

# Participatory Design: Examples and Institutional Needs

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## ABSTRACT

This paper will discuss two participatory design projects, a tool to encourage such design initiatives and institutional supports needed to make participatory design a viable option.

## Keywords

Participatory design, skills based automation, human centered design

## INTRODUCTION

Participatory Design is both a theory, a set of operations and a political and social construct. Thus if successful participatory design projects are to become reality in the United States in the 1990ies all aspects of the participatory design paradigm must be in alignment. In other words the structure must exist legally, socially and technically to allow users to participate and make decisions in the design of their tools and work systems. Dispute resolution means and methods need to be practiced by the participants to enhance meaningful discussion. Moreover, it would be desirable to have decision support mechanisms available to improve the product of a participatory design process.

This brief paper will describe two PD projects and discuss the possibilities of a new decision support tool that can be used a part of a collective design process. The projects in question have supported by the Federal Mediation and Conciliation Service (FMCS) an agency of the Federal government. The National Labor Management Committee of the Custom Woodworking Industry, a collaboration between the United Brotherhood of Carpenters and Joiners (Carpenters) and firm owners identified the criteria for new woodworking machinery. The other project between the United Professionals for Quality Health Care, SEIU and the University of Wisconsin Hospitals and Clinics, entitled the Nursing Information Systems Design Group is in the process of identifying the design for an information system at the University of Wisconsin Hospital. In addition

we will describe an example of a tool that could support meaningful joint system design

## SOCIAL AND LEGAL FRAMEWORK

Richard Sclove, in *Democracy and Technology* describes the concept of robust democracy. [5] As he notes the design of tools, including information and manufacturing systems is presently mostly done by elites with little input and even less decision making possibilities by the users of the tools and systems. A system of robust democracy on the other hand goes beyond merely voting and the formal exercise of a franchise to the development of tools, means and methods for the population to be able to exercise meaningful control over the technologies that determine our lives. Participatory design therefore is one aspect of robust democracy.

However if robust democracy is to work, not just an idea, there needs to be supporting structures and mechanisms that enable it to function. Among the attributes of such a system must be laws that encourage participation and organizations and funds that encourage or allow for technical support for that participation. The design projects involving the Carpenters and Nurses illustrate the institutional lacunae that need to be addressed to encourage success. The projects were organizations of unions and employers utilizing outside assistance to help them reach mutually agreeable conclusions regarding the design of their tools on one hand or of an information system on the other. As such both of these projects are embedded in the legal system regulating labor relations in the US. In addition both projects illustrate the difference between input or voice on the one hand and decision making authority or real power on the other hand.

Workers, employees or consumers cannot be empowered to make decisions by fiat. Every group needs to have an independent source of power in order to be empowered. Secondly although anyone can have input or voice, input is not the same as decision making. One cannot have decision making capacity in any institutional sense of the term without rights guaranteed in some way by legislation and made operable by appropriate access to information and expertise. Looked at from the point of view of funding and access to information and expertise, the current legal and budgetary arrangements in the United States are all negative in regard to institutional support of PD. The projects

In *PDC'96 Proceedings of the Participatory Design Conference*. J. Blomberg, F. Kensing, and E.A. Dykstra-Erickson (Eds.). Cambridge, MA USA, 13-15 November 1996. Computer Professionals for Social Responsibility, P.O. Box 717, Palo Alto CA 94302-0717 USA, cpsr@cpsr.org.

which I will describe in detail below all suffered from the lacks embodied in the current institutional arrangements, or what I would characterize as institutions which support weak democracy.

### **Legal Framework**

In current labor law, employers are not required to negotiate with employees regarding the means and methods of production. By law the areas of means and methods are the exclusive domain of the employers. It is true that in some unionized locations, due to competitive pressures, the growing awareness that complex systems can't run properly without meaningful input from workers that major firms have organized joint labor management committees to investigate production means and methods, but in almost all cases fundamental strategic decisions are made privately, in the interests of profit maximization.[6]

The result is that while there may be input, by law there is no right for employees to have joint decision making authority over the means and methods of production. This system is called effects bargaining. Paula Voos shows convincingly that there is a need for radical reform of current labor law to allow even minimum abilities for working people to organize and obtain the minimum needed for meaningful rights- an independent power base. [6] As a member of the President's commission on Labor Law reform she and the other commissioners assessed the current state of labor law and in their majority came to the conclusion that to address the imbalance of power in our society, the legal ability for people to organize had to be enhanced, thus paving the way for meaningful joint- that labor management committees to deal with complex issues. In other words the commission recognized, just as did the framers of the original labor relations acts of the 1930ies, that workers needed an independent power base in order to be able to represent their views to the employer in a meaningful way. We note that there are proposals to change labor law to allow for the encouragement of company supported worker organizations. But this so called reform, which denies the independent interests of workers vis a vis companies does more to harm the process of participation than help it, for it undermines the notion of equality of power and places even more power in the hands of management to select worker members of such committees.

