PARTICIPATORY DESIGN

Principles and Practices

edited by

Douglas Schuler

Aki Namioka

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The publisher has gone to great lengths to ensure the quality of this reprint but points out that some imperfections in the original may be apparent.

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Foreword

Lucy Suchman
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Computer systems development is invariably accompanied by the problem of how to define requirements for the system's functionality. From the developer's point-of-view, the problem has been viewed as one of somehow eliciting from prospective users of a technology what it is that they need the technology to do for them. At the same time this basic problem is often significantly displaced from any specific site of technology-in-use. Imagined users, model users, or surrogate users like the paid subjects of focus groups and operability tests stand in for those who will actually work with the technology. And stereotypic scenarios or extrapolations from prevailing models of generic information processing tasks take the place of an investigation of the specific activities in which a technology will be involved. Even in those cases where development involves extensive inquiry into relevant work activities, it is often persons other than those who actually do the work who speak on their behalf.

Against such a background, this volume takes up the problem of how to establish meaningful and productive interactions among those directly charged with processes of technology design and use. It does so primarily from a designer's point-of-view. That is to say, with the exception of contributions by Ellen Bravo and Frank Emspak, the voices you find here are not those of workers or system users but rather of researchers and developers concerned with bringing their knowledge of technological possibilities to bear on the work of system design. At the same time, what distinguishes this collection from many previous writings on system development is its central and abiding concern for direct and continuous interaction with those who are the ultimate arbiters of system adequacy; namely, those who will use the technology in their everyday lives and work. A key concern throughout is the question of who does what to whom:

whose interests are at stake, who initiates action and for what reason, who defines the problem (or decides that there is one.)

Many of the contributions here are drawn from the first Participatory Design Conference held in Seattle, Washington in the Spring of 1990. That conference was initiated by members of a project on Computers in the Workplace within the national nonprofit educational organization, Computer Professionals for Social Responsibility (CPSR). As a member of CPSR and program chair for the conference I had the pleasure of being part of a unique, grassroots effort to bring this new perspective home to the research and development community within the United States. The conference was, I think, a very special occasion for all involved, distinguished by its deeply cooperative, nonbureaucratic, widely distributed, and extremely effective organizing committee and by the spirit of excitement that characterized the conference itself.

The chapters in this collection follow in the footsteps of a small but growing international community of scholars and practitioners of participatory systems design. Many of the European originators of this approach are represented here as well as some new and distinctively American approaches. At the same time, the contributors vary significantly among themselves in their conceptualization of the processes in which they are engaged. The goal for these writers is not to offer up a general and unified ideology or methodology, but to report in a variety of ways on the problems and possibilities for a more authentically cooperative process of technology design. As a result the collection is characterized less by any single theory or technique that is *Participatory Design,* as by a rich and diverse set of perspectives and experiences that, despite their differences, share a distinctive spirit and a direction. That spirit and direction is characterized by concern with a more humane, creative, and effective relationship between those involved in technology's design and its use, and in that way between technology and the human activities that provide technological systems with their reason for being.

Participatory design makes explicit the critical, and inevitable, presence of values in the system development process. To predominant values of product quality and work productivity are added broadened participation and skill development. The premise is that these values are closely related; that the productiveness of our work is tied to the extent of our involvement, and that product quality is a matter of a technology's support for the continually expanding and developing work practices of skilled practitioners. Some readers may be surprised to find the voice of organized labor represented here as well. Such representation is critical in a discussion dominated to date by managerial and engineering perspectives. Until we become familiar with and take seriously each other's concerns there will be little hope for a mutually satisfactory future in the development of work and technology.

Within this collection, the differences between European, Scandinavian, and United States environments for system development are clear. At the same time,

all of these countries participate actively in an international economic community that shares many basic relations of business and working life. To the extent that designers within the United States move ahead with a program of broadened participation in technology development, contradictions will inevitably surface between the rhetoric of user-centered design and employee empowerment, and the realities of hierarchical systems of accountability and control. The point here is not to reconcile these contradictions, but to give readers a sense for the range of the issues. The goal of CPSR, the Participatory Design Conference, and the volume that you now hold in your hands is to widen and deepen our discussion. If as a reader you take away a more sophisticated appreciation for the many meanings of participatory or cooperative systems design, including problems and conflicts as well as prospects and shared values, this collection will have done its job. As a product of our efforts, we hope this volume will be judged by its contribution to a continuing process of discussion, debate, and exploration of alternative approaches to computer systems design.


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Preface

Participatory Design (PD) represents a new approach towards computer systems design in which the people destined to *use* the system play a critical role in *designing* it. The approach, pioneered in Scandinavia, is only now beginning to get recognition in the United States. As Paul Czyzewski, Jeff Johnson, and Eric Roberts note in the introduction to the Conference on Participatory Design (PDC '90) proceedings, there are several fundamental ways in which PD differs from *traditional* design.

