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Enterprises in Transition

Learning Strategies for Increased Competitiveness

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Foreword

This study shows that the driving forces of growth should be sought, to a greater extent than hitherto, in the learning strategies adopted by enterprises. Strategies of this type involve organising the work of enterprises to facilitate the development of skills, production processes, products and services.

A number of strategies for learning are identified in the study: work organisation, human resource development, and cooperation with other parties and the use of ICT. The study shows the significance of these strategies for the competitiveness of trade and industry and describes their incidence in Swedish enterprises.

The study was previously published (in September 2000) in a Swedish language version by the Swedish National Board for Industrial and Technical Development (NUTEK). On January 1, 2001 a reorganisation was made of a number of central government agencies. The responsibility for analyses of the driving forces of growth was then taken over by the Swedish Institute for Growth Policy Studies (ITPS), which is now publishing the study in an English language version.

The report is intended for entrepreneurs, employees, employers' organisations and trade unions.

Stockholm, May 2001

Sture Öberg
Director General

About the study

The study was made between 1997 and 2000 by the Swedish National Board for Industrial and Technical Development in cooperation with the National Institute for Working Life, the Council for Work Life Research, European Social Fund in Sweden – Objective 4, the Ministry of Industry, Employment and Communications, the Knowledge Foundation and the Swedish Transport and Communications Research Board.

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In addition a reference group has contributed many valuable points of view. The reference group is presented in an appendix.

Summary

Learning strategies in focus

The causes of growth and the driving forces behind it must increasingly be sought in the enterprise. The learning process in enterprises is in focus in research programmes on management and innovations. In this report we therefore identify a number of conditions associated with learning in an enterprise. We call these conditions learning strategies. The learning process in an enterprise can take place via recruiting personnel, purchasing the services of consultants, or cooperating with other organisations. Learning can also take place internally in the enterprise in the form of organised daily training, through the organisation of the work of the enterprise, and through effective use of information and communications technology (ICT) that supports the learning process.

The main purposes of this study are to show the importance of learning strategies for the profit and productivity of enterprises and to describe the incidence of these strategies in Swedish trade and industry in 1997. We have also related some of our results to relevant parts of the survey "Sweden's workplaces" with its data from 1991. The study of 1991 and our study with its data from 1997 are two of the few nation-wide studies made in Sweden that show the existence of management strategies at Swedish workplaces. Our data is one of the few sources of material that provides broad information about the existence of learning strategies and their importance for productivity and profit.

Otherwise *general* knowledge of the strategies of enterprises is low. On the other hand, knowledge of the importance of learning strategies for individual enterprises is relatively good since most of the studies that have been made are so-called case studies or specific sector studies.

Of great significance for competitiveness

NUTEK has previously shown that strategies that focus on decentralising the work organisation and on human resource development are positively asso-

ciated with productivity and growth. In this report we show that this is still the case. An increase in productivity is a prerequisite for an increase in long-term prosperity. This means that there is a social interest in giving learning strategies greater attention. Since we also see strong links with profit, we argue that it is also in the interest of the enterprises to consider all the possibilities for learning that they have at their disposal in the short term.

The learning strategies we have identified and quantified have a specific, positive relationship with the enterprises' levels of productivity and profit. One interpretation of this can be that good economic performance has made investments in learning strategies possible. Another interpretation can be that earlier investments in learning strategies have given returns in the form of better economic performance. In this report we emphasise the latter since it is reasonable to assume that the learning strategies we have measured are the results of a long-term process.

We find that the productivity of enterprises that have decentralised their work organisation is some three per cent higher than those enterprises that do not have this type of work organisation. The enterprises that have made changes to their work organisation which have involved giving greater powers and responsibilities to the employees have levels of profit which are some 16 per cent higher than those that have not introduced changes of this type. Another example of learning that has a positive effect on results is cooperation. Enterprises that cooperate with others over a wide geographical area have higher levels of productivity (four per cent) and profit (ten per cent) than those that do not cooperate with others at all. We can also demonstrate that the productivity and profit of enterprises that have improved the efficiency of their information functions with the aid of information technology is four to six per cent higher respectively than those that have not done so. However the greatest difference concerns investments in human resource development. The average profit of enterprises that have invested in human resource development is more than 50 per cent higher than those that have not made investments of this type. The difference in productivity is less, some eight per cent, but nonetheless significant.

Furthermore our results show that the proportion of employees with a higher education background is of significance for both productivity and profit of enterprises. Levels of education are also correlated to learning via the work organisation, cooperation with other parties, and to innovative work on the development of products and services.

