance and trust in the new workstation design. Also, participation may provide different behavioural outcomes (Urlings *et al.,* 1990). A working model was proposed in order to understand the outcomes. Figure 1 below illustrates such interpretation. The drillers showed a positive attitude for analogic and traditional information available in the control panel. Several risk factors relevant to the driller's work were identified: stress in the trunk and arms region, monotonous work movements, a high pace work, short and infrequent work pauses, static work postures, adverse head postures, high demands on precision and attention, visibility, vibration exposures, impact forces, and inappropriate seat design.

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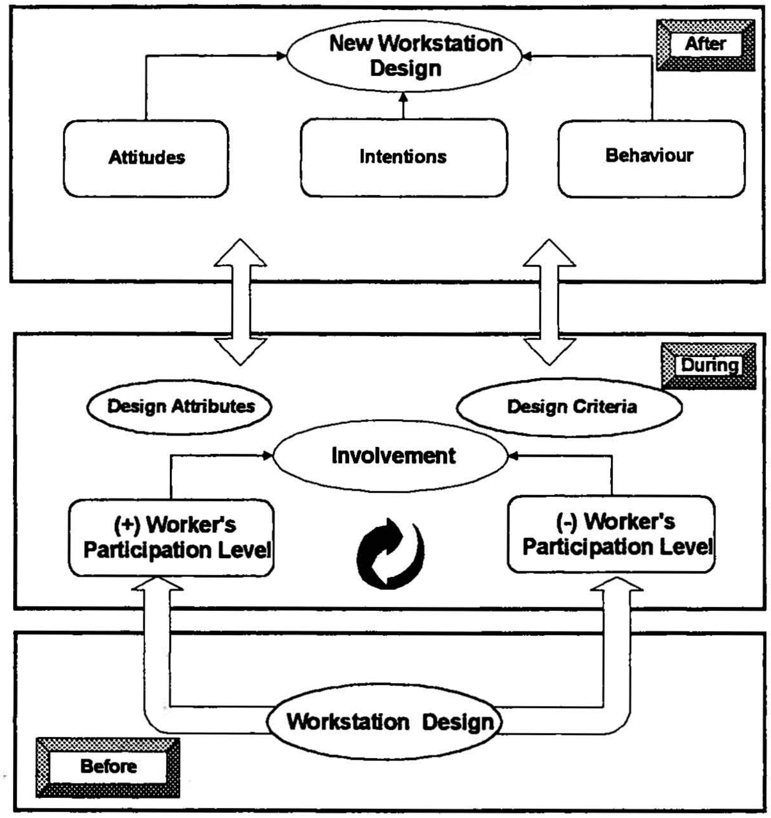

Fig. 1 Working Model for Participation Levels and Attitudes, and the Design Process

While interviews gave important background information concerning work content and work organisation, this information was qualitative. The interviews addressed the issue of whether a new lay out by adopting digital and computer-based monitoring and supervision system were acceptable to the drillers. The quantifiable results obtained from this study were of greater interest to the project group in charge for future platform's upgrade aiming its drilling operation on offshore deep water. It was difficult to limit the scope of this study, including its questionnaire, to opinions of the complete drilling layout at drilling floor and ergonomics constraints for drillers and drilling crew by using a highly mechanised environment.

As a result, by taking in account these outcomes, the design of the workstation has been built in a widely heralded driller's cabin with controlled environment from which the driller can control rig floor operations in a sitting position. Some new equipment has been introduced within drill floor for manual materials handling and other for computer-based driller's supervisory control. The way of working used when designing the drilling control cabin resulted in a functional design. The operators were involved all through the project and were able to offer their ideas and opinions concerning the design. Moreover, the confidence of the management in the ability of the operators to participate in the design of their own working environment contributed to the good work climate and to the desire to co-operate and make a contribution. A higher degree of user participation when designing workplaces may results in a high degree of acceptance among those concerned.

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Power of Persuasion: Non-technical Users and Geographic Information Systems

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ABSTRACT

The inability to create persuasive information displays may be a barrier to full participation in decision-making activities. For example, the neighborhood activists in the city where our university is located are at a disadvantage in city-planning meetings because, unlike the other meeting participants, they cannot use software such as geographic information systems (GIS) to present data effectively to support their arguments. In this project, we focus on the barriers to the use of GIS by users who, like the neighborhood activists, have no technical background. We are taking a participatory design approach to the design of a new kind of GIS interface based on programming by demonstration. The artifact presented here is a paper prototype used during the design of query language symbols for the new interface. Our goal is to enable non-technical users to create persuasive information displays on maps, and thus participate in decision-making sessions on a more equal footing.

