

## CHAPTER 2

### COMPUTERIZATION AND SOME PSYCHOSOCIAL FACTORS IN THE WORK ENVIRONMENT

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The technological device which in connection with administrative rationalization has had, and in the near future will have, great significance is the computer. Many of present day computerized information systems can be partially characterized as mechanization of previous manual routines. Later developments in the electronic data processing (EDP) information system seem to have large and more wide-reaching consequences. Computer techniques are used increasingly as a tool in planning, for decision-making and management of organizations. Technology has thereby not only taken over manual functions, but also tasks which are considered to be intellectual.

Thus far, too much attention has been given to developing the technological side of computers. This has been at the cost of other components such as organization design and working conditions. Studies of the psychosocial effects of computerized information systems on work environment are few.

At the Department of Sociology, Stockholm University, we are studying how work environment is influenced by computer techniques (computerization).<sup>\*</sup> The Swedish Work Environment Fund is financing the project, and the central reference group is the Work Environment Committee of the Swedish Central Organization of Salaried Employees.

The project originated with a problem inventory of the psychosocial milieu conducted at the request of the Swedish Confederation of Salaried Employees a few years ago (Bradley, Börjeson, Lundgren, 1974).

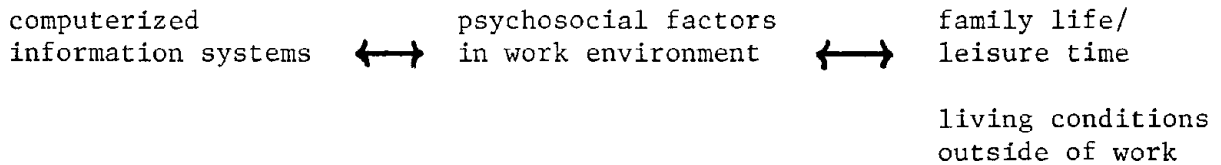
Work environment is studied primarily with reference to psychosocial aspects and has been given a broad meaning. It is linked to the viewpoint of work environment which has to do with the influence of the environment upon the individual at different levels: the level of society, the level of the organization and the level of the individual. Problem framing in the project includes both objective, structural working conditions (especially at the organizational level), and experiences and attitudes related to work.

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<sup>\*</sup> My co-workers in this project are psychologists Ingrid Nilsson and Katrin Goldstein-Kyaga.

## PURPOSE AND PROBLEMS

The purpose of this project can briefly be summarized as a description and analysis of the interplay between:



- What effects has the use of computer technology on working conditions and other aspects of the psychosocial environment?
- What indirect consequences does the individual's actual and perceived situation at work, influenced by computer technology, have on his/her living conditions outside of the job itself (type of leisure life and satisfaction with family and social life)?
- What health related consequences can be observed in connection with computer technology?

In Figure 2.1 a rough sketch of the project's frame is given, where the problems discussed above are set in a larger context. A few concepts are clarified in the following passage.

The computerized information system includes here both purely technological aspects connected with the computer and procedures connected with the use of system techniques. Some organizations use relatively simple machines and procedures, others use computers to control complex tasks or procedures.

The objective work environment has been operationalized for a variety of work areas which have been shown to be relevant for large groups of white-collar workers (Bradley et al, 1974). The choice of factors in the work environment is also based upon a survey of literature from the present project, and a large number of interviews in the planning phase with people who in varied ways work with the rationalization issue, and who have contact with or are affected by rationalization within businesses/administrative authorities, institutions and labor unions. The choice of these areas has been furthered by an extensive series of interviews (the qualitative phase) with employees at the studied organization.

The subjective work environment is constituted of perceptions and attitudes tied to a range of factors comparable to those in the objective work environment. The subjective work environment is closely related to the concept of job satisfaction. A closer specification of subjective as well as objective work environment is given in Figure 2.2.