Because employees in unionized locations have an independent source of power, namely collective organization, they can and do have the ability to move beyond effects bargaining. The most advanced examples exist in the basic steel industry where all contracts with the major steel makers contain agreements to organize joint labor management committees to examine and advise on technologies for production.

### **Financial and Technical Support for Participatory Design**

The achievement of this agreement gets us to the second aspect of the problem- the ability to call upon experts and expertise to allow meaningful discussion of technological- that is design alternatives. There are various technological alternatives that might lead one to the same end but by

different means. In the work place one such alternative might be called human centered production systems- that is systems which while achieving quality and productivity goals also are flexible, enhance rather than dilute or degrade skill, enhance rather than degrade the environment and allow for human creativity rather than boredom. In addition these systems might be designed to at least be benign in regards to human health and safety rather than degrade it. Lack of funding blights theoretical and concrete research and developments in the technical areas needed to support human centered design criteria.

Encouraged by the election of President Clinton in 1992 increased efforts were made to have the federal government explicitly support human centered automation by recognizing its existence in the criteria for selection and funding of research and development projects sponsored by the National Institute for Standards and Technology (NIST). Two parallel and primarily unsuccessful attempts were ere made to secure recognition and funding of R and D or access to information. On the one hand the Advanced Technology Program (ATP) of NIST explored possibilities in this realm, hiring the author to propose programs and criteria for such programs. On the other hand discussions were taking place within the Manufacturing Extension Programs (MEP) of NIST that would encourage, rather than simply tolerate meaningful worker participation and access to factory modernization efforts sponsored by the Federal government. With few exceptions (one of the exceptions being here in Massachusetts) organized labor as an institution is not part of most MEP activities. Efforts to get the Advanced Technology Program to agree to adding selection criteria to their initiatives such as verifiable employment effects or effects on skill were also rejected by the agency.[3] Likewise attempts to get a meaningful program area funded to specifically encourage R and D in areas of skills based automation or information systems was also rejected. The rejection occurred in spite of increasingly active support of union staff, leaders of the AFL-CIO and constituent unions and the activities of the Work and Technology Institute which had the foresight to first raise the issues in ways comprehensible to organized labor. Significant support also came from control systems and industrial manufacturing firms.

The net result, is that institutionally there is neither legal or technical support for Participatory Design initiatives.

Thus in areas of the Federal bureaucracy where one would look to support for PD type experiments dead ends were reached by the end of 1994. The congressional elections which resulted in majorities even more eager to deny diversity in decision making than the previous Congress exacerbated the funding and political problems. However assistance was and is available from a somewhat unexpected source. The Federal Mediation and Conciliation Service has funded at least two PD projects and may fund others as time goes on. The FMCS assists joint bona fide labor management committees. Funds go to train the committees in dispute resolution techniques and for other technical assistance. The FMCS is both product and process oriented

in that they desire specific outcomes to emerge from the collaboration between the work force and management. Thus projects that promise specific new systems designs or technologies that meet the needs of both parties meet FMCS criteria for funding. The two projects described in detail below were both funded by FMCS.

### **PARTICIPATORY DESIGN PROJECTS**

The two projects described below are attempts to use labor management committees composed of workers and owners or managers supported by technical talent to design new work systems. In both cases, management agreed to discuss the actual means and methods of production. Likewise in both cases, the committee agreed to make decisions by consensus. In other words both sides agreed to a decision making process that in effect moved beyond input and voice and to collective decision making. To put it another way, the committees strengthened the concept of participatory design to what I would call collaborative design. People previously outside of the decision making process gained the capacity to make decisions in a new area—namely system design.

#### **The National Labor Management Committee of the Custom Woodworking Industry**

At the family owned small end of the manufacturing scale we find the Mill Cabinet Industry. This group of firms includes those who make fine cabinets, furniture, one of a kind displays and the interiors of casinos and offices. Most of the firms have less than 50 employees, are family owned and under capitalized. The United Brotherhood of Carpenters and Joiners which represents the skilled apprenticed cabinet makers is a cohesive force in the industry.