Keywords

End-user programming, geographical information system, GIS, participatory design, programming by demonstration, PBD

MOTIVATION AND BACKGROUND

City-planning decisions may have profound effects on neighborhoods (where will new police stations be located? will more liquor licenses be issued? will a new shopping center be built?). The parties involved in the decision-making often have unequal access to information and to the ability to present the information persuasively. City planners and commercial lobbyists may have experts to create map-based information displays using geographic information systems (GIS). Inner-city neighborhood activists, however, are unlikely to have the skills to use GIS or the funds to engage GIS experts. Thus, they are not able to participate fully in the decision-making, even though their lives will be seriously affected by the decisions.

We became aware of the barriers that off-the-shelf GIS software presents to non-technical users when a group of social scientists at our university began a project several years ago to develop a GIS application that could be used by community activists of the inner city of Lowell, Massachusetts. The social scientists use computers on a regular basis as part of the their normal work routine, but have no formal background or training in computer science. It became clear early in the project that, despite consultations with a GIS expert [2], the social scientists were finding the software very difficult to use. It also became apparent that there was little hope that community residents with no computing experience would be able to use the software.

As a result of the difficulties they were experiencing with the GIS software, the social scientists ended up hiring computer science graduate students to become GIS specialists and to act as surrogate users both for themselves and for the community activists. Their experience is apparently typical. According to Garson & Biggs [1], many workplaces employ GIS specialists who act as surrogate users.

We performed an analysis of why off-the-shelf GIS software is hard for non-technical users to use [5, 6]. We found that the software requires users to have knowledge of database management systems, geography, and cartography, and to translate their tasks to fit the language and database structure of the GIS.

OUR APPROACH TO EMPOWERING END USERS

In order to free non-technical users, such as neighborhood activists, from dependence on surrogate users, we have taken a programming-by-demonstration (PBD) approach to the design of a new interface for GIS. Users interact with the interface via menus that present choices in non-technical language and that hide the details of how data are stored and how maps are drawn. As a user interacts with the interface to create an information display, the software creates a program representation showing how information was selected and filtered for the display [8].

A program representation is a powerful tool for the user because it provides a record of how an information display was created. The program representation can be studied to identify mistakes, saved for future use, and edited to create a similar display with different information or a different display with the same information.

Our program representation language uses a comic-strip

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metaphor inspired by [3]. As in a comic strip, a program consists of a series of box-like panels, each of which is a "before" panel for any panel that follows it and an "after" panel for any panel that precedes it. The panels tell the story of how an information display was created.

THE ARTIFACT AND ITS CONTEXT

The artifact is a paper prototype of the programming-by-demonstration interface for GIS. The prototype was used during user studies of the comic-strip program representation language and will also be used in participatory design sessions to customize the program symbols for use by specific groups of users, such as neighborhood activists.

We present the prototype to users as a package containing a manila folder, several sheets of sticky-note icons, an information sheet, a glossary/legend, a couple of blanks sheets of paper, and a pencil. The manila folder can be opened to serve as a screen display area. The sticky-note icons serve as templates for panels. Users select and arrange the panel templates in an appropriate order and then use the pencil to fill in the templates and draw flow-control constructs. The result is a program representation similar in appearance to the ones produced by our software.

While the use of sticky notes during participatory design is far from unique (see, for example, Muller's work on participatory design of user interfaces [4]), we are unaware of any previous use of them for the participatory design of programming language symbols for non-technical users. They are especially appropriate for the comic-strip metaphor. Not only does a sticky note carry program symbols, but the sticky note itself plays the role of a comic-strip panel.

ACKNOWLEDGMENTS

We thank Michael Muller for his valuable advice.

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Participatory Design of an Integrated Land Use — Transportation Modeling System: First Steps

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ABSTRACT

Land use and transportation models play an important role in guiding decisions about such matters as transportation infrastructure construction and land use policy. Previous land use and transportation modeling systems have largely been black boxes, understandable only by experts in the field. For the last several years we have been developing and deploying a land use modeling system, UrbanSim, which is integrated with a transportation model. We will be redesigning and generalizing this system, and in the process will attempt to open the black box. We plan to use a participatory design process, bringing in a variety of stakeholders, to determine what are the important attributes to model, how users should interact with the model, and how the results can be most usefully presented.

Keywords

Land use modeling, transportation modeling

INTRODUCTION

The patterns of land use and the available transportation systems in urban areas play a critical role in determining the livability and sustainability of those urban areas. Land use interacts strongly with transportation. For example, sprawl development induces a strong demand for freeways, parking structures, and other features of an automobile-oriented environment, while compact, pedestrian-friendly urban forms can induce demand for transit, walking, and bicycling. In the other direction, major transportation investments can in turn induce different patterns of land development.

