SYSTEMS DEVELOPMENT RESEARCH IN SCANDINAVIA:
Three Theoretical Schools*

JØRGEN BANSLER

Department of Computer Science at the University of Copenhagen
Universitetsparken 1, DK-2100 Copenhagen Ø, Denmark.

Abstract

Scandinavian research in systems development can be grouped into three major traditions, based on quite different ideologies and theories: The systems theoretical school, the socio-technical school and the critical school. The differences among these schools are closely related to the historical and social contexts in which they developed. External political, economic and cultural factors have strongly influenced research in this field. In particular, the basic theoretical differences among the schools reflect their different interpretations of the relationship between capital and labour.

Keywords: information technology, systems development, systems analysis, organizational change, industrial democracy.

*Published with permission of the copyright holder: Elsevier Science Publishers Ltd.
1 Introduction

The topic of this article is the development of different theoretical schools or traditions within systems development research in Scandinavia. I am painting a rather black and white picture of the theories underlying this research. My purpose is to address central theoretical controversies while emphasizing what distinguishes these different research traditions.

In reality things are—of course—much more complex. The research traditions tend to overlap, and many research projects can not easily be classified as being part of one research tradition or another. At the end of the article, I will give some examples of projects which eclectically combine elements from different theoretical schools.

Why do several competing schools exist side by side? What are their origins? Why do they disagree? These questions can’t be answered by looking at events within the scientific universe alone. Research does not develop in a vacuum, in isolation from the surrounding society. On the contrary, the main view expressed here is that systems development research is strongly affected by external factors, such as the economy, politics and culture in a broad sense.

In the following, emphasis is placed on the historical and social contexts in which Scandinavian systems development research has evolved. The first section gives an overview of the different theoretical positions. The following sections present a more detailed historical account of the development of each tradition. Finally, I conclude that these basic divisions in the research field show no signs of vanishing.

I would like to warn the reader that I share many viewpoints with researchers from “the critical school” (see next section). This fact will, of course, bias my exposition to some extent.

2 Theoretical Bases of Research Traditions

When a new field of research develops and matures several competing research traditions will normally exist simultaneously. A research tradition is constituted by a set of basic ideas and values, shared by a group of researchers (Bansler 1987):

1. Knowledge interest,\(^2\), i.e. the underlying aims and intentions which motivate and direct the researchers’ choice of relevant questions and problems to be solved. The knowledge interest is the key to understanding the fundamental distinctions between different research traditions.

2. Metaphysical assumptions, i.e. the set of shared assumptions which cannot be proved by reference to logic, facts or experimental data.

3. Basic notions, i.e. the set of notions which are central and elementary parts of the professional language of the research tradition. I refer to these notions as “elementary”, because their meaning cannot be defined or grasped without referring to the metaphysical assumptions.
The basic assumptions and notions are, metaphorically speaking, the glasses, through which researchers see the world. The “glasses” determine which phenomena they consider to be scientifically relevant, and may bias their perception of what aspects are important.

4. Finally, one can describe a research tradition by its practical results. In the case of systems development research the typical results will be systems development methods, life cycle models, system specification languages, etc. Here, I will be less concerned with the practical than with the theoretical aspects of systems development research.

Scandinavian research in systems development can be divided into three major traditions\(^3\) (Bansler 1987): The \textit{systems theoretical tradition}, the \textit{socio-technical tradition}, and the \textit{critical tradition}.\(^4\)

<table>
<thead>
<tr>
<th></th>
<th>Systems theoretical tradition</th>
<th>Socio-technical tradition</th>
<th>Critical tradition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge interest</td>
<td>profit maximizing</td>
<td>job satisfaction, participation</td>
<td>industrial democracy</td>
</tr>
<tr>
<td>Notion of the organization</td>
<td>cybernetic system</td>
<td>socio-technical system</td>
<td>framework for conflicts</td>
</tr>
<tr>
<td>Notion of the labour force</td>
<td>objects (&quot;systems components&quot;)</td>
<td>subjects (individuals)</td>
<td>subjects (groups)</td>
</tr>
<tr>
<td>Notion of capital/labour relations</td>
<td>common interests</td>
<td>common interests</td>
<td>opposing interests</td>
</tr>
</tbody>
</table>

Figure 1: Schematic comparison of the three major theoretical schools within Scandinavian systems development research.

