1994

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THE SCANDINAVIAN EXPERIENCE

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Abstract

The Collective Resource Approach is an innovative Scandinavian approach to the design and implementation of new technologies in the work place. It attempts to empower trade unions and workers at the local level by exploiting the needs of the highly integrated Scandinavian economies to constantly improve their technology. In this paper we discuss the practical *impact of the CRA in Scandinavia and its likely relevance to the U.S. We conclude that the Collective Resource Approach has not been accepted by workers and unions nor affected in major way the day-to-day practice in Scandinavian work places. The reasons are both ideological and embedded in the Scandinavian systems of industrial relations. For somewhat different reasons, notably the disintegration of the U.S. trade union movement, the Collective Resource Approach seems even less likely to serve as a useful model for the United States.*

Keywords: Collective Resource Approach, work place democracy, unions, technology, industrial relations, work place co-operation, participation, technological determinism.

This paper was originally published in PDC'92: Proceedings of the Participatory Design Conference, Computer Professionals for Social Responsibility, Palo Alto, CA. It is reprinted here with a few minor corrections. Scandinavian Journal of Information Systems is grateful to the CPSR for permission to reprint.

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1. Introduction

The purpose of this paper is to reassess some of the assumptions Americans have made about the so-called "Scandinavian approach" to technological development in the work place. This approach, more precisely referred to as the Collective Resource Approach, originated in the 70's from a research project sponsored by the Norwegian Iron and Metal Workers Union[1]. It has been further developed and tested in a number of research projects carried out in collaboration with trade unions. The DEMOS project, initiated by the Swedish Trade Union Federation in 1975, and the UTOPIA project, set up by the Nordic Graphics Workers' Union in 1981 are notable examples. The central idea of all these projects has been the involvement of workers in the design and implementation of the tools and machines they use in their work.

Scandinavia has always been for some Americans—particularly trade unionists and academics—an extremely attractive model of industrial relations. It is only a slight exaggeration to say that for many U.S. researchers and trade unionists the operative image was of happy workers handcrafting individual Volvo's out of whole blocks of Swedish steel, stopping every half-hour for an hour-long discussion of worker empowerment.

The image received a strong boost in the late 70's and early 80's when Kristen Nygaard, Pelle Ehn and other prominent researchers collaborating with Scandinavian trade unions visited American universities and union halls. They described innovative, even daring, work place initiatives undertaken by coalitions of Scandinavian trade unions, academics, and political activists. Many Americans heard for the first time about the ability of Scandinavian trade unions to demand and get a wide range of consultation rights. These ranged from formal co-operation committees to data and technology stewards to far-reaching health and safety measures. Most important, Scandinavian consultation seemed to extend to the introduction and even the design of new production technologies. For many U.S. observers, this merely confirmed their impression that Scandinavia led the world in innovative work place relations.

The U.S. visits were followed by optimistic and enthusiastic reports—some by Scandinavians, some by Americans[2] describing the concrete changes being implemented in Scandinavian auto factories, hydroelectric stations, woodworking shops and newspaper compositing rooms (see e.g., (Howard 1985, Sandberg 1979, UTOPIA 1985). The reports all described more or less the same events: trade unionists, aided by academics and funded by the Scandinavian governments, had begun the process of inserting workers into the design and thus the management of their own work and work places. Scandinavians—employers, unions, and various governments—have always been receptive to technological innovations. Creative and persistent trade unionists and their academic allies have been able to use this openness to change to achieve what negotiations and decades of social democratic legislation had not: substantive worker involvement in the design and management of their own work. Employers were compelled to find innovative production methods to stay competitive. As long as workers, through their unions and con-

sultants, provided the innovation, they could ask for and get a bigger say in the social relations of the work place. Workers, in other words, could gain a degree of work place control through the back door via technological innovation.

The flow of case studies was accompanied by an emerging perspective on the nature of work place organizations. That perspective has gradually evolved into a theory of organization and industrial relations, including a model for the design and introduction of new technologies in the work place which emphasize the role of trade unions. This theory has been termed the Collective Resource Approach (CRA) (Ehn 1988, Ehn & Kyng 1987) or sometimes just the Scandinavian Model.