Land use and transportation models play an important role in guiding future decisions about transportation infrastructure construction and land use policy. Given the interaction between land use and transportation, it is important to model them in an integrated way.

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THE URBANSIM MODEL

For the last several years, the first author has been developing a new land use modeling system, UrbanSim [4], which is integrated with a transportation model. The system has been applied in metropolitan areas in Hawaii, Oregon, and Utah.

The model simulates the key decision makers and choices impacting urban development, in particular, the mobility and location choices of households and businesses, and the development choices of developers. It simulates the land market as the interaction of demand (location preferences of businesses and households) and supply (existing vacant space, new construction, and redevelopment), with prices adjusting to clear market. The model also incorporates governmental policy assumptions explicitly, for example, the provision of an urban growth boundary or restrictions on development in environmentally sensitive areas, allowing users to evaluate the impacts of these policies and possible alternatives. It is integrated with existing travel modeling software, outputting travel demands for selected years to the travel model, and feeding travel behavior from the travel model back into UrbanSim.

OPENING THE BLACK BOX

Land use and transportation models have historically been black boxes [1], understandable and usable only by a small number of experts. Given the widespread importance of the decisions made about land use and transportation modeling, we would like to open up the model and the process of its design as much as possible. Important points for participation and decision making include what aspects are modeled, how users should interact with the model, and how the results can be most usefully presented. In addition, the model itself should be believable – citizens should have some confidence in its results.

Regarding what is modeled, early transportation models concerned themselves purely with capacity (either automobile alone, or automobile and transit). Other modes, such as walking and bicycling, have generally not been modeled. It is thus problematic to use such a model to investigate the effect of some policy on pedestrian access. In addition, many other properties of the urban environment, such as air quality, and the quality of public spaces and their encouragement or discouragement of interactions among citizens, are influenced by transportation. It is thus important for stakeholders to help specify the aspects to be modeled.

The manner in which users interact with the model is also important – for example, we would like it to be as easy as possible to experiment with important parameters, such as changing an urban growth boundary, to see its effect on the model. Also, we want the results of the modeling activity to be accessible. We plan to experiment with making the results of the model available via the web; and in the longer term we want to make it possible to interact with the model via the internet.

Finally, it is important for at least some of the stakeholders to participate in the design of the model itself, to help foster confidence in the model and to provide greater understanding of the strengths and limitations of the modeling process. (Some aspects of the environment may be quite difficult to model with much accuracy.) We believe that UrbanSim is a promising basis for such an understandable model, because it is behaviorally-based simulation, using terms such as "rent," "average household income," and so forth, rather than being a more abstract and mathematical model.

The LUTRAQ (Land Use Transportation Air Quality) project [2] is a strong example both of considering a wider range of important objectives in planning a transportation project, and of citizen involvement; but a difficulty in that project was the limited capabilities of the technical tools available. One way of viewing our current project is to provide better technical tools for future LUTRAQ-style projects.

PLAN FOR THE PARTICIPATORY DESIGN PROCESS

Our plans for the participatory design process are still evolving. Our current plan is first to identify the principal stakeholders, including staff in government agencies, business representatives, and representatives of neighborhood and environmental groups, and particular individuals from the different groups and organizations who are interested in working on the project. We will discuss the project with individual stakeholders, gathering ideas and concerns. We then propose to employ a "concentric circle" process for user involvement, as described by Rector [3]. One or more "inner groups" would meet fairly regularly, perhaps once a week during the design phase, to work with us on the detailed design. Tentatively, one of these inner groups would concern itself with the technical aspects of the modeling, such as the operation of the market, land development and redevelopment, aggregate demographic and economic changes, and how households and businesses make location choices and travel decisions. A second inner group would focus on policy and planning requirements, the users' view of the system, and the understandability of the model and its interface. An "outer group" would meet less frequently, and would serve as a check on our work and that of the inner groups (as well as providing a vehicle for participation that requires less time commitment). As the work progresses, the groups will also be evaluating data availability, and considering limitations of time, budget, and technology. Our initial UrbanSim model will provide a concrete artifact that can serve as a starting point for this participatory design process.

We would very much welcome feedback on this plan from other Participatory Design Conference participants.