Although all three research traditions are concerned with practical systems development, they focus on completely different problems, because their basic aims and intentions are different. As a consequence, the respective research projects also differ as to whether problemsolving involves cooperation with management and/or labour unions (Bjørn-Andersen & Hedberg 1977, Clausen 1979, Sandberg 1979).

\textit{Systems theoretical} researchers view the use of information technology in the workplace from a narrow economic perspective. Their objective is to rationalize work processes by using computer based information systems to eliminate waste in labour, time and materials.
Socio-technical researchers are concerned with the socio-psychological problems caused by the system designers’ neglect of the human factor. They believe that, by paying more attention to human needs in systems development, increased job satisfaction and higher productivity can be achieved at the same time.

Finally, researchers within the critical tradition deal with the use of information technology and workplace democracy. They want to strengthen the position of employees and unions vis-a-vis managers and capital owners.

These three research traditions differ mainly with respect to their perception of the nature of organizations. Within the systems theoretical tradition an organization is treated as a cybernetic system. A great deal of attention is given to the development of methods for the analysis of control systems and information flows. According to the socio-technical tradition, organizations are envisioned as two interrelated systems—a social and a technical system—and emphasis is placed on the analysis of human relations and behaviour patterns. The critical tradition sees the organization as a social entity, as a framework—not only for cooperation—but also for conflicts among various interest groups, especially between managers and workers. They stress the significance of interests and of power.

There are two more major issues which the schools treat differently. The first concerns the definition of workers. The labour force can be considered either as objects ("system components") or as subjects. The systems theoretical school, based on Taylor’s mechanistic view of workers and organizations, has incorporated the former definition. In contrast, the two other schools stress that people are not machines and that organizations consist of networks of social relations which are not in any way analogous to mechanical systems.

Secondly, work is defined differently, either as a cooperative relationship or as one of conflict. The critical tradition insists that the relationship between labour and capital is an antagonistic class relation. The systems theoretical and the socio-technical traditions, on the other hand, maintain that employers and employees by and large have common interests. See figure 1.

The three research traditions are, in other words, based on quite different ideological assumptions. Therefore, it is not surprising that their theoretical frameworks and methods differ and are incompatible to a certain extent.

These differences are closely related to the historical and social contexts of the three theoretical positions. Systems development research is not independent of the conflicts characterizing the use of information technology in the workplace. The relationship between capital and labour, which infiltrates social relations in the workplace and determines the development and use of technology, is also reflected in the fundamental theoretical controversies permeating these research traditions. Regardless of whether they want to or not, researchers will always have to relate to the clash of interests between capital and labour—they will have to take sides. Neutral or value free research in systems development is an illusion.
With this in mind, it is important to note the significant economic, political and cultural differences between Scandinavia and other developed capitalist countries, e.g. USA. Labour relations are especially important in this context. Compared with American standards the labour market in Scandinavia is highly unionized. Approximately 60–70% of the total workforce, and more than 90% of the workers in the private sector are union members (Kjellberg 1983). The strength of the trade unions has considerable influence on the way employers introduce new technology in the workplace. Thus Scandinavian managers quite often commit themselves to a policy of participation and "co-operation" in order to avoid industrial disputes (Kraft & Bansler 1988). Managers and systems analysts in Scandinavia also pay more attention to the social and psychological problems related to the introduction of new technology than in USA or in other Western European countries. This becomes obvious when one compares Scandinavian and American technical literature on systems development.

3 The Systems Theoretical Tradition

The systems theoretical tradition dates back to the sixties, a period characterized by an almost unbounded confidence in science and technology. In this period of technological optimism, computer technology was envisioned as having almost infinite potential. The participants in the first Scandinavian conferences on computers were engaged in enthusiastic debates on the prospects of using computers to manage and control individual enterprises, as well as society, in a rational and scientific way (NordSAM 1960, 1961, 1963, 1964, 1966, 1967).