In the following sections, we examine CRA as a unique product of Scandinavian social and industrial relations (Section 3) and ask how successful it has been in Scandinavia (Section 4). Finally, we ask whether it may be useful as a model for participatory design in the United States (Section 5). First, however, we describe the legal and organizational structure within which workers and employers negotiate changes in the tools and social relations of the work place.

2. The Structure of Scandinavian Industrial Relations

By U.S. standards, Scandinavia is a model of humane and progressive industrial relations. It is not that Scandinavia is free of industrial disputes; rather, in Scandinavia industrial conflicts appear to be settled by reasonable people in reasonable ways. The system of industrial relations agreements, both public and private, influences day-to-day Scandinavian industrial relations to a much larger extent than in the U.S. The extraordinary array of private agreements, government statutes and informal but detailed customs which govern industrial relations in Scandinavia have no counterpart in the U.S. Indeed, they may strike Americans as bizarre. Yet we have seen no sustained analysis of this system, from either Americans or Scandinavians, in their discussions of worker empowerment and the role of new production technologies[3].

A peculiarity of Scandinavian industrial relations—indeed, of Scandinavian societies in general—is that they are simultaneously highly organized and centralized yet small-scaled and flexible. Employers associations and trades union federations have established in all the Scandinavian countries a system of deeply-rooted collaboration between organized employers and organized labor. Employers and the trade unions see their ongoing co-operation as the foundation of the Scandinavian economy and as the guarantor of the region's high standard of living.

Although in the last 15 years Scandinavia has experienced a wave of consolidation and even concentration of ownership, by American standards the Scandinavian economies are small-scaled. To use Denmark as an example, of the 6,932 Danish firms in the manufacturing sector in 1985, half employed fewer than 20 people. Only five percent employed 200 or more people and one and a half percent employed as many as 500 people. The single largest industrial enterprise in the country employs 8000 people. By comparison, U.S. manufacturing firms with fewer than 20 employees accounted

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for only eight percent of the manufacturing work force in 1982[4].

With a few significant exceptions, private sector unions belong to the Confederation of Danish Workers' Organizations, universally known as the Landsorganisation (LO). The total LO membership is 1.4 million, and nearly all Danish private sector workers are in unions. By contrast, only about 15% of the American work force was unionized in 1988.

Approximately 30% of Danish private sector firms are members of employers' trade or industry associations which in turn are members of the Federation of Danish Employers' Association, the Dansk Arbejdsgiverforening (DA).

The LO thus represents nearly all Danish workers, while the DA represents the most important private sector employers. The two associations by virtue of their size or importance set the pattern for virtually all Danish enterprises. Historically, the DA and LO are usually called the "main organizations," a term we shall use here.

Similar organizations play functionally equivalent roles in all the other Nordic countries.

The main organizations effectively regulate industrial relations in Scandinavia, even for those employers and workers who do not belong to member enterprises or unions. Their agreements, which are private contracts but in formal terms have "the force of law," commit virtually the entire private sector to a system of mediation and arbitration. In practice the main organizations, with the support of the state, can effectively compel individual unions and enterprises to accept settlements imposed by "mediation"

teams composed of representatives of the main organizations.

The Scandinavian industrial system differs in striking ways from U.S. system of industrial relations. We have discussed these differences in detail elsewhere (Kraft & Bansler 1993). For our present purposes, the most important characteristics of the Scandinavian system of industrial relations are

- intimate collaboration between employers and unions in apprentice systems and other forms worker education and training.

- an elaborate array of site committees which discuss and occasionally determine local issues, including critical matters of technological innovation.

- the global reach of contracts which effectively cover the entire national economies.

- a strictly enforced prohibition against strikes or lockouts when a collective agreement is in force.

As we shall see, together these provide both the opportunities and limitations for worker control in Scandinavia.

