Post Modern Times
Participation Beyond the Workplace

Joan Greenbaum[1]
Department of Informatics
University of Oslo
Post Box 1080 Blindern
0316 Oslo Norway
joan@ifi.uio.no

ABSTRACT
This paper argues that the conditions of post-industrial capitalism are markedly different from those of the industrial period and thus result in the design and use of different systems. Notably one of the major consequences of these differences is the use of distributed information technology and management strategies like work flow analysis to spread work beyond the workplace. Thus participatory design techniques based on workplace participation need to be expanded to go beyond individual workplaces and the workers who remain there.

Keywords
Division of labor, economic objectives, flexibility, labor costs, industrial, participation, post-industrial relations.

BEYOND THE WORKPLACE
Probably the most well-known film character of the industrial period is the role played by Charlie Chaplin in the silent film *Modern Times*. Here he personified modern man set adrift by the rapid pacing of the mechanized assembly-line. The dominant first world nations of the industrial period have now entered a post-industrial era[2], which in many ways contrasts sharply with those industrial characteristics that divided labor and attempted to control it through the sequential flow of automation. Charlie Chaplin's character and its warnings linger with us, but the message of those warnings needs to change with a better understanding of the way economic objectives influence information system design now. Post-modern "man", is no longer caught in the clogs of the unending assembly-line or excessively routinized office work, but instead is being confronted with work that is being made more intense by policies of reorganization and information technology. An economic and historical understanding of this is useful for formulating participatory design agendas that go beyond supporting small groups of workers, and workers located in one workplace.

In this paper I argue that the economic objectives of post-industrial capitalism, like those in the industrial period are clearly being expressed by companies when they order and buy information technology and that these objectives need to be critically in focus when participation is included in design projects. As business and government organizations make strategic plans for reorganizing work, jobs and information technology, they often ask line workers to "participate" in the decisions that will be made. Consultants who advocate Business Process Reengineering strategies, for example, often include focus groups, workshops, questionnaires and interviews in their list of ways to get workers to "buy into" the new reorganization, resulting in the fact that many American workers, worn down by a decade of "employee involvement" programs like Total Quality Management (TQM), are rightfully sceptical about participatory projects. I believe that participatory design strategies need to be seen in the wider economic context so that design environments can be constructed in order to secure bottom-up strategies before inviting and encouraging people to participate in technical design processes. As Andrew Clement (1994) points out, empowering workers with design assistance is a critically important function. One suggestion for achieving this is going beyond the workplace and organizing broader communities of support. This is explained in the last section.

Economic objectives increasingly include cutting labor costs by both intensifying work practice and by holding wages down. The first, that of intensifying or getting more out of labor is now often accomplished by integrating formerly divided work practices and reassembling them through information technology designed for coordination and communication instead of automation flow (Greenbaum, 1995). As examples of work instensification, professional workers such as lawyers, and clerical workers like administrative assistants, say that they are expected to do far more work in a day, as well as work longer hours in order to get all of their work done.[3] The second objective, that of cutting labor costs can be accomplished by distributing work and jobs to sites of lower labor cost. A typical example in the US is the location of credit card centers and other telephone based offices in rural areas where wage rates are lower and there is a supply of available

service workers. These labor cost cutting objectives are specified through managerial strategic plans. This paper argues that it is important to recognize them when creating participatory design projects and realistically attempt to create design environments where common interests of workers, users, customers and citizens can be actively supported and better protected.

The economic changes that are now rapidly impacting work and influencing the type of systems that are chosen to support it are often done in the name of global competition. Indeed increased global competition is one of the characteristics of post-industrial economics. But the presence of heightened global competition is an outgrowth of prior economic and political choices, and it is important to understand these choices in order to better understand the choices we now face in technical system design. I do not argue that we can effect overall economic objectives through technical participatory practices, but I do present analysis which could help system developers understand where and when participatory practices could be effective.

In Scandinavia, participation as a springboard for industrial democracy has been built into laws in the form of worker rights (see Bjerknes, et al, 1987, Clement and Van den Besselaar, 1993, Bansler, 1989). But *industrial* democracy was rooted in economic characteristics of industrial capitalism, notably the rise of strong factory-based trade unions to counter act the power of large manufacturers. Now, in the post-industrial period union membership is declining in most developed countries as the industrial work force declines, and even in Scandinavia where membership is still relatively strong, political activity to maintain and secure workplace rights is weakening as post-industrial work sites of offices, homes, satellite centers and virtual workplaces cease to provide the base for organizing that centralized, industrial workplaces did. The shift in economic focus discussed in this article points to the need for broader-based design environments which can function as trade unions did in the industrial period--protecting as well as supporting the interests of working groups against the interests of individual companies. This does not mean that the goals of influencing the quality of working life and workplace democracy should be forgotten (see Bjerknes and Bratteteig, 1995). Rather it illustrates the importance of building communities where these critical objectives can be returned to in practice, not just in theory.

Workplace activities and economic functions are noticeably different in the third world as Jørn Braa points out (1994, 96). He argues that since the majority of people in the third world are without formal employment, the community rather than the workplace should be seen as the site for effective participation, both politically and in terms of designing systems that can be used by members of the community. Here I propose a conceptual base for understanding how changes in the economic structure of the post-industrial countries of the first world necessitates a similar change in focus. In the first world, however, it is not that the majority are without formal employment, but that centralized workplaces and clear cut ties between

employers and employees--a central point of both trade union and participatory ideologies--are becoming less important. Therefore it is suggested that the focus of participatory activities also needs to shift beyond the concept of central workplaces in order to encompass broadly defined communities which parallel economic interests in post-industrial countries. These may include communities in the third world sense, but also go beyond geographic communities to consider customers, technical user groups and non geographic communities.

This paper presents an overview of the relations between overall economic objectives, managerial and organizational decisions and technical design in order to consider where to put influence during design projects. The next section examines the overall economic level, analyzing some of the characteristics of economic growth during the early industrial period and comparing these to the changes occurring now in the early post- industrial period. The third section looks at managerial and organizational decision-making, presenting an analysis of the way computer systems in the 1970s and '80s (early post-industrial period) were designed to continue the automation-like principles of the prior period. It also shows some of the ways older industrial-based managerial and work characteristics form the base of building newer organizational and technical structures. The last section brings the history together with suggestions for refocusing participatory practices to more consciously take these economic considerations into account.

UNDER ONE ROOF

While it is not possible to summarize two hundred years of Western economic history, it is useful to point out a few of the highlights of earlier periods that contrast sharply with economic developments now. Figure 1 highlights some of the major characteristics of the industrial period contrasting them with post-industrial factors--specifically those that computer systems are designed to support.

One of the ways of characterizing early industrial capitalism (late 1700s-early 1800s) was the fact that workers were brought from small home-based workshops into larger factory units. The guiding economic principle was that of *economies of scale*--where profits were derived from creating larger units of operation. This implied that work which was situated under one roof, like that of factories, would be more efficient than small-shop enterprises. Economies of scale formed a basis for work organization and the beginning of managerial practices. In the early period this meant that in order to bring workers out of their small enterprises and off farms, *labor contracts* were needed to compel workers to work in one place and work for set periods of time (see Marx 1867, Thompson 1968).

The use of labor contracts which specified wages and hours reinforced economies of scale through managerial practices aimed at disciplining and supervising large numbers of workers into producing standardized products at a faster pace. Over the course of the nineteenth century and throughout the first half of the twentieth, labor was *divided*

Industrial Period	Post-Industrial Period
Economic Characteristics:	**Economic Characteristics:**
• centralized workplace	• distributed workplaces
• economies of scale	• flexibility of scale and place
Organizational Characteristics	**Organizational Characteristics**
• labor contract	• temporary agreements
• rationalized division of labor	• partial re-integrated labor
• close supervision	• individual/group responsibility
• hierarchy (later bureaucracy)	• flatter structure-professionalism
Technical Characteristics	**Technical Characteristics**
• mechanization (later automation)	• communication
• product based	• information based
• sequential flow	• distribution

Figure 1: Selected Characteristics Affecting Design

and rationalized along lines that led to the need for *close supervision* and a *hierarchical* structure of control for management. The technical systems that were introduced to support this form of divided work organization were based on *sequential flow of products* leading to systems of *mechanization and automation*.

Industrially developed countries in North America and Europe experienced a major break-up of these industrial characteristics by the 1980s. The principle of economies of scale proved not as effective in the face of increased global competition and politically deregulated economies. As a case in point, the American auto industry was an example of how detailed division of labor and flow-oriented systems of automation hindered international competition for American auto companies. In the 1980s this was also becoming clear in office work where detailed division of labor, centralized offices and bureaucratically centralized decision-making were cited as management failures (see Peters, 1982).

The economic shifts were becoming visible in computer system specifications by the late 1980s when companies began to call for information systems that could handle communication functions and distributed work (see Greenbaum 1996). These changes in technical requirements reflected the economic change toward flexibility of scale and place as well as distributed workplaces. These in turn were evidenced by organizational changes which stemmed from the separation of work from place and the delinking of labor contracts from employment, resulting in an increasing reliance on temporary agreements rather than employment contracts. By the 1980s the post-industrial economic and political landscape was shifting out of the workplace and away from the fixed time and place arrangements of industrial relations.

The next section examines the key organizational changes that took place during the transition from industrial to post-industrial capitalism and the way this transition has effected management decisions about the design and use of technical systems.

BUILDING ON THE OLD

Information system design like that of factory automation is ordered to fit into economic and managerial objectives. But during a period of economic transition such as the 1970s and 80s there are contradictions between economic objectives and the ability of management to deliver work organization and technology to meet them. In such cases the design of technical systems often lags behind or runs in counter directions to management objectives, for design and work organization are built up from existing economic, organizational and technical systems (see Aronowitz, 1988). Thus, while the characteristics of post-industrial economies (see Figure 1) are different than those of the industrial period, computer system design and methods used for development are strongly influenced by prior periods.

Young people entering the labor market today have a hard time imagining that corporate bureaucracy was the theme song of the 1970s. The rhetoric that they now hear about the ways that companies need to be "lean mean market machines" stands in stark contrast to the prior period. Yet the ground rules of bureaucratic functioning--from its reliance on rule-based decision-making to the rationalistic way computer systems were designed--are still with us. Three types of organizational control from this period have become the building blocks of newer management strategies and computer system design. These are:

• corporate managerial control was based on getting workers to internalize company rules

- division of labor was focused on separating tasks and dividing the "head from the hands"(see Braverman, 1974) and
- computer system design and system development procedures mirrored corporate practices of control and division of labor (see Friedman, 1989).

The 1970s

Bureaucratic control was an outgrowth of management's perceived need for close supervision. Its success was based in part on the degree to which it institutionalized rules into organizational practice. In *Contested Terrain* Richard Edward, (1979) describes what made corporate bureaucratic controls work: "The defining feature of bureaucratic control is the institutionalization of hierarchical power. 'Rule of law'--the firm's law-- replaces 'rule by supervisor command'"(p.21). In the 1970s , strictly divided tasks were a cornerstone of bureaucratic functioning. Management theory today is based on professionalism rather than bureaucracy, yet professionalism is another form of getting the 'rule of law' internalized still further in the individual so that hierarchical levels of managers are not needed to enforce it.

Edwards also describes how division of labor is used to stratify work and motivate workers along the corporate path. He explains: "work becomes highly stratified; each job is given its distinct title and description; and impersonal rules govern promotion. 'Stick with the corporation', the worker is told, 'and you can ascend up the ladder'"(p.21) In post-industrial organizations today the ladder, or career path is often gone, and strict stratification is loosened in favor of workers doing more all-around tasks, but newer forms of work organization are still rooted in getting workers to follow impersonal rules.

To understand how divided labor can be put back together in new ways it is useful to briefly go back to Braverman's (1974) analysis of the 1970s . While the late industrial period he was studying was clearly characterized by divided, rationalized and separated tasks and workers, he warned us that this can take many forms, including those where, for example "office rationalization has in part been taking place under the banner of job enlargement and the humanization of work" (p.37). The same warning can be made for the flexibility arguments management puts forth today. While the newer jobs, like bank customer service representative include a good deal of job enlargement, studies report that the pay is low compared to the skill level, and the intensity of work with its accompanying stress is often reminiscent of assembly-line jobs even though workers are doing more integrated tasks and using a wide range of skills (see Greenbaum, 1995, Herzenberg et al, 1996).

Braverman describes how in the 1970s consultants were called in to cut labor costs and "enlarge" jobs: "In a typical case, a bank teller who is idle when the load at the counter is light will be pressed into service handling other routine duties such as sorting checks" (p.39) This example is still relevant although technically and organizationally out-of-date since banks have outsourced check processing to service bureaus and rely on customers using cash machines and telephone services instead of tellers. It illustrates that integration of tasks can be built around the work pieces that remain in activities that organizations consider as part of their "core" economic functions--an "enlargement"of work that distributed systems are better able to fit.

In the 1970s, organizational policies of bureaucracy and extensive division of labor were the basis for the design of mainframe computer systems which were programmed for routine and repetitive processing. The "idealized" form of computer system design was of course modelled after factory automation where parts were processed in a sequential and linear fashion and where rules and controls were centralized in the computer department. This type of automation was applied to service sector organizations like banks, insurance firms and government agencies which had to handle large volumes of transactions.

A key characteristic of this factory model of automation was that work had to have been rationalized and data standardized, *before* programming could be attempted. According to management theory of the time, this meant that control over data, procedures and indeed, computers, was to be centralized. Standard bureaucratic management practices were also applied to system development projects. Procedures for systems analysis fit in with this rationalistic perspective since they reflected both their engineering roots in Operations Research during World War II and managerial procedures in isolating problems and separating tasks (Greenbaum, 1979). The emphasis was, as it still is, on managing quantitative data so that management could review the numbers and accountants could record them in order to control costs.

The combination of routinizing tasks and standardizing data led to computer systems that specialized in processing routine transactions, such as simple tests for accepting or rejecting insurance claims, processing payrolls at regular intervals and accessing flight reservations by destination--routinization of data and procedures that are still with us today, even though computer system development and computers have changed a great deal.

The 1980s

Management theories of the 1970s had relied on two central industrial-era concepts for underpinning their bureaucratic practices: economies of scale and extensive division of labor; and computer systems were designed to reflect this. By the 1980s however, market conditions had begun to change and management theory began to change also. According to most management accounts the factory image of automation in the 1970s didn't result in faster document production or enhanced office productivity (Bowen, 1986). In fact, while it produced sharp divisions between back and front office jobs and thus between salaries, the outcome of the 1970s was rapidly growing office employment (Greenbaum, 1995).

By the mid 1980s management literature was reporting that rigid bureaucratic practices, extensive division of labor, and standardized data processing applications were leading to

worker and customer dissatisfaction, as well as lack of productivity gains and lack of control over data and service output. Popular literature claimed that the "Japanese were doing it better" and phrases from "leaner and meaner" to "flexibility" were borrowed from loose translations of what were believed to be the basis of the Japanese success story. In management journals, decentralized management strategies were discussed as a necessary replacement for centralized ones and job enhancement and upskilling were advocated in place of rationalization and deskilling at least in front office jobs like administrative assistant and customer service representatives. Along with these changes in management theory computer companies were advertising the personal computer as a technical solution to fit with the newer decentralized, more skill-based strategies(see Howard, 1985).

In practice, the 1980s was a period of transition for management in adapting previous strategies to much more rapidly changing economic conditions (Greenbaum, 1996). Characteristic of this transition was the hold-over of design principles from the industrial period, exemplified by terms like "office automation" and the "paperless office", which were rooted in the concept that office systems should be designed to fit the automation paradigm including an emphasis on the "flow" of information in computers rather than in paper documents (Office of Technology Assessment, 1985). Bureaucratic work organization and stand-alone technology were not in step with what upper management thought it wanted to accomplish. In 1986 Fortune magazine ran a cover story claiming that:

> "U. S. business has spent hundreds of billions of dollars on them [office computers], but white-collar productivity is no higher than it was in the late Sixties. Getting results usually entails changing the way work is done and that takes time." (Bowen, 1986 p.20)

Some of the contradictions emerging during this period were: the gap between decentralized PCs and the concept of "data flow"; reliance on single-user systems amid increasing emphasis on team-based work; and decentralized computing embedded in bureaucratic organizational structure. In addition, the existing division of labor didn't fit the more integrated patterns where some professional workers like managers were expected to do some administrative work, such as word processing, and administrative workers like secretaries were expected to do more professional tasks, such as data base administration.

In retrospect it was clear that these contradictions were reflected in misfits between the three areas that management needed to keep in tandem: overall managerial control functions; division of labor and computer systems. On the overall level, calls for decentralized planning had not shaken off the well-entrenched practices of bureaucratic rule-based behavior, nor were they necessarily supposed to. Corporate upper-level managers had to find a way to make decisions more rapidly while still keeping some form of control over centralized rules--the basic building block of bureaucracy.

In the area of division of labor, organizational theory advocated new forms of work organization--forms where some work would be divided while other tasks could be integrated into broader job categories. And in the area of technology, the gap between older centralized mainframe processing and decentralized PC-based computing called for the need for a focus on communication through networked systems.

The 1990s

Work reorganization and reliance on networked hardware and software form a basis for supporting the post-industrial economic principle of flexibility of scale and place. While work reorganization and some forms of computer support have resulted in restructured labor processes and jobs that are more integrated, this form of integration, like its predecessor, rationalization, is based on controlling labor costs. The white collar jobs that remain in core business functions, although having more overlapping functions and broader spans of responsibilities, obviously don't respond well to either factory-like automation or bureaucratic control. Increasingly organizations say that they are replacing bureaucratic practices with the creed of "professionalism" as a way of getting office workers to produce more. Phillip Kraft puts it this way:

> "Taylorism's chief shortcoming is that it can be applied to some aspects of design and administrative work but not to others. When employers try to extend Taylorist control techniques to design workers and mangers, the results are at best ambiguous. The problem is fundamental: managers seeking to extract the greatest value from "creative " workers need to manipulate not only behavior but imagination. They must inspire as well as control". (Kraft, 1996)

Older forms of division of labor like those Frederick Taylor, the turn of the century "efficiency expert" advocated, broke specific jobs down into separate tasks, and information system design was based on "automating" these tasks into a flow of procedures and data. But management theory and information system design can now be based on the concept of reintegrating tasks and jobs and using design strategies of coordination and communication to integrate individual jobs and redivide labor over time and space. The results fit the prevailing post-industrial economic objectives of flexibility and distributed workplaces meaning that work can be separated from place and be moved to locations where the labor market has appropriate skills and can be hired for lower wages. It also means that temporary work agreements become more attractive to employers instead of the industrial practice of filling central workplaces with jobs based on employment contracts.

Studies show that these characteristics are now becoming noticeable at the overall economic level in the U. S. where wages are stagnant, job security is decreasing, and there is an increase in unequal distribution of income (see Head, 1996). Not insignificantly, the Bureau of Labor Statistics is using a new measure of unemployment which includes discouraged workers and those working part-time when they are looking for full-time work. This new measure puts the

unemployment level at 10.7%, although it is the old statistic (between 5-6 percent), which is released to the press each month (Kuttner, 1996). Studies are clearly needed to know more what this means in terms of work for people caught between jobs or working in new places or under temporary agreements.[4] But since the development of information systems is an immediate and ongoing problem, the following section addresses the need to focus participatory design practices in the larger economic framework.

STRATEGIES FOR MOVING BEYOND THE WORKPLACE

Post-industrial economies are centered on the economics of management's need for flexibility over where and when people work. This has meant a shift from central workplaces to organizations that parcel work out to different companies, sub contractors and individuals working from home. This implies a number of shifts in where and when participatory projects can be effective. These are presented on a meta level based on the preceding overall economic analysis, but each provides a basis for further more concrete discussion.

Creating communities of use

- **Wider design environments.** Computer support for *workplace* activities is a necessary but not sufficient condition for the way work is now being divided. It would be useful for users to create more protected design environments where groups of citizens, customers, workers and users as well as political interest groups could get together *outside* of the scope of individual organizations in order to express their needs–thus creating communities of use.

- **Development outside organizations.** Wider design environments would mean a shift in the role of those system developers who would choose to support these activities. Industrial-based computer and MIS departments placed system development in centralized departments which were charged with the responsibility for seeing to it that management plans were implemented. System developers working under post-industrial conditions could create their own design support practice, just as some developers supported trade union activities in the industrial period.[5] In this way systems developers could become technical advisors, consultants and employees for communities of use, working *outside* rather than inside a given workplace.

- **Making and finding communities.** Computer user groups are one form of community which can form across workplaces and which can be supported by technical advisors interested in participation and progressive change. Additionally, pre-established communities such as citizen groups, as well as issue-based groups like environmental and women's groups have begun to seek out computer consultants and technical support. These groups, like unions could form the basis of more protected design environments. A more difficult and political undertaking would be forming new alliances between workers in core employment and temporary workers, and between workers and customers. Once formed such alliances can be supported and encouraged through participatory design activist approaches.

- **Research and teaching.** Systems support for communities of use would require research and teaching about new participatory practices and the ways systems designers can use their skills to support such communities. In the late 1960s and 70s, urban planners, social workers and trade union representatives, among other support-oriented occupations were educated to provide resources to broad communities. Interdisciplinary practices would be useful in building towards support-oriented systems development. The change in role for system developers would need to be supported by education and research, particularly in university departments.

Design in the context of downsizing

- **Beyond design for work practice.** Design for work-practice is a useful way of acknowledging worker skill in the workplace, but on an operational level it often directly contradicts management strategies like Business Process Reengineering which aim at lowering the cost of labor. Given post-industrial emphasis on integrating work and computer systems within new organizational structures, design based on current work-practice within an organizational frame puts workers in the difficult position of exposing their current skills without any reasonable assurance that their skills will be useful in the future. Including labor needs as well as customer and citizen interests in design requirements offers a way of going beyond designing for work-practice.

- **Realistic design specifications.** Empirical research is needed about how to include business strategic plans in preparing participatory design activities. Such studies can build on interdisciplinary research including labor economics for a better understanding of the economic goals of proposed changes. Organizational strategic plans often conflict with the interests of workers, customers and citizens, but such plans need to be seen in advance or design specifications may end up not being used.

- **Supporting the supporters.** System developers preparing to provide technical support for communities of use could use support themselves from professional organizations that acknowledge their right to help such communities make decisions. In the US Computer Professionals for Social Responsibility is an example of such an organization that could provide systems developers with their own community of support. It would also be important to involve international associations like the ACM in recognizing the contradictory nature of computer system design and accepting ethical standards for those who support community rather than organizational interests.

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On a concrete level there are a range of activities that community-support system developers could engage in when they are hired by communities rather than individual organizations. Many organizations contact vendors to help make "buy or build" decisions about applications. As redesign, not just maintenance, becomes a larger issue, decisions about which applications to buy, how they should be installed, and how they can be integrated into existing systems come into the foreground of design activities (Braa, Bratteteig & Øgrim, 1996). These types of often early analysis or feasibility decisions represent precisely the kind of issues that user-worker-community-customer groups need support with. In fact if community-based groups got support for analysis or early design activities (see Kensing & Munk-Madsen, 1993)--activities occurring before new systems are bought or ordered--they could have a stronger impact on managerial decision-making within an organization. Similarly, citizen groups need this type of information in order to influence governmental information technology policies and the delivery of services that government agencies provide. Many of the support activities system developers could provide revolve around relatively inexpensive and low-tech cooperative design techniques which build on active cooperation between developers and users. Such activities include : workshops, trips to vendors, visits to other use sites, education and cooperative prototyping (see Greenbaum & Kyng, 1991, see Kyng 1988).

Traditional system development practices addressed the economic need of managing large scale development efforts based on industrial practices and conditions. Participatory design approaches evolved in the very early part of the post-industrial period when supporting user interest in small parts of larger scale projects seemed to be enough to provide a basis for better design. But now post- industrial economic and organizational characteristics are more firmly entrenched and thus strongly influence the way information technology is designed for use. In particular the *short-term* profit making objectives of global capitalism are often at odds with the need to design systems for *longer term* use. It can be counter productive as well as sometimes professionally irresponsible for system developers to carry out small scale projects for individual occupational groups or departments working within an organization undergoing rapid change, unless they are fully aware of the economic objectives and job related consequences of the proposed changes. Awareness of economic objectives is rarely hard to come by since it is usually spelled out in management strategic plans, in specification documents, or in compnay reports.

System development in post modern times needs more than creativity, some good principles and a tool bag of techniques to provide useful support for communities of interest whose jobs, working conditions and economic interests are at stake. Perhaps the *Dilbert* cartoons of Scott Adam's are replacing the character played by Charlie Chaplin in *Modern Times* as a symbol of how people are lost in their work environment. Like Chaplin, Dilbert needs to be taken seriously. Participatory design is an approach that can be part of this process, but its design objectives and methods can use a realistic overhaul. This article sets the stage for such a discussion.

ACKNOWLEDGEMENTS:

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[1] This paper was written when I was on leave from the Computer Information Systems Department, LaGuardia Community College, City University of New York; 1995-96. Current email address:joanbaum@ix-netcom.com.

[2] Post-industrial economies are those where the Gross National Product comes primarily from services rather than goods production (industrial) or the earlier period of agriculture. It is generally considered that the U.S. entered this period sometime in the 1960s, and Canada as well as Western European nations tipped from their industrial base in the 1970s. The economics of Third World and develeoping countries combines characteristics of each period, but is beyond the scope of this paper. See Jorn Braa in this Proceedings for disucssion of community support for participatory design in South Africa.

[3] This example as well as some other examples used here is taken from research I conducted as background to my recent book, *Windows on the Workplace*, (1995), however the theoretical analysis of industrial and post-industial work organization is developed for this article which was written as a follow-up to the book and should be seen as a companion piece to an article entitled "Back to Labor" which I wrote for the CSCW '96 conference, documenting the need for a labor perspective in the study of work.

[4] Bureau of Labor Statistic measures are available through Department of Labor publications and by calling the Department for monthly information. For examples of some studies on distrubted and home work see Herzenberg, et al, (1996) and see Wagner et al 1996 "Teleworking Perspectives" Working Paper, Technical University of Vienna, and see Felstead & Jewson "Researching a Problematic Concept: Homeworking in Britain, Labor Process Conference, Aston, England, March 1996..

[5] Trade union supported projects are certainly still important under conditions where unions have democratic practices and enough power to accomplish their objectives. But membership in unions has been declining as the industrial base declines, and other outlets for worker and community support need to be considered.