Organization structure can be described here as methods for division of labor, bases for decision-making and organizational expedients. Organizational structure is further connected to the concept of work environment. The main point is not, however, the study of the connection between computer technology

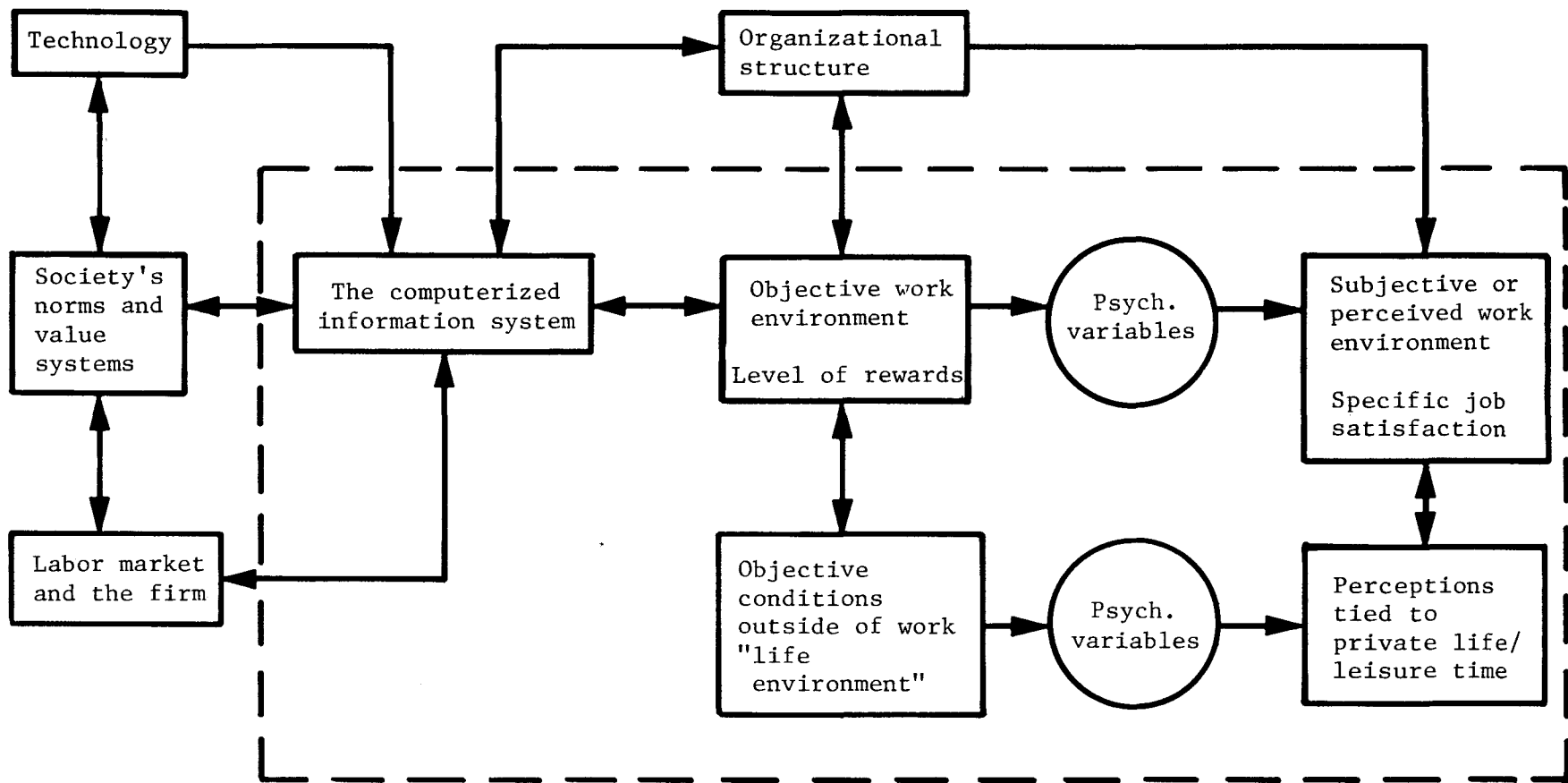


Figure 2.1 An outlined model of the relationship between computer technology and work environment

The pointed field in the above diagram gives the range of variables upon which the present project is concentrated.