3. The Collective Resource Approach and Later Developments

The corporatist nature of Scandinavian industrial relations, industrial relations law and, increasingly, the Scandinavian states themselves, has important practical consequences for the management of new technologies. Scandinavian employers and unions have been able to confront complex and potentially divisive issues, including technological in-

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novation, in a systematic and deliberate way. Above all, Scandinavian employers and unions both appreciate the crucial role technological innovation plays in keeping the region competitive in an international market.

3.1. The CRA

It is here that Scandinavian trade union activists and their allied researchers have sensed an opening: the mutual dependence of organized labor and organized employers offered well-organized workers the chance to take command of their work processes and work places. Their reasoning is simple and compelling: if Scandinavian employers required the co-operation of highly disciplined, flexible and well-organized workers to compete in a global market, they would be even more dependent on workers who seized the technological initiative and led the way in the developing new and sophisticated design and production technologies.

In other words, the Collective Resource Approach encourages workers and their unions to take the initiative from management rather than reacting to management's proposals and demands. In order to do so, workers and local unions must learn about the design and use of new technologies, their likely impacts on jobs and working conditions, as well as possible alternatives (Ehn 1988, Ehn & Kyng 1987).

A basic assumption of CRA is that by itself a participative approach to the development of new production technologies is not sufficient to achieve genuine worker control. Traditional participative schemes cause problems for the trade unions. Management-appointed project group participants are often not union representatives, and if they are, likely to end up as "hostages" with no real influence. As a consequence, unions should only participate in projects or working groups if they at the same time create their own alternative working groups which parallel the official project organization.

As part of the Collective Resource Approach, researchers and unions have developed a model for independent trade union activities when negotiating with management about the introduction of new technologies in the work place (Ehn & Kyng 1987). The model emphasizes the role of independent study groups consisting of union members and often external consultants. The purpose of the model is to:

* allow the local union to obtain its own knowledge and expertise with regard to technology and work organization, particularly by undertaking its own research into these areas,

* decrease the risk of local unions being overpowered by management when participating in management-controlled project groups,

* develop a basis for negotiations which is well- supported by union members.

The local union activities prescribed by the model are, however, very resource consuming. As a consequence, the local union needs outside help. Such help may be workers, consultants and central union officials with experience handling the introduction of new technology.

According to the Collective Resource Approach, the primary role of the *national* unions is to support the initiatives of local unions in the work places.

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In addition to assisting locals in their negotiations, this support may consist of

- negotiating national "framework" agreements, such as, for example, the Danish technology agreement (subsequently incorporated into the Agreement of Collaboration),

- providing and paying for education and training for shop stewards and union members,

- conducting and sponsoring research in the design and use of new technologies, including the development of alternatives to capitalist forms of production systems and work organization.

The national unions must, in other words, not only engage in the traditional collective bargaining processes, but also play an active and independent role in the development of new machines, systems, tools and work organization by local unions, chiefly by subsidizing local union initiatives. In this way, the unions are able not only to criticize the initiatives of employers and management, but present practical counter proposals. The ability to present alternatives is considered a necessary precondition for exercising influence.

A well-known attempt to implement CRA was the UTOPIA project, in which researchers and graphic workers collaborated to design computer support and professional education for text and image processing. (The UTOPIA project is discussed in more detail below).

3.2. Recent Extensions of the CRA Theory

Recently, the emphasis in CRA-inspired research among academics has shifted from issues of power and industrial democracy to making the system design process more *co-operative* and *participatory*. The research focuses on how to involve users in the design process, how to foster co-operation between designers and users, and how to make the process more inviting and meaningful for the designers themselves. It concentrates on the processes going on within the individual project group, deemphasizing the political constraints of the organizational setting. The key idea is to bring the users' *tacit knowledge* to bear in the design process by using mock-ups and prototypes to simulate prospective work situations. Creating more innovative designs and enhancing the fun and excitement of the design process has gradually supplanted the original goal of increasing trade unions' and ordinary workers' influence on new technology as the primary goal of CRA (*cf.*, for example, (Greenbaum forthcoming, Kyng 1991) and the various articles in (Greenbaum & Kyng 1991)).