Potential for greater learning

There is a great potential to increase the incidence of learning in Swedish trade and industry. When it comes to work organisation, the decentralisation of results follow-up seems to have the most important impact on economic performance. But our data on different aspects of work organisation included in the analysis show that the most highly centralised function is that for results follow-up: some 80 per cent of the enterprises state that it is centralised at the executive level. A relatively large proportion of the enterprises, some 20 per cent, state that they do not have any form, or only very limited forms, of human resource development (according to our definition). There is a relatively high incidence of cooperation with other parties. However, the proportion which cooperates with institutes of education is relatively low, some 30 per cent.

The incidence of learning strategies varies between sectors. Learning strategies are given more emphasis by enterprises in the service sectors than by enterprises in the manufacturing sectors. We also find that the knowledge-intensive sectors (both manufacturing and service) that are characterised by high educational levels stand out in general as having a higher incidence and a greater range of learning activities. Enterprises in labour-intensive manufacturing stand out as having a low incidence of, in principle, all the learning strategies presented.

Learning strategies are also found more frequently in large enterprises than in small enterprises, even if the difference between size classes is not as great as that between sectors, in general. The difference between large and small enterprises is most obvious where the scope of human resource development activities is concerned.

The analysis indicates a tendency towards a lower incidence of decentralised work organisations and of personnel development in the form of planning talks or decentralised planning in 1997 in comparison with 1991. At the same time formal requirements in respect of educational levels and the skills of the labour force remain high.

Challenges to industrial policies

One of the great challenges to the policy of competitiveness and growth is to develop a policy for learning. We have identified a number of areas in which action should be taken, areas where central government has a clear

responsibility to increase learning or where central government can contribute in various ways, directly or indirectly, to increase learning and long-term economic growth. Even if we give prominence in this report to the challenges faced by industrial policy, education policy decisions must also include industrial policy considerations to a greater extent than has been the case hitherto. We would also emphasise that employers and trade unions, individual enterprises and individual persons all have a great responsibility for these issues.

In addition to central government's responsibility to synthesise knowledge of learning processes and to develop better methods for the assessment of the importance of learning for enterprises, individuals and society, we have also given prominence to certain areas in which action should be taken. One such area is *human resource management*: to remedy the imbalances that exist between supply and demand for persons with different educational backgrounds. Another area is continuous *human resource development* of the labour force. It should be pointed out that it is the employers that have the main responsibility for human resource development at the working places, but that central government can also promote human resource development, for example though programmes such as the recently implemented Objective 4 programme and the new Objective 3 programme. The government also has the responsibility for strengthening incentives for employees to undergo education and training, for example through individual learning accounts. A further area in which measures can be taken is to increase the possibilities to establish efficient *cooperation* between enterprises on the one hand and enterprises and educational and research institutions on the other. Efforts should focus on small enterprises which often have limited resources and whose cooperation with other parties is relatively limited. Information communication technology, ICT, and, specifically, increasing knowledge of how to use ICT, may also be of great importance for the policy for competitiveness and growth . Finally we would give prominence to the role of the government in spreading *information* on the importance of learning.

Contents

Chapter 1

Background and aims

Chapter one provides a background to why new strategies in enterprises, human resource development and education have come increasingly into focus as driving forces for competitiveness and growth. Furthermore we describe the main aim of this study and indicate different methodological problems in analyses of this type. Finally we present the contents of the other chapters of the report.

Background

In an environment of increasing international competition, changing customer demands and the ever-increasing pace of technical innovation, the survival and competitiveness of enterprises are increasingly dependent on qualified personnel and their ability to predict change, to adapt to new conditions, and to find new solutions, products and production processes. Swedish trade and industry has also succeeded in making good use of the advantages and potential resulting from these changes, both during the post-war era and during recent years. During these periods of time the rate of growth in the Swedish economy was high. One recent example is how information and communication technology (ICT) has affected the flow of information, the work organisation, the demand for ICT skills, as well as the functioning of markets and the services and products which are in demand and produced. On the other hand the Swedish economy struggled with low rates of growth in productivity from the early 1970s up to the 1990s despite the constant high pressure of change in the outside world. The main reasons for the weak growth in productivity are considered to be the low levels of education in trade and industry in Sweden compared to many competing countries, inadequate structural adjustment, and a lack of faith in current economic policies as well as uncertainty about access to the European market.[1]

The above-mentioned structural problems in the Swedish economy led to the appointment of a productivity delegation in 1989.[2] The productivity delega-

[1] NUTEK (1995).

[2] Government Official Report 1991:82.

tion ascertained that growth in productivity in Sweden had fallen chronically behind in the 1970s and the 1980s. The following main components were formulated for a growth strategy:

1. An increase in competition to strengthen the driving forces of productivity and to increase the pressure for transition. This component included a fixed exchange rate, the closing down of the "emergency service" for enterprises in crisis, membership of the EC and the introduction of greater competition in several sectors, not least the public sector.
2. Better incentives and better conditions for people to work: better levels of education, a more effective work organisation, and wage formation that encouraged human resource development and assumption of responsibility.
3. Improved incentives for real capital formation: fixed rules for stabilisation policies, better relative returns on real investments, better incentives for savings and a programme for infrastructure modernisation.