Many researchers and managers believed in the idea of constructing total computer-based management systems. By collecting, storing and preparing thousands of data about workers, production, sales, etc., the total management system would enable managers to effectively control every aspect of their enterprises. The dream was to make the organization work as predictably and regularly as a clockwork.

Professor Börje Langefors of the University of Stockholm played a major role in the development of the basic ideas of the systems theoretical tradition. Börje Langefors started his work on a theory of information systems in 1963 when he was still employed at SAAB aircraft industries as an engineer. The main features of the theory are presented in his books Theoretical Analysis of Information Systems, (Langefors 1966) and System för företagsstyrning, (Langefors 1968). This work was the first attempt at creating a "scientific" basis for systems development in Scandinavia and a milestone in the development of the research tradition. By defining the basic concepts and formulating the central questions Langefors determined the direction and the overall framework for subsequent research (Langefors & Sundgren 1975, Langefors & Samuelson 1976).

In the seventies a group of researchers associated with the large project called Information Systems for Administrative Control, ISAC, at the University of Stockholm formulated a systems development method based on Langefors'
ideas and the theory of information systems. The project was partly financed by private business interests such as ASEA, IBM and Saab-Scania, and the research itself was carried out in close cooperation with big firms in the Stockholm area.

Today many companies, especially in Sweden, use the ISAC method or parts of it. Institute V, a non-profit private institution in Stockholm founded by a number of large corporations, provides consultant services and conducts research aimed at elaborating and improving this method. The ISAC method and its various versions are described in a number of books and reports (Lundeberg & Andersen 1974, Nissen & Andersen 1978, Lundeberg et al. 1978, Anveskog et al. 1983, Anveskog et al. 1984). Essentially the method consists of a procedure and a set of tools for analyzing flows of information and materials.5

Several other Scandinavian methods, developed in the seventies and eighties, are based more or less directly on the original ideas of Langefors, e.g. the MBI method and different methods for conceptual information modelling (Bubenko 1980, Hugoson et al. 1983, Goldkuhl et al. 1984, Bubenko 1986).

The systems theoretical tradition is clearly linked to corporate interests. The theory of information systems and for instance the ISAC method deal with questions concerning "rationalization", "efficiency" and "control", while questions concerning health and safety, working conditions or the "quality of working life" are ignored.

Börje Langefors' basic idea was to look at organizations, from the point of view of a systems engineer, and to apply the principles of engineering to the design of information systems:

"It ... became clear that theoretical methods, used in engineering systems analysis of different kinds, offered significant promise as a basis for development of scientific methods in information processing systems design." (Langefors 1966, preface)

Langefors considered information technology to be a control technology, and he consequently treated organizations as cybernetic systems. The central notions and assumptions of the systems theoretical tradition are thus directly related to the pioneer work on control and communication of Norbert Wiener (Wiener 1948) from the thirties and forties and to the work on industrial organizations of C. West Churchman (Churchman et al. 1957) and J.W. Forrester (Forrester 1961) from the fifties and sixties.

To regard a phenomenon, e.g. an organization, as a cybernetic system implies a number of assumptions about the nature of the object (Langefors 1966). First, it is taken for granted that one can define the optimal behaviour of the system in some sense. Second, it is assumed that the behaviour of the system can be described by a set of rules, and that the system will respond to external stimuli in a predetermined and predictable way. Third, it is assumed that one can construct an "algorithm" or a procedure for the optimal control of the system.

In other words, the systems theoretical tradition treats organizations as a kind of "machinery", which function regularly in accordance with certain basic
rules. As a consequence the members of the organization, the employees, are conceptualized as "system components" or "factors of production" comparable with tools, machinery and raw materials.

By treating organizations as cybernetic systems the researchers choose to ignore the qualities which distinguish human beings from machines or objects. As a result, they fail to see the crucial importance that informal communication, human relations, values and social conflicts play for the behaviour and development of organizations.