4. Idea versus Reality

The theory and goals of the Collective Research Approach were laid out in some detail by 1985, *cf.* (Ehn & Kyng 1987). The strategy has been developed and tested in several research projects, and implemented by progressive unions with the help of academic researchers and consultants. We are now in a position to evaluate CRA *practice*. In spite of the enthusiasm of its supporters, it does not appear that the Collective Resource Approach or related work has affected in a major way the day-to-day practice in Scandinavian work places. On the whole the strategy has not been widely accept-

ed by either employers or the national unions.

4.1. CRA Implementation

It has proved to be more difficult to change practice than the researchers initially believed. Social and technological constraints, especially concerning power and resources, have been underestimated and the trade unions' willingness to adopt the CRA strategy has been overestimated. The UTOPIA project is a case in point.

The UTOPIA project was carried out in co-operation between the Nordic Graphic Workers' Unions and research institutions in Sweden and Denmark. The aim was to develop a computer-based system for newspaper production, designed to support the co-operation of highly skilled printers and journalists, a democratic work organization, and the production of high-quality newspaper lay-out. The system was designed in co-operation with the state-owned Swedish publishing company, Liber, which also had the responsibility for implementing and marketing the system[5]. The UTOPIA project group had made a conscious effort to coordinate the design of the computer system with the attempts to create a new work organization. The pilot project, at the Swedish newspaper *Aftonbladet*, proved how difficult it would be to realize the ideas of the design team. According to their agreement with Liber, UTOPIA members were to participate in the installation of this first system, in order to help define the work organization and recommend the necessary training. Management at *Aftonbladet*, however, refused to co-operate and adopt the new work organization. The journalists' union also opposed the experiment. In the

end, although *Aftonbladet* bought the UTOPIA-designed technology, the new concept of work organization had to be abandoned, *cf.* (Bansler 1989b, Ehn 1988, and Howard 1985).

Several Scandinavian researchers have noted similar problems with the implementation of the strategy after studying various CRA projects. For example, Stranddorf, reviewing the Scandinavian literature as well as his own case studies, concludes that:

> ... [t]he attempt to carry out strategies [based] on a collective resource approach has so far only had little success. The planning of the management is based on existing distribution of knowledge and material resources in the working life and in rest of the society....The conditions the strategy tr[ies] to change are deeply and strongly [grounded] in ...production and planning. Besides this, it is difficult to establish activities of the employees concerning new technology because of internal conflicts, lack of interest and support, difficulties in the building of knowledge and so on....Big experimental projects are important for the development of the strategy, but such projects won't be sufficient. Those projects are very resource consuming, and the conditions for implementation and diffusion of the strategy are often bad. To change the ways of planning the collective resource approach more broadly [has] to be established as an underlying and fun-

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damental perspective of union activities and politics. (Stranddorf 1989, from the English summary).

Clausen and Langaa Jensen, in a paper discussing different approaches to technology assessment and industrial democracy, list the following problems connected with the CRA strategy (Clausen & Jensen 1990):

- Employees and unions at the local level seldom possess enough resources, particularly knowledge and time, to carry out the strategy successfully.

- It is difficult to integrate the technology-related activities with the unions' traditional activities, and they are not considered a high priority by union officials.

- The approach has often been promoted by one or two very enthusiastic individuals within the unions. This has had little effect in the long run.

- Large parts of the union movement are afraid that the (local) co-operation with researchers from the collective resource approach may undermine the unions' long-standing policy of co-operating with employers.

- Locally, i.e. at the level of the individual company, it has proven to be difficult to identify clear "decision points" where demands could be put forward and negotiated with management.

- The employees and their representatives are involved too late in the process. The result is that the impor-

tant decisions have already been made by management.

- Many unions are more concerned with recruiting new members from other unions when new technology is introduced rather than actually trying to influence the decisions about how the technology should be used.

Clausen and Jensen conclude that the difficulties in implementing the CRA strategy have to do not only with obstacles and unfavorable conditions at the individual work places, but also with internal trade union problems such as political disagreements, unclear objectives, and demarcation disputes between unions.

Finally, Clausen and Lorentzen, reporting on four case studies of the introduction of new technology in Denmark, conclude that the local unions' strategy has been chiefly defensive. In general the unions have been unprepared for influencing the development and introduction of technology and their response has often been to try to stop or slow down the process. The overall union strategy focuses almost exclusively on the impact on employment levels. Because the unions have very limited abilities to influence this they are marked by resignation and feelings of powerlessness with regard to the introduction of new technology in the work places (Clausen & Lorentzen 1986).

4.2. Ideological and Structural Barriers

At first, it may seem odd that the CRA has gained so little acceptance by the Scandinavian trade unions. The reasons are ideological as well as structural.

4.2.1. The Scandinavian Tradition of Consensus

The trade unions are bound to an ideology of consensus and co-operation which goes back to the end of last century. It is a way of thinking and a political strategy which the majority of the union officials, shop stewards and ordinary members support. In the work place, the relationship between management and employees is usually characterized by mutual respect and trust. This predisposition to act co-operatively with employers is clearly related to a broadly-based social consensus in Scandinavia about maintaining both social peace and a high standard of living (Bansler 1989b, Kraft & Bansler 1993). As a result, shop stewards and workers are often reluctant to participate in local CRA activities and national unions are generally suspicious of the CRA strategy.

4.2.2. Structural Barriers

The structural impediments to the CRA have to do with the organization of formal "consultation" embedded in Scandinavian industrial relations. Under the main agreements, joint co-operation and technology committees provide a structure within which employees may examine and comment on technological and management changes employers intend to introduce. The agreements are thus a mechanism for resolving disputes during the term of a contract, when strikes and lockouts, the chief weapons in industrial conflicts, are prohibited. Workers may formally object to new production technologies, or to changes to existing technologies, on the basis of what they consider violations of the collective agreement or because of threats to what one of the agreements calls "health, safety and honor." Unions, on the other hand, depending on the country, have little or no authority to block any management initiatives. Instead, if committee discussions prove unsatisfactory, either party may call for outside mediation.

In sum, Scandinavian managers and worker representatives are obliged to come together regularly to anticipate or resolve technology-based disputes. Although employers must discuss with workers the effects of anticipated or impending changes, the collective agreements between the main organizations give workers or local unions little formal authority to control, design, or delay the introduction of new organizational structures, staffing levels, schedules, or new production technologies. Workers face clear limits in their ability to "co-determine" the organization of work. The Danish Agreement of Collaboration, for example, obliges the employer only to notify employees of pending work place changes, including technological changes, and hear their responses. It does not empower workers to veto or unilaterally alter management plans. Employers are obliged only to inform union members of these committees of impending or proposed organizational changes, including technological changes, but they may introduce any new technologies they choose and manage them as they see fit, within the scope of the appropriate collective agreements and law.

The trade unions, particularly at the national level, traditionally have relied on this structure of joint committees to influence informally the introduction of new production technologies. As we have seen, they have few legal alternatives. In fact, the unions, and especially the union federations, have developed

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close working relations with their employer counterparts. Because of this, unions have been reluctant to challenge directly management decisions about changes in the organization of production. To the extent the Collective Resource Approach threatens to upset this carefully crafted mechanism, national unions and especially the main organizations are not likely to pursue a policy which, in effect, challenges their influence with employers. Indeed, the most recent Co-operation Agreement between the Danish LO and DA reaffirms the legal rights of employers to initiate and manage changes in the work place, including technological changes, with virtually no restrictions other than notifying the appropriate joint committees.

It is also interesting to note that while CRA researchers and local unionists were originally successful in getting large grants from the main organizations (and governments), the main organizations drastically curtailed funding when it became apparent that they were subsidizing creative challenges to their long-standing industrial relations system.

In short, while progressive academics and local trade unions may energetically support the concepts behind the Collective Resource Approach, the national unions and especially the trade union federations are unlikely to because CRA threatens the elaborately defined system of centralized industrial relations which the main organizations helped create. The highly organized and co-operative nature of industrial relations of the region provides a fertile ground for the rise of worker participation projects while at the same time structurally short-circuiting major transformations in the relations between employer and worker.

5. CRA in the USA?

Greenbaum, among others, has suggested—cautiously—that the Collective Resource Approach and its offshoots can be applied in U.S. work places (Greenbaum forthcoming). Here we ask how relevant CRA might be to participatory design or to the broader issues of worker empowerment in the United States? The question is particularly timely because the United States, like the Scandinavian countries, has come under intense competitive pressures in an increasingly global economy.

5.1. Structural Barriers

The American system of industrial relations lacks several of the crucial ingredients of the Scandinavian system upon which CRA (and co-operative work) theory depends. We list only the major ones here, and refer the reader elsewhere for a more extensive analysis (Kraft & Bansler 1993).

In contrast to the Scandinavian systems, U.S. industrial relations are characterized by:

- an overwhelmingly non-union work force. It is fair to say that U.S. labor movement has disintegrated. About 15% of all U.S. workers are in unions, even fewer in the private sector. At its peak 40 years ago, the U.S. trade union movement represented only about 40% of the work force. In the Scandinavian countries the private sector union membership is about 90%,

- a system of industrial relations law which covers only wage minima, health and safety regulations, pensions and little else. Employers and

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workers are under virtually no pressure to act co-operatively by law or, obviously, by contract,

- a system of worker education and training which is entirely controlled by employers or by schools responsive to the wishes of employers. It may be more accurate to say that there is no system of worker training other than what is provided (or subsidized) by individual employers,

- an explicit rejection of worker participation and power-sharing as negotiation issues by U.S. unions; instead they have focused almost exclusively on wages, hours, conditions of work and, recently, job security.

Structurally, then, the CRA formula of "control of the technology = control of the production system"—which is problematic in any case—makes little sense in the context of U.S. industrial relations.

5.2. Ideological and Cultural Barriers

The structural differences between U.S. and Scandinavian industrial relations are fundamental. No less striking are the ideological and cultural differences. The analogue to Scandinavian co-operation is U.S. individualism. If U.S. employers have successfully opposed union organizing efforts (and succeeded in decertifying many established unions), they have made their case to a receptive audience. Surveys have consistently shown that the majority of U.S. workers are hostile to trade unions. Design and technical workers in the private sector are especially hostile: of U.S. programmers and systems analysts, for example, fewer than one half of one percent belong to unions[6].

It is arguable, however, that the most striking cultural difference between the U.S. and Scandinavia is the *individualism of U.S. employers*. Although most large firms belong to industry associations and many smaller firms belong to chambers of commerce and similar organizations, U.S. employers are obliged to follow no common industrial relations policies. They can treat employees any way they want subject only to federal and state labor law and, sometimes, contracts. One outcome of this corporate individualism is nearly a century of taylorized work and military-like command and control management systems[7].

A relentless taylorism and, in the last fifteen years, a government-sanctioned campaign to create "union-free" work places, have given U.S. managers something they have always wanted: nearly complete control of most work places. Ironically, managers now also have something they have decided they don't want: a badly trained and unresponsive work force ill-equipped to compete in the global market.

U.S. managers have responded to their increasingly uncompetitive position by emphasizing "team work." Words like "co-operation," "job ownership," "participation," and even "empowerment" have become common in management writings and training courses.

But these words have different meanings in the U.S. than they do in Scandinavia. They are reflections of a radical organizational and ideological restructuring. U.S. firms are in the process of reducing their middle-management ranks and need, therefore, to find other ways of controlling workers. Such terms reflect, in other words, an ongoing proc-

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ess of speed-up for both middle-managers and workers, including design and technical workers. There is no empowerment taking place in an organizational sense, and no team work except on management's terms. The U.S. version of teams and co-operation is not an employee-controlled alternative to the conventional management hierarchy; it is an alternative management system of control. A society which substitutes individualism for co-operation, which transforms "team work" into another form of control and "empowerment" into a "voluntary" intensification of work is not fertile ground for a genuinely participatory work system.

In summary, the concept of worker empowerment has been thoroughly co-opted by employers who use the term to coerce flexibility, to mandate creatively, and to more efficiently control, not liberate, their workers. To paraphrase Greenbaum, there is increasing participation but little democratic control (Greenbaum forthcoming).

complexity of the formal consultation system has at the very least the effect of diffusing and channelling worker doubts about management-initiated technology innovations. The success of the arrangement between the main organizations has been based on increasing, not decreasing, centralized negotiations in industrial relations. Can the Collective Resource Approach successfully manoeuvre around this formidable and (from the perspective of the trade union confederations and employers associations) smoothly functioning system? On the basis of early attempts to put CRA into practice, it seems unlikely that CRA will find much success unless it also succeeds in changing this century-old system of industrial relations.

For different reasons, notably the disintegration of the U.S. trade union movement and the nearly unchallenged position of U.S. managers to control the work place, CRA seems even less likely to serve as a useful model of genuine worker empowerment in the United States.

6. Conclusion and Summary

The Collective Resource Approach attempts to empower workers at the local level by exploiting the need of the highly integrated Scandinavian economies to constantly improve their technology. In doing so, however, it challenges the first principle of Scandinavia's industrial relations system: to preserve industrial peace through mediation and negotiation under the direction of the main employer and worker organizations. The system mandated by various agreements and by labor law precludes effective worker initiatives at the level of production. The

Notes

[1] In our presentation at the PDC conference, we stressed that there is no such thing as *The* Scandinavian Approach. There are not one, but several Scandinavian approaches to systems design. In this paper we focus the most well-known and influential of these, often referred to as the Collective Resource Approach. It is the source of many participatory design projects in Scandinavia and elsewhere, including those such as UTOPIA, which have been repeatedly cited at the first two PDC conferences.

For more detailed accounts of the history of the Collective Resource Approach see (Bansler 1989a, 1989b, Ehn 1988, Ehn & Kyng 1987).

[2] The handiest compilations of these early reports and studies are the various publication announcements of the Arbedslivscentrum of Stockholm. Other relevant lists are published by the Depart-

ment of Informatics of the University of Oslo and the Norwegian Computing Centre. See also the articles collected in (Bjerknes *et al.* 1987, Bjørn-Andersen 1982, Briefs *et al.* 1983, Sandberg 1979) as well as the book by Pelle Ehn (1988) and the special issue of *Office: Technology and People* on *Scandinavian Approaches to Systems Development*, Vol. 4, No. 2, 1988.

[3]The following section is based on (Kraft & Bansler 1993). Because of space limitations, readers are referred to that paper for sources on the Danish economy and industrial relations system. Although the industrial relations systems of the Scandinavian countries differ in significant ways, in most essential details all are based on the Danish model which was formally put in place in 1899.

[4]Sweden is the only Scandinavian country that manufactures automobiles and military aircraft. It thus has more heavy industry, particularly in iron and steel and machinery. It also has somewhat larger enterprises than Norway and Denmark. Cf. (Kraft & Bansler 1993).

[5]The design and construction of an actual production system lay outside the scope of the UTOPIA project. In 1982, Liber proposed to test many of the ideas of UTOPIA in practice. Liber was the prime contractor in a $10 million project to develop a fully integrated text-and-image processing computer system, known as TIPS. For a more detailed description of the UTOPIA project see (Ehn 1988, Howard 1985, UTOPIA 1985) as well as the articles in (Briefs *et al.* 1983).

[6]Ten years ago Philip Kraft and Steven Dubnoff surveyed a large sample of U.S. software workers. The few software specialists in trade unions were all captive members, that is, they were put in unions involuntarily as a result of agency (representational) agreements between unions and employers, often as a result of federal arbitration. The results of that survey have been published in various places. A listing may be obtained from the first author.

[7]The following argument is more fully developed in (Kraft 1991, Kraft & Truex III 1992).

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