PUGET SOUND REGIONAL COUNCIL INVOLVEMENT

The Puget Sound Regional Council (PSRC) is the Metropolitan Planning Organization for the Seattle-Tacoma metropolitan area. PSRC is responsible for coordinating transportation planning within the region, and currently operates land use and transportation models in support of coordinated land use, transportation, and air quality planning. PSRC is eager to collaborate with us in this project. Key staff will participate in the review of the design and development of the modeling environment, and provide feedback on the policy and planning requirements for potential use of the modeling system in the region. PSRC will also make data available for analysis and use in the modeling environment.

FURTHER INFORMATION

While the UrbanSim model itself has been in existence for several years, our participatory design work is just beginning. For updated information, please consult our web site: www.urbansim.org

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Usor: A Web Based Collection of User Oriented Methods

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ABSTRACT
This web site contains short summaries of different user oriented methods. All methods are described by means of a simple template. The methods are also classified with regards to when in a design process the method can be used, what level of user involvement required, and why and in what context the method can be used. The classification scheme makes it easy for the reader to search for and browse the methods. There is a mailing list connected to the web site where user oriented methods can be discussed.

Keywords
Methods, user orientation, web site, mailing list, references, summaries, usability

INTRODUCTION

Usor is a web based collection of user oriented methods — mainly systems development methods. Some methods, however, originate from other areas such as the *Future Workshop* [2], a technique for helping small groups of people generate and implement creative ideas.

A user oriented method is a method where the users are considered in some way in the development process. This could mean anything from just being aware of the users to involving users in all steps in the development of the product.

Usor is a place to read about, get a short introduction to, and get a reference where to read more about user oriented methods. It does not contain extensive definitions of any of the methods. Because of this, only published and publicly available methods are and will be included.

AUDIENCE

Who is this collection intended for? The descriptions are easy to understand for every reader, regardless of their previous experience in user oriented methods. Additionally, the references and the classifications are useful both to experts and beginners.

WHAT IS A METHOD?

We have used the definition from Olson and Moran [4], who defines that "a method implies a systematic, repeatable way to design". Additionally, a method is defined as something that includes (1) a statement of the problem that this method addresses, (2) a device (a tool, technique or model), (3) a procedure for using the device, and (4) a result, or rather a definition of the nature of the result.

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GOAL

This web site exists for three reasons: (1) to provide an overview of existing user oriented methods, (2) to provide a good source for references in the area, and (3) to offer a place for discussing user oriented methods. The third item is accomplished by means of the Usor mailing list, see below.

What makes Usor special? What makes Usor usable?

- It is complete with regards to what is presented. No named methods on the pages leads to an empty description.
- It is maintained by a research institute and is therefore publicly available and not commercially tied.
- Much effort has been spent on the classification and it is therefore easy to search and find a specific method not only by its name, but also by its content.
- It contains a mailing list on which user oriented methods can be discussed. The discussions on this list will be reflected in the contents of the web site.
- The readers of Usor are encouraged to contribute with their opinions on the descriptions and with their own methods. Anyone could have their method included in the collection, provided that it has been published. No restrictions have been introduced so far.

DESCRIPTION TEMPLATE

All methods are described according to the following template.

- A short introduction to the method and a description of what problems it addresses.
- **Classification.** The classification of the method. This states something about the contents of the method.
- **Results.** What kind of results the method is expected to produce.
- **How to perform the method.** How to perform the steps of the method. The steps are briefly described to give the reader an idea of what skills and resources are required for using the method.

- **Benefits and limitations**. What is good and what is bad about the method? When is it appropriate to use it and when is it inappropriate?
- **Further reading**. Where can I read more about this method?

CLASSIFICATION SCHEME

The classification of the methods is an important part of Usor. In order to browse and search the methods in a meaningful way, some sort of classification needs to be used. The classification scheme must support the readers in their efforts to find a suitable method for a particular situation.

The classification is based on the classification made in an article by Sweeney, Maguire & Shackel [5]. There are three main categories.

- **Activity**. The activity is the state in which the development process is. Most software cycle models or system development methods are easy to divide into the following four activities; *planning* (what?), *analysis* (how?), *design* (the design of a product or a prototype), and *evaluation* (assessment of a product or a prototype).
- **User involvement**. The user involvement states in what way end users are involved in the development process. Remember that in this context, even if you do not have any user participation, your work can be user oriented. The three levels are *modelling* (theoretical models of the interaction), *without* (pretending to be users based on experience), and *participation* (users participate).
- **Goal**. The goal is the reason why the method is being used. It also states something about what type of problems that are being addressed. The four different goals are *diagnostic* (identify shortcomings and recommend redesign solutions), *summary* (does the system support the users task?), *certifying* (generate quantitative information), and *envisioning* (producing visions of the future).