> It rejects the assumption that the goal of computerization is to *automate* the skills of human workers, instead seeing it as an attempt to give workers better tools for doing their jobs.
>
> It assumes that the workers themselves are in the best position to determine how to improve their work and their work life. In doing so, it turns the traditional designer-user relationship on its head, viewing the users as the experts—the ones with the most knowledge about what they do and what they need—and the designers as technical consultants.
>
> It views the users' perceptions of technology as being at least as important to success as fact, and their feelings about technology as at least as important as what they can do with it.
>
> It views computers and computer-based applications not in isolation, but rather in the context of a workplace; as processes rather than as products.

Participation stands in contrast to the cult of the specialist. In the specialist model, an expert is sought out. The question is presented to the Expert who will eventually produce the Answer. With this approach, those most affected by the conclusion must sit idly by, waiting patiently for enlightenment. PD, of course,

demands active participation. PD, however, is not *against* expertise. There is no reason or motivation to belittle the role of expertise. Specialized training and experience, both technical and interpersonal, are important. In the participative model, however, this special expertise becomes yet another resource to be drawn on—not a source of unchallenged power and authority. A partnership between implementers and users must be formed and both must take responsibility for the success of the project.

During the course of editing this volume we have come across several disciplines that prominently incorporate the idea of participation. These include participatory education, participatory architecture, and participatory economics. Although these other participative endeavors are not as familiar to us as participatory design of computer systems, it is clear that these other approaches are motivated by similar concerns as the PD practitioners in this book. The most basic motivation is the idea of democracy. To be more concrete: People who are affected by a decision or event should have an opportunity to influence it. Participation is the key element in democracy. The other compelling idea is that quality can improve with strong and effective participation of the people involved. User involvement and iteration are generally acknowledged to be more critical to success in software design than adherence to conventional design paradigms. Participation is essential to social interaction. It is also essential to good design.

The material here has been chosen in order to illustrate the underlying philosophy and motivation as well as present enough information to begin applying PD in design. We've also sought to transcend the *Scandinavian context* by offering examples and advice that are pertinent to those of us in the United States. To best present the material we have divided the volume into 5 sections. *Context* introduces the motivation for PD in the United States. *Principles and Issues* presents theoretical issues as well as implementation issues. *Approaches to Participatory Design* gives examples of Participatory Design inspired projects in the United States. This section includes descriptions on how to conduct a project using PD. *Guidelines for Technique Development* offers suggestions for how people considering PD can introduce the concepts and ideas to the participants. *Case Studies* talks about the results of PD projects, both in the United States and Europe.

While it is impossible to offer a blueprint for PD, we hope that this volume supplies at least some of the conceptual scaffolding.

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We would like to acknowledge the people who have contributed to this book, knowing full well that this list is incomplete. The people listed below contributed

to this book or to the Participatory Design Conference (PDC '90) or in some cases, to both.

First, we would like to thank Paul Czyzewski and Jeff Johnson who chaired PDC '90. We would also like to thank Lucy Suchman, who as the program chair was largely responsible for the outstanding program at PDC '90. Lucy invited many of the people from Europe and the United States who have significantly contributed to Participatory Design development. In addition, we appreciate her thoughtful forward to this book.

We are very thankful for all the work that the contributors put into this book. In particular we would like to thank Jonathan Grudin, who not only contributed with two chapters but helped immeasurably in organizing the work, reviewing, and providing an effective European liaison. We are also grateful to the following people for providing invaluable support: Eric Blossom, Darlene Crane, Carolyn Curtis, Marcia Derr, Danielle Fafchamps, Roger Hayes, Heather Holmback, Lesley Kalmin, Dave Kadlecek, Dave Levinger, Max Palevsky, Steve Poltrock, Eric Roberts, Lois Toback, and anonymous reviewers.

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I CONTEXT


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1 The Hazards of Leaving Out the Users

Ellen Bravo
Milwaukee, WI, 9to5,
National Association of Working Women

INVITED TALK
PARTICIPATORY DESIGN CONFERENCE
SEATTLE, 1990

At 9to5[1] we're very aware of the hazards of implementing automation without involving the people who will use it. For many years we had a contest called "the pettiest office procedure." The winners one year were lawyers who had installed beautiful new beige carpet in their office. Like the good lawyers they were, they thought about the consequences. They wanted to keep the carpet unmarred, but their secretaries' chairs had rollers on the bottom that would create tracks on the rug.

So the lawyers decided—without consulting or even bothering to inform their secretaries—to have the chairs nailed to the floor. Of course, when the secretaries came to work the next day, they could not perform their job because they had to roll from the typewriter to the computer to the telephone. This is a great example of what happens when you omit the user. Not only does it incapacitate the user, but think about what the carpet must have looked like when the lawyers had to have the chairs unnailed.

I focus here on a very significant and large group of users, namely, clerical workers. A lot of what I have to say can be extrapolated to apply to users at other levels as well.

Clericals are usually omitted from every step of the technology process. They are left out of decisions on how the technology should be introduced, how the equipment should be designed, how the job should be designed. They are also

[1]9to5 is an advocacy group for low income working women and families.

omitted from decisions about the application of software and systems. Leaving out the users isn't just undemocratic—it has serious *consequences* for worker health, human rights, job satisfaction, and also for the work process and the bottom line. When called upon for systems design, please consider carefully in what kind of atmosphere and on what equipment these systems will be applied.