The turning point in the economy, the crisis of the first few years in the 1990s, had the effect that a number of enterprises were closed down, a considerable proportion as a consequence of an extensive process of structural adjustment. The restructuring took place with unexpected force. The process of structural adjustment was reinforced by the anti-inflationary policy in place at the time, which was combined with the ambition to make a rapid reduction in the deficit in public finances. There was also a sudden reversal of policy which improved the incentives for long-term growth, and thereby employment. The rationalisation and improvements in efficiency brought about by technical developments also consolidated this process. All in all it can be said that the combination of the constraining forces of the 1980s and the reinforcing effects of the 1990s caused the negative sides of structural adjustment in the form of structural unemployment. In particular capacity was reduced in the protected domestic market industries – in three years just over eight per cent of the production capacity was lost.[3]

Many of the enterprises that were sufficiently robust to survive the crisis were given a boost on the export market as a result of the devaluation of the Swedish krona. The export industry increased production considerably during 1993 and thereafter. Analyses show that there was a core of profitable

[3] NUTEK (1997).

enterprises that were successful in maintaining high levels of profitability, even during the crisis. In particular the knowledge-intensive sectors were able to retain their capacity and even increase it.[4] The service sectors experienced a considerably longer, drawn out financial decline even if the pattern differed to quite some extent between the different sectors. In general, in comparison with export-oriented industry, it took one or two years longer for the demand for services to turn upwards once again, mostly due to the fact that a large proportion of the operations of the service sectors focus on the domestic market. This demand was negatively affected by the introduction of higher taxes to meet the large deficit in government finances. The long-term effects will be ascertained in the future, but hitherto the results achieved by those parts of trade and industry which focus on the domestic market have been poorer than by those which focus on exports. However, all in all it can be said that the Swedish economy has made positive progress since 1993. In a comparison with other OECD countries, growth in Swedish industry is appreciably higher.

Why then should enterprises choose to produce and develop services and products in Sweden? One of the decisive factors in the long term can be the professional expertise of the Swedish labour force and its experience of working in a stimulating and productive work organisation. Levels of education in Sweden, particularly in manufacturing, are lower than in several important competing countries, but basic knowledge, in the form of reading, writing and arithmetic, is high, even among those with low levels of formal education. A vigorous focus on education and human resource development can give us a leading position in this area.

The analyses in this study shall be seen in the light of the demand for greater competitiveness and higher rates of growth in the Swedish economy, and that the causes and driving forces of growth must increasingly be sought in the enterprises and in the enterprises' strategies for learning.

Aims

Although learning strategies have attracted a great deal of attention during the 1990s, few empirical studies have been made in the field, and very few which have tried to draw general conclusions on the effects of learning strate-

[4] NUTEK (1995).

gies for the economic performance of enterprises.[5] On the other hand, there is relatively good knowledge of the enterprises' strategies and the importance of these strategies for individual companies. Most of the studies that have been performed are so-called case studies or sector-specific studies. If the aim is to draw general conclusions, this presents a methods problem. The few extensive studies that have been made are, to a large extent, not sufficiently representative or have had a low response rate and therefore there are some doubts where their conclusions are concerned.

Thus there is a need to make an analysis of a number of different strategies which are all associated with learning, and to present information on the structure of these strategies. With the exception of shortcomings in the "measurement" of learning strategies, which most studies suffer from, our data are one of the few sources of material that can shed further light on these particular issues.

In the light of the fact that there must be an increase in the knowledge of the learning strategies of Swedish enterprises and the significance of these strategies for competitiveness, the main purpose of this study has been formulated as follows: to demonstrate the significance of different learning strategies for the profitability and productivity of enterprises in general and to describe the actual incidence of these strategies in Swedish trade and industry. It is also interesting to compare our results on the incidence of new management strategies in 1997 with results obtained in 1991. The 1991 workplace study is one of the few exceptions where representative studies in Sweden are concerned. The reason for relating the two studies to each other is to enable us to say something about the process of change that has taken place during the 1990s.[6]

This is the way we have chosen in order to make a contribution to the discussion on learning strategies. The results of our general analyses can also provide a reference base against which different case studies can be related. Knowledge about driving forces for long-term productivity and for profitability in the enterprises can provide further data for both industrial policies and enterprises and employees directly.

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[5] Cappelli & Neumark (1999).

[6] le Grand et al (1993).

Methods

The empirical studies that have previously been made of different strategies differ among themselves and from this study in several respects. One is *why* strategies are studied. