WORKSHOP MATERIAL

Workshop Proposal for Conference on Participatory Design
Seattle, Washington, March 31-April 1, 1990

A Mega Workshop

Organizers: Kim Halskov Madsen plus a number of people to be discussed when we know which workshop we are going to do.

In Aarhus and its surrondings we have applied various kinds of workshops supporting differents aspects of participatory design. In this "Mega Workshop" we will demonstrate how the different kind of workshops may be combined. We will attempt to get as close as possible to a real design situation; for instance it would be fine I we, in advance, among the participants of the conference could find a group of people who actually wanted to design something.

A "Mega Workshop" could FOR INSTANCE be in the following three part:

METAPHOR BASED DESIGN: Metaphor may be used to stimulate fantasy about how computers may be used at a workplace. For instance a library may be seen as both a "warehouse" and a as "meeting place", giving rise to both quite different computer applications and quite different task for the staff at the library.

THE ORGANIZATIONAL GAME: (similar to what Pelle did in Skagen)

COOPERATIVE PROTOTYPING: see workshop proposal above

Each of the three parts would consist of a presentation of our experiences from previous workshops and a discussion of how it may be applied in the specific situation.

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The Scandinavian Model - fiction and reality

Organizers: Pelle Ehn and one or more of Joan Greenbaum, Susanne Bodker, Morten Kyng or others

There seems to exist a notion of a particular Scandinavian way of participatory design. This Scandinavian model (or are there many models) is deeply rooted in ideas of industrial democracy and active user participation in the design process. The idea with this workshop (or panel) is to give the participants a better understanding of state of art of the Scandinavian model - of visions, but also of short-comings in reality. The workshop will also discuss constraints and possibilities of implementing the Scandinavian model in the U.S. context - redesigning the model to be useful in redesigning the U.S. workplace.

The workshop/panel discussions are based on segments from two videotapes. The first one, "Computers in Context" (1986) is a video "selling" the Scandinavian model to an U.S. audience. The second one contains workshop situations from a conference on "Systems Development and Creativity" held in 1989 in Scandinavia. It highlights new methods and techniques for participative design, like future workshops, role playing, prototyping, simulations etc.

After the first video segments, "Computers in Context", there will be a first discussion (possibly in groups). It will be a fiction and reality discussion focusing on lost visions and problems in practice: what was really implemented, how representative are the examples, what can be learned from short-comings, what are the conditions for successful implementation, can this be done in the U.S. and/or how different is this from what is being done in the U.S., etc. Is industrial democracy at all an important aspect of participatory design?

After the second video segments, "Systems Development and Creativity", there will be a second discussion (possibly in groups). Rather than focusing on the "political" aspect of participatory design, this session concerns the boredom of systems development. Which tools and techniques can we use to make design more interesting, more engaging and more relevant, not to say more fun, for the participants? Are for example the use of future workshops, role playing, games and simulations a necessary development of the Scandinavian Model, or an academic distortion of the original democratic ideas of participatory design? Which are the conditions for creativity in participatory design, in Scandinavia and in the U.S. ? IsJcreativity at all an important aspect of participatory design?

This workshop/panel will be led by researchers who over the last fifteen years have taken an active role in the ideas and the reality of the Scandinavian Model.

PROPOSAL:

We propose to do a workshop -- one of a series we have been doing since October 1988 -- that explores the role of communications and the effects of media upon design activities. It is broken into two parts, an exercise and then reflective discussion on the exercise. The exercise has three (or four) groups play roles in the design process.

- Participants would break into small groups, physically located in different rooms.
- The groups would be software engineers, users with short term needs, users with long term needs, and (optionally), programmers responsible for system maintenance.
- Minimum group size is 4, max is 7; therefore, 12 is minimum workshop size, 28 is maximum.
- The group exercise would take at least 2 hours, although 3 is better. This would be followed by a 1 hour discussion/debriefing, for a total of 3 (or 4) hours.
- Each group would communicate to the others in order to complete the project which is the the design of a system.
- The communications between groups would be restricted to just a few media: face-to-face, written messages, and videotapes.

PREMISE:

The workshop s are part of our research to better understand communication within and between groups of participants involved with large, distributed projects. We view design as a social process. Successful designers establish and maintain a shared understanding of an emerging artifact. They accomplish this by communicating with each other. Designing with the users requires involving them in the communications among the other players in a design effort.

We view successful participatory design as requiring new ways of working, but needing to honor the methods and practices that have arisen over the years in software development and other design domains. Participatory design should not stigmatize either its participants or its products. Participatory design must not stand apart (like the way public housing is identifiably different from private housing); it must be an integrated, natural part of the design process.

The design process must include the communication tools already being employed in the design work; participatory design -- like other design approaches -- may be enhanced by including new communication media in everyday design practice.

ISSUES:

The workshop setting has proven to be an effective training ground for designers, using familiar and unfamiliar media to explore issues of relationships which are fundamental to understanding the design process:

- Mediated Communication -- How does the communication media impact the design process? Is it possible to have effective participation at any part of the process using any media? How do these mediated communications feel in various situations? How does a particular media shape design thinking? How does a group express its shared imagination?

- Power Relationships -- What are the underlying working relations like? How do they shape the communications in design? How do they alter the result? How are conflicting values and interests resolved?

- Fluid Nature of Roles. In active, close-knit design groups, the moment-to-moment roles of the participants are in flux. (Closely connected to the power relations issue, this is about how participants perceive themselves and take action within the group.) How do participants define themselves? What is meant by "expertise"?

- the "Incrementalness" of Design -- Decisions and interpretations accrete, but they do not follow a pre-ordained path to a product. Most of the interactions build a shared understanding of the problem/solution space. It occurs in little steps. What are legitimate actions within the context of a project? How fast should iterations happen? How do you do an iteration if there is ambiguous understanding?

- Tailorability -- Participatory design results in a greater number of people with notions about how the emerging artifact should be. Many have proposed that this enlarged community of invested people be used to arrive at a better (and ongoing) fit between product and use after the product has been delivered. Where does the responsibility for the success (or failure) of a design effort lie? How does the work environment interact with the work? How does it get changed to reflect the work?

BACKGROUND:

We are part of the Design/Use/Shared Spaces research area at Xerox Palo Alto Research Center. Our work has been a synthesis of the study of design methods and practices, and technologies to support design. We have developed a multi-media infrastructure called the Media Space in which we explore the interaction between media and work.

The projects that we do are concerned with participating constructively with others. The particular approach that we take is to introduce communications technologies (computing, audio, and video--media of all sorts) into the design world. How do these make design practice different? How do these create opportunities for improving design processes? How do they support designers working together in the messy, "political" process of design?

We have been approaching these questions in a series of case study projects that involve varying degrees of intervention in the project. Several years ago we did a small project that involved the design of servomechanisms. In that project we focused on providing computer-based tools to support activities that spanned electrical and mechanical engineering. In the course of that project we discovered that computer-based tools were fundamentally ineffective at spanning the communications and cultural gap of these two design domains. Following that, we came to believe that video offered more possibilities for bringing people together and supporting the negotiated nature of groups work.

We then did an experiment that simulated distributed architectural design practice that uses recorded and real-time video. Three designers worked together (and with their client) without being in the same room. They met each other through edited videotaped interviews; they worked intensively together in separate locations connected by real-time video and electronic mail; they relied on a videodisc library to explore background information and related images; and they used recordings of their design activity to provide the rationale in their presentation to a client. [1] More recently we have done a project that involved providing video services to a project whose participants were designers and developers of xerographic technology. The project dealt with processes and machines that are extremely complicated, and the effort involved a large number of people with specialized knowledge and different roles. The novel use of video in this project sought to facilitate and support the social process of design by providing ways for participants to interact.

The tentative results from our case study projects were augmented by our workshop experience. Besides providing a training ground for designers, they are a testbed for collaborative methods and technologies. In our previous workshops, the participants simulated a design process by playing the roles of a company's marketing, engineering, and manufacturing divisions, and were limited to individual face-to-face discussions (emissaries), written and drawn messages (FAX), videotapes, and real-time shared drawing.

In addition to developing an understanding of design process in a number of domains, we have begun to have some understanding of the impact of media upon work life. We have seen:

- that paper (forms, memos, etc.) enables bureaucratic organization, "specialization", and depersonalized relationships;
- that personal computing empowered individuals (to do more analysis, for example), at the expense of the organization;
- that face-to-face experiences are negotiated; and
- that video with its "you-can-be-anywhere-and-everywhere,-and-therefore-nowhere-in-particular" quality both delivers experience and objectifies experience. [2]

We then bring this back into design, looking for technological opportunities to improve design communications.

[1] Weber, K. & Minneman, S. "THE OFFICE DESIGN PROJECT" (a videotape). Xerox Corporation. Palo Alto. 1987.

[2] Stults, R. "Experimental Uses of Video to Support Design Activities". Xerox Corporation. Palo Alto. 1989.

AUTHORS:

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Beginning in 1985, at PARC, he has explored the nature of the design process and the potential for audio/video/computing systems to support the design process in a variety of domains (mechanical engineering, architecture, and the arts), resulting in the development of the concept of Media Space. From 1974 to 1985, as developer and (ultimately) manager of computer systems for Skidmore, Owings, and Merrill (San Francisco), he brought the firm into a leadership position in CADD, facilities planning, facilities management, project management and other computer-based systems within the architectural profession. He has worked on the participatory design of transit services for Marin County and administrative facilities for Pacific Bell. In the latter capacity, he developed an information system to document the evolving programmatic image of a large (8,000 employee/2,000,000 sq ft.) administrative building.

The inadequacies of computational representation led Steve to co-develop the Media Space at Xerox PARC. It is a multi-media (video/audio/computing) environment.

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Scott Minneman joined the Design and Media Spaces Area at Xerox Palo Alto Research Center in 1987 to study the practice of engineering design and the impact of video and computing technologies on that activity. From 1983 to 1986, as a researcher and project manager at the Rehabilitation Engineering Center at Tufts New England Medical Center, he worked on a variety of projects to design, develop, fabricate, and deploy technologies to aid physically and cognitively disabled people.

His ongoing doctoral work, at the Center for Design Research in the Mechanical Engineering Department at Stanford University, focuses on understanding and improving the communications within and among design groups collaborating on large engineering projects.

The Media Space:
a research project into the use of video as a design medium

by Steve Harrison and Scott Minneman
a technical report of the Xerox Palo Alto Research Center

We seek to improve design processes by enabling better communications within the design process.

The communication needs of designers are increasing as their projects become more complex and design teams become distributed; the communications solutions available to designers may have profound changes on the way design is practiced.

We believe that design is a social activity—the interactions of individuals within groups and the relation of groups to one another. Another way we express this point of view is to say design is the social construction of a technical reality.

Video—unlike text, drawings, and computing—delivers the experience of being and working together. It can take you *somewhere* else and *somewhen* else.

We have developed a collection of prototype electronic environments to enhance communications between designers. These workplaces are called "Media Spaces"—environments that support both real-time connection and the creation and management of video documents. Media Spaces are made of audio, video, and computing systems that connect designers across time and space.

We use these environments as the settings for case studies of existing practice in a variety of design domains. The analysis of these studies yields some insights into the nature of communications and documentation in design, in particular about the relation of public and private behavior in design.

Motivation

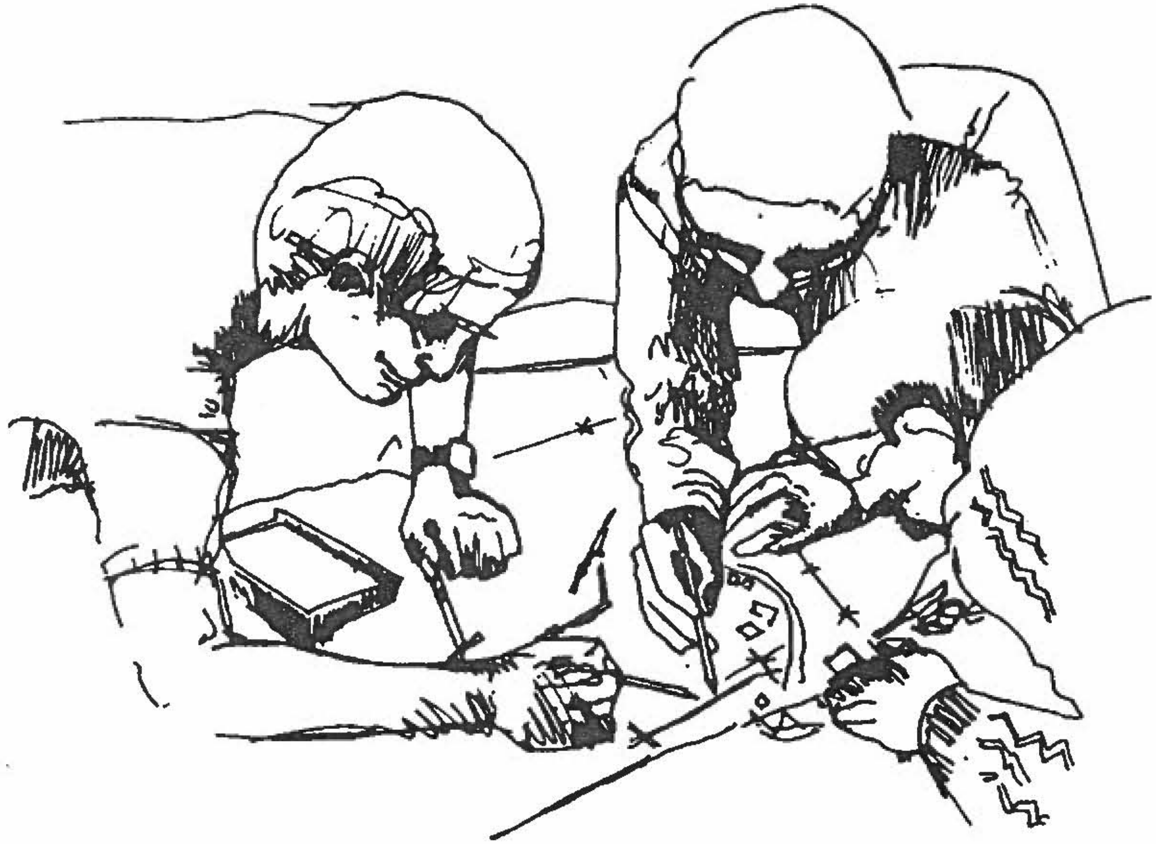
The study is motivated by two observations:

Observation One: design is a social activity, carried out among people working in a group.

This is most visible in the architecture of the drafting room; the continuous open space, the piles of drawings for all to see and share, and the work culture continuously promoting an awareness of the activity of design team members and the progress of the project. Usually, work goes on separately, designers drawing at their drafting tables. But it is open work, available for kibitzing or impromptu review and explanation. The people share the space and are part of the "team".

But not everyone works in the drafting room. What happens to design when people become cut off from each other by walls, miles, or time zones? How can designers work with other designers, with consulting engineers, their clients, or contractors without being present? Design activities become discontinuous—fragmented by meetings, telephone calls, and presentations made across town (or half-way around the world). Frequently, this results in bureaucratization of process that stifles creative activity. The distances and discontinuities are increasing as we build more complex artifacts that are further removed from the offices of designers, clients, manufacturers, and suppliers.

Question One: How can we do design at a distance?



The social nature of design is seldom so clear as when designers are hunched together over sheets of yellow tracing paper. While this scene is common in small design projects, opportunity for this kind of interaction is rare in larger and more complex projects.

Observation Two: video will soon become a pervasive part of the communications network and more integrated into everyday office practice.

In trying to find a technological answer to the question posed from observation one, we explored existing uses and upcoming changes in telecommunications technology. Signs of this change are already visible:

- Phone companies and cable television networks are beginning to install fiber optic wiring and advanced switching services that can handle some kinds of video.
- Video and computing equipment are colliding into what is emerging as "desk-top video". Video equipment continues to get smaller, faster, and cheaper with more functionality. (Note the explosive development of VCRs.) Business equipment is getting "smarter" and more ubiquitous. Single person design offices can now afford a computer, even one used for CAD. Already, inexpensive pc's are combined with vcr's to create limited-distribution promotional videos.
- Teleconferencing, once the province of Fortune 500 companies, is rapidly getting more affordable. The technology for compressing a full-motion video signal is continually moving forward–sending better quality images over less-expensive lines. Instead of requiring special-purpose teleconferencing rooms, the equipment is compact enough to be put in any meeting room. Various compression technologies (such as DVI) are even beginning to show up as single chips that will be integrated into other equipment.
- Video is becoming more legitimate in the workplace. Video-based training systems are used in many large institutions to bring "reality" to instruction. Some companies distribute videotape annual reports, and management reports to far-flung employees now come as slickly-produced tapes.

What will design be like when video communication networks are as pervasive as the phone system? What form will change orders take if editing video recordings becomes as easy as word processing? What will the relation between clients, consultants, contractors, and designers be if they all appear to each other to be working together in one large studio created by video technology? Will the experience of designing change?

Question Two: How will design practice change as result of these new technologies?

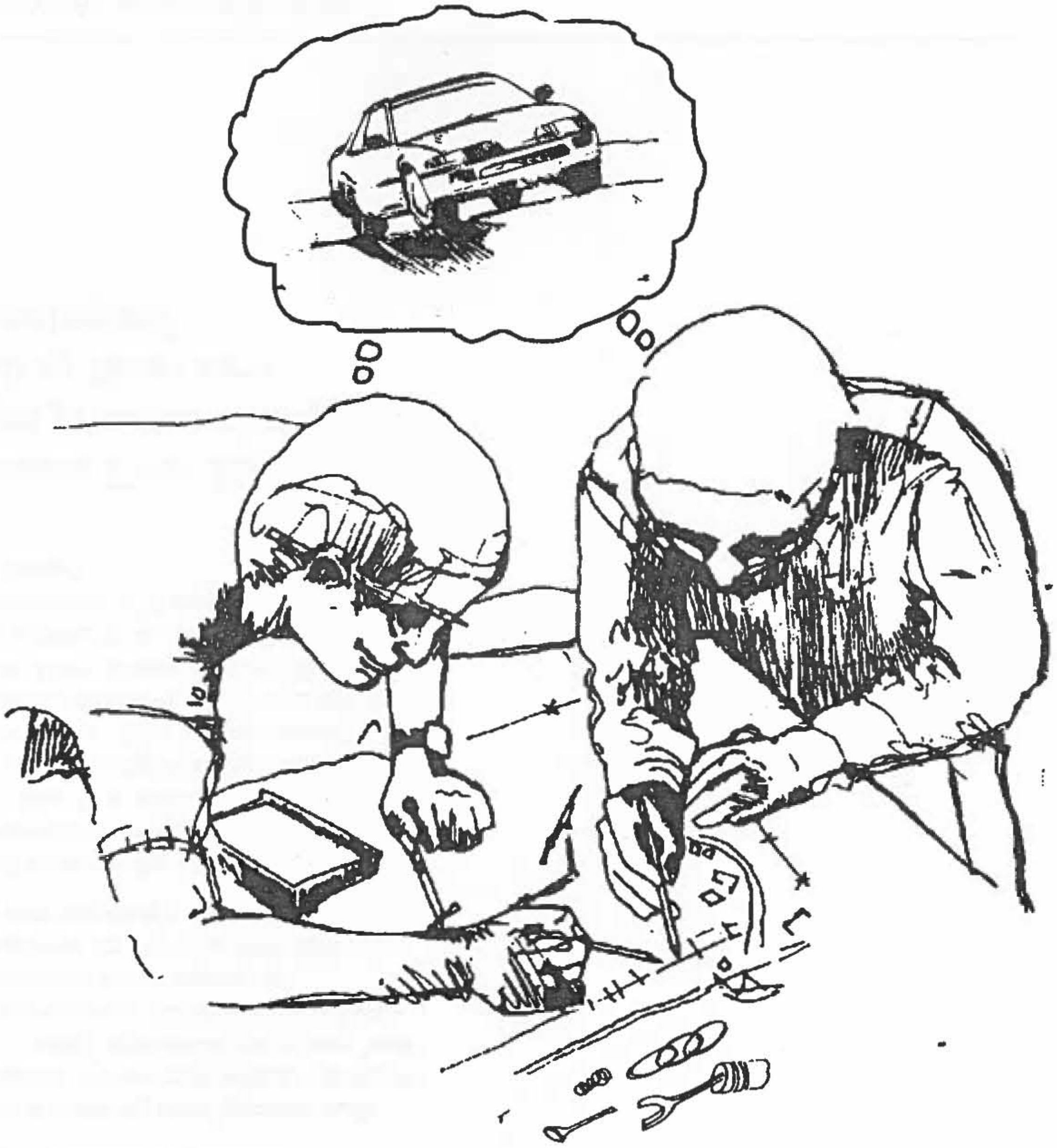
Design

Our first observation is that design is fundamentally a social activity. The purpose and effect of this social activity is to establish and maintain a shared understanding among the participants. The communications between designers manifest the development of this understanding. Focusing on design as communication, rather than information processing or problem solving, has profound effects on both how to view design process and how design will change as communications technology changes. [1]

To answer the question of how design will change, we need a description of the social nature of design. By its nature, social process is messy and active, constantly evolving, interactive, and ill-defined. However, it can be characterized by a few phenomena. These phenomena are well served by the video medium.