Let me begin by talking about health hazards. You're all familiar with the problems of eye strain and vision deterioration that users are experiencing. For example, a 1987 study in Massachusetts looked at 1500 clericals employed at 38 worksites in six different industry groups (Rossignol et al., 1987). Researchers found that 72% of the workers had daily or almost daily eyestrain, about 140% more than people who weren't working on VDT's.

Many studies have shown an increase in temporary near-sightedness. You may have seen an ad that asks what are the three most popular computer accessories. The answer is Tylenol, Ben-Gay, and Visine. What we're finding is that Visine doesn't eliminate temporary near-sightedness, just as Ben-Gay and Tylenol don't take other kinds of problems away. People are experiencing permanent changes in their vision.

Dr. James Sheedy, Associate Professor at the University of California, Berkeley school of Optometry and Chief of the VDT eye clinic there, said they are seeing a higher than normal incidence of focusing problems among people in their 20s and early 30s. Sheedy says many of these people are borderline: They have slight problems that would never appear as symptoms except for the extra load brought on by the way they use VDT's. The problem is not inherent in the technology but comes from the design of the workstations and the design of the job. According to Dr. Sheedy, these problems may actually be causing a breakdown in the focusing mechanism of the eye.

I could tell you horror story upon horror story of what happens to people who work in improperly designed workstations. A California word processor described the various kinds of problems she had: the pain behind her eyes, the headaches, the difficulty reviewing, the blurring when she looked at a distance. She had eye therapy as prescribed by two optometrists—all of which she had to pay for herself, because her employer did not acknowledge her problem as job related. She eventually had to leave and go to a non-VDT-related secretarial job at a cut in pay of $800 a month. Her story is not atypical.

Some problems occur as a direct result of the way the office is set up. I met a women in a VDT training who described how her eyesight had deteriorated a lot over the last 4 years. I asked her to describe what her office looks like. Management decided to set up her workspace as the model office of the organization. They had beautiful wood walls put in with spotlights to highlight the wood. There were hanging strobe lamps throughout the room. And in the middle was the secretary's desk with the VDT. Because her desk had no light on it, the managers decided to train the spotlights directly on the VDT. In addition, they bought her a spectacular wooden desk. She asked for a formica finish, but the

managers wanted it to be natural wood to go with the walls. They were afraid the secretary would harm the wood, so they put a pane of glass over top of it. In sum, this poor woman had to deal with reflections all over the place because no one bothered to consider her needs.

The other thing that's contributing to people's eye strain and deterioration of vision is having to read these ridiculous menus in order to pursue any operation on the computer. There must be ways programmers could help to reduce eye strain.

Another big area of health hazards for VDT users is musculo-skeletal strain. We've all seen the pictures of splinted reporters. Once repetitive strain injuries, or RSIs, started occurring among prestigious reporters and even some editors, the big secret came out that RSI is a major problem among people who use computers. A friend who worked in a public defender's office told me how they just plunked down the computers on regular desks. Within 6 months, 4 out of 16 clerical workers in that office had carpal tunnel syndrome.

Some of you should be familiar with this problem from 911 operators in Seattle. When the operators went back to work with carpal tunnel syndrome, some coworkers walked around with their hands curled up and ridiculed the operators for having "puppy dog" syndrome. That's how little recognition there is for the seriousness of what can be not just painful, but a permanently disabling condition resulting from the lack of user involvement in the office set-up and on the job.

The main thing I want to discuss is what has been described as the chief occupational hazard of the computer age, namely, stress. A 1987 study by Denise R. Resko and Phyllis Kernaff Mansfield asked VDT workers and non-VDT workers about a number of symptoms. The researchers controlled for family stress and for job stress that was not connected to VDT's. They found that VDT work in and of itself was creating higher rates of stress symptoms: headaches, gastrointestinal problems, menstrual problems, musculo-skeletal problems, etc. (Resko & Mansfield, 1987).

Why is this happening? 9to5 did a study on stress back in 1984, which was the first time that people really looked at stress among working women. Until then, it had been considered mainly an executive, and therefore a White male, problem. This study, which had 40,000 respondents, showed some very interesting results.

Although women managers were more likely to describe their jobs as being very stressful, clerical workers were more likely to experience the health symptoms of stress. Like the women managers or professionals, the clerical workers had high levels of responsibilities—but unlike the managers, the clericals had little control. It was this absence of control matched with the high level of responsibility that created the stress. The singular condition that most contributed to stress in the 9to5 survey was computer monitoring.

The same kind of results have been found in the Framingham heart studies. When they looked at women clericals, they found they had twice the rate of heart

attacks as all other women workers; if you add in variables of low income and children, the clericals had four times as many heart attacks. Why? They were more likely to have an unsympathetic boss, a dead-end job, and no outlet for their anger. In other words, they were more likely to have lack of control.