USER STUDIES

The first version of this web site was evaluated [7] using an adapted version of the Thinking Aloud method [3]. The test subjects were asked to think aloud while solving a number of tasks. In contrast to a regular thinking aloud session, the test subjects were encouraged to comment all their spontaneous reactions about the web pages and their content instead of describing each action they did. The second version of Usor is the one that is presented here. Most matters commented on by the test subjects has been changed accordingly.

ACCESSIBILITY

One important aspect when creating web pages is to make them easy to read and understand. Many people tend to forget that this also should include people with disabilities. There are a couple of guidelines on how to design web pages that are accessible for all users and Usor meets these requirements, therefore Usor has got the *Web Access Symbol* [6] and the *Bobby Approved* icon [1].

USOR MAILING-LIST

The web site also contains a mailing list. This mailing list offers a place for discussing user oriented methods. The list is unmoderated and will be so for as long as possible. The goal is to have the discussions on this list to be reflected in Usor. If, for example, some specific opinions or experiences are shared on this list and they are considered to be of interest to all Usor visitors, they will be integrated on the web pages.

DISCUSSION

Usor is on the web right now, and will be so as long as it fulfils a purpose. The activity on Usor is dependent on the readers. Only if the readers take an active part, the goals and the visions of this web site will be fulfilled. We will try to spread the word about this web site to anyone that could be interested and to any web site that could be relevant. But you play an important role as a reader of this document, try to spread the word about this web site and take a look yourself, either at this conference or later.

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The Ford/MIT Design Project: A Remote Client Collaboration

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ABSTRACT
The Ford/MIT Design Project was a case study on computer-mediated collaborative design environments involving designers at the Massachusetts Institute of Technology and a client group at the Henry Ford Academy of Manufacturing Arts and Sciences in Dearborn, Michigan.

Keywords
collaborative design, design communication, computer supported design, distributed client collaboration, education

INTRODUCTION
The Ford/MIT collaboration was an intensive design project conducted in April 1998 by the School of Architecture and Planning at the Massachusetts Institute of Technology and the Henry Ford Academy of Manufacturing Arts and Sciences, a charter school created through the partnership of the Ford Motor Company and the Henry Ford Museum and Greenfield Village. Students, educators, architects, and researchers from MIT and the Henry Ford Academy were brought together, via videoconferencing and internet-based technologies, to design new educational spaces for the academy's expansion.

THE COLLABORATION
The design goal of the Ford/MIT project was to propose design concepts for a "studio of the future," a prototypical space that would help support the Henry Ford Academy's objectives for hands-on, integrated, projected-oriented, technologically enriched learning as the school develops its campus. The overall objective of this computer-mediated design project was to use telecommunication technologies to build a virtual design environment in which educators and ninth grade students from the academy were able to work together with faculty and graduate students in the Department of Architecture.

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The design concepts were generated to support the Academy community and communication, to link site resources for learning and socialization, to empower students and teachers in the educational process, and to encourage varying forms of cognitive development within a context of metropolitan, regional, and global learning opportunities. The concepts – for campus plans, studios, classrooms, "techno-tubes", home bases, and multi-media laboratories on wheels -- accumulated into a vision of a school where the boundaries between architecture, pedagogy, and distance collapse. At the same time, the concepts embraced design -- of landscape, buildings, transportation, and communication -- toward shaping a sense of place and identity for the Henry Ford Academy. The architectural and educational product concepts developed by the MIT designers exploded prevailing notions of high school facilities and proposed a learning environment like no other in America.

The computer-mediated collaboration process between the staff and the 9th grade students at the Henry Ford Academy and the graduate students at MIT provided hands-on experience that was reflective of the kind of new learning environment envisioned in the "studio of the future" design proposals. The Ford/MIT collaboration created an environment in which MIT designers had the opportunity to understand and design for the needs of a real client group and to convey their design ideas through telecommunication technologies. Simultaneously, this project clearly embodied the Academy's pedagogical approach of using technology to link students and teachers with information, mentors, scholars, and peers to build a unique environment that improves and expands high school educational experiences. For both the Henry Ford Academy and MIT participants, this project successfully demonstrated the exciting potential of interweaving physical and virtual educational environments to nurture a culture of collaboration and a community of learning that exists far beyond the walls of each school.

The collaboration provided an opportunity for the MIT students to interact with clients in a real-life setting. The academy students, on the other hand, had the opportunity to test their own ideas about education and see how they might be realized in an architectural way. This pilot project successfully demonstrated the possibilities of creating a mutually beneficial partnership between industry and educational institutions..