Experience

To use objects is to experience them, so design is the creation of experiences. The creation of the experiences is done indirectly and suggestively, but almost always in visual and tactile terms. The confusion of the image with the thing itself is very powerful and is a fundamental tool in the creative repertoire of design. The experience of creating that experience — of constructing the intersection of dreams and reality — is done through drawings or models. It is through the images that we get back to the experience or try to convey some sense of it to others. So too with design process: video images of design activities



The unstructured activities of sketching and talking together help create a shared understanding among participants.

can afford us the immediate experience of the design process, regardless of time and space.

Ambiguous Communications

A critical component of creative interplay comes from ambiguous communications. Creating something new requires an ambiguous set of perceptions—otherwise only the previously understood comes into being. Pinning things down early in a design process runs counter to innovation at later stages. It squeezes out the element of surprise and restricts alternate interpretations. Design works in the tension between explicitness and implicitness; therefore, ambiguity is a common and healthy characteristic of communications in a design group.

Two kinds of ambiguous communications are fruitful: confusion between the symbol and its object, and multiple meanings for the same symbol. Ambiguity and misunderstanding lead to a colorful, exciting world. Any complete model of a design process must be capable of reflecting the uncertain, fanciful, and ambiguous states of our minds. Video is a transparent medium conveying the implicitness of nuance, gesture, and presence. [2,3]

Negotiation as Modus Operandi

The members of a design group represent various interests, and in the course of designing, they confer with each other to reconcile their interests. In this sense, designing can be understood as negotiation. In the early stages of a project, negotiation frequently involves decisions that affect the scope or direction of the work. In the later stages of a design project, participants usually are more aligned and the negotiation addresses details. Observation of designers in action reveals that virtually everything about a design problem is negotiable. Video is well suited to the sorts of interactions found in most free-wheeling negotiations. [3,4,5]

Enrollment of Participants

This research is aimed at the typical medium size design consultancy. Even the "individual designer" collaborates at various phases of a project with engineering consultants, clients, and suppliers. At various times throughout a project these participants function as a group.

Participants become part of a group and must maintain working relations within it. They do this by "buying into" the goals of a project. Enrollment has a quality of ownership, a personal investment in the emerging artifact. This personal investment results in each participant wanting the artifact to reflect the results of their negotiations. From our work, we have seen how people can act as belonging to a group through both real-time and recorded video interactions. [4,5]

The Failure of Computing

Computers have been promoted as a tool for doing design at a distance. After working with computers for many years, it has been our experience that computers poorly serve the social processes of design, and therefore lack the essential capability to serve a distributed group. CAD is a very useful documentation tool, but it has not proven itself equally useful as an open-ended design tool for architects. The visual and dynamic nature of design makes it particularly unsuited to textual or computational representation. The computational environment—like its progenitor, text— generally eliminates multiple meanings. In doing so, it creates a static set of ideas that leave little latitude for expression and interpretation.

This same requirement for precise specification also makes CAD hard to work on together. It works best when most rigorously structured along the functional lines of the design organization (body shop, electrical, mechanical, and assembly), and the conceptual hierarchy of the object (modules, assemblies, and parts). Within each one of these layers, only one person can "drive" at a time, preventing simultaneous interaction between designers on the same object. This partitioning also blocks access to the gestalt of a design — it must always be seen as the sum of its constituents. Losing the gestalt, in turn, blocks shared understanding and further distances designers from the project and each other.

Computers also fail designers because communications through them are unrealistically bureaucratic. The cost of the seemingly infinite malleability of computing is regimented compartmentalization. To make effective use of computers, the communications must reflect the same compartmentalization. The collective activity of design cannot be experienced through computers; things cannot be said ambiguously through computers; positions cannot be negotiated through computers; and people remain estranged from, not engaged with, the group through computers. The fluid and shifting relationships between people that are so clear when pencils and hands dart across sketches are lost on PERT charts and CAD drawings.

The Promise of Video

One answer to the first question, "How can we do design at a distance?" is video. It can change the nature of work by:

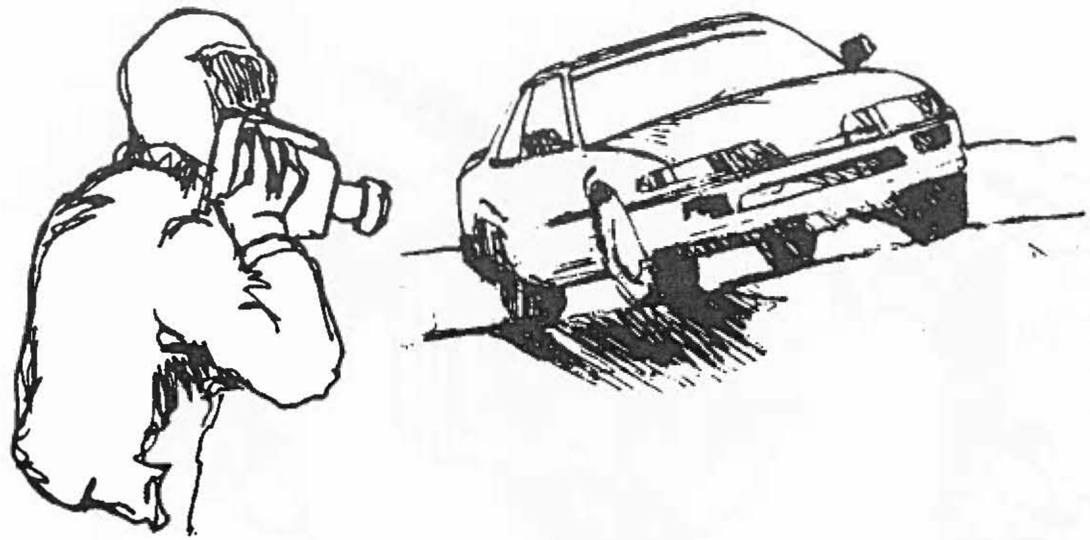
- connecting across space. People and places can be brought into the design studio enlarging it to the limits of the electronic network.
- connecting across time. People who must be in two places at once can be brought into the design studio through recording. Events can be re-experienced.

Some Current Uses of Video

A survey of current uses in the profession today reveals that the properties of video have not gone un-noticed in the profession; video has already found a place as a documentation and presentation tool. Almost all of this is the result of availability of high-quality portable recorders ("camcorders") that permit designers to "do it themselves". They can:

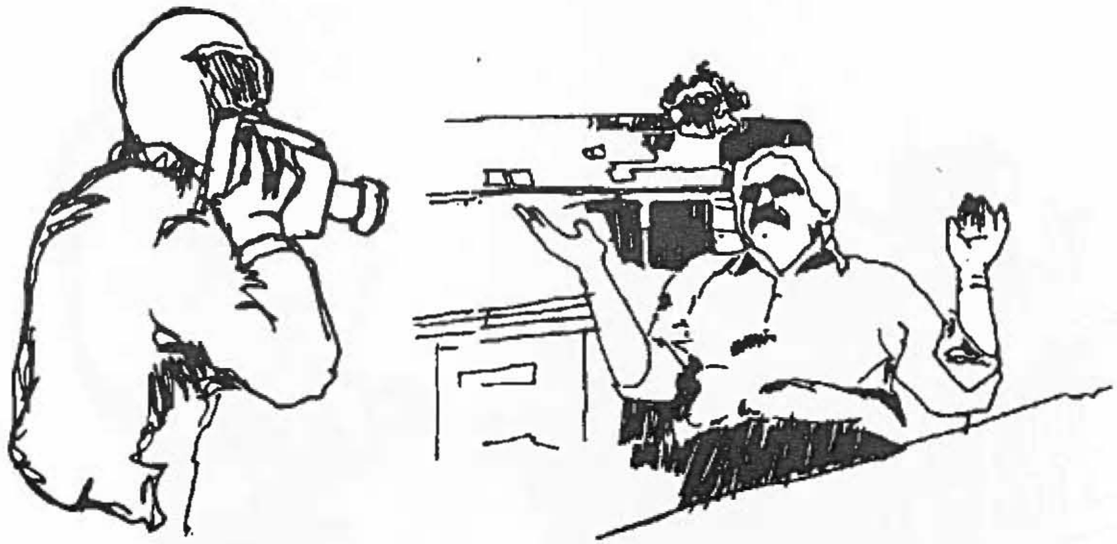
Document Existing Conditions

Especially useful for modifications to existing products, video can show the reality of actual product performance. It can take back to the office the the play of sunlight across a well-finished contour or wheels that unnervingly leave the ground. Designers can use these records as a jumping off point in their work, rather than making up how real products behave in the real world.



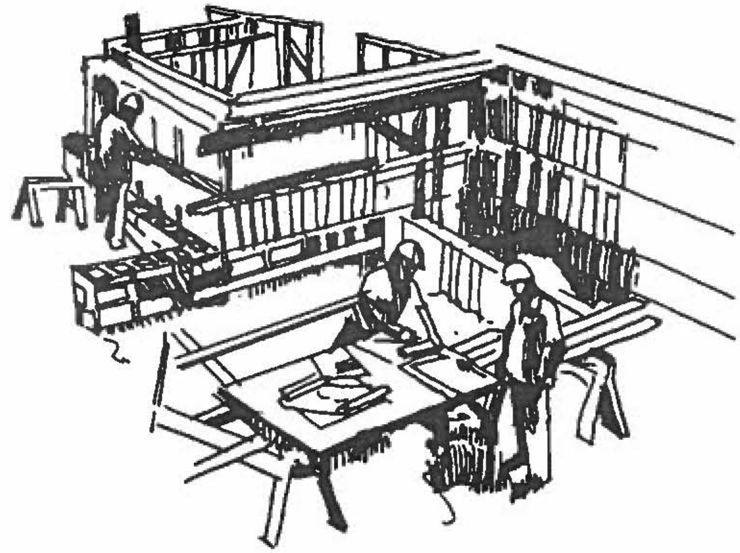
Survey Users

As a data collection tool, video may used to show how people work and live. Usually, this data is then distilled as part of the analysis and is not delivered as part of the final report. Most of this use has been to collect documentation on special cases, where access is otherwise restricted, such as in-field focus groups. Not only does it provide user input "on their own turf", it also delivers the context of their comments. It can even provide a detailed, visceral record of how people use existing artifacts.



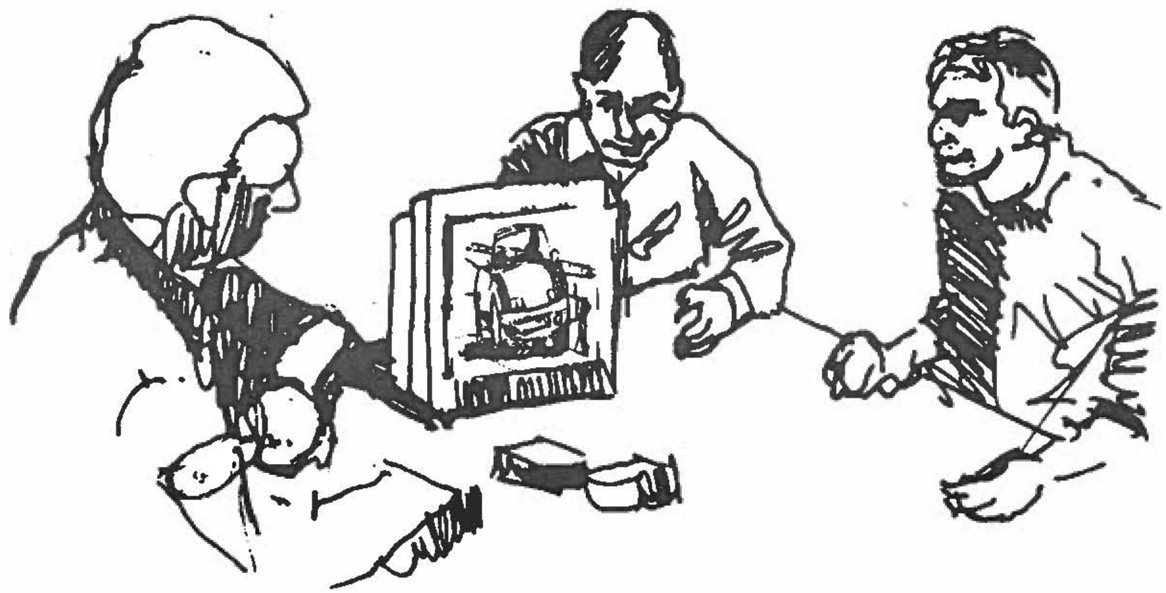
Document the Manufacturing Process

Using video to observe the manufacturing process can preserve techniques and skills that may be integral to the qualities of the finished product. This record is useful for coordinating design intent with final product, for improving manufacturing processes, and for educating designers. The major limitation in this use has been the potential to upset the often-fragile working relations at the manufacturing site.



Project Presentations

One last use, presentation and promotion, is commonly employed by design professionals. However, the technology has generally not been under the control of designers directly, but instead turned over to video professionals who bring the persuasive illusory power of video to create slick client presentations and video "brochures". High production values, derived from broadcast and advertising, require high capital investments and special skills.



Some Future Uses of Video

We can already see some of the first uses of the next generation of technology (videodisc and hypertext systems, desktop tape editing stations, and inexpensive "smart" VCRs and TVs) and its impact on design. The next generation will include:

- product literature libraries. Using robust hypermedia systems, product literature would be available that showed form, function, and maintenance that is cross-referencd and automatically updated. It would be possible to answer the question, "What is it like to use this valve?"
- simulate the experience of environments. Combining drawings, models, computer graphics, personal presentation, and libraries of images, video could provide for more convincing environmental simulations.
- document the design process and connect participants. This has been the main focus of our research and development efforts creating a prototype distributed design environment called the Media Space.

The Media Space

So, what will practice be like when there is a ubiquitous video environment? To explore that question, we built a demonstration design environment which we call "Media Space". We use it everyday as part of our work space and as the test bed for our studies of design communications.

What is a Media Space?

It is a system that integrates video, audio, and computer technologies, allowing individuals and groups to create environments that span physically and temporally disjoint places, events, and realities. It is also a way of working—of being "media aware"—that brings the illusionary power of media into everyday work.

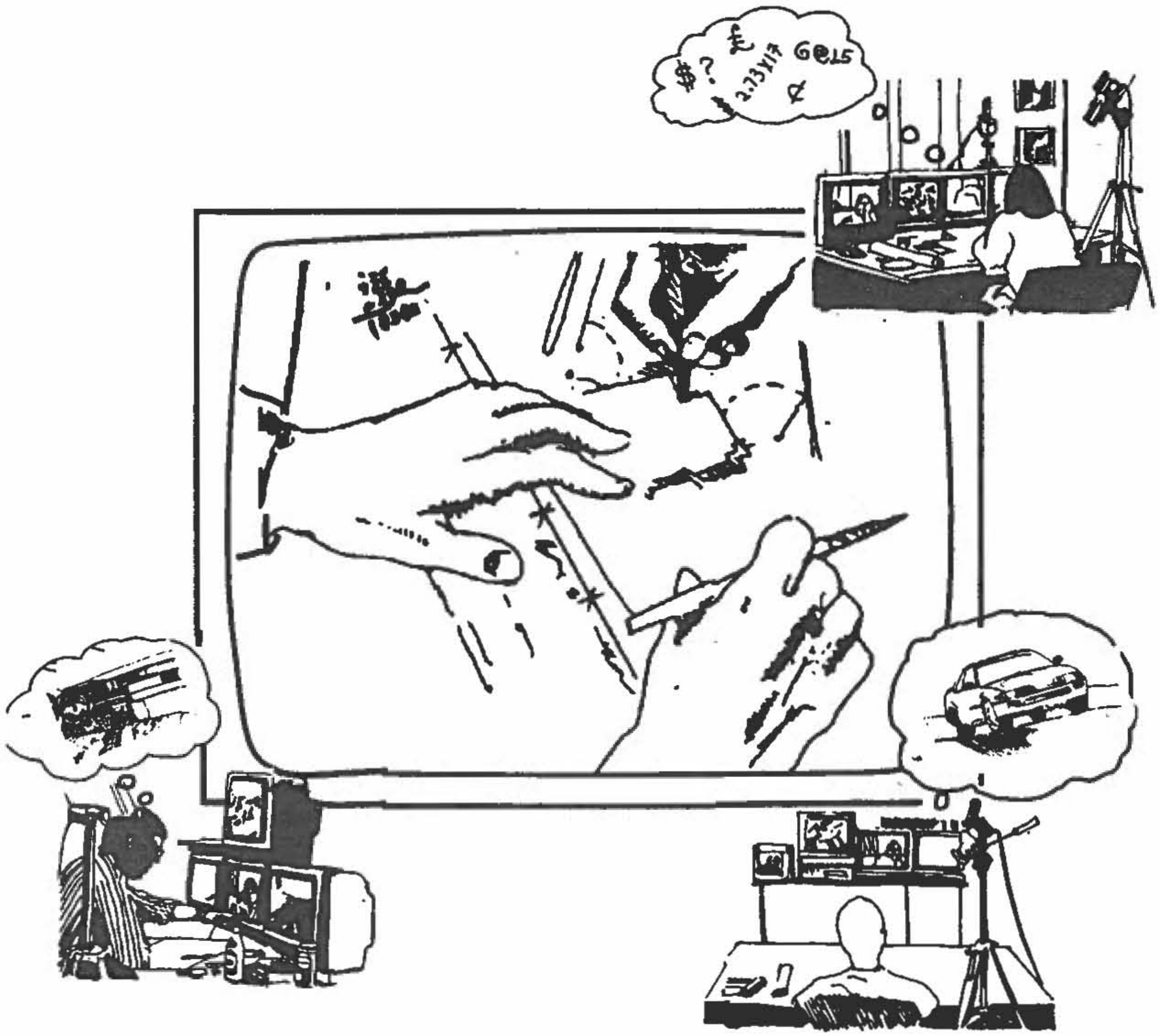
No, Really, What is a Media Space?