Considered next are five ways in which technology is adding to stress, then I discuss what that really means in terms of human health and other costs.

First of all, lack of control comes from software designed without knowing or thinking about the needs of the users. A librarian, for example, described a book ordering procedure that originally entailed one form, which now has to be entered on three screens. A dues accounting system for a local union now requires three steps for something that could be done in one step. The person who programmed the system did talk to the staff before developing the program, but did not check back with them afterwards to see how it was working and whether there were any glitches that needed to be changed.

There should be a law: No one who hasn't managed a database should be allowed to program one. I call this law: "No one should be allowed to make menus who hasn't had to eat off them." If you've ever entered data into a database and had to manage it, you know that one of most common things you have to deal with is duplications. You enter a name and then you find that person was already on your list and you want to go back and delete the dup. Say you have two 'Gloria Williams'—if you delete 'Gloria Williams,' you have no "Gloria Williams.' You have to trick the computer: change one of the 'Gloria Williams' to 'Gloria Wilhelm' and then delete 'Gloria Wilhelm' so that 'Gloria Williams' will still be on your list. Why isn't there a simple thing that says: "dup, delete one"? The computer would know there are two; take out one, and you have what you need.

Or how about this for a revolutionary idea. Shosana Zuboff, in her book, *In the Age of the Smart Machine,* (1988), discusses the fear of computer operators that they won't be able to retrieve their data. Computers now work on the principle that what you input is worthless until it reaches a certain stage, at which point you tell the computer: This is now good enough; save it. It should be the other way around: Everything I enter is worthwhile unless I tell you to the contrary. Everything would automatically be saved. You would never have to worry that an error would happen or that the system would go down before you had saved your document. Before you could get out of the document, the screen would say: Name this or type the word "delete." Not: hit "y" or "n." It's much easier to delete what you don't need than to go back and re-key what you lost. The greatest angst, as any one of you who's ever done this know (and I see you nodding your heads), is losing something that you composed from your head with no notes. If the computer treated us as having daily brilliant thoughts, it would save everything we did.

These were examples where the user needs are not understood. The second area related to stress is where the user needs may have been understood, but we'll never know because we can't understand the instructions either in the menus or

in the manual. Consider the "stop print" function in some database programs. You make a mistake or you see that it's not printing the way you want and you want to kill it. So you quickly open the manual under "print" and look for "stop" and there is nothing. So you look under "s" for "stop" and there is nothing. So you look under "k" for "kill"; you even look under "a" for "annihilate." And there is nothing in the index that tells you how to make the darned thing stop. Instead you have to pay $135 a year to some user network that you call up when these things happen, and they tell you how to get the thing to stop printing and how to start over again.

I think that there is very little malice involved in people who make these instructions. The problem is people who don't speak conversational English, even though they are not foreign-born. They simply speak "tech-ese"; we need an interpreter to understand them. It would obviously be a lot easier if the people who used the system helped design the instructions.

A third area that contributes to stress is software designed without regard to the impact on the user. An insurance clerk told 9to5 that every time the system was about to go down, a message flashed on the screen saying: "fatal error." Even when you know that you, in fact, have not murdered anyone with your keystroke, the stress effect on your heart and breathing are the same every time the message comes up.

TWA has a new call distribution system. It has eliminated the 6 seconds that you used to have between calls to finish scribbling your paper work, or take a sip of water, or maybe crack your neck. There are now no seconds between calls. Clearly, whoever designed the system had no idea what it would feel like the instant you hang up to have to pick up the phone again.

The fourth area is software that is designed to manipulate or control the user. On an episode of "L.A. Law" Roxanne led the secretaries in a walkout. One of the issues they were up in arms about was VDT's. They were concerned about the hazards, but they were also really angry because their machine was flashing messages saying, "My world is calm," "My world is productive," The secretaries were incensed. Their world was not calm. They were trying very hard to be productive. They found the messages patronizing and offensive. Nowadays software manufacturers boast about programs with this capability. Greentree Publishing, for example, advertises a software package called "Subliminal Suggestion and Self-Hypnosis" with everything from feel-good messages to more pointed commands like "work faster."

But the fifth area related to stress is the most insidious, the fastest-growing, and the most frightening: The computer is actually used to spy upon the user. We tend to think of spying as something you do to the enemy. And we treat very seriously people who spy on us as a country or who sell our secrets to other countries. Yet we are promoting the use of technology as spy and the worker as the enemy. Here the worker is no longer in any way a subject but becomes the object of the system.

Imagine being a reporter writing your first draft. You're just kind of spitting

out your thoughts. Suddenly you get a message on the screen from your editor: "Bad lead. Start over." PC Week Magazine advertises software with such capability by telling the reader: "Look in on Sue's computer screen. You monitor her for a while. . . . In fact, Sue doesn't even know you're there."