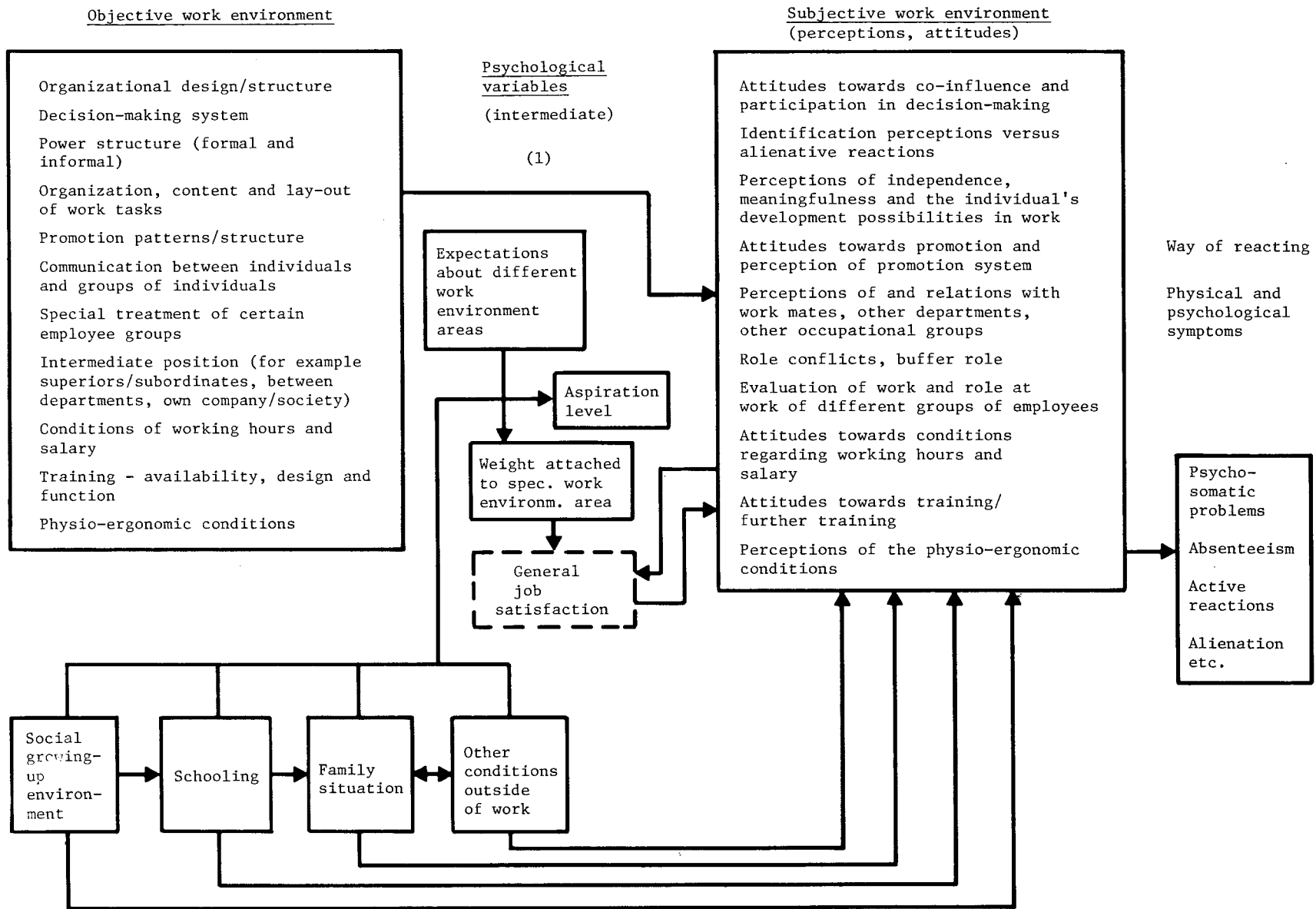


Figure 2.2 Further specification of the relationship objective-subjective work environment shown in the model in Figure 2.1.

and organization structure/organizational development. However, the design and shaping of the organization is an important factor which must be taken into account when studying the relation between EDP and work environment. It can also be seen as a part of the work environment.

Objective conditions outside of work encompasses certain behavior (such as consumption) that comprise the actual circumstances during the time away from work. These conditions can conceivably be influenced by a change in connection with the use of EDP at the place of employment. At the same time consideration is paid to analyze certain attitudes, assessments connected with private life/leisure time and family life against the background of computerization of the individual's employment.

Psychological variables are meant here to designate a range of intermediate psychologically relevant variables such as level of expectations, weight attached to job aspect, necessary in order to understand and explain both specific and general job satisfaction and its dynamics.

As stated earlier, the main focus is upon studying the effects of computer techniques upon different psychosocial factors in the work environment.