In a physical sense, cameras and monitors are placed near drafting tables, desks, conference tables, CAD stations, diazo printers, and coffee pots—wherever people gather at work. The cameras and monitors are linked to each other and to recorders and videodisc players that provide a library of interactions that can be retrieved as an integral part of routine work. These local area audio and video networks can be connected together in remote point-to-point configurations. Subsets of the larger group can then connect themselves together to form project teams that are in the same virtual room or out to a remote location like a job site.

The video can be used as an open window from one space to another and, by using recordings (both videotape and videodisc), from one time to another. Instead of physically relocating, virtual groups can be formed by reconfiguring the electronic connections between offices. Video images keep the participants in touch with others who are absent—temporally, physically, or both. Media Space defies walls and clocks.

Coordination of the connections is accomplished using the networks of computers that are already in the workplace for word processing, accounting, project management, and CAD. In addition to controlling access to devices, they are used to organize the video records of the design activity, index and access the recorded material being collected and viewed, collect data about how the material is accessed, and provide groups with the ability to mark their activity (flagging places in their process they or others might want to revisit).

Combining recording and real-time connection has a great systemic synergy: adding a recording capability to real-time connection is cheap and provides a useful journalling service to users, and having retrievable recording makes real-time connection much more than a "picturephone". For example, we frequently use this facility in our everyday work to record meetings that someone else might have a peripheral interest in. By watching snippets of the recordings, the absent individual can stay appraised of an activity without a big time investment. [6]



Case Studies

What happens when designers actually work in a Media Space? We study actual design projects set in the Media Space, openly intervening in their communications. The methodology is a kind of participatory observation. The means of communication are visible to the participants and under their control. For example, wherever possible, the participants are responsible for pointing their own cameras. Recordings of the actual communications form the basis of the research data. The case studies and technological explorations are closely coupled, each informing the direction and scope of the other.

These case studies, along with other ones of designers in different disciplines, have been reported in more detail elsewhere.

House Addition Design Project

A small architectural design project was tracked from conception through building occupancy using video to record the project. The recordings depict aspects of a design process that are nearly invisible in computation-based records and demonstrate the possibility for using video to provide connection within a design group. Designers and client used video recordings to track design decisions made in their absence. [7]

The Office Design Project

Using the Media Space to simulate regionally distributed offices, we had three architects collaborate on a design project. Using video, the architects worked the design to completion without meeting face-to-face. [4]

Careful consideration was given to simulate a real design project. The designers were given a program by a client. Developing the design in a two-day charrette, the project, a conceptual design for a new kind of office, was then presented to the client.

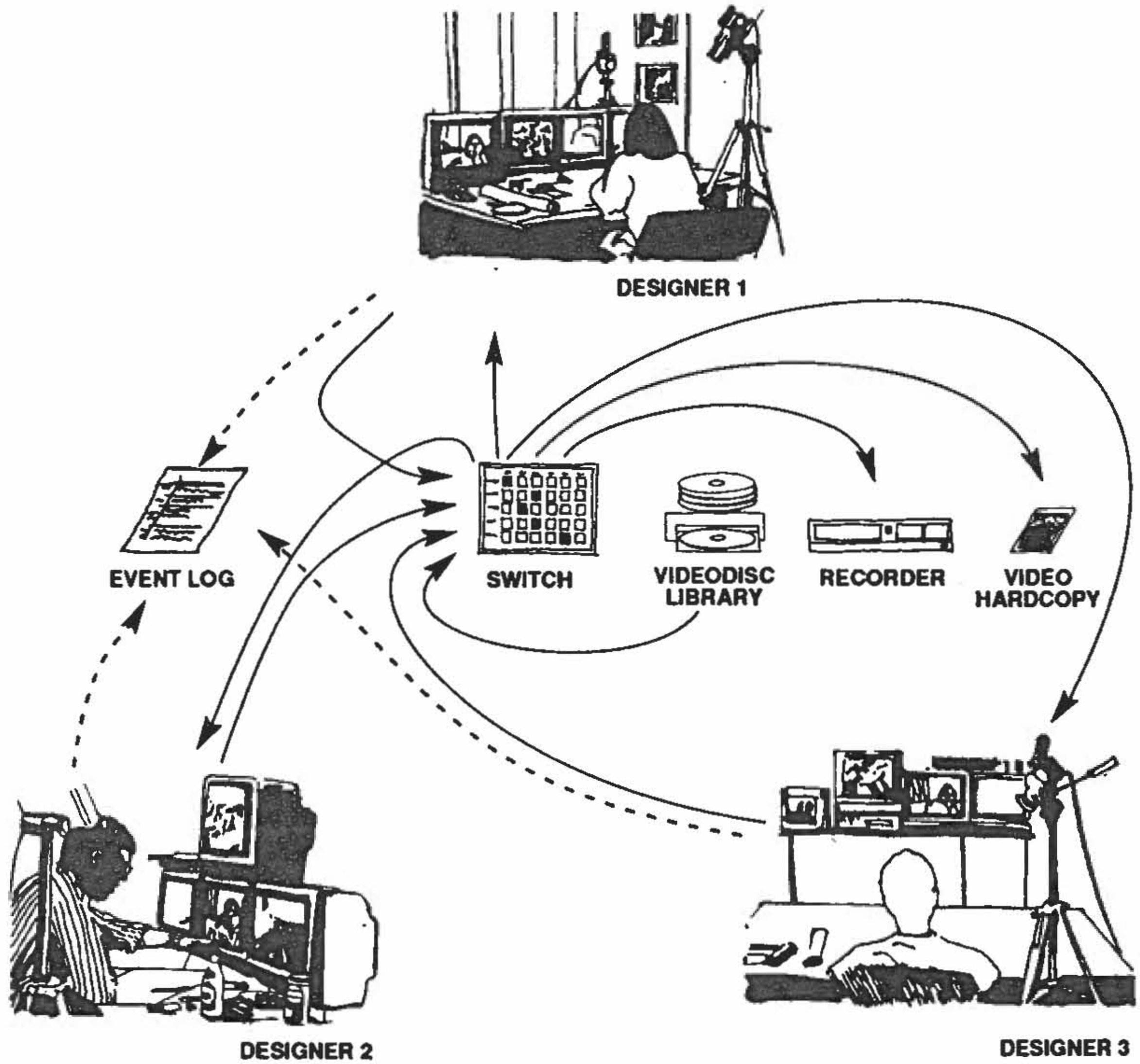
The program, the introductions of participants to each other, and the presentation by the designers to their client were delivered through videotapes and videodiscs. The Media Space provided live video connection during the charrette so they could talk and draw together from their separate offices. Besides simulating a high-bandwidth connection between the architects' offices, it provided a shared videodisc library of their reference material, paper prints of the real-time and video disc images, and recordings of all their interactions. The recordings of the deliberations in the charrette were edited to form the core of their presentation to their client.

The three designers were able to design effectively in this electronic workplace and they felt the artifact that they designed was constructively influenced by working in a video-based environment. A few phenomena of note were:

- when the designers started the charrette, they behaved as though they knew one another, having become acquainted with each other only through videotaped interviews;

- the designers learned to operate in Media Space without much training;
- the designers were focused on the design task while working in the Media Space;
- design history became design rationale—the design was described to the client in terms of the process of its creation by showing videotapes from the charrette in their presentation;
- the client became engaged with the experience of the design process through videotape replay; and
- the designers expressed some preference for electronically mediated relations over face-to-face relations since it permitted them to draw together from the privacy and convenience of their own drafting table and to be visible and active in the group while working privately.

Three particular qualities of a Media Space were observed that create and sustain social relationships in a design group: extended awareness of other members of the group, image-based familiarity, and the representation of process. [5]



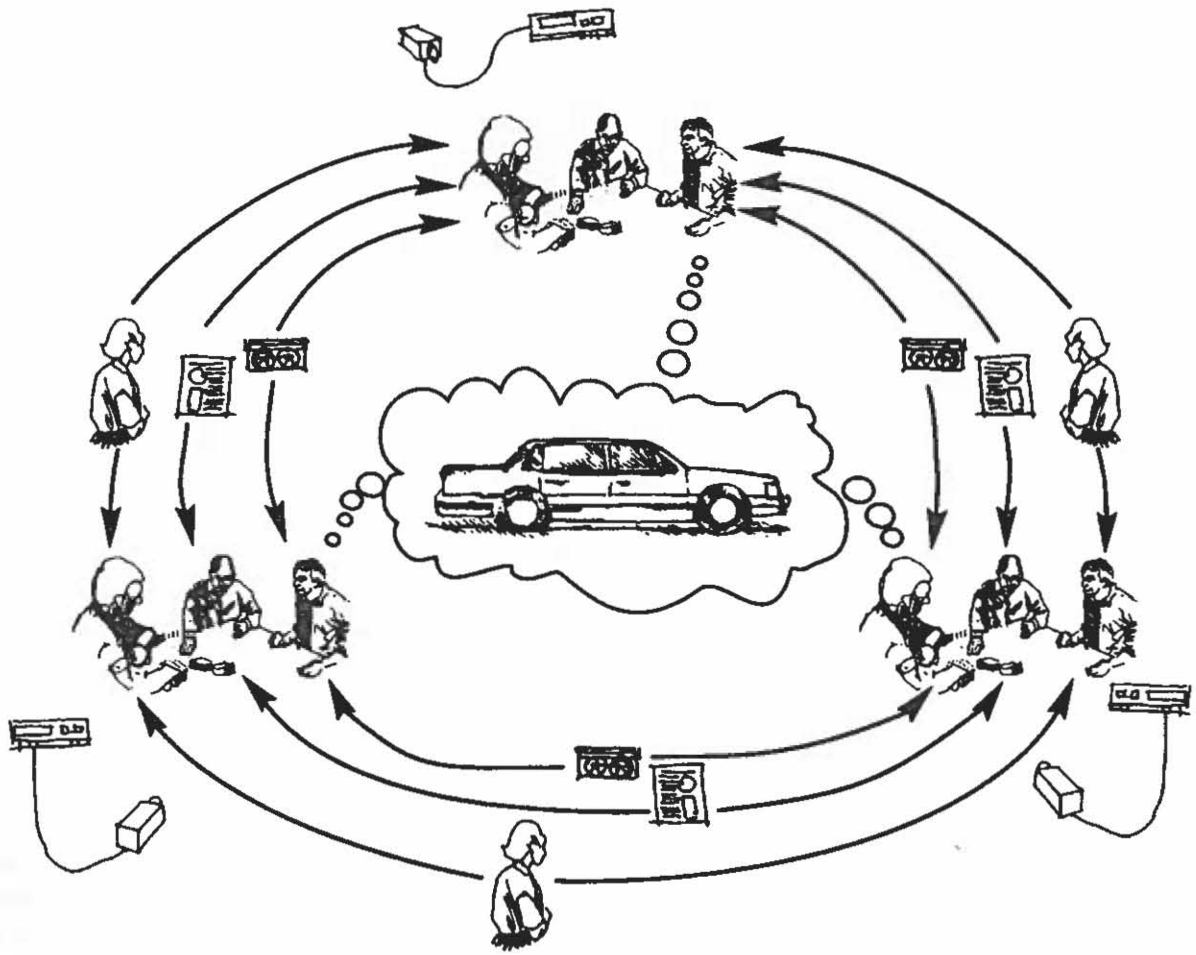
In this charrette, three architects work together in separate locations, meeting only through video. The Media Space also provides a shared library of video scenes, a log of events to aid in retrieving recordings, and hardcopy images. The recordings of the work are both a journal that they use in their design work and one that we use in our design research.

Design Communications Workshops

A series of workshops with industrial engineering and designers explored issues surrounding training of designers to make effective use of media in complex work group settings. The workshop simulated the product planning process within a manufacturing company with the participants playing roles in the company's marketing, engineering, and manufacturing divisions. Each division had to communicate with the other two, resolving ambiguous project roles and goals, and negotiating design decisions.

The workshop focused on the use of video to support the interactions within and among the company's divisions. As with the Office Design Video Project, the communications between the designers were carefully structured and the effects identified. The study investigated the way small groups of designers behaved when working together, and the suitability of video to substitute for the physical setting for that behavior.

The groups sent video "memos" to each other. They were quickly made using camcorders and vcr's. The memos conveyed some sense of the degree of agreement on various points and overall intention within a group. Groups began to get a sense of all the members of the project and understand how they "fit" within the development of it. Video memos also allowed distant designers to "get inside" and point at specific problems they were having; they could show what was wrong and how they proposed to solve it by pointing and talking, just as if they had brought the machinery into the design studio.



Groups of designers play the roles of Marketing, Manufacturing, and Engineering in a small manufacturing business. Over the course of an afternoon, the groups must interact in order to complete their assigned tasks. They communicate by sending an emissary, written or drawn messages, or videotape recordings to each other. Each group also prepares and circulates a videotape status report at hourly intervals.

Control of the communications technology was vital to the functioning of the groups and to individual effectiveness within a group. Some participants preferred to remain "off-camera", but found that they could positively change their relations within the group if they could control the "story" that emerged by being responsible for pointing the camera and selecting images. In addition, some participants became aware of the effect of their own appearance, speech, and other forms of personal presence on the interactions in design development. The workshops helped train them in skills of effective presence and distribution of their working image. [8]

Observations About Video as a Medium for Design

The Media Space is more than the technology. It is a way of working using electronic technology to warp time and space, to bring the illusions of film, radio, and television into everyday work settings. It is believing that an emphasis on communications will extend the common experience of the group, thereby improving both the process of design and the design of buildings. The research suggests that video can:

- document the design process. By recording design activities and indexing the recordings in coordination with the development of the design, a usable design history can be kept that maintains design rationale.
- connect participants. Project teams can be sustained over distances and across organizational lines through live video images. Designers, clients, consultants, and contractors can work in an extended design studio for the duration of a project through the use of cameras and monitors.

In addition to formulating specific technology development recommendations, the research has uncovered some particular observations about video in design:

- The medium retains many of the vital qualities of face-to-face interaction (ambiguity, negotiation, visual communication) that are lacking in computers.
- The necessary facility to both use and act effectively in video can be acquired quickly by designers and integrated into work practice.
- The use of real-time video connection can result in an intense task focus.
- Some people resist being recorded on video and do not cooperate in its use; of these, some lose their resistance if they see that video is under their control and can serve them. This may require development of additional skills.

The effect of all this is that backstage is brought onstage. Video tends to diminish the distinction between public and private. By making it more convenient to capture and replay casual elements of design activity to improve design process, formerly private activity is given public display. Standard forms of interpersonal relations change when the answer to "Why is this so?" is a video recording of the design process. The significance of individual roles diminish with a concommitant rise in the importance of being part of the action. [9]

As a process representation, video carries the content of the work process, references to the design documents and other artifacts (at times becoming an artifact itself), and the social process between the designers. In video form, all these separate kinds of actions are represented together without distinction, in marked contrast with the highly regimented symbolic representations of computerized project management systems.

If this vision of the design practice comes to be, then the nature of design documents, manufcturing observation, project participation, and the relations with other designers will be changed. The settings and rituals of design will change. The issue is message of the medium—the medium's effect on individuals and the way they work together. [10,11]

Ideally, the preceding should have been presented in video form, but the submission requirements dictated printed text. The experience of the video itself would have conveyed the force of the arguments we're making in a direct visceral way that the process of reading ultimately cannot.

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PROPOSAL FOR A HALF-DAY WORKSHOP FOR "CONFERENCE ON PARTICIPATORY DESIGN"

Integrated, Domain-Oriented Knowledge-Based Design Environments: Conceptual Frameworks and Innnovative System Designs for Participatory Design

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Anders Morch,
NYNEX, White Plains

Abstract

The workshop will address specifically issues related to: informing the user, critiquing, argumentation, high-level participant-oriented abstractions, and end-user modifiability.

Our Qualifications

All of us have been involved in developing conceptual frameworks and innovative systems in support of participatory design. We have built integrated, domain-oriented knowledge-based design environments in a number of different domains:

- JANUS -- a system which supports architectural design
- FRAMER -- a system which supports user interface design
- COBOL-CRITIC -- a system which supports the development of COBOL programs
- LISP-CRITIC -- a system which supports the incremental improvement of LISP programs

User participation has been a guiding principle in these system building efforts in the following ways:

- Our systems are built not as traditional expert systems (potentially de-skilling users) but as cooperative problem solving systems amplifying human problem solving capabilities.
- Our systems try to support human problem-domain communication, allowing domain experts to work directly with the system in a world which is built around their conceptual view.
- Our systems are built as critiquing systems, in which users set the goals (as opposed to tutoring systems which are system controlled).
- Our systems integrate a construction component and an argumentation component; the argumentation can be challenged at any time by users.

- Domain experts participated in the design of the systems and in their evaluation.
- Our systems support end-user modifiability, extending the control of users beyond the original design time to the whole life time of a system.
- We have cooperated with a leading architectural firm (Hoover, Berg, & Desmond, Denver) and discussed the process of participatory design in their work environment.

Representative publications by our group:

G. Fischer, R. McCall, A. Morch (1989), *Design Environments for Constructive and Argumentative Design*, CHI'89 Conference Proceedings, ACM, New York.

G. Fischer, R. McCall, A. Morch (1989), *JANUS: Integrating Hypertext with a Knowledge-Based Design Environment*, Proceedings of Hypertext'89, ACM, New York.

G. Fischer, A. Lemke, T. Mastaglio, A. Morch (1990), *Using Critics to Empower Users*, CHI'90 Conference Proceedings, ACM, New York.

G. Fischer, A. Girgensohn (1990), *End-User Modifiability in Design Environments*, CHI'90 Conference Proceedings, ACM, New York.

G. Fischer, A. Lemke (1988), *Construction Kits and Design Environments: Steps Toward Human Problem-Domain Communication*, Human Computer Interaction, 3(3), pp. 179-222.

Proposed Structure for Workshop

We envision the following structure for the workshop:

- We would give an overview over our systems and the conceptual framework behind them in order to provide "objects-to-think-with" for the discussion.
- we would raise a set of general issues (see below) to be discussed among the participants.