In May 1993 the unions and the firms joined together in a joint company union technology committee. Officially entitled the Technology Sub Committee of the Custom Woodworking Industry, the committee's function was to assess the technological level of the industry and recommend appropriate courses of action. After examining the technological level of the industry via visits to trade shows, a number of firms, machine suppliers and apprenticeship programs, the owners and workers decided that the technological level was low and that the new machines coming into the industry did not meet their needs. Therefore the committee decided to determine their own criteria for new equipment. The committee also decided that if they could come to agreement on the criteria for machine/software design that they wanted to actually finance the design and production of these technologies. The committee adopted six criteria:

- machinery to be flexible - defined as capable of being used in production of one of a kind items;
- a technology system that would encourage self-learning, which is defined as cabinetmakers, drawing on their craft skills and way of conceiving work, able to utilize machinery, preferably without learning a whole programming language;

- systems that would improve competitiveness of the firms, for example low cost but durable machinery;
- equipment or systems that would decrease product throughput time;
- ergonomic considerations such as noise, fumes and repetitive motion syndrome to be dealt with in the design of the equipment;
- enhancing the skill of the craftsman "...the committee doesn't want machinery that reduces the skill content of craftsman's jobs... the jobs of workers using machinery should not be made dull and repetitive". [2]

Practically speaking the criteria meant that equipment had to be quieter but also be able to cut and shape rapidly. The software had to be designed in such a fashion as to encourage shop floor programming and to build on the tacit knowledge of the carpenter - especially as it related to the changing and variable nature of wood. The notion of building on the knowledge of the carpenter and designing controls and software to do that has two aspects. One suggests using the knowledge of the carpenter to assess the conditions of the material rather than building expensive sensing devices and complicated software. This idea follows from the design criteria of low cost and the agreement on the value of skilled work. The second aspect addresses the view that programming using existing software basically asks the skilled worker to learn a different language and conception of his/her work. The committee felt that it would be most helpful to develop software that enhances rather than replaces the thought process of the skilled carpenter.

Overall there was a desire to enhance a work organization that is basically collective on content, rather than breaking the work up into discrete packages such as programming, design etc. The committee decided that the concept of "craft", that is the unification of conception and execution, needed to be enhanced because it is a positive good for the industry and, in fact, allows the custom woodworking industry to exist in the first place. The craft concept is the dominant view that most workers have of themselves. In turn the conception of craft is equated with quality and valued by the owners. [2]

While the results of the collaborative design phase were judged positive by the participants, the ultimate results of the project underline the lack of institutional commitment to participatory design. In discussions with NIST/ATP, project managers steadfastly ignored the recommendations of the industry and workers and insisted that the technical challenge was to build a sensing system to sense imperfections in the wood.

In the absence of any program that would support designing tools or software based on skills commissioning the actual design of either software or machines did not materialize. Meanwhile Japanese machine makers who did not have the same anti skills or technological silver bullet fetish did produce machines that were close to the needs of the industry, although the software issue was not fully addressed.

## **Collaborative Design of Health Care Information Systems: The Nursing Information System Development Group**

In 1995 the University of Wisconsin Hospitals and Clinics, Center for Clinical Sciences, Department of Nursing (UWHC) and 1199W/United Professionals for Quality Health Care, Service Employees International Union (1199) entered into an agreement to jointly develop the design criteria for the new information system being implemented by the UWHC. "Our project is aimed at ensuring participation in the design of a technical system, by its primary users, nurses." [4] In October 1995 the FMCS awarded the committee a grant to assist the project. As of this writing the project is ongoing. Of particular note is the signed letter of intent from the superintendent of the hospital to work with the joint committee to integrate the nurses' needs with the overall design of the UWHC information system. Of course only time will tell how successful this effort will be.

The composition of the group includes registered nurses and senior nursing administration including the information systems manager. The Executive Associate Director of Nursing, the Executive Director of the union and the President of the union are also members of the group. The author has been the facilitator and trainer for the group.

To date the committee has identified the values most important to nursing. It is the group's desire that the system support these values. As the NISDG put it is the overall goal to "design an information system which supports nurses in their work as information gatherers and users, as opposed to an information system by which, by design or neglect, facilitates collection and recording of information in ways which frustrate or undermine the professional roles of nurses." [4]

As with the Carpenters' project all key decisions are made by consensus especially those decisions that reflect values.

The committees plan of work includes finalizing the information map of the key departments- meaning understanding both the formal and informal flow of information and determining to whom nurses must communicate and what be communicated. After this task is completed the group will identify the types of technologies that might support nursing values, especially systems which will allow for an increased bed side presence. Once the basic systems are identified, e.g. wireless communications, interactive record keeping etc., the group will refine their requests. At this stage the group intend to present a white paper to the overall hospital administration and enter into broader discussions to ensure that the overall information system incorporates their concerns.

As with the Carpenters project institutional constraints hamper the work. The FMCS for example can supply only limited financial support for any individual project. Software or systems development is both time consuming and expensive. There is no existing publicly funded system in place that would allow a group like ours to view several competing ideas at once and get relatively unbiased

information. Thus the only way to proceed is to purchase engineering or technical assistance at considerable cost, or become dependent on a medical information system software house which certainly has its own objectives.