I have tried to show in Figure 2.2 the areas of work we study. The outline can be regarded as a specification of Figure 2.1.

What questions are then important in connection with the development of computer technology. I will give a few examples here:

- How does computerization affect organization design, real influence as well as attitudes to co-influence and participation in decision-making on the job?
- Does the content of work tasks change radically? Do we get new types of occupations with strict control and little possibility for people to influence methods, work pace and contacts with other people?
- Have promotion and development patterns, and attitudes toward further training changed at work?
- Are new social groups appearing at work? Can computerization make it possible to erase the traditional distinction between white-collar and blue-collar workers? Are new groups of white-collar workers arising? Will the differences between men and women in working conditions be changed?
- Are changes taking place regarding conditions of working hours, e.g., shift work and overtime? How are salary forms affected?
- We are trying also to illustrate the indirect consequences of computerization on living conditions outside of work (such as how leisure time is spent, and the degree of contentment with family and social life). Finally, we are investigating whether computerization has any provable effect on health.

## SUBJECTS AND METHODS

The project's first field investigation took place at a government-owned company with approximately 5,000 employees, all of whom work in the Stockholm area.

Data was gathered by internal documentation (derived from the company's statistics, protocols, etc.) interviews of experts, semi-structured interviews, interviews with employees from the company, and questionnaires with fixed alternative answers. Certain information about absenteeism was taken from the company's personnel files. In both the qualitative phase (interviews) and the quantitative phase (questionnaire) a type of cross-section method has been used. All subjects of investigation have been exposed to the studied computer system for one year.

The questionnaire's design was based on two methodological strategies. One strategy was to study the effects of computerization (an extensive EDP system) on different psychosocial components of work environment. This was to be done by comparing groups of employees within the organization, which differ from one another in respect to their relationship to EDP. Another strategy was to use a questioning technique where the subjects were directly asked about the effects of computerization on different working conditions. These so-called "computer effect questions" come directly after the so-called "straight questions". A similar formulation of "computer effect questions" and "straight questions" was used in the same part of the research instrument. The instrument can therefore, because of this construction, be used both in follow-up studies and different types of cross-section studies.

The method for revision of data has been a qualitative analysis of interview material, descriptive statistics, and certain multivariate methods of analysis.

A stratified randomly sampled group of 424 people from different departments with fundamental differences in computer technique was selected. The following departments were included: bookkeeping (operating departments, ABDE and C), EDP department, accounting, auditing and investigation.

The percentage of nonresponse in the investigation was 14.7% of which 10.5% were sick during the period that data was being gathered. A total of 4.2% did not wish to participate.

It is evident from the results that the employees of the operating departments and the EDP department in various ways differ from other departments by mentioning different work environment problems. I will briefly describe the background data which characterize these departments.

The EDP personnel are primarily young, well educated men. Most of them have shift work, and have been employed for only a short time. The operating departments are comprised wholly of women with high average age, relatively low education level, and a long period of employment. Half are part-time workers.

## RESULTS

I will briefly give here some empirical experiences which are taken from the first analyses of our project. The computer system studied concerns so-called batch-processing of information.

The employees of the company's EDP department understand most clearly that the purpose of their work in a broad sense is more for society in general, compared with other departments. At the same time, because of this and other reasons, they have difficulty relaxing during leisure time. They often go to work despite the fact that they might be ill. There is psychological pressure here which is partially related to the fact that there are no replacement workers for them. On the other hand, the employees of the operating departments feel that they are highly interchangeable, and this has indirect effects on their feelings of self-confidence.

The EDP employees have a relatively secure work situation compared with other employees within the organization. Anxiety about transferal seems most prevalent in the operating departments. The number of employees decreases successively in connection with increased automation. The level of anxiety in the company as a whole is relatively high. More than a third feel anxiety about transferal.

The introduction of a computer system naturally affects the nature and content of work. Nearly one-half of interviewed subjects had their tasks altered within their section as a result of introduction of the computer system. And what has happened with work tasks? The principle effect upon job content was noted in the operating departments which seem to have a lesser sense of satisfaction, meaningfulness and independence than other departments. The work is thought to be less interesting, have fewer work operations and is experienced as monotonous. The work is considered to be unqualified, less meaningful and with lesser opportunity for initiative-taking. Other departments are more satisfied with aspects of job content.

Several of the mentioned aspects of job content have undergone changes thought to be a result of the computer system. The operating departments have noticed negative changes while two departments and to a certain extent the EDP departments have noted positive changes.

There has, therefore, occurred an enrichment of work for certain departments (accounting and investigation departments) while for others work became more meager. However, the number of employees who had more meager work was much larger.

A striking result was that dependency on certain work routines had increased for all the departments which indicates an increased formalization and control of the employees' tasks.

Both the operating and EDP departments had noted a heavier workload than the other departments. The work is felt to be hectic and stressful, the work tempo too fast, too uneven, and too dependent on machines and equipment. Deadlines are built into the job everyday, which has caused, among other

things, an increase in psychological strain. EDP is thought to have too much responsibility and the operating departments too little.

Computerization is considered to have caused an increase on the workload for the operating departments and EDP. The workload has generally increased for all of the departments. The results should be seen against the background that the number of transactions handled also increases.

The computer system has brought about an increase of psychological strain on the EDP department in several different ways. This is evident from the results of an investigation of workload, intermediate position, promotion, salary conditions, physio-ergonomic relations and health issues (see below). An important reason for psychological pressure on employees of the EDP department was the increased risk that mistakes in their work could occur. The possibility of making a mistake has increased (47%) and thereby an increased anxiety for making mistakes was noted (42%). The consequences of these mistakes have also increased. Psychological pressure on the individual worker comes about in combination with EDP-inferred problems with correcting mistakes.

Delays in work caused by abnormal halts of the computer or manual errors have immediate consequences for working hours, especially for the employees of the operating department. Disruptions in computer procedures increase the risk of overtime. A striking number (70%) considered the technique itself to be the dominating cause whereas only 41% named manual errors.

Approximately one-half of the subjects were dissatisfied with influence at work on a whole, particularly those from the operating and EDP departments. As regards the computer system's effect on the degree of influence, both the operating and EDP departments have decreased influence. This is, however, true for different areas of work. Influence on work pace and work methods have decreased somewhat for the EDP department, and influence over planning has decreased for the operating department.

Both knowledge of how the computer system has been developed, and the possibilities for influencing the system via the labor unions is considered to be insufficient. Approximately one-half of the subjects say that there has not been any opportunity to influence the system, and many subjects have answered that they were totally ignorant about how the system functions.

Finally, the results indicate that one can talk about a general "computer anxiety". Quite a few, 83%, believe that computers will in the future decrease the possibilities for people to influence their work and life situations. This underlines further the fact that vigorous effort must be made to prevent the threat that is coupled to this technique. This must at the same time mean that the possibilities that this technique can have for mankind's ability to influence life situation must also be examined.

In connection with the purpose of the computer system, the subjects interviewed felt that technological development completely controlled the changes which occur. The subjects regard this development as largely impossible to control by human actions. The gains made by rationalization, in the form of



reductions of personnel, and thereby other closely related factors concerning competition on the labor market, have also been given by the subjects as the purpose of the computer system.

The EDP department differs from other departments in that more people have positions which give opportunity for promotion and development. More people there than from other departments expressed an interest in promotion, but were dissatisfied with the promotion policy reliance on seniority. Good possibilities for training and promotion were also highly valued for this department.

As many as 80% couple increased influence and positive stimulation with promotion. Promotion has been a way of achieving increased decision-making capacity within the present system.

Personal relations with nearest work colleagues and subordinates seem to be good. However, relations between the different departments were less satisfying. The EDP department easily becomes an isolated unit within the organization. It is principally the employees from this department who react negatively to this condition. They express dissatisfaction with the possibilities for contact with other departments. They speak about an "iron curtain".

The few people who have directly mentioned worsened contact opportunities as a result of the computer system have coupled this to noise level, stress and reliance on machines.

The intermediate position which characterizes many white-collar workers has also been studied against the background of computerization, and the associated so called buffer role. Results show that EDP can be described as the organization's "buffer department". The demands from different quarters, often contradictory, are concentrated or accentuated in the EDP department. In this department the EDP system seems to have caused an increase of demands and a row of contradictory messages within work roles. The demands come primarily from other departments or personnel groups within the company, but also from other interest groups.

The results emphasize that great physio-ergonomic problems exist today in the traditional white-collar working place. Certain problems seem besides to have been strengthened in connection with the development of computer technology. This concerns mainly the operating departments and includes the following aspects: noise/sound conditions, suitability of the work place to the work itself, work posture, and mechanical equipment.

In summary, it is the operating and EDP departments which differ most from the other departments in the organization in that they are most dissatisfied with different aspects of the work environment. This has an impact on different health aspects for the two departments. The employees in the EDP department show, however, more signs of psychosomatic symptoms than the other departments. They feel, as was mentioned previously, that the work is often hectic and stressed, that the work pace is usually too high and uneven, and that the work is too dependent on machines. They feel they have too much responsibility, and mention that the job is undermanned. Furthermore, there are clear psycho-

logical pressures, due to anxiety, for making mistakes. The consequences of these mistakes are greater for the EDP department. They are also dissatisfied with the pay.

The purpose of the so called questions concerning health issues which were included in the investigation was to indirectly illustrate the complex of the stress problems. To allow the individual himself to express how often he or she experienced problems with certain listed symptoms of somatic, psychological or psychosomatic nature naturally gives a rough picture of these conditions.

The following lists can to a certain degree illustrate the connection between symptoms and the factors in the work environment which are considered to have contributed to their appearance, as the subjects themselves have perceived it;

<u>Department</u>	<u>Symptoms</u>	<u>Aspects of work environment considered causing certain symptoms</u>
Operating	Pain in the shoulders, neck	Physio-ergonomic conditions
	Back problems	Work posture
	Headache	Extension of working hours
EDP	Sleep problems	Physio-ergonomic conditions
	Tiredness	The work itself and its content
	Irritation	Extension of working hours

I can mention here that computerization has in different ways received attention as a fundamental control mechanism, with effects on the physical as well as the psychosocial work environment. Research approaches in somewhat varying and complementary directions have been started with the intention of penetrating this area. A research group (DEMOS) is working in close cooperation with the Swedish Trade Union Confederation within the area of democratic management and planning of work. The project is partially the Swedish equivalent of a Norwegian research project.

At the Economic Research Institute (ERI) in Stockholm a project is being carried out which concerns investigation of how human values can be built into systems development. In one of Professor Gardell's research projects, phenomena concerning computerization are studied. Ergonomic oriented research on display terminal technique has been carried out by the Work Environment Committee in Sweden.

Finally, the labor unions (the computer groups of the Swedish Trade Union Confederation and the Swedish Central Organization of Salaried Employees) are

working out a remedy program and are developing information and knowledge centers concerning computer technology in relation to work environment.

I believe that within the next few years it will be possible to make a synthesis of the results and experiences that have successively grown out of this research. I have limited myself to giving a rather rough pattern of results from the research we are pursuing at the Department of Sociology in Stockholm.

#### DISCUSSION

It is claimed in the literature on the subject that computer technology is itself neutral, and can be used in alternative ways. If this is so (a few doubts have been expressed), then you can say that computer technology and its development are neutral in terms of its ability to help work environment to correspond to human needs.

It is difficult to generalize from the various studies, but on the whole, results today indicate that too often a system is built which worsens the work environment both objectively and subjectively.

Computerization is an example of a rationalization form which can be used in different ways. It can make difficult, or prevent, satisfaction of human needs and rights, but it can also consciously be used to construct a work environment which fulfills these needs and rights.

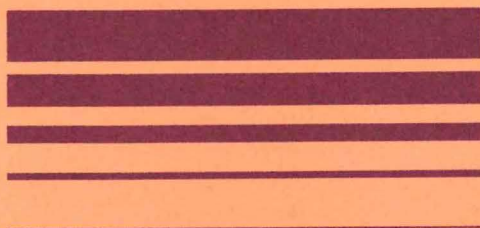
Much mystification today is coupled to computer technology. But within this suspicion and vigilance there is also a place for an embryo of greatest importance in the development context. Many people in Sweden and other industrialized countries have lived in a society without computer technology, they have not been born in a so-called computer society. This will increase the possibility to wonder about, ask questions, react, etc. The next generation will grow up in a computer society; already in school they will receive an education about computers, and will probably regard the computer as a self-evident medium.

A breakthrough has taken place in the Scandinavian countries regarding participation in decision-making. These conditions can benefit research work which will have great relevance for society's development in the long run as well as aiming at providing a basis for the actual practical solutions to problems within organizations.



PROCEEDINGS

# Reducing Occupational Stress



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