In a New York company that had 100 or more terminals in one room, someone told us that occasionally this message would appear on her screen: "You're not working as fast as the person sitting next to you." The computer is able to count every keystroke that you enter, every minute that you are away from your desk to use the bathroom. In fact, it is now not uncommon to have bathroom break statistics posted, with the people who need the fewest potty breaks minutes at the top of the list. This is going to give a whole new meaning to "wellness program," a whole new set of exercises to learn to keep from going to the bathroom outside of break.

Let me share some very serious examples. A lot of this happens in the airline industry. On our job problem hotline we heard from an airline reservationist who was suffering from severe mental stress, insomnia, and stress-related jaw spasms. This is how she described her job: "The computer tracks your time on the calls and it's connected to a light on the tower. If the light goes out for more than 14 seconds, they come on and listen and make nasty comments at you through the earphone."

Another sales agent described how workers punch into three different things: the VDT; a keypad called the Collins; and headsets. Management tracks every second of their working day. Daily and weekly printouts map the average call length, the length of time between calls, the unplugged time, and sales performance. This woman said, "I get more grades in a month than my kids get in their whole life from school." Supervisors can listen into your calls not only with customers but with your coworkers. And you get demerits if you have too much unplugged time, if you didn't sell enough rental cars, if you didn't get enough people to get their tickets in the mail, etc.

This woman, although she'd been there seven years and had a good work performance every year until they implemented this system, was threatened with losing her job because she had too much unplugged time—read: time in the bathroom, time between calls. And she was very nervous, trying to get her statistics up. Her supervisor noticed she didn't look well and told her, "Take 10 minutes and pull yourself together." And the woman said, "I didn't know what was happening to me, but I had a feeling it was going to take more than 10 minutes to take care of it." In fact she had a nervous breakdown and was in therapy for 8 months.

Practices like these have very serious consequences for our whole concept of worker rights and the issue of worker health. A group in Massachusetts did a survey on the consequences of computer monitoring. Sixty-two percent of the people they interviewed did not know at the time they were hired that they were going to be monitored on their job. Barbara Garson (1988) in *The Electronic*

Sweatshop gives an example of a woman who plugged in her headset, turned to a coworker and said, "The doctor says it's cancer," then took her first call. An hour later her supervisor called her in and said, "Is there any way we can help you with your cancer?" The woman stormed out of the office, marched up to her coworker and said, "How dare you tell them." The coworker replied that she had said nothing. That was the first time they realized that their private conversations could be overheard by the same people that were listening in to their calls with customers.

Almost one-quarter of the people who answered the survey in Massachusetts said that their individual stats were publicly posted either by the week or by the month. This misuse of computer systems, treating the user as the object rather than the subject, has serious consequences for worker health and also for the bottom line. A friend of mine did a study on the introduction of technology into three different workplaces and what its impact was on users. She interviewed 161 clerical workers and asked them various questions about how automation had been introduced. The two conditions that most correlated to a high rate of health symptoms were too little training and too much down time—where the user, in other words, had too little control to use the machine effectively.

There are lots of studies that show that productivity goes up 10–25% when you create healthful and ergonomically designed workstations, and the opposite is true when you don't. Harley Shaiken has written about studies demonstrating that computer monitoring is counterproductive. People say they use this technology to improve productivity, but it doesn't work. It makes you wonder if that was ever the intent at all, or if in fact the intent, as Shaiken maintains, isn't rather to control and intimidate workers.

I've been sitting on a commission in New York on the skills for the workforce 2000. They have identified two different trends in management. One trend, representing about 5 to 10% of businesses, is toward a high skilled, high value-added workforce, which requires a new form of work organization—what you refer to as "participatory design," a team approach. But the majority of workplaces instead have a low-skill, low-cost, high turnover view of management. If you have that view of how to do business, obviously you need control in order to get your workers to do the job because the attachment, loyalty, morale don't exist without investing in the workers.

We all know Big Brother didn't work in Eastern Europe. Why is it taking some people so long to figure out that it's not going to work in the United States? It's going to take a lot of work on our part to see that it stops. In answer to the question, "How do we get management to realize that these things need to change?", the most significant way is by creating the power among workers and like-minded professionals to make them change.

You can also use arguments of the bottom line. Stress claims cost an average of $11,000 as compared to $5,000 overall for worker compensation claims. The National Institute of Mental Health said that 30 million Americans suffer mental

strain on the job that is workplace-related. A third of those people are under the age of 30. More than half of them are female. We are talking about symptoms that may affect a minority of workers, but they affect them in very significant ways, both for the workers and for the workplace.

Clericals have been thought of as *just users, just women, just secretaries.* The idea that they would have something to say about how the work should get done is really a radical departure from business as usual in the United States. We also have management that focuses on short-term rather than long-term cost effectiveness. It's not really more expensive to do what we want to do, but it's not the way that American management on the whole thinks. And it's clearly a question of power.

Pay attention to this author who characterizes much of American management style as the "military method of leadership." The author asks why so many American managers ignore the basic rights that are enshrined in the Declaration of Independence and then gives this answer: "Simple. It requires the CEO's and the top VP's to give up power. This is threatening to them." The author of that opinion piece, by the way, was not a radical 9to5 member, but the president of Catholic Knights Insurance Society in Milwaukee, a man named Daniel Steininger (1990). He also quotes some remarks from the man who started quality control circles in Japan, to the effect that companies exist in order to guarantee a good income to their employees and to see that they live a happy life; and if they don't carry out this function, they don't deserve to exist.

Clearly, the only way to reverse this situation is to involve users in decision making and that means some radical re-thinking about how jobs should be designed. Variety and rotation of tasks, multiskill approaches have to be incorporated into the actual job. There are people trying right now through various approaches to make this happen. At Ohio Bell, for example, a collective bargaining agreement limited secret monitoring. It said management could take aggregate data, but could not use data on individuals. People have been trying litigation with mixed results. There are four key cases, two of them in favor of the worker, two of them in favor of management. At 9to5 we are looking for a test case linking the issue of monitoring with the right to privacy. And legislation has been introduced, the Privacy for Consumers and Workers Act, which provides mainly for the right to know and privacy protections.

We need to see a much more interactive model, where users are involved at each step of the way, where the locus of control shifts to include or mainly be in the hands of the users, where everything starts from the needs of the workers. If workers don't yet have the ability to conceptualize what they need, they certainly know a starting place. We need to figure out how to create the language and the interaction so that the conceptualization can take place with the users playing an integral part. We need to have designers experience work so that they know how the application is going to be used and what it will mean.

I end by cautioning you about the concept of participatory design. The idea of

worker participation is being espoused by some people in top management, but I suspect in very different ways. There is a big difference between making suggestions and making decisions; and there is a difference between having the right to participate and having power. As you pursue the issue of participatory design, I encourage you to make sure that users include clericals, and to make sure that participation involves decision making.

Editor's Note

More information on the topic of computer monitoring and health and safety issues can be found in two 9to5 publications: *Stories of Mistrust and Manipulation: The Electronic Monitoring of the American Workforce,* and *VDT Syndrome: The Physical and Mental Trauma of Computer Work.* To order, call 9to5 at 216–566–9308.

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2 Workers, Unions, and New Technology

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The best way to change the structure of American industry in a manner that preserves productive employment, produces a better quality product, and restructures the technology among more democratic lines is for users and designers to find the means to talk with one another as equals and then actually effectuate a decision. To be able to talk with each other as equals, to engage in a participatory design process, we need to construct a support mechanism to enable the process.

In this chapter, we focus our discussion on how people in the factory see new technologies being implemented. In effect, we focus on one class of user. We emphasize metal working and factory work primarily because unionized workers have been the most able to express concerns about the way their work is structured. However, the issue of top down implementation and design of new technologies is the same for office workers, hospital workers, as well as draftsmen, planners, and large numbers of lab technicians.

Workers at all levels share the problems of the apportionment of skill, the design of our tools and equipment (especially software). It is, therefore, apparent that we need to forge links with all users and thus develop more global criteria for the construction of software systems, factories, and the productive apparatus including all office work and data processing.

Although unionized workers in the private sector have traditionally been the ones to raise questions about technology implementation this may be changing. Organized public sector workers may soon be in the best position of all to raise questions of work organization, technology, and enhanced quality of service resulting from meaningful worker input. The demand to cut costs in the public sector may provide unionized workers with a means to push a worker-oriented skills-based agenda. When employees have a chance to reorganize work and

make efficient use of new technologies the organizational structure of the system is altered reducing many expensive and not necessarily productive management positions while maximizing expanded service delivery roles. As more and more office workers get organized, particularly in the public sector, and express themselves collectively, we anticipate increased discussion of job restructuring in the office setting.

Throughout the chapter, I will use the terms *worker* and *labor*. Who is the *worker* and what do we mean by *labor* in this essay? The *worker* is defined as the nonprofessional work force. *Labor* tends to indicate blue collar organized labor. Generally, the old terms blue and white collar, with the exception of professionals, delineate this group of workers. The mental paradigm is the traditional factory. In most such institutions the line between those who implement and those who program and design is very clear.

Ultimately, any strategy that has as its objective bringing together conception and execution will have to involve computer programmers and designers. At some point, workers, programmers, and designers will have to begin to meet together and figure out how to work collectively in order to bring about change on the shop floor. In an addendum to this chapter, I suggest a model for a technology design project which may provide a framework for cooperation. However, the chapter itself is more limited. My goal is simply to discuss how *technology* is viewed looking up from the bottom, and suggest steps that organized labor can take, in the immediate future, to enhance its ability to represent the work force.

A FAMILIAR STORY

The story is familiar. Workers notice some new managers and engineers in the work place. People are measuring something. All of sudden new equipment or computer terminals come in. Some individuals are assigned to the new system—but no one explains how the new system *really* works. Different jobs are created—but it seems that management keeps the interesting work—even though workers used to do it. Older workers aren't trained on the equipment. All of a sudden they aren't flexible enough and don't know enough. New people usually brought in out of seniority are put on the job.

The union leadership has been told some new equipment is coming, but they have not been told much about its capabilities. The leadership is uneasy—and so are the workers. But after a few weeks of talking with management about the effects the new equipment may have on the work force, only some details like shift assignment and some bumping rights are straightened out. There is no discussion about the new jobs and management is still doing the work. No one feels quite right. . . There is a sense of loss.

Often the introduction of new machines or office procedures is accompanied

by a veiled threat. Either do it the new way or no new investment. In these times of plant relocations and shut downs only a fool would argue about how investments are made—at least so the story goes.

Besides—who knows if there is a better way to put in new technology. After all, don't the engineers and management know best?

The story does not end yet, although the *official* role of the union usually stops after the conclusion of the first flurry of discussion about new means and methods. But time goes on and the work force including management tries to get used to the new equipment. To a degree it becomes part of the landscape.

But the equipment is not working too well. Even after a few months the new system is not living up to expectations. Start up costs are high. Problems happen all the time. Quality problems show up and the company is still in trouble—threatening their own existence as well as our jobs.

Is There Another Way?

There are other ways of implementing technological change that allow workers to enjoy the promise of the new technologies. To estimate if those ways can be of use to American workers we must first understand what technology is and who actually implements it.

What is Technology?

A good definition of technology is *the means and methods through which we as a society produce the substance of our existence*. What does that mean? There are old tools, like a shovel and new tools like a robot. There are old sources of energy like steam and new sources of energy like electricity. Materials are also part of technology. Old materials like cast iron and new materials like fiber optics. Then there are techniques of production—old, like weaving, and new as x-ray lithography for producing micro chips. Finally, there is the organization of work—craft work is an old form of organization, the assembly line is newer, and various computer aided flexible manufacturing systems are the newest.[1]

WHO IMPLEMENTS THE TECHNOLOGY?

In spite of massive changes in the technical base of our factories and offices it is still the worker who implements the technology. As yet there is no substitute. On the surface there appears to be a contradiction between the tremendous investment in sophisticated equipment and its use by relatively unskilled workers.

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[1]Since the beginning of the production of goods, there has been an *old* technology and a *new* technology. The pace of change, however, has altered.

Sometimes this contradiction expresses itself as the new jobs are more boring and less creative than the old. However, the fact remains that people are needed. And because people implement even the most costly and modern technical system there is a way out of the seemingly downward spiral of job displacement, poor quality, and excessive costs associated with the introduction of new technology.

The way out derives from the concept that most working people have the same aspirations as everyone else. Increasingly, working people and their organizations are coming to realize that the technologies that are being implemented in the work place are not immutable and can be changed. The introduction of new technology is an opportunity for labor to regain the initiative in regards to management over job content, skill, wages and benefits.[2]

TECHNOLOGY: THE PACE OF CHANGE

For about 50 years from 1920 to 1970, the technology in industry changed incrementally and relatively slowly compared to the last 10 years. The basic job structure was designed by F. W. Taylor, who proposed reducing each individual job to its smallest least skilled portion as a means of achieving management control and hence efficiency.

Over time the basic trend in work organization was to separate conception from execution. This reached its most capital intensive form in the automobile industry although much of the so called *women's work* in light manufacturing, and almost all office work is organized in the same manner. In the early 1950s, the first numerically controlled machines were designed. The Numerically Controlled (NC) machine tool provided a means to further separate execution from conception. At that time some firms specifically identified deskilling workers to reduce control over production as one driver behind the development of new technologies—specifically the numerically controlled machine tools.

Starting in the 70s the technological pace of change picked up. Not only did technique change but the actual job structures changed as well. The organization of work changed. In the machine trades the programmer increasingly decided on to speeds, feeds, and tool sequence. These functions had been in the heads of the machinists. In large manufacturing plants fairly rigid production control systems like Materials Resource Planning (MRP) displaced the clerks who had tradi-

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[2]But in order to take advantage of this opportunity working people need some ingredients which have previously been missing in a view of technology. First, working men and women, and our unions, need to understand the new technologies with the same precision that we understood the older technologies. Second, from that understanding workers need to project a vision of what is possible. Above all working people need to regain and build on their self-confidence. The basic building block of our self-confidence is the pride which most workers share in producing a good piece of work.

tionally specialized in production control functions. To a greater and greater degree people became monitors rather than doers.

Over the years the response of organized labor to issues of technology has centered on the effects of technology, not its design. When industrial unions organized themselves in the 1930s the structure of work was not challenged by the CIO and, by and large, was not an issue. By the mid 1970s the pace of technological change was fast enough so that many union staff people, full time officers, and workers with seniority active in the union but not affected by the *new* jobs lost their understanding of the actual way in which work was performed. The net result was that unlike European unions, which are more involved in issues of job content, American unions until recently did not see this as a major issue.

THE BARGAINING PROCESS: DOES IT FIT THE RAPIDLY CHANGING CONDITIONS?

The essential outlines of modern collective bargaining became law 50 years ago. In the bare essentials industrial unions agreed to negotiate about the effects of the technologies. The legal structure that regulates unions specifically restricts unions from having a right to bargain on "means and methods." (Management may agree to discuss the issue, but it is not a mandatory subject for the purpose of collective bargaining.)

Management has the right to choose tools, energy forms, techniques, and organization of work. Unions negotiate primarily concerning compensation—including benefits. An important exception has been the increased activity regarding health and safety effects of the machines and office equipment. One group of unions—the craft unions maintained their practice of intervening concerning means and methods. They have been able to continue this tradition through the control of training, especially apprenticeship training.

This bargaining structure no longer meets the needs of many workers. Bargaining that is limited to wages, hours, and a narrow definition of working conditions in a rapidly changing technological world fails to ensure a better standard of living for most workers. However, what choices do workers have? Having to change the bargaining system in order to negotiate concerning technology hardly seems like an opportunity. Labor law is fossilized and administrative law mechanisms are controlled by business interests seemingly dedicated to marginalizing unions. But there are forces in the manufacturing world that recognize change must occur.

FORCES FOR CHANGE

If only union members were negatively affected, then the chances for reform of the labor relations structure would be very poor. Research and experience indicate, however, that it is also true that the modern equipment does not work as

effectively, quickly, and at as high a quality as possible without the in depth and voluntary participation of the work force. Although management resists many changes that limit its authority, American firms also have to face competitive pressures abroad. Successful competitors have been those industries that have been more willing to change the scope of collective bargaining and bring labor to one degree or another into the process of determining means and methods. American management may not like it but if faced with a determined well organized union projecting a program of how to get things done better, bit by bit the door to more innovative and inclusive agreements would be opened.

What do we Need to Know?

The best negotiating committees are formed by members who understand the contract and who also have a detailed knowledge of the equipment they work with. They can use this knowledge to bargain effectively. When that knowledge is diluted or removed from the purview of the union its ability to bargain intelligently on any issue is reduced.

Understanding *technology* means a basic understanding of the work process and its potential. Unions, and workers in general, need to know what software is and how it can be programmed. Working people need to know that software can be redesigned so that workers on the shop floor can program it. Users need to know if *one way* information systems often found in offices are truly one-way or if they can be reconfigured for increased operator interface.

Part of our understanding must revolve around the issue of worker intervention. One must know how flexible the systems are—and as part of that one must know with what precision systems are capable of monitoring work.

Understanding the production processes, including work flow, scheduling, and the operation of the firm's information system allows the local union to bargain effectively because it can control production. By understanding the real position of the worker in the firm's productive apparatus the union membership can plan for the future. For example, if the specific jobs in question are transitory due to technological change, for example, key punch operators, then emphasis has to be put on training and alternative job paths for those workers. Likewise, as working people better understand how new technologies impede or expedite the transfer of production to non union areas labor's legislative and bargaining objectives can be altered to match those dangers more precisely.

TECHNOLOGY IS NOT A SEPARATE ISSUE

Technology bargaining is not a separate issue from other parts of the contract. It should not be treated as one item on a laundry list of items. The companies understand that the design and implementation of means of production are central

to the work place and so should unions. Firms usually design their bargaining strategy based on how they want their equipment used and don't treat *technology* as a separate issue. Neither should unions.

Technology bargaining could be called bargaining over means and methods. Trade unionists can use such bargaining as a way to project a vision of the workplace as a means of motivating people to do something about it. Very few people get all excited about a grievance or some technical change in the contract. But there is much more interest when unions start talking about more general ideas including adding some skill and control to the workplace.

The Workers Role in Job Design

What should workers do if their firm is willing to negotiate the design of a new system? The first task is to create a list of design criteria. These criteria should reflect the reality that the firm must be profitable. Thought must be given to criteria that need to be added for the system to maintain employment. Criteria need to be defined which can enhance skills. The second task is to reject criteria based only on minimizing jobs and employment. If the firm is to increase market share, produce better, etc., then overall costs have to decrease. In fact, based on our earlier criteria, costs of the hourly wage for our members may go up in absolute terms—although maybe not as a percentage of the cost of production. However, overall costs of production may go down as quality improves and as the firm is able to respond more quickly to problems, as a result of increased skill and flexibility within the work force.

At this point the problem is not a technical one. It is a political, technical, and economic one. Workers have to convince management to bargain about how they want to run the enterprise. Can this be accomplished?

The situation, legally, is that management has a technology rights clause. They also have a right to do everything else clause. These clauses are called *a management rights* clause. It is unlikely that a union can insist that this be dropped as a precondition for discussions. But if workers are successful in getting management to the table then in the next round of formal contract negotiations they should consider trying to limit this clause.

In order for workers to get management to talk, there are two tracks that can be pursued at the same time. The first track challenges management as to their overall strategy. In other words ascertain if they just want to reduce labor costs or do they want to increase productivity and quality?

In order to challenge management workers need to have time. Part of negotiating about technology is to have time to analyze the new systems. It is important to insist on formal, early notification of any impending changes, along with the company's estimate of the impact on the work force. Meanwhile, it is also important for workers and the union, using their own sources, to have an independent estimate of the expected effects of the new systems on employment and skill.