One is limited in the alternatives precisely because there is no institutional framework for participatory design initiatives. While it might seem reasonable for the University Hospitals to support the implementation of the design criteria outlined by the nurses, there is no particular reason for them to do so, as the direction of the nursing initiative is exactly in the opposite direction from the direction now being pursued by HMOs - namely the reduction in number and role of R.Ns.

## **TOOLS TO ENCOURAGE COLLABORATIVE DESIGN**

Participants in a collaborative design project can have difficulty crossing educational and cultural barriers. This is especially true when one combines skilled and unskilled workers, engineers and administrators. Difficulties are increased when the rules for the project require consensus. Often the most widely used tools to achieve consensus are various group problem solving methods. These tools are a necessity to inform the collective decision making but inadequate to the task of allowing a labor management team to assess a large complex system such as production organization in a factory

## **ACTION**

An example of a possible tool which can aid a joint process is the ACTION system. The ACTION tool helps designers evaluate different manufacturing strategies. It is a decision support system. A joint labor management team can use this tool in conjunction with "traditional" collaborative design techniques. Given the institutional barriers to participatory design why is a DSS tool important? In our view the existence and use of such a tool can be of assistance in building a base for participatory design. So far, many firms and unions who are not involved in PD have seen the practical value in this tool and indicated to us that they wish to employ it. The tool may reinforce efforts by unions to encourage firms to engage in meaningful collaborative projects.

The objective of the ACTION tool is to successfully integrate technology, organization and people systems (TOPS). The developers have designed a tool which involves the conception of risk management which they define as "an effective design process is one in which all risks about possible design options, including those affecting workers are effectively understood and managed." [1]

The developers based their conception on two premises. First, there is a broadly diffused expertise among workers, engineers, technicians and managers. Second, that different disciplines and stakeholders can work together to create an understanding of the picture as is and then "what is to be".

The designers of the tool also believe that the participants must have a broadly diffused understanding of how different features of design can compliment or inhibit each other. For

example a just in time system may inhibit workers' flexibility while at the same time reducing inventory. Further the tool is designed so there are systematic procedures and a language for discussing all factors in a TOPS design to ensure educational leveling and thus enable meaningful participation by the entire team.[1]

Proper use of the tool allows the team to see how the many manufacturing variables are aligned after a collective decision is made as to the objectives of the system. For example if one wanted to achieve rapid throughput and flexibility, the ACTION system would lead one through an analysis which would indicate that skill, including training need to be aligned in order for such a manufacturing system to work.

In the next few months as the PC version becomes available we expect to see this tool in wider use in collaborative or participatory design groups.

#### **LINKS BETWEEN HIGH PERFORMANCE WORK ORGANIZATION and PD**

At present many firms and unions use the term high performance work organization (HPWO). The term means different things to different people, but in the usage by unions HPWO includes a strong commitment to the joint design of tools and work organization. Participatory design is a means to those ends. The two case studies briefly described above are examples, within the American context, of the possibility for workers and management to agree on the design criteria for tools and information systems - a major building block within HPWO. The ACTION decision support system may be a tool to encourage a collaborative approach to system design, another major aspect of an overall high performance work organization.

Given the absence of institutional support both financial and legal, what is the importance of the case studies and the decision support tool? The one institution in the United States that is actively engaged in efforts to achieve participation in design decisions are the trade unions. For example both the United Steel Workers of America and the International Association of Machinists have major contracts that require participation in the design of tools and systems. The successful collaborative determination of design criteria, as opposed to cooperative implementation of systems designed by the firm are of importance, given legal obstacles to union intervention in determining means and methods of production as well as political and organizational resistance from firms. To put it another way, one difficulty with participatory design in the American context is the difficulty in bringing the process down to the point of production so that workers themselves can take part in the process. Both cases are examples of a method to structure worker participation in the design process, as opposed to professionals hired by unions working with

other professionals. The ACTION decision support tool likewise works best when workers involved in the area under discussion meet in a facilitated environment with engineers, planners and others to determine the characteristics of the existing or proposed system as they define collectively the objectives of the new system. The successful attempts to design mutually satisfactory systems and the development of new tools to aid this process is of direct assistance to the unions advocating meaningful participation in the design of the workplace.

#### **CONCLUSION**

Participatory design projects have had a slow evolution in the United States. Material resources to support research and development in technologies that would support the process are lacking. Legal obstacles remain. However some projects such as the two described above have succeeded at least in reaching the first step-definition of design criteria in a collective fashion. Or to put it another way workers, engineers and managers have participated together and designed tools and systems. The next steps, actually producing the tools and systems is underway, but it too suffers from no political commitment to the process at most levels of government and thus a concomitant lack of resources, legal, technical and financial to encourage the process.

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