To the extent that the systems theoretical tradition treats human beings as something special, different from other "system components", they are regarded as complicating factors which impede the construction of effective control systems, because they do not function as "regularly" as mechanical components. To a certain degree human beings act on the basis of their own "irrational" intentions and aims, and it is difficult to predict their behaviour and their response to external stimuli. In order to reduce "uncertainty" caused by "human error" it is therefore necessary to limit the system's dependence on the responsibility and initiative of the individual worker.

The basic ideas of the theory of information systems are in many respects identical with the ideas expressed by Taylor in his "Principles of Scientific Management" from the beginning of this century (Taylor 1911). Taylor and the systems theoretical school share the same mechanistic view of organizations and workers, and they have the same goals—control and regularity.

The systems theoretical tradition, like Taylor, supposes that most work processes—and not only the most simple ones—can be reduced to "rules, laws and formulae". They believe that it is possible to find "the one best way" to carry out the work, and to control the process by prescribing the process step by step. They treat, so to speak, the worker as a flexible "human machine", which can be "programmed" to execute certain sequences of instructions.

This implies, that the theory of information systems contains the same inherent contradictions as "scientific management". The critique of Taylorism is therefore also relevant in the assessment of the systems theoretical research.

The primary objection against scientific management has been the conceptualization of human beings as "machines". No attention is given to the fact that workers have needs and faculties which no machine possesses (Braverman 1974, Friedman 1977, Thompson 1983). First, in many cases Taylorized work ruins the workers' health, because the extreme division of labour and the routinized work processes involve a constant, monotonous strain on mind and body.

Second, by standardizing and "programming" work scientific management destroys any intrinsic interest the workers may have in their work. Their work becomes meaningless and worker dissatisfaction increases, because the work process neither requires nor stimulates the faculties of the worker. This in turn, may result in carelessness, absenteeism, high turnover and labour unrest.

Third, scientific management overlooks the uniqueness of human beings, that they are capable of thinking and acting appropriately even in unexpected and
unusual situations. Instead of taking advantage of this positive aspect of labour power, scientific management tries to reduce the scope and the significance of workers' initiative as much as possible.

4 The Socio-technical Tradition

The use of information technology at work spread rapidly during the late sixties and early seventies. Many companies introduced payroll and accounting systems, and the most advanced companies made the first efforts at implementing computerized systems for inventory control and production planning. The introduction of these new types of management systems involved in many cases extensive changes in the organization of work and the content of individual jobs. Since the main purpose was to increase management's control with the process of production, workers received them with some reluctance, opposition and at times open hostility. As a result, many systems did not function satisfactorily, and some had to be scrapped all together.

It became evident that systems development not only involves problems of a technical nature, but also social and organizational problems. This is why many systems analysts, managers and researchers during the seventies began to take an interest in such non-technical subjects as "resistance against change", "human factors" and "socio-technical systems" (NordDATA 1968–1987).

The Norwegian engineer and researcher Rolf Høyer raised the issue of socio-technical systems design at the NordDATA Conference in 1970. He argued that traditional systems development methods failed to produce the desired results because they ignored the "human factor" and the strong resistance against technological change which the "social systems" create (Høyer 1971).

The socio-technical ideas attracted the attention of systems development researchers not only in Norway (Høyer 1974), but also in the other Scandinavian countries, for instance Bo Hedberg in Sweden and Niels Bjørn-Andersen in Denmark. They initiated several empirical research projects on the sociopsychological implications of the introduction of computer systems and they tried to develop new methods for systems design and organizational change (Borum 1977).

This research was, to some extent, inspired by the Norwegian Industrial Democracy Project that started in 1960 (Thorsrud & Emery 1969). It was a joint project between the Norwegian Federation of Trade Unions and the Norwegian Employers Confederation. The project was partly carried out in cooperation with researchers from the Tavistock Institute of Human Relations. However, as far as systems development is concerned, the work of Enid Mumford and her group, at Manchester Business School, on methods for socio-technical systems design also had a very significant impact on the early development of the tradition (Mumford & Ward 1968, Mumford & Henshall 1979). Today most of the socio-technical research within the area of information technology concentrates on organizational impact and organizational change (Bjørn-Andersen et al. 1979,

The theoretical foundation of this research tradition is the so-called socio-technical systems theory (Herbst 1972, Kelly 1978, Mumford 1987, Olerup 1989), which includes a fundamental critique of scientific management.

Instead of this mechanistic approach, socio-technical systems theory proposes that organizations will be more efficient if they are deliberately designed to ensure a high degree of “job satisfaction”. In turn, this will lead to a high degree of responsibility and loyalty towards the company, ensuring better performance and higher productivity. So, the researchers regard “job satisfaction” as a primary objective for systems development. On the one hand, it is an end in its own right, and on the other hand a means for obtaining higher productivity.

Although the socio-technical school recognizes the existence of conflicts between management and workers, it emphasizes their common interests in the development of new technology, which is based on their mutual interests in preserving workplaces. The relationship between labour and capital is not interpreted as class antagonism, which would require that researchers would have to take sides. Hence, the socio-technical school assumes a third position as mediators in the conflicts between management and workers or as standing outside these conflicts.

The socio-technical systems theory treats organizations as two systems—a social system and a technical system—which function together. In order to function optimally the two subsystems of the organization must adapt to each other and be in a state of harmony or balance. In other words, if one optimizes the performance of one of the systems at the expense of the other system the result will be sub-optimal.

The two systems, however, operate according to different sets of rules. Each system has its own “logic” and “rationale”. To optimize the performance of the social system one has to consider how human beings and social groups differ from mechanical systems. In order to encourage employee responsibility and commitment, working conditions must meet the psychological and social needs of the employees, i.e. they must have a “meaningful job” with variation and autonomy, and be treated respectfully, etc.

The socio-technical school criticizes systems developers for ignoring these basic human needs when they design and implement computer systems (Bjørn-Andersen & Hedberg 1977, Høyer 1971, Bjørn-Andersen 1980). The systems designers commit the same mistake as Taylor did: They optimize the technical system at the expense of the social system. Their knowledge of social systems is inadequate and they tend to attach more importance to technical and economic objectives rather than to “human” or social objectives.

The most obvious way of changing this situation would be to re-educate the systems designers. Most researchers, however, do not believe that such measures are sufficient.

Instead they recommend a participative approach to systems development.
(Bjørn-Andersen & Hedberg 1977, Høyer 1974, Briefs et al. 1985). The end users must take part in the design and implementation of the computer based systems, because they—unlike the systems experts—possess detailed knowledge of the organization and the work processes in question. They are able to consider, not only the technical aspects, but also the social and human aspects of systems development.

An additional advantage of the participative approach is that the users, during the process, develop a more positive attitude towards the introduction of the new systems. They get the feeling that they have influenced the design decisions and they will therefore be committed to make good use of the systems.

Although many of the socio-technical ideas and recommendations have gained widespread acceptance among systems designers they have, however, only had little impact on how the systems actually developed. Researchers within the socio-technical tradition have recognized this paradoxical situation (Høyer 1977, Hedberg 1980, Bjørn-Andersen & Kjaer 1985): They have, on the one hand, demonstrated the crucial importance of "job satisfaction". They must, on the other hand, again and again note that managers and systems designers disregard the "human factor" when they design and introduce new systems. This paradox exposes a theoretical problem in the socio-technical research: The idealistic and inadequate understanding of the driving forces behind the technological transformation of work.

According to the socio-technical systems theory, the oppression of human needs in the work process is not an inevitable result of technological development. On the contrary, it is a result of the fact that modern work organizations and modern technology have been designed in accordance with the principles of scientific management (Thorsrud & Emery 1969, Herbst 1972).

Scientific management, based on a "negative view" of human nature, stresses the separation of conception from execution, the division of labour and the need for strict managerial control. Workers are treated as unreliable and erratic "components", but this leads to a vicious circle:

"Work, which does not stimulate the worker, does not create the will to participate and cooperate either. The responses to the absence of cooperation are normally more detailed supervision and increased control, which in turn lead to even less enthusiasm and initiative." (Thorsrud & Emery 1969, p. 25, author's translation)

The socio-technical school in an attempt to change this circular reasoning replaces the "negative view" of human nature with a "positive view" which stresses the virtues of human skills and creativity. It refrains, however, from analyzing the social origins of the notions and values inherent in scientific management.

By interpreting the principles of scientific management as simply the results of a negative—but erroneous—view of human nature, the socio-technical systems theory fails to see that Taylorism, and modern technology, is a product of Western
capitalism. Taylorism is not a "mistake" or a "parenthesis" in the development of work and technology. On the contrary, the appearance of the scientific management movement can be considered as a result of the economic conditions and the class struggle between capital and labour in the United States at the turn of the century (Braverman 1974, Nelson 1975); and the later dissemination of Taylor's ideas and the widespread application of the principles of scientific management have been closely related to the development of capitalist economies (Friedman 1977, Littler 1982, Thompson 1983).

The socio-technical school, underestimating the role of economic and social forces, in effect also underestimates the difficulties involved in "humanizing" work and improving "job satisfaction". By concentrating on the individual workplace and insisting on the assumption that, in principle, capital owners and workers share common interests and that Taylorism is an "historical mistake", the socio-technical school can block the way towards a more encompassing understanding of the dynamics of technological development in society and in the workplace.

5 The Critical Tradition

The critical research tradition, like the socio-technical tradition, appeared in the early seventies, at a time where union attitudes towards new technology were undergoing significant changes.

Scandinavian trade unions have traditionally been very positive towards the introduction of new technology in the workplace. This positive attitude was based on the belief that technological development would lead to an ever increasing standard of living, also for workers. During the fifties and early sixties trade unions actively supported the introduction of new materials and new systems of machinery as well as new forms of work organization (including for instance the use of piece rate systems and time and motion studies). They even expressed their support for these so-called "productivity enhancing measures" in formal agreements with employers and their associations.

However, in the sixties and the early seventies union attitudes started to change. People within the trade union movement—mostly shop stewards and local officials—began criticizing the introduction of new technologies, the use of piece rate systems, shift work, etc. They called attention to the negative impact this had on working conditions and on the health and safety of workers.

The accelerating technological development was accompanied by a rapid increase in productivity, but it also resulted in a growing number of injuries and work-related diseases. Accidents became more frequent, because piece-rate systems speeded up work, new chemicals caused eczema and cancer, new machinery resulted in reduced hearing, etc. Many workers were disabled and expelled from the labour market. In Denmark, the number of workers living on disablement pension almost doubled from 1960 to 1972 (Statistisk årbog 1961-73).

On the national level unions were reluctant to change their policy, but little by little they were forced to do so by the growing pressure from local unions, shop
stewards and militant groups of workers. The unions had to take a more critical stance. In principle, they maintained their support for technological development as a means for increasing the standard of living, but they started criticizing the way in which employers introduce and use new technology.

Initially the unions had very little knowledge about the consequences of the new technologies, and they had no strategy for influencing the introduction of new technology in the workplace. In response to the growing need for realistic strategies unions initiated several large research projects in the seventies.

In 1971 the Norwegian Iron and Metal Workers Union (NJMF) started the first project, the NJMF project, in cooperation with Kristen Nygaard and Olav Terje Berge from a public research institute, The Norwegian Computing Center (Nygaard & Berge 1975). They studied what impacts the use of computers would have on working conditions, the distribution of skills, and the balance of power between employers and unions within the metal working industries. At the same time and in co-operation with local unions, they experimented with how to gain more influence in introducing new technologies in the workplace.

The NJMF project was a pioneer effort. For the first time, researchers, shop stewards and workers together studied the possible effects of new technology and together they tried to formulate realistic union strategies addressing the consequences of these developments. The project became a "model" for trade union projects in Sweden and Denmark. In 1975 the Swedish Confederation of Trade Unions (the LO) started a project on "computers, trade unions, and industrial democracy", called the DEMOS project (DEMOS stands for "Democratic Control and Planning in Working Life") (Carlson et al. 1978). In 1976 the newly established Trade Union Research Council in Denmark decided to promote research on computers and work from a trade union point of view, and in 1977 the DUE project started (DUE stands for "Democracy, Development and EDP") (Kyng & Mathiassen 1982).

For the last decade the ideas and research methods of these initial projects have spread throughout Scandinavia (Bjerknes et al. 1987). Several similar research projects, concerned not only with the consequences of new technology but also with the development of alternative technologies, have been conducted. Examples are the UTOPIA project from Sweden (Bööker et al. 1987), the TIK-TAK project from Denmark (Foged et al. 1987), and the FLORENCE project from Norway (Bjerknes & Bratteteig 1987).

Researchers from the "new left" and activists from the student movements of the early seventies have played a leading role in the establishment of this union-oriented research tradition. Among the many people who have contributed actively to this development are Kristen Nygaard from Norway, Pelle Ehn and Åke Sandberg from Sweden and Morten Kyng and Lars Mathiassen from Denmark.

The critical research tradition is in many ways a child of the political radicalization and the anti-authoritarian wave which washed over Western Europe in the late 60's. Much of the work within this tradition has been influenced by the ideals and values of this movement. Most important was the ideal of democracy—within
all spheres of life, including the workplace. The researchers' long-term objective is "workplace democracy", not a formal, representative democracy, but a real democracy based on the active participation of all employees (Sandberg 1979).

The "new left" and the student movements in Scandinavia questioned the dominant ideology about the "objectivity" of science and the "neutrality" of technology. Radical students and young researchers saw the development of new technologies as an integral part of the struggle between capital and labour, and they criticized the way in which capital owners and managers exploited new technology to further their own ends, often at the expense of the workers.

The "labour process debate" initiated by Braverman's book Labor and Monopoly Capital (Braverman 1975) had a considerable influence on the basic orientation of research. As Pelle Ehn and Morten Kyng have put it:

"Given this basic understanding [of the relationship between capital and labour], it is no wonder that the debate and research in the mid-seventies emanating from Braverman's work came as a great relief and to a large extent formed the general understanding of work and technology..." (Ehn & Kyng 1987, p. 35)

Researchers from the critical tradition openly admit that their research is political. In their opinion it is illusory to talk about non-political or "unbiased" research. Pelle Ehn and Åke Sandberg say it this way (Ehn & Sandberg 1979, p. 13): The exceptional thing about union-oriented research within the critical tradition "has nothing to with the fact that it is political. What is exceptional is the fact that the researchers have chosen sides with the wage earners and their unions." [Author's translation]

The critical tradition rejects, in other words, the harmonious view of social relations in the workplace, which imbue the systems theoretical and socio-technical research traditions. In their view organizations are not cybernetic systems or symbiotic socio-technical systems, but frameworks for conflicts among various interest groups with unequal power and resources. Social relations at work are characterized—not only by cooperation—but also by conflicts and struggles between managers and employees, and among different groups of employees.

They especially stress the importance of the relationship between capital and labour (Ehn & Kyng 1987). Capital accumulation or the generation of profits is the basic driving force behind technological development, while considerations for "the quality of working life" and for the workers' health and safety are of secondary importance. This situation leads to constant clashes of interests at individual workplaces, between managers and workers, as well as to regional and national conflicts between unions and employers' associations.

Since these conflicts are related to the class structure of society, they cannot be "resolved" or abolished at the level of an individual organization, as the socio-technical tradition believes. The "participative approach" to systems development is not sufficient. A real democratization of working life must involve
profound changes in the structure of society, and these changes will depend on the balance of power between labour and capital. A truly democratic working life will only become a reality after a prolonged struggle by the unions against the dominance of capital over labour.

The researchers believe that trade unions—especially at the local level—must play an active role in the democratization of systems development. They must carry out their own investigations, independently of management, and raise their own demands regarding the use of new technology in order to establish a basis for negotiations with management. This is the only way they can avoid being integrated and co-opted in a decision-making process essentially controlled by managers and systems experts.

While the two other research traditions restrict their analysis of systems development to the level of an individual company, the critical tradition places systems development in a broader social and economic context. The critical school offers a more encompassing understanding of systems development.

This approach, however, is not completely unproblematic. One weakness is the way the role of the trade unions is perceived. Researchers do not state it very clearly, but implicitly they take for granted that the trade unions' primary long-term objective is a democratic working life where the dominance of capital over labour is abolished. The validity of this assumption, however, is not obvious, when you look at recent trade union policies.

Job security, higher wages and shorter working hours have for many years been given higher priority than the struggle for democracy at work. The majority of the trade unions support the rapid technological transformation of work, because they still believe it to be a precondition for increasing—or at least maintaining—the standard of living. In order to ensure economic progress, the majority of Scandinavian unions have therefore committed themselves to a policy of cooperation which facilitates the introduction of new technology in the workplace (Kraft & Bansler 1988). As a consequence, they are neither willing to support a radical critique of the way employers develop and introduce new technology, nor are they willing to go very far in their attempt to curtail employers' "right to manage".

This research thus builds on a rather optimistic view of the trade unions as "progressive and democratic forces".

6 Concluding Remarks

I have focussed on the differences between three main traditions within Scandinavian systems development research in order to clarify central theoretical controversies.

As mentioned in the beginning, these differences may not be that clear-cut in real life. Many research projects do not clearly belong to one and only one theoretical school. Let me give two examples.

In 1986 a research group associated with the University of Aarhus, Denmark, finished a large project on "methodical working practices in systems develop-
ment", the MARS project (Andersen et al. 1987). Their research is socio-technical in orientation, but it also incorporates elements from the critical tradition. Their treatment of conflicts and power in organizations, partly based on transaction cost theory (Ciborra 1981, Ouchi 1980), clearly demonstrates this.

Goldkuhl and Lyytinen from SYSLAB in Sweden try to reframe the problem of information systems development by conceptualizing information systems as "institutionalized communicative action systems". Development of information systems involves changing the existing "language game" by specifying and implementing new rules for the language and its use (Goldkuhl & Lyytinen 1982, Lyytinen 1983, Goldkuhl & Lyytinen 1984). Their work is inspired by Langefors' theory of information systems, but they transcend the cybernetic perception of communication embedded in this theory. Instead they relate to theories of language as speech acts (Wittgenstein 1958, Searle 1969).

The important point, however, is that although the boundaries between these research traditions are not rigid, the major theoretical differences show no sign of vanishing. None of the research traditions have been able to supersede the others, and the distinctions between the different theoretical positions continue to exist. Central questions regarding the nature of organizations and work as a human activity remain unresolved.

Notes

1. This concept is related to Kuhn's concept of 'paradigm' (Kuhn 1962), which, however, doesn't include 'knowledge interest'.

2. 'Knowledge interest' is a translation of the German notion Erkentnissinteresse. See e.g. the work of Jürgen Habermas (Habermas 1968).

3. Markku Nurminen has made a somewhat different categorization (Nurminen 1987 & 1988). He distinguishes between three perspectives: the systems theoretical, the socio-technical and the humanistic perspective.

4. In Danish I prefer to call them informationsteoretiske, socio-tekniske and fagpolitiske (Bansler 1987). "Fagpolitisk" has a double meaning. On the one hand it refers to trade union politics, and on the other hand it refers to critical or radical science. The critical tradition is sometimes also referred to as the collective resource approach (Ehn & Kyng 1987); and the systems theoretical tradition may occasionally be referred to as the infological approach.

5. The method is in many ways similar to Yourdon and DeMarco's Structured Analysis (DeMarco 1979, Yourdon 1982).

References