General Issues

- What are the roles for participating users in design?
  - critique designer's proposals
  - contribute solution proposals
  - describe their needs
  - describe situation/ processes/ constraints
- How can we support the user in playing these roles?
- What are the roles of the professional designer?
  - point out issues
  - generalized procedural/methodological knowledge
  - specific technical knowledge
- In what areas is the *user* in a better position to make decisions than the *designer*?
- In what areas is the *designer* in a better position to make decisions than the *user*?
- Should the users be given what they say they need?
- What causes participatory design to fail?
- What is necessary for participatory to succeed?
  - rapid prototyping - design by trial and error?

- educating the user?

- What are the success stories in participatory design? What can we learn from them?

Specific Issues to be Addressed in the Proposed Workshop

The workshop will address specifically issues related to: informing the user, critiquing, argumentation, high-level participant-oriented abstractions, and end-user modifiability.

Showing unanticipated consequences of design decisions (making the situation "talk back"):

- What technologies can educate the user while leaving the user in control?
- How can users be helped to see the consequences of design decisions? How can we make the construction situation talk back? What software technologies can achieve this goal?
- How can simulation, walk-throughs, gaming (what-if games) serve this purpose?

Critiquing:

- How do critics facilitate informed participation?
- What is the difference between computerized and human critics?
- What are the potentials and limitations of computer-based critics?
- Can critics cope better than expert systems with the incompleteness of the background knowledge for any realistic situation?

Argumentation

- When do Issue-based Information Systems (IBIS) succeed/fail?

High-level participant-oriented abstractions:

- How can we guide the user's own explorations?
- Can design environments, with high-level participant-oriented abstractions built-in, help the user contribute their solutions to the design process?
- Can design environments turn breakdowns into opportunities for learning new knowledge?

End-User modifiability:

- What design issues should be left for the user to decide after the project is completed by building an adaptable system?
- Does end-user modifiability decentralize control, support evolution, allow users to tailor systems to their needs and extend participatory design beyond design time?

If you need further information, do not hesitate to contact us.

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CONFERENCE ON PARTICIPATORY DESIGN, PDC'90, SEATTLE, WA, MARCH 31ST AND APRIL 1ST, 1990

Conceptual Frameworks and Innovative System Designs for Participatory Design

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Abstract

One of the basic assumption behind participatory design is that users themselves are in the best position to determine what they need and want. But without help (e.g., showing the consequences of their assumptions, asking the right questions, assisting in contextual elaboration, helping in breakdown situations, etc.), users are often unable to provide this information. We will discuss a conceptual framework and describe innovative system building efforts which are oriented towards: informing the user, critiquing, argumentation, high-level user-oriented abstractions, and end-user modifiability.

We will discuss *participatory design* from a number of different perspectives: (a) from a design methodology research point of view, (b) from a cooperative problem solving approach towards computer system design, (c) from the experiences of a designer practitioner in architectural design and (d) from the experiences which we gained through our system building efforts.

The paper is organized as follows: first we discuss the conceptual framework, then describe briefly our system building efforts (emphasizing within each of them aspects related to participatory design) and articulate a number themes, hypotheses and issues for discussion.

Acknowledgements

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Table of Contents

1. Introduction

Traditionally, artifacts have been designed by professional designers without participation of future users. Often the users did not even get to describe or specify their needs — the designers assumed those needs based on their own knowledge or other sources.

The promise of participatory design is to improve the match of the designed artifact and the needs of its future users by involving the users in the design process.

Our approach to enable participatory design is to build computer-based design environments that let users design themselves with the support of a knowledge-based system. Supporting users as designers is necessary because they are often unable to identify the crucial issues, ask the right questions, consider all important alternatives, and anticipate all consequences of design decisions.

There are at least two strong arguments for participatory design: the ethical and the technical. The ethical argument is that it is unjust not to let the stake-holders — i.e., those who have stake in the outcome of a design project — have a say in the project. The technical argument is twofold: 1) you simply cannot determine what will be appropriate for particular use situations and users's varying needs without participation; 2) to devise and evaluate design solutions, it is highly useful to have a wide range of points of view from the users, who understand the problem situation best.

What is the problem of participatory design? In other words, if participatory design is so good, why isn't it done more? Our experience has shown that there are fundamental barriers to effective participation. It is often ineffective because participants are missing crucial skills or information. Thus, for example, in architectural design a simple but significant barrier has been the difficulty non-designers have of understanding architectural drawings. It is hard for them to visualize what a building will look like much less to imagine how it will perform if built. Similar barriers exist in other design fields. Thus, if users are left to design for themselves, their chances of making fatal technical errors are greater than their chances of being successful.

For effective participation the need for a variety of design skills must be obviated. Participants should not have to know how to use complex codes or notation systems, such as those required for architectural drawing or computer languages. They should instead be able to work directly on their problems, using personally meaningful abstractions from the problem domain. Instead of engaging in human computer communication they should be able to perform human problem domain communication.

For effective participation the need for a variety of kinds of information must also be met, but getting this information to participants is difficult. They cannot be taught all possibly relevant information in advance. They must instead get just that information for which actual needs arise. In particular, they must be made to understand what information is relevant when it is relevant to the design task at hand. They must also be made to know how it is relevant and why. Above all, they must be given useful information which they do not know they need.

For the effective participation of anything but very small numbers of people, methodological and technological support is needed for managing information. Our experience shows, in particular, that computer support is an absolute necessity.

We have developed systems which attempt to solve the above-described problems. These systems have resulted from an iterative process of systems building and evaluation which has stretched over many years and is not yet over. This development builds on earlier iterative efforts by others. From all these efforts we have learned crucial lessons. The most basic is that supporting participatory design is not trivial. We have also learned a great deal about what does and does not work. From these lessons we have derived a system architecture containing components which we believe are crucial for participatory design. In the sections below we explain our experiences, the common (software) architectural principles we have developed, and finally the specific systems.

Our development of support for participation is by no means complete. Our architecture of support systems for participatory design evolves with each system we build. Perhaps the great open question for us is what is missing from our present list of system components and interactions.

2. Conceptual Framework

In this section, we will first describe the history of *participatory design* in the field of architectural design. We will then discuss the potential of integrated, domain-oriented knowledge-based design environments towards enhancing participatory design. A general architecture for these environments will be presented.

2.1. Early Efforts at Participatory Design

Those who have recently become interested in participatory design need to take into account the more than twenty years of experience in participatory design in architecture, urban planning and policy making. There was in particular a great surge of interest in participation in architecture and urban planning in the 1970's. Perhaps the most influential theorist in this movement was Rittel. Our own efforts grow, in part, out of his early efforts to develop support for participation in design.

Rittel's theory of design problems as "wicked problems" implied the need for participation in all types of design. To facilitate such participation Rittel developed the IBIS (Issue-Based Information System) method for organizing and documenting design discussion. IBIS has since been applied to a variety of types of design, including software design.

With IBIS, design focuses on the discussion of various design questions, referred to in the method as issues. The method of issue discussion in IBIS is deliberation, i.e., the consideration of arguments for and against alternative answers — or positions — to the issues. The intention behind IBIS is to promote participation by inviting consideration of a wide range of opinions on issues before decisions are taken on them. The separate ''islands'' of issue discussions are connected by a variety of relationships. These included similarity of issues, one issue's giving rise to another, one's replacing another, etc. The overall result is a large network of interrelated texts.

IBIS has a twenty-year history of implementation efforts. This history can be accurately characterized as an iterative process of discovering and satisfying conditions — i.e., needs — for successful application of the method. These needs have been of many kinds, including technological, methodological and political. This provides a cautionary tale about the complexity of developing successful support of participatory design.

The Need for Hypertext. When invented [Kunz, Rittel 70], IBIS was intended as a paper-only — i.e., non-computer — system. Several attempts were made in the early 1970's to implement large paper-based IBISs. These revealed that the information management needs of IBIS required electronic assistance. In the late 1970's there was an unsuccessful attempt to manage a large IBIS using stand-alone word processors together with a mainframe-based information retrieval system. This showed both that a single integrated system was required and that conventional, keyword-based retrieval was not adequate for managing the networks of text that IBIS generated.

In response to these problems McCall [McCall et. al. 81] and Rittel [Conklin 87], working independently, developed the first, primitive hypertext systems — on microcomputers — for IBIS in the early 1980's. Conklin [Begeman, Conklin 88] developed a system in the late 1980's which supported use of IBIS by multiple participants at separate sites. Additional IBIS hypertext systems have since been developed at the University of Colorado, Boulder [Fischer, McCall, Morch 89a].

The central lesson of these development efforts is that high- level computer support is essential for participatory design, and not merely a luxury. Paper-based IBISs simply do not work. Hypertext is the minimal technology. Each increase in sophistication of IBIS technology has provoked a round of user demands for additional functionality. Currently, it seems safe to say that considerably more functionality will be needed before IBIS users will be truly satisfied.

The Need for Reusable Issue-bases for Problem Domains. One severe problem with IBIS is that it is very labor intensive to create an issue base from scratch. This has been one of the most important factors inhibiting use of IBIS. For many problem domains, however, there is a great deal of overlap among the issue bases for separate projects. Such issue bases are unlikely ever to be identical in all respects; nevertheless, there are sufficient commonalities for development of standard issue bases for particular problem domains. These can be tailored by users to fit their particular problems far faster — and with better results — than issue bases can be built from scratch. This removes a significant obstacle to the use of IBIS and thus to participatory design. The idea of recurringly useful domain-specific issue bases, in turn, leads to the notion of class hierarchies of issue bases with inheritance of argumentation. We are now exploring this concept.

The Need to Provide an Experiential Foundation for Argumentation. Extensive experience with the use of IBIS for design of software suggests to us that argumentation by intelligent participants is not by itself and effective basis for design. Many erroneous arguments seem plausible until checked against experience. It is therefore crucial to provide bases — even informal ones — for testing arguments by putting the solution configuration in a simulated use situation. This might be done using "walk throughs," scenarios of system use, functional (computer) simulations, and/or prototyping.

The Future of IBIS. Our understanding of the conditions required for successful implementation of IBIS continues to evolve through the building and evaluation of systems. This process itself parallels the alternation between construction and argumentation which we have come to see as crucial for design. We do not know precisely where this process is taking us nor when it will end. We do feel, however, that significant progress has been made and that the goal of effectively supporting participatory design with IBIS is within reach.

2.2. Architecture of Integrated, Domain-Oriented Knowledge-Based Design Environments

Assumptions behind our Approach. User participation has been a guiding principle in our system building efforts in the following ways:

- Our systems are built not as traditional expert systems (potentially de-skilling users) but as *cooperative problem solving systems* amplifying human problem solving capabilities [Fischer 90].
- Our systems try to support *human problem-domain communication*, allowing domain experts to work directly with the system in a world which is built around their conceptual view [Fischer, Lemke 88a].
- Our systems are built as *critiquing systems* [Fischer, Mastaglio 89], in which users set the goals (as opposed to tutoring systems which are system controlled).

- Our systems integrate a construction component and an argumentation component [Fischer, McCall, Morch 89b].
- Domain experts participated in the design of the systems and in their evaluation [Fischer, McCall, Morch 89b].
- Our systems support end-user modifiability, extending the control of users beyond the original design time to the whole life time of a system [Fischer, Girgensohn 90].

The Need for Integrated Support of Construction and Argumentation. Our attempts to use IBIS for architectural and urban design have indicated that IBIS is unlikely to work unless related to the drawing that such designers do. IBIS's support for argumentation must be integrated with support for construction, i.e., creation of the form of the solution. This finding is predicted by Schoen's theory [Schoen 83] of design as a continual alternation between situated action — e.g., drawing — and reflection-in-action. To support participatory design, the discourse which is central to participation must be integrated with support for participatory construction of solutions — of buildings, software, hardware, or whatever. Participatory design can then be expected to alternate between construction and argumentative discussion.

Systems aimed at supporting participatory design using IBIS issue-bases must relate this argumentation to the current construction context. In particular, they should help designers do the following:

- see where their construction knowledge is inadequate (to perceive breakdowns, to "let the situation talk back")
- find the argumentative knowledge they need for such situations (ideally, all the knowledge and only the knowledge useful for the task at hand)
- understand how generalized argumentation about principles of design relates to their particular construction situations
- understand how to perform the contextual elaboration needed to go beyond generalized prescriptions to make intelligent exceptions and perform detailed situated construction actions.

These requirements have led to the design of an architecture for integrated, domain-oriented knowledge-based design environments (see Figure 1) containing:

- A *construction kit* (See Figure 3). This is a set of building blocks corresponding to high-level abstractions from the problem domain. A construction kit supports human problem- domain communication and preserves the situatedness of work [Lave 88] while using the computer. A construction kit obviates the need for the user to master skills of computer programming.
- An *argumentative hypermedia component* based on IBIS (see Figure 4). This makes the user aware of information in the reusable issue base, i.e., information in the form of issues, possible answers, and arguments. It also allows the user to enter issue-based information and thus to incrementally specify personal design constraints at various levels.
- *Critics*. These inform the user by allowing the situation to talk back. For those who do not have extensive experience in the problem domain the situation is often mute unless the system has a component which speaks up and points out issues that the user might otherwise not have considered. Critics points out suboptimal aspects of the artifact and provide entry into the exact section of the IBIS issue base where the issues relevant to the current construction situation are located. This supports the transition from non-reflective knowing-in-action to reflection-in-action.
- A *catalog*, i.e., a collection of previously designed artifacts. This illustrates the space of possible designs in the domain and serves as a source of situated examples for statements in the issue base. Catalog examples provide a link back from argumentation to construction by making abstract principles concrete and ready to be integrated into the artifact under construction. They also support case- based reasoning to complement generalized argumentative reasoning. This is especially use-

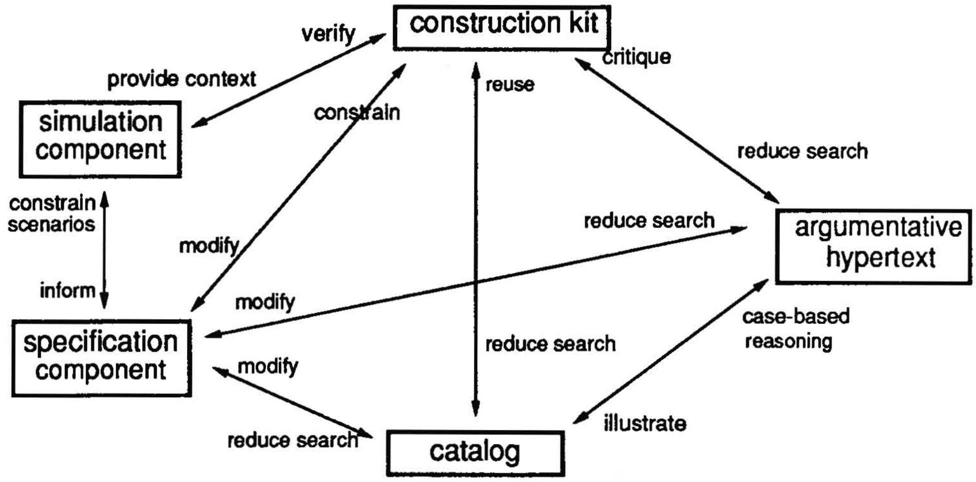

Figure 1: An Architecture for Integrated, Domain-Oriented Knowledge-Based Design Environments

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ful when argumentative generalizations are not sufficiently well defined.

- A *specification component.* This allows users to input their goals, which the system can then use to situate its information by filtering out argumentation, critics, and catalog examples which are not relevant to the specified problem situation.
- A *simulation component.* This informs the user by improving the capability of the construction situation to talk back. Simulation complements the argumentation component — especially the reusable issue base — which can never capture all relevant aspects of the situation [Suchman 87].

3. Innovative System Designs

We have built integrated, domain-oriented knowledge-based design environments (instantiating the architecture of Figure 1 in a number of different domains:

- FRAMER — a system which supports user interface design [Lemke 89]
- JANUS — a system which supports architectural design [Fischer, McCall, Morch 89b]
- COBOL-Critic — a system which supports the development of COBOL programs [Dews 89]

3.1. FRAMER: The Role of Checklists in Participatory Design

FRAMER (see Figure 2) is a knowledge-based design environment for program frameworks, which are high-level building blocks for window-based user interfaces. A program framework consists of a window frame of nonoverlapping panes and an event loop for processing mouse clicks, keyboard input, and other input events. Program frameworks also manage the update of information displayed on the screen.

We have pointed out earlier that users as designers may not know the design issues that must be decided and the alternatives that are available. This point was confirmed by our experiments with the first version of FRAMER. This version does not contain that information and users were unable to decide what steps had to be done to create a complete functional program framework. The checklist in the current version

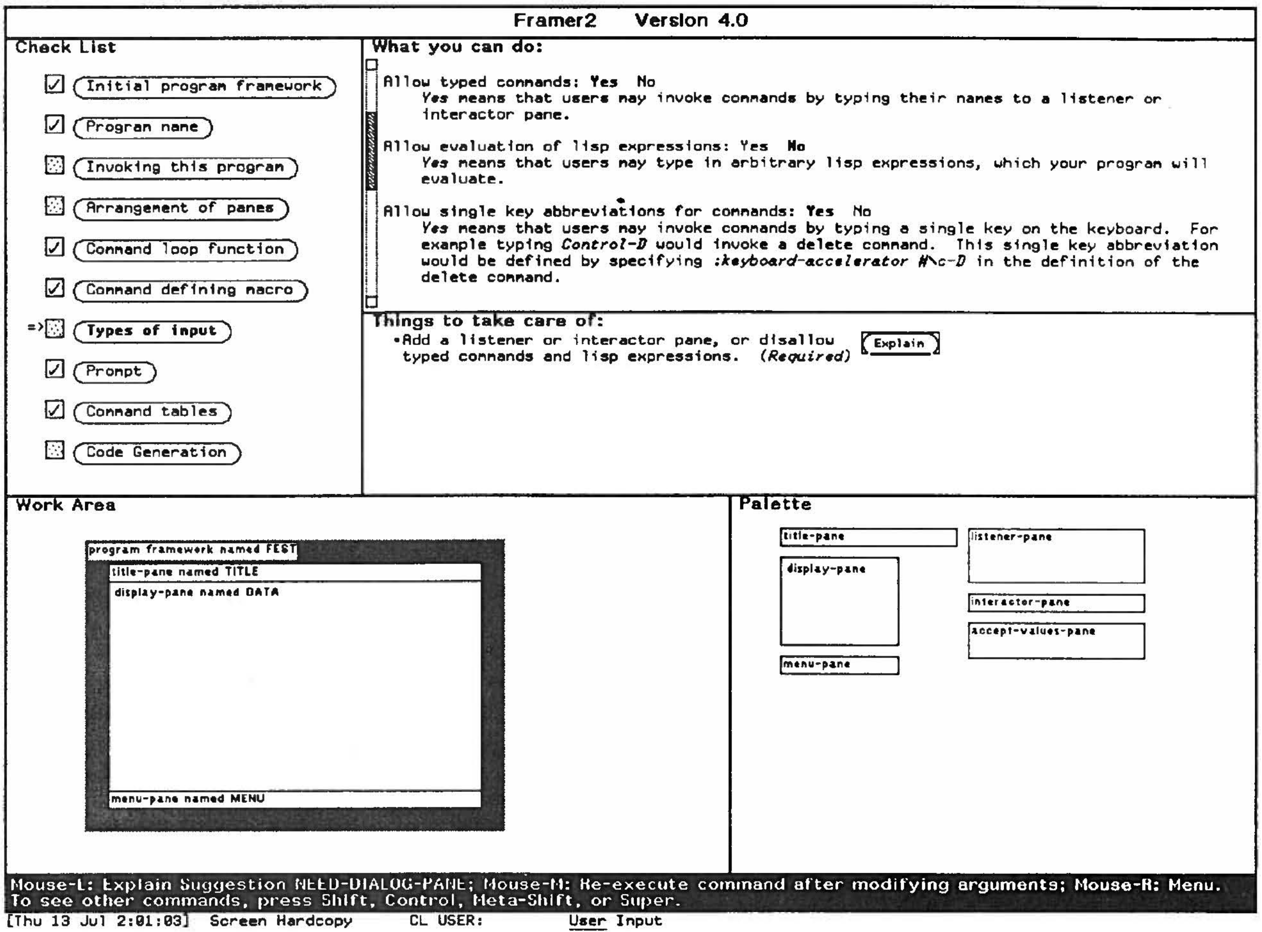

Figure 2: FRAMER

of FRAMER addresses this problem by providing the designers with an explicit problem decomposition that is appropriate for the design of program frameworks.

The checklist serves as the main organizing tool for the interaction with FRAMER. With the checklist, the system indicates to the user how to decompose the problem of designing a program framework, and it helps to ensure that designers attend to all necessary issues, even if they do not know about them in advance. Each item in the checklist is one subproblem of the total design process. By selecting a checklist item, designers tell the system their current focus of attention in the design process. The checklist is also a tool for the designer to keep track of which issues have or have not been resolved.

The checklist in FRAMER contains up to ten items. When the designer selects an item in the checklist, the system responds by displaying the corresponding options in the specification sheet shown in the neighboring "What you can do" window. Critics are grouped according to the checklist items. The critic pane always displays exactly those critic messages that are related to the currently selected checklist item.

When designers believe that the topic of one checklist item has been completed, they indicate this fact to the system by checking off the associated check box. This causes the system to verify whether all constraints represented as active critics are satisfied. If so, the system inserts a check mark into the check box. If there are critics that are not satisfied, then the system displays an explanatory message instead.

The exact set of checklist items displayed depends on the designer's previous design decisions. The system displays only those items that are currently relevant (i.e., it is context-sensitive); for example, the prompt item is only displayed if command-based interaction is specified.

Cooperative Problem Solving Aspects of FRAMER. The cooperative system architecture of FRAMER was designed to cope with the ill-structured nature of the user interface domain. Most non-autonomous design support systems operate in well-defined domains. For example, PRIDE [Mittal, Araya 86] operates in the well-defined domain of paper path design for copiers. In this domain, the design problem can be completely decomposed in advance, and for each design question there is a well-known set of possible answers. This is not true of the user interface domain. The challenge for the FRAMER system was to define an architecture that can support designers effectively even if the system's knowledge is incomplete.

Future Work. An active area further investigation in our work is the design of generalizations of the checklist and the specification sheets. These two components taken together represent a two level hierarchy of design issues. We are extending this to an unlimited number of levels by using the concept of issue-based information systems (IBIS). Issue-based information systems represent argumentative design knowledge as hierarchies of issues, answers, and arguments for or against choosing those answers. To make an IBIS component more responsive, we are adding active mechanisms similar to the ones found in the checklist and the specification sheets.

3.2. JANUS: Integrating Constructive and Argumentative Design

JANUS allows designers to construct artifacts in the domain of architectural design and at the same time to be informed about general principles of design and their underlying rationale. This is accomplished by integrating two design activities: construction and argumentation. *Construction* is the activity of "doing" design and is supported by a knowledge-based graphical design environment (see Figure 3). *Argumentation* is the activity of "thinking and talking about" design and is supported by a issue-based hypermedia system (see Figure 4).

JANUS provides a set of domain-specific building blocks and has knowledge about properties and constraints of useful designs. With this knowledge it "looks over the shoulder" of users carrying out specific designs. If it discovers a shortcoming in the users' designs, it provides feedback in the form of a critique. If the user is unclear about the meaning of this critique or how to resolve a potentially problematic situation, the critique will trigger reflection and will serve as an entry point into a hypertext system for general principles of kitchen design. In this hypertext system the designer can browse through relevant issues with answers and arguments about the current construction situation. This will assists users in improving their designs in an evolutionary way. In this way JANUS supports participatory design by not being an expert system that dominates the design process by generating new designs from high-level goals or resolving design conflicts automatically. Rather than potentially "de-skilling" users, JANUS lets the designers control the behavior of the system at all times and serves them as a "cognitive amplifier" which augments, rather than replaces, creative and analytical problem solving skills.

3.3. The Relevance of End-User Modifiability for Participatory Design

End-user modifiability [Fischer, Girgensohn 90] allows the users of a program to modify its behavior. The participation process is extended beyond the original design time to the total life time of a system. The nature and specifications of problems may change and evolve over time. This makes it necessary that

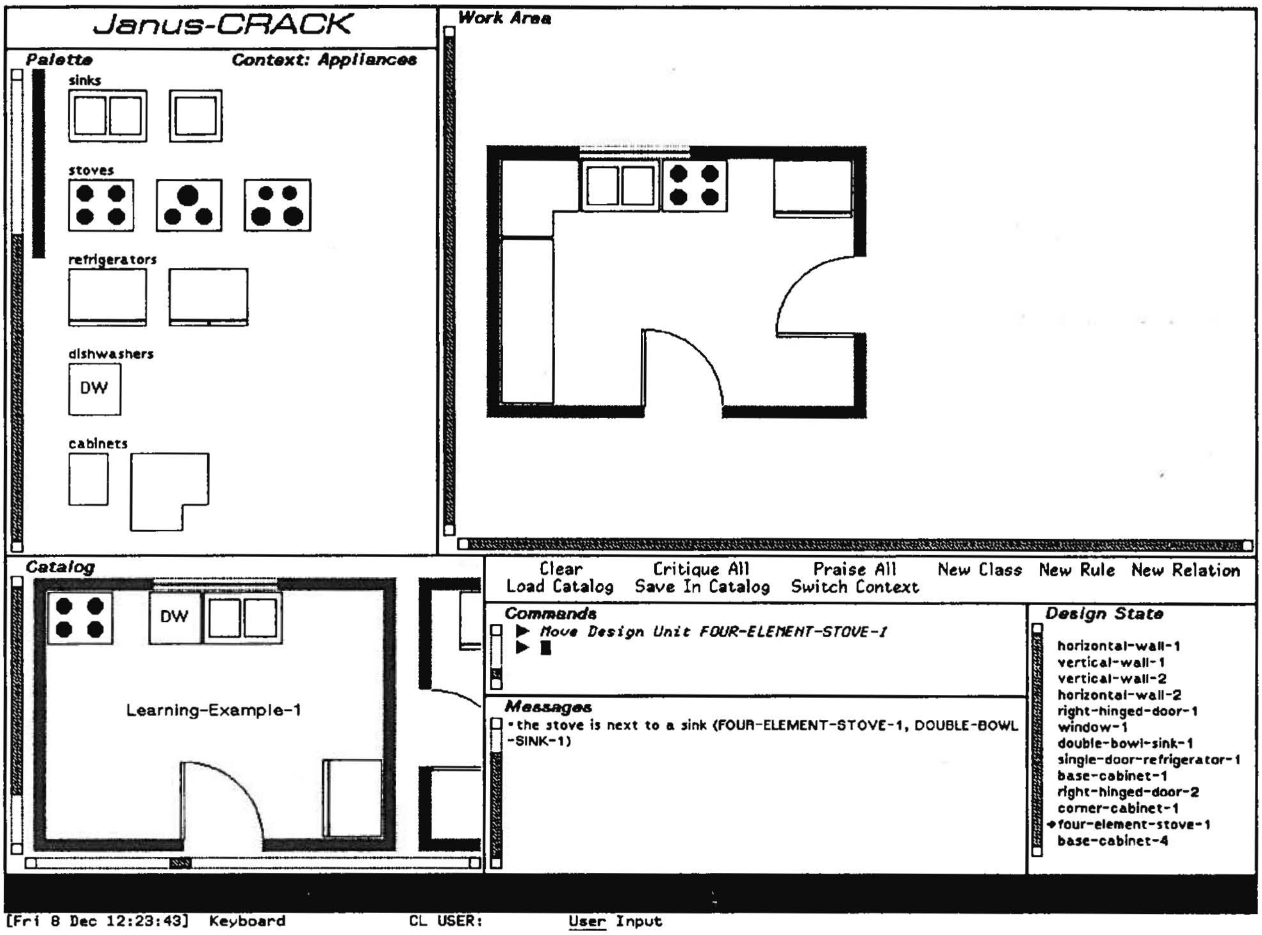

Figure 3: JANUS-CRACK

This screen image shows JANUS-CRACK, the construction component of JANUS. Building blocks (design units) are selected from the *Palette* and moved to desired locations inside the *Work Area*. Designers can reuse and redesign complete floor plans from the *Catalog*. The *Messages* pane displays critic messages automatically after each design change that triggers a critic. Clicking with the mouse on a message activates JANUS-VIEWPOINTS and displays the argumentation related to that message.

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a system is modifiable during its whole life time.

Users must be able to participate in all phases of the design or redesign of a system. They are the domain experts and must have some control over the system because they understand the semantics of the problem domain best. End-user modifiability is a necessity in cases where the systems do not fit a particular task, a particular style of working, or a personal sense of aesthetics.

End-user modifiable environments will free the designers of a system from the impossible task of anticipating all possible uses of a tool and all people's needs. The goal of making tools modifiable by the user is not just transferring the responsibility of good tool design to the user. Normally, users will not build tools of the quality a professional designer would. But this is not the goal of end-user modifiable systems. Only if the tool does not satisfy the needs and the taste of the users — which they know best themselves — should they be able to adapt it. The strongest test of a system with respect to user

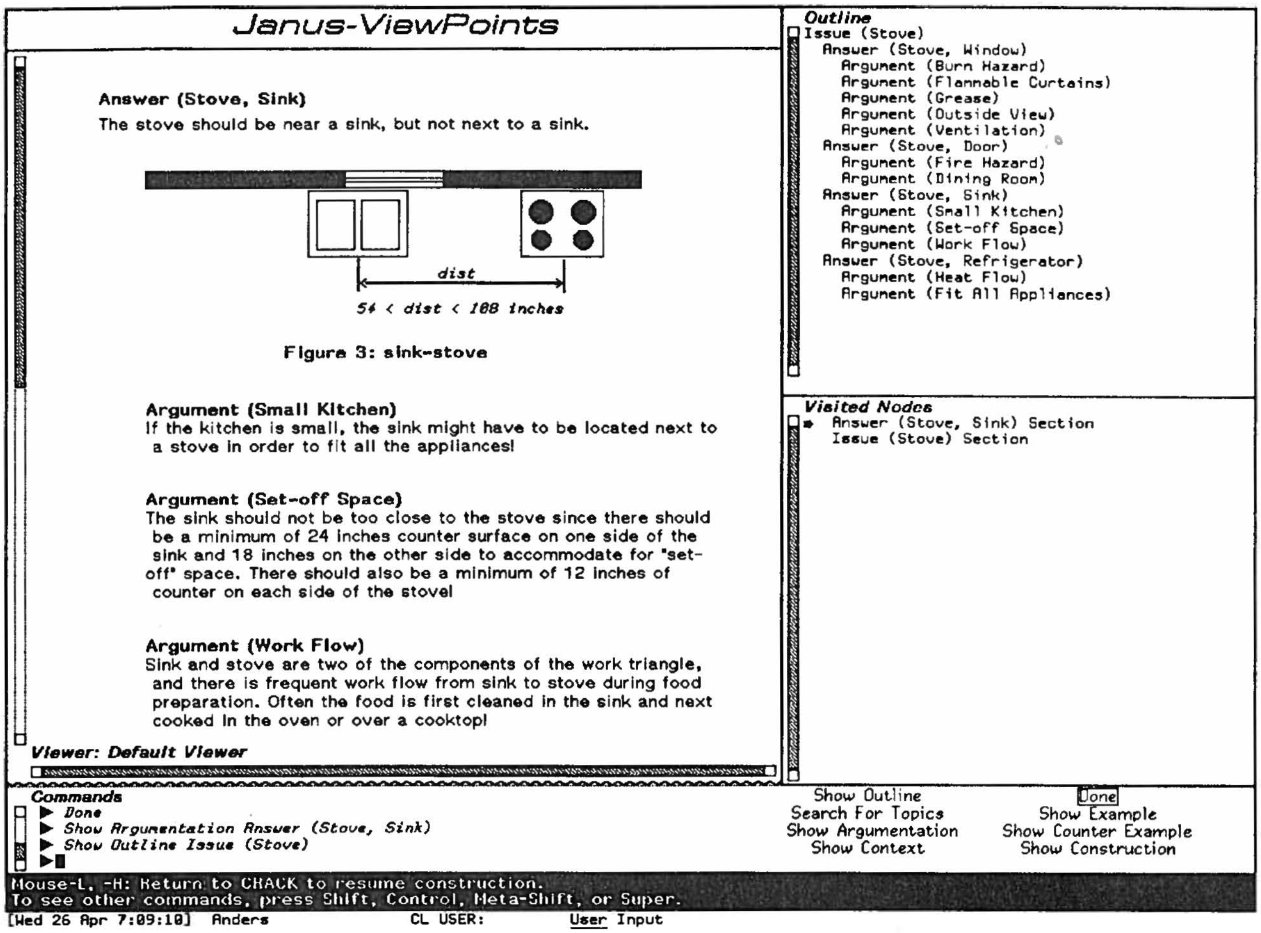

Figure 4: JANUS-VIEWPOINTS

This screen image of JANUS-VIEWPOINTS shows an answer to the issue of where to locate the kitchen stove with respect to the sink and graphically indicates the desirable relative positions of the two design units. Below this is a list of arguments for and against the answer. The Outline pane shows a larger context which includes all the answers to the issue of where a stove should be located with respect to other design units.

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modifiability and user control is not how well its features conform to anticipated needs but how well it performs a task (in the context of the problem domain) the designers of a system did not foresee.

EMACS [Stallman 81] is a success example for end-user modifiability helping the evolution of a system. Users think of small changes, try them, and give them to other users. If an idea becomes popular, it can be incorporated into the core system. Users do not have to change the source and to recompile EMACS in order to modify it. But they have to be able to program in LISP, and that allows only a certain class of users to modify EMACS.

There are high costs associated with a failure to support end-user modifiability. Users are not in control of the interaction designed to achieve their goals. They have to put up with an unsatisfactory state of affairs, or they may not use a system at all, if it does not fit their needs.

Methods for Achieving End-User Modifiability. Changing the source code is not an acceptable method for the modification of a program by an end-user. The user might be unable or unwilling to perform this unstructured task. A *constrained design process* [Fischer, Lemke 88b] makes modifications easier. The design space is constrained in a user and domain dependent way. Even a computer expert can take advantage of a constrained design process if the required modification is within the scope of the constraints.

Three subtasks have to be supported in order to make a system end-user modifiable: locating existing system functionality, comprehending existing system functionality, and performing the changes.

Locating Existing System Functionality. High-functionality computer systems [Lemke 89] contain a large number of abstractions in an integrated software environment. Such systems can increase our productivity and efficiency by providing many built-in facilities that users would otherwise have to construct. They have the potential to support a "copy&edit" strategy [Lenat, Prakash, Shepherd 86; Lewis, Olson 87] for making modifications from a rich, initial foundation. Instead of starting from scratch, new functionality can be achieved by modifying an existing part of the system. The limited success of modification as a major programming methodology is in our opinion directly related to the lack of support tools for exploiting the power of high-functionality systems. Having a large set of existing building blocks without good retrieval tools is a mixed blessing. The advantage of reuse and redesign is that existing buildings blocks — which have been used and tested before — already fits the users' needs or comes close to doing so. The problem is that it may take a long time to discover these suitable building blocks or to find out that none exists.

Comprehending Existing System Functionality. Locating promising parts of the system is just the first step in the modification process. In the next, step users have to comprehend an existing object in order to carry out the modifications. External modifications that do not require an understanding of the internal workings of an existing object are preferable to internal modifications. In addition, a system constructed using a layered architecture is very helpful. In such an architecture, users can remain in the higher layers during the comprehension process.

Performing the Changes. The last step in the modification process is to carry out the modifications. To do so, users should have a clear understanding of the implications of the change with respect to the problem domain. The system should support the mechanics of the change (e.g., with property sheets, animated examples, context-sensitive help at every stage). A uniform interface for the comprehension process and the modification process makes changes more natural, a principle violated by many systems (e.g., the Symbolics Document Examiner [Walker 87] offers a different writer's and reader's interface).

End-User Modifiability in JANUS. The possibilities for modification in earlier versions of JANUS were restricted to making modifications easy for artifacts constructed *within* the design environment. Experimental use of JANUS by professional and amateur kitchen designers indicated that situations arise that require *the modification of the design environment itself.*

We have extended the JANUS system with knowledge-based components to support the following types of modifications:

1. introducing new classes of design units into the palette (e.g., a "microwave"),
2. adding new critic rules to the system (e.g., "the microwave should be next to the refrigerator"),
3. allowing the definition of new relationships (e.g., "between"), and
4. supporting the creation of composite design units (e.g., a "cleanup center").

The knowledge-based components supporting these modifications provide a uniform interface for all

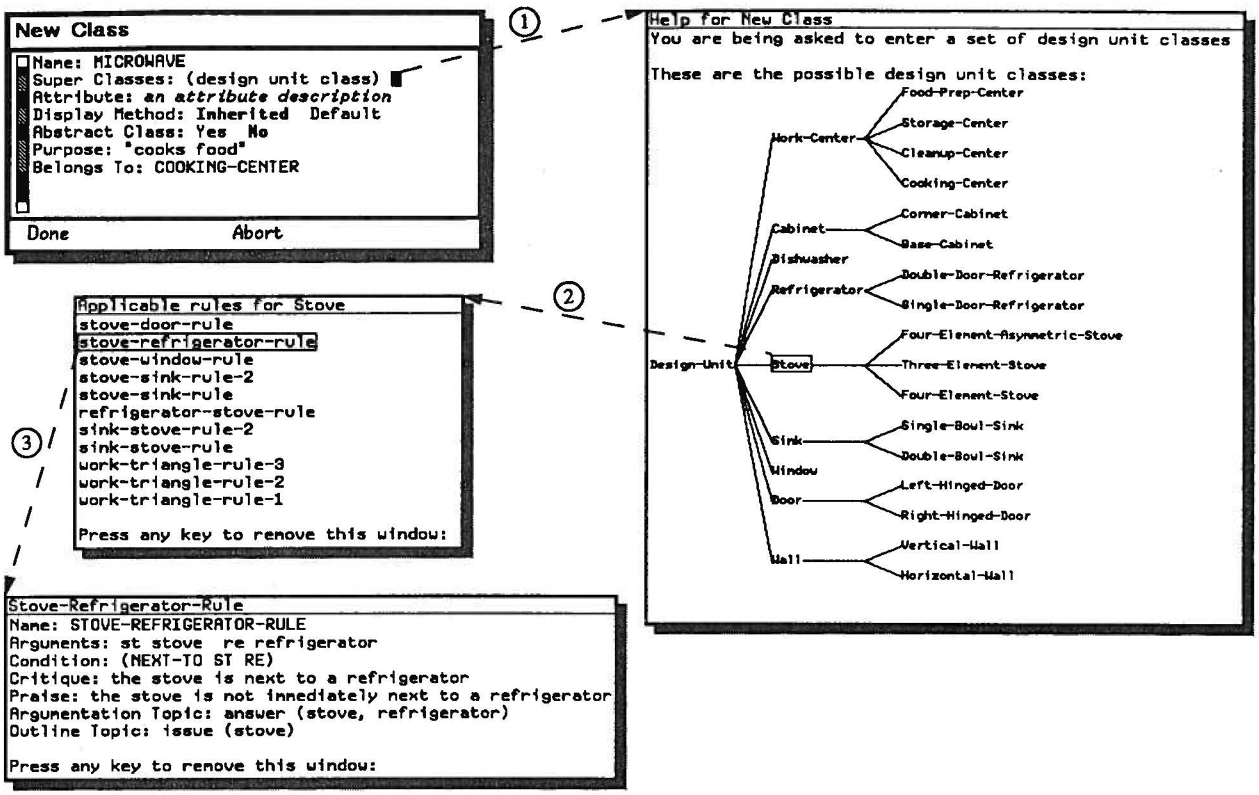

Figure 5: End-User Modifiability in JANUS

After the user presses the HELP key in the field "Super Classes," a window with the class hierarchy is displayed (1). Every class in the hierarchy is mouse-sensitive. A window with the list of rules that are applicable to a class is displayed by a mouse click on that class (2). The rule names are also mouse-sensitive, and a mouse click opens a window with the definition of a rule (3).

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modifications in the form of property sheets. These components give context-sensitive help at each step in the modification process, allow users to modify an existing example, take advantage of the layered architecture of the system by minimizing the number of layers that users have to cross, and exploit the properties of object-oriented representation supporting differential descriptions. Figure 5 shows an example of a modification process.

3.4. Participatory Design in the GRACE Project and in the COBOL Critic

Project GRACE and the COBOL Critic. The COBOL Critic is part of the GRACE Integrated Learning Environment. GRACE, a computer-based learning tool suite, is being developed by the Intelligent Interfaces Group at NYNEX Artificial Intelligence Laboratory in order to teach entry level programmers at New York and New England Telephone how to program in COBOL [Dews 89]. The GRACE student interface consists of five components — an editor, a critic, a tutor, a hypertext reference system, and a mainframe link. This workshop will mostly address the participatory design considerations used in the development of the COBOL Critic.

Adapting Grace to the Workplace. GRACE will be integrated into a six week COBOL language training course, part of a ten week Initial Programmer Training program at New York Telephone's Computer Technology Learning Center (CTLC) [Gray, Atwood 90]. This allows the system to be used and evaluated in a setting involving real-world constraints and requirements. Its development is enhanced by the different backgrounds provided by the members of the GRACE Project team including computer scientists, cognitive psychologists and a CTLC COBOL instructor. The inclusion of an instructor on the team has enhanced our ability to direct the system toward actual classroom experience. Because we are dealing with a professional training program as opposed to a university course, we have a more variety of students in the classroom and higher demands on the integration of the system into the existing classroom setting. There are no prerequisites for students in the program. As a result, they have a wide range of capabilities and experience. After a short period of instruction on the use of the system, they must be able to concentrate on how to solve the exercise, not how to use the computer.

The students are involved in the design process through iterative prototype-evaluate development. We prototype in the lab and bring the system down to the site for evaluation with the current students in the classroom setting. The sessions are videotaped and the protocols gathered are analyzed for enhancements to the system. In one session students encountered some problems understanding our use of terminology. For example, the menu item `Describe Work Areas` was to be used to describe internal work areas for counters and switches. Instructors and students usually refer to the work area descriptions as merely "77 levels" (77 level is a special indentation column for data items), though that is not strictly an accurate description. When an instructor says "77 level" he or she can explain what is meant more fully. This is a general problem related to the importance of capturing the *"language of the workplace"* and not imposing some abstract language more suited for computers than humans. This is sometimes referred to as "user oriented languages" [Nygaard 84] or "human problem-domain communication" [Fischer, Lemke 88a]. One of the efforts of the COBOL Critic is to capturing the language of the workplace (in our case the CTLC) in order to support efficient learning and practice of programming and not hamper it by an obscure (though easily representable) computer terminology.

COBOL Critic: A Tool for Skilled Programmers. One of the reasons for having a critic as part of an integrated learning environment is to allow for novice students to advance to a higher level of competence by introducing them to a programming environment for professionals. Here they can practice basic skills learned with the tutor. One of our goals with the critic is to augment problem solving skills required for coding, debugging and maintaining COBOL programs in large corporations.

We acknowledge that breakdowns (as described in [Winograd, Flores 86; Suchman 87; Schoen 83]) are inevitable in any problem solving process. We can not "design away" or enumerate a priori all the problematic situations students can come in when writing computer programs. Rather than coming up with a "fool-proof" design which transfer most of the control and responsibility to the computer, we are using breakdown situations to our advantage by making them an integral part of the learning environment. Knowledge-based critics function as program checkers (similar to a compiler or interpreter) with immediate feedback. The critics have knowledge at three levels:

1. program syntax
2. program semantics
3. problem specific goals for specific exercises and style and standards guidelines.

The critics obtrusiveness will vary with their level of knowledge (i.e., syntax has to be enforced whereas guidelines can be ignored). The critics present information in one sentence which will either trigger immediate action (if recognized and understood based on previous encounters) or reflection if more background information is needed. In the latter case a COBOL hypertext reference system is available for

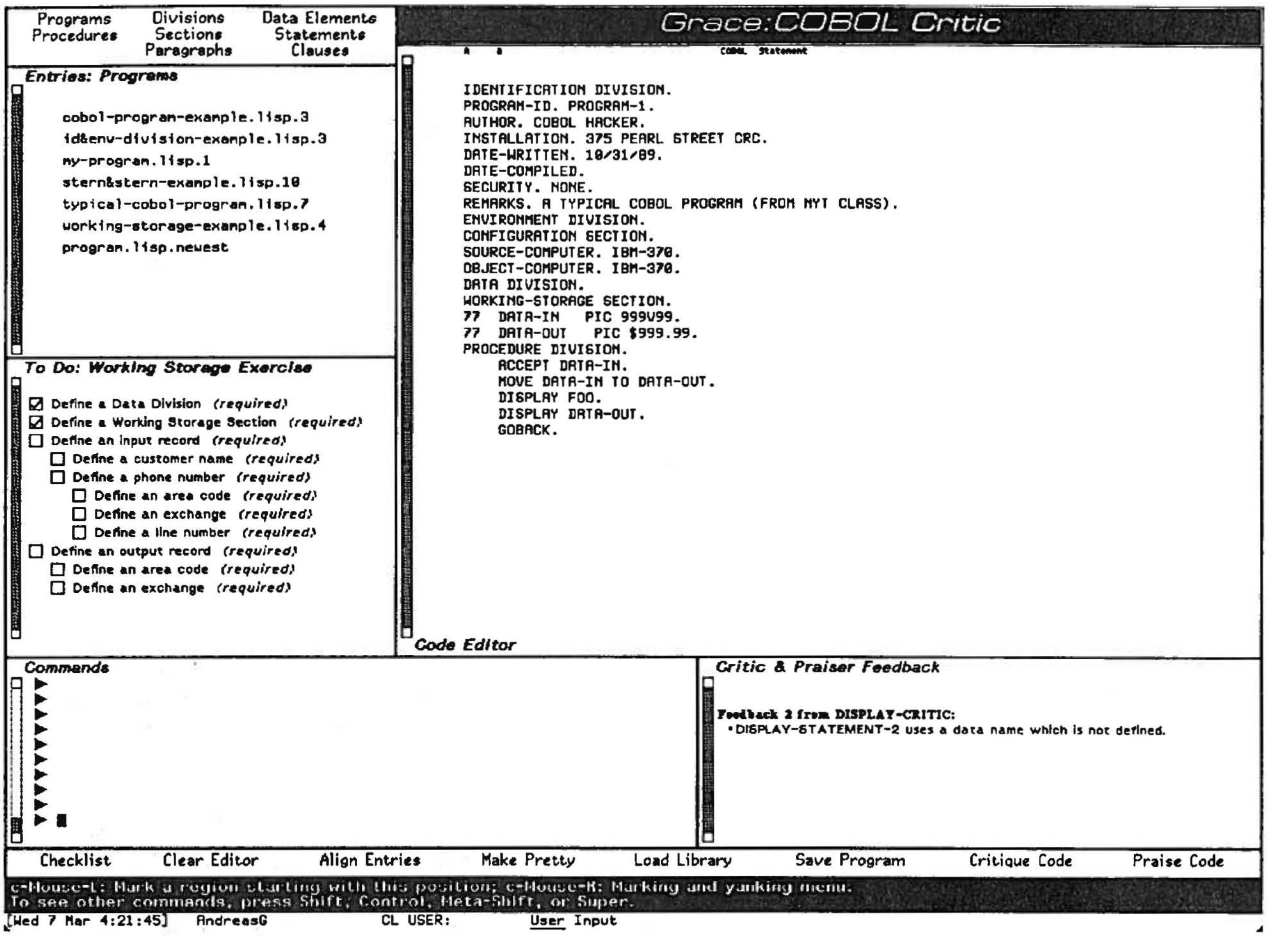

Figure 6: COBOL Critic

browsing. This hypertext manual is under development by one of the COBOL instructors working in the GRACE team. In this way we turn problematic situations into situations which foster opportunities for learning new knowledge.

4. Themes, Hypotheses and Issues for Discussion

4.1. General Issues

1. What are the roles for participating users in design?
   - critique designer's proposals,
   - contribute solution proposals,
   - describe their needs and preferences,
   - describe situation, processes and constraints.
2. How can we support the user in playing these roles?
   - give them alternatives to choose from
   - engage them in a dialog (argumentation)

3. What are the roles of the professional designer?
   - point out issues,
   - contribute generalized procedural and methodological knowledge,
   - specific technical knowledge,
   - has better design skills than the average user.
4. In what areas is the *user* in a better position to make decisions than the *designer* and vice versa?
5. Should the users be given what they say they need?
   - users should be allowed to change their minds
6. What causes participatory design to fail?
   - users have not always a clear understanding of their needs
7. What is necessary for participatory to succeed?
   - rapid prototyping — design by trial and error?
   - educating the user?
8. What are the success stories in participatory design? What can we learn from them?
9. Critical question: Who are the users e.g. of a word processor? They are not known in advance. The set of users is potentially very large and very diverse. Is participatory design only applicable to custom-made software?
10. Participatory design can lead to overdesign (Hoover).
11. What is the participatory design process and what are the roles of professional and lay designers and the design environment? Does the design environment completely replace the professional designer? Hoover's method: let users make a draft that serves to elicit user requirements — then the professional designers create the artifact (with more or less user involvement) as it is later implemented.

4.2. Specific Issues

The specific issues will address: informing the user, critiquing, argumentation, high-level user-oriented abstractions, and end-user modifiability.

1. Showing unanticipated consequences of design decisions (making the situation "talk back"):
   - What technologies can educate the user while leaving the user in control?
   - How can users be helped to see the consequences of design decisions? How can we make the construction situation talk back? What software technologies can achieve this goal?
   - How can simulation, walk-throughs, gaming (what-if games) serve this purpose?
2. Critiquing:
   - How do critics facilitate informed participation?
   - What is the difference between computerized and human critics?
   - What are the potentials and limitations of computer-based critics?
   - Can critics cope better than expert systems with the incompleteness of the background knowledge for any realistic situation?
3. Argumentation
   - When do Issue-based Information Systems (IBIS) succeed/fail?

4. High-level participant-oriented abstractions:

- How can we guide the user's own explorations?
- Can design environments, with high-level participant-oriented abstractions built-in, help the user contribute their solutions to the design process?
- Can design environments turn breakdowns into opportunities for learning new knowledge?

5. End-User modifiability:

- What design issues should be left for the user to decide after the project is completed by building an adaptable system?
- Does end-user modifiability decentralize control, support evolution, allow users to tailor systems to their needs and extend participatory design beyond design time?
- What skills do users have to learn in order to modify their systems (end-user modifiability comes not for free)?

5. Organization of the Workshop

The organization of the workshop is centered around the goal to achieve as much *participation* as possible. We envision the following structure for the workshop:

- We will give an overview over our systems and the conceptual framework behind them in order to provide "objects-to-think-with" for the discussion.
- We will show with slides participatory design in projects in architectural design.
- we hope that this will provide enough background information for an interesting discussion with the participants of the workshop.

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CONFERENCE ON PARTICIPATORY DESIGN
Seattle, Washington
March 31 - April 1 1990

PROPOSAL FOR HALF-DAY WORKSHOP

Despite the fact that participatory design has been more successful in Europe, especially in Scandinavia, participatory design in Scandinavia is not unproblematic.

When one looks more closely at users influence on design, much research shows that mainly men excert and benefit from this influence. Women do not have influence on design. Why?

Some researchers have claimed that women do not have influence because eg.

- they are generally passive and
- because they lack education in computing.

I thought there was more to it than that. My master thesis centers around the hypothesis: All theories and methodologies are based on a model of man. Is the model of man behind the theories and methodologies for participatory design a man?

I applied a gender perspective on some of the major theories of design, tried to identify their model of man, and related this to theories about women's lifes. I backed up my discussions with empirical data from interviews with four women from the Ministry of Education in Denmark. All had been involved in participatory design.

The conclusions were that the participant in the design theories and methodologies is a man. There is not taken considerations of how women can excert influence on design.

However, the women directly involved in informal fourth generation prototyping projects on very operational levels were very enthusiastic and satisfied with the design.

If women are going to have the possibility for participating in design, we need to develop new theories or methodologies based on a model of man which is a woman. From my theoretical discussion and the empirical data I found some guidelines for how the present theories and methodologies could be changed.

I would like to present these.

Yours sincerely

Benedicte Due-Thomsen, MSc.

PROPOSAL FOR HALF-DAY WORKSHOP
ON WOMEN AS PARTICIPANTS IN DESIGN
OR TOWARDS A NEW THEORY OF DESIGN

* I present a framework for understanding and describing influence. It is a combination of three different theories for design, how a model of man can be portrayed and how individuals react to this model of man. It might sound complicated but it is really straightforward.
  Duration: 10 minutes

* I present the three different theories for design
  Duration: 20 minutes

* The participants are split up into groups of 5 or 6.
  Duration: 5 minutes

* Break
  Duration: 10 minutes

* Group work: The participants are asked to reflect on difficulties they see in imagining themselves as the participants described in the theories for design. The focus should be on womens possibilities for participating versus the possibilities described in the theories for design. Would we like to be one of the participants within the theories? Why? And why not? What changes would we like?
  Duration: 1 hour

* Break
  Duration: 15 minutes

* Reporting back: The groups are asked to shortly report back what their conclusions were. I will try to back up the conclusions with the results from my own research.
  Duration: 1 hour

"WOMEN AS PARTICIPANTS IN DESIGN"

by Benedicte Due-Thomsen[1]

Abstract

Based on the hypothesis that the assumptions behind participants influence on design in systems development theories are founded on an idea of human beings, my thesis is a discussion about whether this idea of human beings is based on womens working lifes. The discussion is illustrated by interviews with female clerks in the Ministry of Education in Denmark. The conclusion on the discussion is that the idea of human beings in the systems development theories is not based on womens working lifes. In the light of the discussion, potentials for change of the assumptions behind participants influence are suggested such that women can gain increased influence on systems development.

As a starting point for the thesis I formed a conceptual frame which related influence, gender, womens working lifes and systems development. The conceptual frame was formed on the basis of an extensive literature study. For the description of influence I used Neergaard's specification of influence variables (Neergaard-81):

- purpose of the influence,
- influence in certain project phases,
- degree of influence and
- form of influence.

Furthermore, in describing influence I included Neergaard's influence resources (ibid.):

- time and energy,
- knowledge about computing and systems development,
- knowledge of application area,
- status,
- possibilities for sanctions and disposal of rewards and
- motivation.

For the description of the underlying idea of human beings (in this connection perception of gender) I applied Harding's three categories of gender (Harding-86):

- the symbolic gender,
- the structural gender and
- the individual personal gender.

It has been my assumption that influence, among other things, is contingent of the reactions, which are a result of a persons confrontation with the underlying idea of human beings in the preconditions for influence in the systems development theories. This means that a person reacts partly on the preconditions for influence but also on the underlying symbolic, structural and individually personal gender. The figure on the next page shows

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[1] MSc.in Computing and Business Economics from the Copenhagen Business School. Ph.D. student at Psychological Laboratory, Copenhagen University, Njalsgade 94, DK-2300 Copenhagen S, Denmark

this relationship:

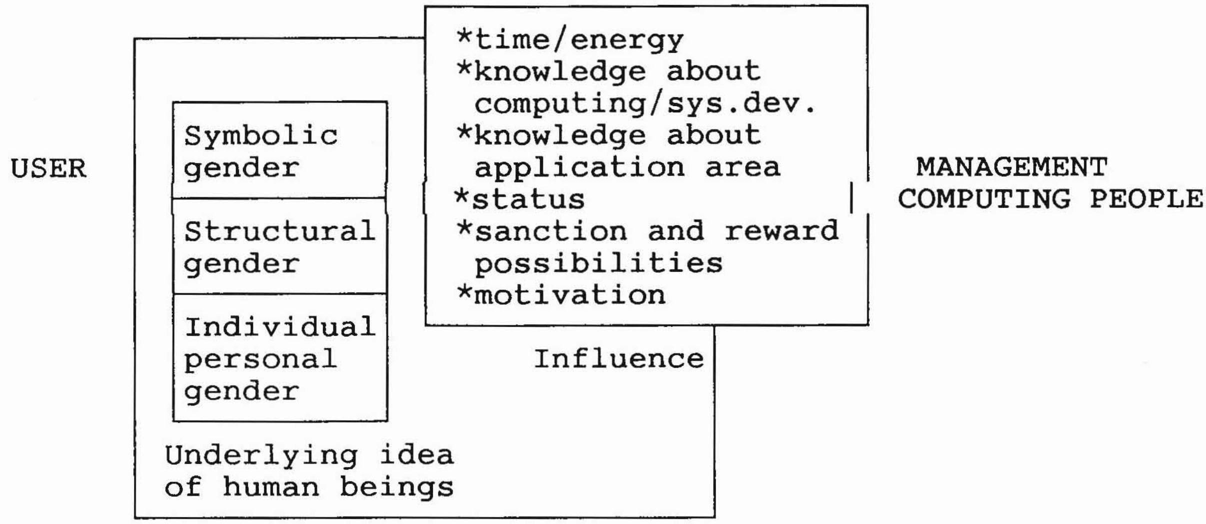

Figure 1: "A conceptual frame for influence as a reaction on the underlying idea of human beings in the assumptions for influence"

A group of active female clerks at the Ministry of Education in Denmark have been interviewed; partly as a group and partly individually. The interviews are supplemented by an interview with a woman from the computing department in the Ministry of Education. The empirical data have been used as illustrations to the theoretical discussion.

From the assumption that womens possibilities for influence needs to be understood on the basis of their total life, I have tried to describe womens working life, ie. the life at the place of work and life in their home. In that connection I have looked at womens socialization, womens double work, womens paid work (with a focus on women in offices), women in their homes and women and computing. In the description of womens working life I have implicitly aimed at including aspects of symbolic, structural and individual personal character, with the purpose of making visible the idea of human beings behind womens working life. On the basis of this understanding I have formulated a series of assumptions about what preconditions for influence this life gives.

The understanding of womens working life I have used as a form of "optic" or "looking glasses" for reading the theories on systems development. From Bansler's descriptions of the three central systems development theories (Bansler-87):

- the information theoretical,
- the socio-technical and
- the trade union political,

I have tried to implicitly describe the idea of human beings underlying the assumptions behind participants influence on systems design. I have tried to make visible the preconditions for influence together with the relevant influence variables.

Thereafter, a theoretical discussion and empirical illustration was carried out to find out whether the systems development theories' preconditions for influence were based on womens working lifes, and thereby on women as the underlying idea of human beings. The answer is clearly no. By concrete examples it was shown that the systems development theories partly do not include womens symbolic, structural and individually personal gender. Furthermore, the theories do not include the interaction between the two genders: men and women.

Taking off from the theoretical discussion and the empirical illustration, several suggestions for changes in systems development were found. Eg. it was demonstrated that there are wishes for:

- more time to learn to use computers,
- management learning more about computers,
- more activity on the part of the unions re. computing,
- an equal hierarch and equal representation of the sexes in committees and project groups and
- more fora, where women can meet.

A series of suggestions were found, which could not be categorized under Neergaard's influence variables or preconditions for influence. Rather, the suggestions for change could be grouped under the following headings:

- the systems development milieu,
- the systems development symbolic gender and
- the systems development structural gender.

In tis way, it was demonstrated that there are wishes for changed meetings forms, a different composition of the sexes in the project groups and that women are symbolically represented in systems development.

The conclusion on the discussion about whether the systems development theories are founded on an idea of human beings which is women is therefore no.

However, the conclusion is coloured by a certain amount of doubt. Eg. I have not clarified whether the conclusion that the systems development theories are not based on an idea of women as human beings, is the reason for women not having influence in the real world. Expanding slightly further, it is unclear to which degree the systems development theories affects practice. It is therefore obvious that the theories' affect on practice is an area, which could be valuable as a research area.

It also became evident that the interviewed women were not "typical clerks". They had been promoted and they were everything else than passive. Therefore, it could be the case that the "typical clerks" have a completely different perception of systems development than the interviewed women have.

Furthermore, it is also doubtful to which degree the two lifes, the paid work life and the life in the home, affect each other. In connection with my interviews I did not offer much attention to the womens life in their homes. Since womens preconditions for influence ought to be understood on the basis of the preconditions which their total life gives them, my empirical data does not offer much possibility for completely understanding womens working life, and thereby the preconditions for influence.

I have in my thesis completely delimited other parts view of the clerks influence, other than an interview with a woman from the computing department at the Ministry of Education. Eg. it is uncertain what management has to say about the problem. Since the interviews clearly showed that management constituted a considerable hindrance for the womens influence, it could be valuable to continue with this problem.

Furthermore, one of the conclusions were that the systems development theories completely had ignored the interaction between the two genders. Since the interviewed identified this interaction as one of the problem areas, it would also be valuable to carry out more research within this area.

Conclusively, it can be seen that there are lots of things to take hold of. This thesis was just a start.

<u>Literature:</u>

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Workshop proposal for the
CPSR conference on
participatory design

Reciprocal evolution of research, work practices and technology

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1.0 Reciprocal evolution of research, technology and work practices

Here is a great simplification of a complex history. Computers were originally created by people who had scientific, mathematical or engineering problems to explore. As computers widely became a focus of interest in and of themselves, computer scientists and researchers began to explore the capabilities of these machines beyond their original applications. Lo and behold, they stumbled upon a seemingly limitless landscape of possibilities. They found themselves developing computers for contexts and uses with which they were highly, if not entirely, unfamiliar. Few others than the programmers, scientists and engineers had the knowledge or access to do so. Industries sprang up to develop tools because it was profitable and because it was exciting to work in an area that was new and which many claimed had the power to shape a brave new world.

Computers were not entirely the domain of computer developers. Despite the difficulty of learning to program, practictioners in the arts, sciences, media, and academic disciplines learned to develop applications for their own work. Yet for the most part, tools were not built by the people who would be using them. Practitioners adapted more to the technologies than the technologies were changed to suit the people who used them.

Of late there has been a call for technologies better suited to the practices and values of the communities who use them in their day to day tasks. Technology driven changes have met their boundaries of effectiveness in many domains and a technology driven approach is no longer valid.

The notion of participatory design has emerged in consrast to technology driven design. Participatory design defines situations in which users participate in the design of systems. These typically include extensive prototyping, rather than specification based designing, and also involve users in the design of protoypes. Protoypes are tested both in the laboratory and in 'real world' sites as a way of collecting information about how they are learned and used. Including users in the analysis and design of computer technologies is recognized an an effective technique for developing different and more usable systems.

We think the notion of participatory design ought to be refined to the notion of *reciprocal evolution*. Reciprocal evolution describes situations in which one continually re-examines and re-adapts research, work practices and technologies to determine what the next state of each will be. They are equal in determining the future of the other. We've found in our own work that design is not the ordering activity. Research suggests new systems; the use people make of systems suggests technological changes; and the technology changes how people approach their work.

Reciprocal evolution as we practice it involves constant reconsideration of our work in three areas:

• How people re-organize their work practices when new technologies are provided. The role that the technologies assume in the day to day work and interaction. How the technologies are used in different ways than considered or intended. New work practices that are made possible or obvious by the tools.

• The generation and review of new design scenarios in response to what we observe and what pratictioners suggest about how a system can be better used and learned;

• The effect of new design scenarios and work practices on the research topics that are of importance to the continual evolution of the technologies and work practices.

The key shift from a technology driven approach must be a commitment to *evolving technology* beyond prototyping and new versions. The technology is no longer the focal point of the development and marketing activities, but a probe with which to investigate and stir up work practices, and to suggest new research directions.

2.0 Goal of the workshop

Our goal in this workshop is to provide participants with hands-on experience of the reciprocal evolution among these three areas - technology design, work practices, and research - through activities involving two multimedia computing projects, Picasso and MediaWorks.

Picasso is a project for research on the use of multi-media communications channels; how they change, enhance and detract from communications and work practices. As part of our research, we are designing prototypes with various functionality and forms. We place these in sites with whom we have long term relationships both to see how the people organize their work and communications with these new channels; and to investigate how people develop expertise with new technologies through use.

MediaWorks is a research and development project designed to create and refine easy access multimedia composition tools for school-aged children to use for research, composition, and presentation of interactive multimedia documents that are used for learning purposes and peer teaching. The media used includes text, graphics, color photos and digitized imagery, music/sound, animation, and video. As part of the after-school club-based research, students critique the tool features and recommend new functions and designs as they encounter problems (and recognize new opportunities) in doing their activities with multimedia computing.

3.0 Workshop design

The workshop will have a highly experiential format.

- Introduction: Brief review of the aims of the two projects and how the workshop activities will be organized.
- Tape analysis: Group work to analyze tape segments of people working together with traditional communications media, and also working with the Picasso and MediaWorks technologies.
- Generation of design scenarios: Group session to generate new design scenarios based on the analysis of people using the technologies in their work and with their own hands-on experiences with Picasso and MediaWorks.
- Implications of analysis and design scenarios on research: A discussion session where the research issues that would provide insight into work practices and exploration of technological alternatives are considered.
- Critical reflection on what was learned in each of the sessions. Comparisons by participants with what they currently do.
- Conclusion: We present the response that we had to the situations, how the tools changed the work practices, how the tools were changed by what our users suggested and what we observed, and how our research concerns developed in response.

Workshop H: Ethnographic Field Methods and Their Relation to Design
Jeanette Blomberg
Xerox Palo Alto Research Center

This workshop will explore the relevance of ethnographic field methods to the design of new technology. We will begin by discussing some of the principles that guide ethnographic research, and then ask in what ways the ethnographic approach might provide new ways of thinking about design practice. For example: (1) that we often design for "worlds" we know little about, (2) that the member's point of view might provide valuable information to help shape design, (3) that our designs impose a particular view of the world on others, and (4) that the use and therefore the meaning of technology is embedded in a larger social/historical context.

Through the workshop we will outline some of the methods that have been developed to get at the member's point of view (observation, participant-observation, open-ended interviewing, interactional analysis, etc.). These methods typically involve (1) the personal involvement of the investigator, (2) an improvisational style of work, (3) a willingness to be in situations out of one's control, (4) an iterative approach to understanding. The workshop will be led by an anthropologist and by industrial and human interface designers who have been adapting the ethnographic approach to their design practice.

Ethnographic Field Methods and Their Relation to Design

Jeanette L. Blomberg (Xerox, PARC), Jean Giacomi and Andrea Kundin (Xerox Industrial Design/Human Interface Group)

This workshop will explore the relevance of ethnographic field methods to the design of new technology. We will discuss some of the principles that guide ethnographic research. For example: (1) Ethnographers are concerned with how particular behaviors fit into the larger whole (holistic). Particular behaviors are understood in relation to how they are embedded in the larger social and historical fabric of the everyday life of the people studied. The connections between activities, groups, artifacts, and domains are explored. (2) The attempt is to understand other people's behavior from their point of view (relativistic). There is always the danger of recasting other people's behavior in our terms and by so doing imposing our perceptions of reality on others. (3) Ethnography is non-evaluative in the sense of the "right" or "wrong " way of doing things (descriptive not prescriptive). An attempt is made to withhold judgement of the efficacy of the behaviors observed, trying instead to make sense of them from the members point of view. What may seem like an "irrational" act to the outsider may make perfect sense once it is understood in relation to the larger whole. (4) Investigations take place in the environment of the people being studied (natural laboratory). Ethnography involves learning about a world you don't understand by encountering it firsthand. The commitment is to making sense out of the way people naturally talk and act when they are involved in ordinary activities.

This workshop also will explore how the ethnographic approach might provide new ways of thinking about design practice. For example: (1) We often design for "world's" we know little about. As designers we often have little access to the experiences and traditions of the people for whom our designs are intended. How might access to such information change the way we design? (2) Member's point of view might provide valuable information to help shape design. If we understood something about the knowledge people have that organizes their behavior and allows them to make sense of their world, perhaps this understanding could be reflected in our designs. (3) Our designs impose a particular view of the world on others whether we acknowledge it or not. Can an understanding of member's point of view allow our designs to work more harmoniously with traditional practices? (4) The use and therefore the meaning of technology is embedded in a larger social and historical context. Therefore, our designs can only be evaluated within the larger social context of their use. What techniques might be suitable to this purpose?

The workshop also will outline some of the methods that have been developed to get at member's point of view. (observation, participant observation, open-ended interviewing, interactional analysis, etc.). These methods typically involve (1) the personal involvement of the investigator, (2) an improvisational style of work, (3) a willingness to be in situations out of one's control, (4) an iterative approach to understanding. Analytical categories in ethnographic work are emergent and are revised as fieldwork progresses. Partial and tentative understandings are revised as new observations challenge the old. Ethnographers try and find situations that require them to question their current understandings. This particular analytical stance requires qualitative, open-ended data gathering techniques.

The issues raised in this workshop have grown out of a collaboration between an anthropologist (Jeanette Blomberg) and members of Industrial Design/Human Interface group. Two of these designers (Jean Giacomi and Andrea Kundin) will join Jeanette in leading the workshop. The three have been working together on adapting the ethnographic approach to support their design practice. This adaptation includes developing ways of reflecting member's point of view in emerging design concepts, bringing designers and users together to collaborate over evolving design concepts, and animating the user environment in such a way that members of the design team who are unable to have direct contact with users can "experience" something of the user environment.

COMPUTER PROFESSIONALS FOR SOCIAL RESPONSIBILITY

CONFERENCE ON PARTICIPATORY DESIGN

Proposal

Workshop on "GRAPHIC RECORDING IN SYSTEMS DESIGN"

Purpose

To introduce the use of graphic recording techniques to improve the results of interaction between users and computer professionals during system analysis and design. The use of graphic recording allows project teams to leap beyond professional jargon and get to the meat of fundamental user needs. Graphic recording also stimulates the development of creative solutions by the entire team. The techniques have been refined for six years with joint user/technical teams in complex business/project environments.

Workshop Objectives

1. To give participants hands on practice with the basic techniques of graphic recording. Even with a half day workshop, participants can return to their work and utilize the skills immediately.

2. To stimulate discussion on other techniques workshop participants may have used in real project activity to improve user - computer professional interaction.

3. To demonstrate how techniques from other professionals fields can directly benefit computer systems development. Examples: Organizational Development, creative arts, and various types of business analysis.

Workshop Description

1. Introductory presentation, approximately 30 minutes in length with time for questions and answers.

2. Stand up demonstration and practice by participants of basic skills of graphic recording. (About 1 hour including feedback and discussion.)

3. Exercise to demonstrate need for complete neutrality in recording. Break up into small groups and practice listening and recording exactly as spoken. (About 30 - 45 minutes with feedback and discussion.)

4. After a break, have a short lecture on specific ways to apply graphic recording in the analysis and design stages of systems.

Examples:

Research
Requirements evaluation
Structured Analysis
Team building
Training
Personal visual journal

5. Exercise: Each participant prepares their own poster describing one way they could apply graphic recording on a real project.

   Each participant presents their poster back to the group.

   Discussion and questions and answers about experience of expressing themselves graphically.

   (At least one hour to complete this entire exercise.)

6. Open discussion: What other techniques have participants used themselves or been exposed to. (15-20 minutes)

7. Closing comments and final questions -- Graphic recording only one of many techniques which can be refined to improve user/computer professional interaction. But rule is:

   When in doubt DRAW!

   (30 minutes)

8. Session evaluation. (15 minutes)

Submitted by:

Darlene B. Crane
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Background:

Ms. Crane has over fifteen years of experience in management and information systems development. She has an MBA in finance and professional training in Information Systems Development. She specializes in bridging the gap between the business and technical communities to optimize business results from information systems. She has researched and tested her graphic facilitation techniques over six years with real project teams.

CPSR -- CONFERENCE ON PARTICIPATORY DESIGN

Workshop Proposal

Graphic Recording in Participatory System Design

or

When in Doubt, Draw

Purpose

This workshop will introduce the use of graphic recording techniques to produce effective collaboration between users and computer professionals. Visual thinking tools are regularly used in the fields of Organizational Development, Marketing and Advertising, Architecture and other engineering fields. However, in systems design, graphic tools have focused on structured, sometimes rigid graphic models for documentation.

Visual thinking tools build a flexible visual vocabulary which can be used throughout the development process. With a visual vocabulary the user and computer professional can build a shared vision of success and overcome the barriers of professional jargon. Through careful selection of different visual formats, the entire team can work through complex issues, develop a range of solutions, and proceed through analysis of the alternatives.

By challenging the minds of the entire group with the different visual formats fundamental insights are uncovered about how systems should be built and implemented.

Background

The use of graphic recording with joint user/technical teams evolved over seven years. During work in industry on a number of projects, the graphic recording tools produced the clearest system requirements, a sense of ownership by the whole team, and a mode of discovery about what a good system could be. The next step was then to start testing and stretching the usefulness of the techniques on different projects. Tests indicated:

1. A confident, trained graphic facilitator can build a collaborative design methodology which supports the entire development cycle.

2. The graphic facilitator must be a "neutral" party who does not favor the technical staff over the user staff or vice versa.

3. The graphic skills are transferable to the project team and give people from radically different backgrounds a tool to understand each other's view points and positions.

4. The graphic techniques made the difference between success and failure in planning and executing difficult phases of projects.

Workshop Outline

This three hour workshop will provide hands on practice and discussion of the usage of graphic recording tools on project teams. The workshop activities will include:

- An opening presentation which defines graphic recording and its role in building joint intellectual activity between users and computer professionals.

- Workshop participants will then learn the visual tools by practicing the basic techniques.

- The instructor will then demonstrate different types of graphic formats and when they can be used in the systems development process.

- The workshop will close with a discussion on introducing the techniques into the participant's project environment. Examples of how resistance can be overcome will be presented.

Workshop Leader

Darlene B. Crane is the founder of Crane Consulting and has over fifteen years of experience with major corporations in management and information systems development. Ms. Crane has created a model for collaborative project management applying graphic facilitation. She has conducted her own research in methods to improve the analysis of business processes and the role of the user in systems development. Her education includes an MBA in Finance, an MA in Japanese Studies and an MA in Library Science.

Workshop Title: Organizational Politics and Participatory Design or, Why Projects Fail

Proposed by: Paul Scheer

The purpose of the workshop would be to explore the issues described in the title with the participants, primarily through the discussion of examples. In addition to sharing individual experiences, explanatory models and critical skills would be sought.

Two alternative formats are presented. Conference organizers can select a preferred format from along the continuum defined by these two alternatives. The format can be easily fine-tuned during the workshop according the expressed interests of the participants.

Alternative 1: Participants drive the workshop

This format would be the most interactive. Participants would be primed to bring and describe extended examples of project successes and failures. The workshop leader would function primarily as a facilitator, encouraging interaction among participants who would themselves be expected to provide explanations, counter-examples, helpful hints, etc. The workshop leader would not "lecture."

Alternative 2: Leader drives the workshop

This format would be less interactive but would still be participative: participants would be expected to bring examples which the leader would fit into an overall explanatory framework. The framework could be presented through a unified "lecture" or through bi(y?)te-sized tidbits sprinkled throughout the half day. The workshop leader would bring handouts and overhead foils.

Workshop Leader's Perspective

Everything that ever happens in an organization, including the implementation of computer systems, is an example of the "social construction of reality." Each organization member strives to achieve their own desired goals, which they believe contribute to the overall objectives of the organization. Each individual's beliefs regarding the connection of means to ends constitute a different version of "reality." This is the ground on which organizational politics is played out.

Which version wins? Strategic contingency theory suggests that players who are able to solve critical strategic problems for the organization become powerful and are then able to use their power to impose a definition of "official reality." When a single individual or faction dominates, a single version of official reality may persist for years, surviving even changes of top management. When several powerful players compete within an organization, official reality is a metastable consensus, ever-shifting with the outcomes of power struggles and problems posed by the organization's environment.

To have a desired project supported requires that it be framed in terms that are most consistent with the dominant reality. In fact, the operative definitions of common terms like project "success" and "failure" are often different from their commonsense meanings, being likewise conditioned by the dominant reality. The relationship between an individual's version of reality and the dominant reality is referred to as the individual's alignment. According to this view, without a compatible alignment, the best possible individual effort is doomed to failure.

The primary organizational skills that the proponent or manager of a project requires are these:

1. the ability to decipher another's alignment (what a person says is not always what is meant)

2. the ability to communicate understanding of another's alignment in a <u>non-threatening</u> manner

3. the ability and willingness to construct a compatible alignment (especially when the dominant reality is distasteful to one's personal values)

This set of skills is not normally included in the Computer Science or M.I.S. curriculum. It is more common to the training received by labor negotiators, psychotherapists and martial arts practitioners.

System developers and users sometimes find themselves at odds due to a mutual failure to appreciate what the other needs in order to be successful. At other times user and developer are united in an endeavor that is not fully supported (or is totally unsupported) by management. In these and other situations, effective participatory design requires effective alignments underlying the system development process to empower the end user.

Organizational Politics and Participatory Design or, Why Projects Fail

by

Paul Scheer

The purpose of this workshop is to explore how organizational politics may constrain attempts to implement participatory design. In keeping with the participatory theme of the conference, workshop attendees are requested bring examples of actual projects to discuss. Through group discussion of both successful and unsuccessful projects we will attempt to identify explanatory models and critical organizational skills.

System developers and users sometimes find themselves at odds due to a mutual failure to appreciate what the other needs in order to be successful. At other times user and developer are united in an endeavor that is not fully supported (or is totally unsupported) by management. Conflict situations such as these are often resolved politically.

Organizational politics tends to have a negative image. Political decisions often seem arbitrary, not rational. The technical education that most systems developers receive omits any training in conflict resolution skills. Yet, if as seems likely, all organizations have politics, effective design (whether participatory or not) dictates active involvement with the organization's political process.

Workshop Agenda

1. Introduction

   - What do attendees want from the workshop?
   - Review/modify agenda as appropriate

2. Solicit Examples for Discussion

   - Nature of project
   - Participatory?
   - Successful?
   - Noteworthy issues

3. Participants Select Examples for In-Depth Discussion

4. In-Depth Discussion

   - Elicit further information
     - who were the key players?
     - what was the organizational environment?
     - what was the expected payoff from the project?
     - were there any hidden agendas?
     - at what stage did problems appear, if at all?
     - was anyone (dis)satisfied by the outcome?
     - any lingering questions about what happened?
   - Draw simple data flow of project process
   - Participant discussion
   - What conclusions can be drawn from this example?

5. Wrap-Up

   - Final questions or generalizations
   - Evaluation of workshop process
   - Pass out reading list
   - Adjourn

An Approach to Organizational Politics

1. Social Construction of Reality

Everything that ever happens in an organization, including the implementation of computer systems, is an example of the "social construction of reality." This means there is a tacit understanding among organization members about which goals to strive for, permissable work methods, the nature of success and failure and the factuality of events. The nature of this agreement is underdetermined by "objective reality" and thus, has a very large subjective component.

How this tacit understanding comes about is a problem in the sociology of knowledge. What maintains the structure of official reality, once established, is organizational power.

Each individual's beliefs, goals and working methods constitute a different version of reality. Individuals who stray too far from official reality are counseled to change their ways. More serious offenders are disciplined, ostracized or fired. This is the ground on which organizational politics is played out.

2. Power and Decision Making

Which version of reality wins? Since organizations must exist in the "real" real world, there would seem to be limits to the free play of subjective imagination. Competitors, hostile raiders and the stock market, for example, are supposed to keep corporate managements in line.

Strategic contingency theory suggests that players who are able to solve critical problems in the organizational environment become powerful and are then able to use their power to impose a definition of official reality. When a single individual or faction dominates, a single version of official reality may persist for years, surviving even changes of top management. When several powerful players compete within an organization, official reality is a metastable consensus, ever-shifting with the outcomes of power struggles. In the absence of serious problems posed by the organization's environment, such power struggles are mostly about perceptions.

3. Politics and the Systems Development Process

Both development and user organizations play politics. A successful project outcome can simultaneously reinforce and undermine the power of user organizations (systems projects are presumably undertaken to achieve greater control over some aspect of the environment; such greater control may encroach on the turf of competing user organizations). Users are thus motivated to enlarge or protect their turf. They do this by limiting the membership and authority of project teams.

In many organizations the ability to deliver complex systems projects on schedule and within budget is itself a critical problem. As a result, development groups are under the gun to adopt methodologies that will reliably deliver the expected systems (or risk being decentralized or outsourced). Development managers are thus motivated to protect their turf. Like users, they do this by exercising control over project teams.

4. <u>Framing and Alignments</u>

To have a desired project or development methodology supported requires that it be presented in terms that are most consistent with official reality. Creating such a description is called framing. Opponents of a project or effort will also attempt to frame your effort, painting it in unflattering terms. Goals that are justified mainly by reference to abstract standards such as objectivity, empowerment or logic are most vulnerable to such hostile framing.

The frame that persists will be the one that most convincingly supports the official reality. An individual who must push for the acceptance of a particular project or development methodology is, in effect, trying to redefine a small part of reality. The relationship between this person's version of reality and the dominant reality is referred to as the individual's alignment. An alignment which doesn't threaten the official version of reality is termed compatible. According to this view, without a compatible alignment, the best possible individual effort is doomed to failure.

5. <u>Required Skills</u>

The required organizational/political skills include the following:

- How to figure out what someone else wants when they don't say what they mean or mean what they say (what's that person's alignment?)

- How to let someone know that you understand what they want without threatening to blow their cover (empathic understanding of the other's alignment)

- The ability and willingness to construct a compatible alignment, especially when the dominant reality is distasteful to one's personal values (giving in to get your way)

Reading List on Organizational Politics

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Participatory Design by Non-Profit Groups

Part 1: Volunteer Groups, Learning and Participatory Design

Margaret Benston

One of the major problems faced in any participatory design project is creating an area of common discourse and shared knowledge. Technical people can't be effective resources unless they know at least something about the group that they are working with. Conversely, people in the user group can't make decisions without at least a rudimentary conceptual map of the terrain. For participatory design to function, these (the users) must be able to choose between options, question declarations by technical people and, most importantly, raise questions and issues beyond the immediate ones presented by existing options or by the mindset of the technical resource people. For this to happen, space and time for learning by users must be an integral part of the design process.

The exact form that that learning takes will vary from application to application but it probably should be some form of 'experiential' learning so that the material, so far as possible, is 'owned' by the participants in this process. It should also, so far as possible, be integrated into the design process--if one of the hallmarks of this whole approach is to break down the separation between design, implementation and use, so too we need to break down the implied separation between learning and design.

The need for people to develop such a conceptual map however does imply that the process is not an easy or speedy one. I also believe that there is need for an initial period of basic learning, in most applications, before the interactive process can begin. In the case of computer communication systems, for example, there are major learning barriers to overcome in the initial stages--the software involved is multilevel, a wide range of infra-structure hardware is involved and understanding the physical and logical structure along with the actual differences in organization of information on different applications (e-mail, conferencing, bbs, etc) is not always easy. In addition, the social organizations and networks implied by different options are also not transparent.

Non-profit groups typically operate with little money and with already enormous demands on staff and volunteers--one of the major problems in attempting to work with them in a participatory way lies in their members finding the time for an approach that at times simply seems another burden. It's hard for over-stretched people to be future-oriented enough to recognize that the time put in during early stages will be repaid later. My experience has been that there is a resistance to the need to learn enough to even begin the design process. There is a strong tendency to want the expert to do it for them.

Since our point of view is that of technical resource people it is easy to stress the learning process that the potential users must go through and forget how much we must learn ourselves. In much of the work that we've done with non-profit groups, we've also been acting as volunteers and so there are many of the same pressures to short-circuit our half of the learning process. There is also perhaps a tendency to assume that because we share many of the values of the people we are working with that we understand how their particular group functions. Teaching the resource people about their group also creates more responsiblility for the users and further stretches their resources.

The result in several projects has been a real pressure on the part of users to be treated as clients and to have the experts simply take over and do the job. Although the net result looks much the same as the situation in conventional business system design, the reasons why this happens are quite different.

Part 2: Feminism and Participatory Design of Computer Communications Systems

It seems to be the case that outside of work settings, women use computer communications systems much less than do men This, at least in part, reflects gender differences in approaches to science, technology and machines. Boys and men are expected to learn about machines, tools and how things work. The male world includes cars and motorcycles, power tools, electronics and computers. Girls and women are not expected to be interested in such things: instead they are expected to be good at interpersonal relationships and to focus on understanding people rather than things. Women are excluded not just from an understanding of machines and tools but from access to the underlying technique and the physical principles by which machines and tools operate. This means that even when women use tools or machines, they are not the designers, creators or the maintainers of this equipment. Generally, they stand outside a world of technology considered to be male.

There are at least two main ways in which gender differences are manifest in regard to computer communications systems. First, men's and women's access to these systems differs--both in terms of physical access and in potential ways of learning about them. Second, gender differences in language and cognitive style may also influence relations with such systems.

Let us consider questions of learning first. If a man needs to learn something about a new technical area, he generally knows someone else (male) who has at least some expertise in that area and who can serve as a resource. This informal learning from peers is a key element in male culture around technology. The situation is quite different for women. Because of the gender socialization, there are few female peers who are knowledgeable about technical matters. In some (many?) cases, male hobbyists or lay experts turn out not to be particularly good resources for women. Men may not relate to women as equals around technology (it may be in quite subtle ways). It is sometimes hard for women to dicuss technical issues with men--asking a question or raising a problem may be seen simply further proof (as if any were needed) that women do not know what they are doing. Thus, the informal networks that support this kind of learning among men are generally missing for women. This means that in working with women's groups, the members may start out at a less knowledgeable or less confident level than do men.

Because of differences in cognitive style and language use, gender differences may also influence approaches to these systems. (Such differences are described by Spender in Man-Made Language, by Gilligan in In Another Voice and by Balenky, etal in Women's Ways of Knowing). One style of discourse (largely associated with men) has been characterized in these works and others as governed to a large extent by rules and 'facts', by abstraction and by attempts to achieve an ideal of 'scientific objectivity'. Another communication style (more generally associated with women) is more process centered, more focussed on the 'other' and on relationships. This discourse is directed to the resolution of the conflicts between the world of facts and the world of emotion. It is the styles of objective, 'male' discourse, however, that are dominant in this culture. There is also evidence that the roles that men and women take in conversation are quite different.

Very little research on gender differences in the styles of use of computer-based communications systems has been done. There is, however, some indication that computer conferencing systems, for example, favor male styles of discourse more than female. Such systems are weighted heavily toward the formal presentation of ideas and the setting for those ideas in almost completely abstract. On the basis of informal sampling locally and on the few published reports, women's choice seems to be away from the more abstract, formal interchanges of an organized computer conference and more toward use of messaging systems. Such potential differences in cognitive style would be important to bring out in the participatory design process. Systems designed for use by feminist (or other community groups that put a high value on alternate styles of discourse) might want to support different kinds of interaction than do conferencing systems, for example.

A further, and very important problem, lies in attempting to embody the principles by which a group operates in the communication system. As Marilyn Asshton-Smith points out, in a report of attempts by her group to introduce electronic mail, feminists want to investigate ways in which communication can 'speak the truth', independent of the power or authority of the speaker. How can we exchange ideas, feelings, knowledge and opinions as well as make decisions within non-heirarchical organizations? How can we use communications processes, structures and technologies to foster that free flow of information and decision making?

In reporting on first period of operation she asks "But is this neophyte communication system a feminist system? As feminists we are familiar with the ways in which communication can be closed and the way it is linked with the maintenance and exercise of power." She points out several problems which arose--among them 1) the fact that even though information was widely distributed, sometimes it was apparent that private communication underlay some of what was going on and 2) there was difficulty in following a discussion to a conclusion when a decision was called for.

One of the conclusions she draws is that "patterns associated with other technology were the communicative patterns we tended to follow..they in fact work well on electronic mail and it is a perfectly legitimate communicative form. There are patterns which are most effective if one person is making decisions and thers are asked for their advice (as in a presidential form of government)... But to the extent we are attempting to recreate the decision-making processes of a "good" meeting, in which communication is fully open and all participate until there is a resolution of differences based on something other than power, we have much work to do." (All quotes are from "Communicating: the Feminist and Electronic Mail" presented by Asshton-Smith at the 1988 Canadian Research Association for the Advancement of Women conference).

It seems clear that the participatory design approach has much to offer in trying to accomplishs these goals.

Prepared by Margaret Benston (The 'our' refers to work with Ellen Balka)

Part 3: Communication and Network Structure

In our work, we have been concerned with the interaction of the technical dimensions of computer networking systems, and the social aspects of group interaction which occurr in relation to a given computer networking system. Among the issues we have been concerned with are the relationship between network structure and the types of communication a given structure accomodates. After looking at several computer networking systems used explicitly for the purpose of feminist dialogue (as described by system users), we have come to the conclusion that as long as technical efficacy is primary, social goals are likely to go unfulfilled. Thus, in order to asure that the social goals of a group are met, social goals should be considered equally alongside technical efficacy.

In discussing the design of computer networking systems, we are accostomed to thinking of the range of decisions related especially to hardware, as strictly technical decisions. However, social and technical choices are made during the design and implementation stages of computer networks, which ultimately set some parameters in terms of the types of social interactions which can occurr. In trying to understand how social choices interact with technical decisions to produce a computer network with certain strengths and weaknesses in relation to social goals, the analogy of a party is useful.

In comparing computer networks to a party, the place a party is held (for example a room or building along with the furniture in it) can be thought of as analogous to the physical structure of a computer network. The format of the party (e.g. cocktail party vs. dinner party vs. potluck brunch) as well as who the hostesses choose to invite can be viewed as social characteristics, analogous to social decisions made about the computer network. Actually, decisions about the physical structure of a computer network, like decisions about where a party is held, are also based on social goals. In relation to computer networks however, the social nature of decisions about the physical structure of computer networks have been one step removed, with technical grounds being considered first, followed by social decisions of a narrower scope.

If the room selected for a party has very formal furnishings, most guests will make some attempt to act appropriately formal. Similarly, if a party is held on a beach, a different mood is conveyed, and most guests will be inclined to dress and act more casually. In a similar fashion, decisions about what computer hardware and software are used for a network, and how the network is physically organized determine the types of communication possible, and set a stage for social interaction on computer networks. For any particular physical network structure, some things will be true, regardless of who the users are.

If users of a multi-node computer network (for example Usenet) decide they want to exchange thoughts on women's issues, participants at each node must decide on a common node to coordinate the distribution of messages coming in from all nodes. In contrast, if users of a single node wide area network (for example PeaceNet) wanted to have a discussion about women's issues, they might begin by deciding whether to have their discussion via a mailing list (similar to multi-node systems), a bulletin board (similar to a single-node local system) or a conference.

When we throw parties, we make many social decisions; whom to invite, whether children are welcome, whether alcohol is served, whether events are determined by guests spontaneously or are orchestrated by the hostess and so on. Similarly, within the limitations inherent to whatever physical network structure we have chosen, many explicitly social decisions must be made. For any communications act, we must decide whom to include, in some cases (a mailing list or computer conference) whether the information exchange is moderated or unmoderated, and, if it is moderated, what criteria the moderator should follow.

If our goal is simply to explore a set of issues with people who are geographically dispersed, and have a place to get feedback on thoughts, a multi-node mailing list, such as those available on Fidonet and Usenet might be an appropriate solution. Or, if we want the potential to have structured discussions, (computer conferences) between several people on specific issues, and have access to resources such as databases containing bibliographies and mailing lists, we might choose a single-node commercial system. This is the type of service the founders of the Amazon Line, (from Toronto) hoped to provide, and supporters of the Compuserve Information Service (a large network accessible worldwide, run on a for-profit basis on a computer in Ohio) Women's section attempted to ensure.

If the main goal of our communication is to increase the information flow between individuals and/ or organizations in a single city, a single node computer bulletin board system might be most appropriate. The Women's Bulletin Board system in New York city attempts to serve this function for that city's women's community. Or, if encouraging daily communication between board members and committee members of a nationwide women's organization, (many of whom have institutional access to computers) is our goal, we might set up a private multi-node mailing list. The Canadian Research Institute for the Advancement of Women (CRIAW) has taken this approach to meet their short-term goals

The use of Usenet newsgroups, (as well as other distributed mailing lists with similar physical stuctures) provide an interesting case study from which one can argue for the need to accord social goals equal importance alongside technical efficacy. Women began using Usenet newsgroups as a communications channel for the discussion of feminist issues in the early 1980s. The Usenet structure in part reflects the social values and goals of many programmers and hackers over the years. Usenet has been referred to as an administrationless volunteer-maintained computer network of information anarchists (DE Marrais, 1984). Virtually anyone with access to a computer that runs unix and is identified as a Usenet node can gain access to a Usenet newsgroup, including several that deal with women's and/or feminist issues.

As most women who have read and/or participated in any of the Usenet newsgroups related to women's issues and feminism would probably argue, one of the most striking features of these groups is the extent to which the concept of feminism, and the very notion of gender roles, are a contested terrain. Put another way, while the groups were theoretically set up to accomodate discussion of women's and feminist issues, one of the most noticable features of these groups is the extent to which just what constitutes feminism, as well as what constitutes the appropriate set of behaviours for both men and women, is continiously contested.

While it would be easy to argue that this sort of debate is not uncommon to discussions about women's issues and feminism, at the same time, the extent to which basic assumptions are debated is frequently commented upon by group participants (usually women). While there are undoubtably many reasons for this, my intention here is not to come up with a definative reason for why this debate exists, but rather to link this problem to the physical structure of the network, with the goal of making the point that social goals (in this case, of using Usenet newsgroups to discuss women's issues) occurred after technical decisions about the network strucutre, hardware and software were made.

In the case of Usenet newsgroups, the strucutre of Usenet itself accomodates large, open groups with fluid membership. Because Usenet newsgroups are by default un-moderated, (a social decision which is supported by the software) debates often rage out of hand, causing many group participants to drop out of the groups, and causing other participants to question the extent to which the group's goals (of discussing feminist and women's issues) are being met.

While I suspect that no one involved in the design of Usenet ever intended the system to be used for the discussion of women's issues, at the same time, at some point several people shared an assumption that given the availability of this technology, Usenet could be used to meet the social goals of discussing feminism and women's issues. And, while the Usenet newsgroups dedicated to discussion of women's issues suchman.pa@Xerox.COMzperform some function, it is, as many group participants debate, not clear that the newsgroups fulfill the function for which they were intended.

While Usenet newsgroups dedicated to women's issues are perhaps an extreme case, the high level of dissatisfaction of group participants with debates which occurr online perhaps indicate that the structure of Usenet is not well suited to the social goals of discussing women's issues. At the same time, this mis-match helps illustrate the arguement that when technical efficacy leads to the use of a computer system for specific social goals, those goals will often remain unfullfilled.

While it would be tempting to conclude that no one ever intended Usenet newsgroups to be used in the way participants in soc.women (and its predicessors) have attempted to use them, it is also worth noting that the process of deciding to use a computer system for a specific purpose, despite the fact that it was not designed to fulfill that social function, is a very common method through which groups adapt computer networking systems. If our intention is to improve the extent to which groups can meet social goals through the use of computer systems, we should conclude from the example of Usenet outlined above, that social goals must be given equal consideration alongside technical efficacy in designing or selecting computer systems to meet specific social goals.

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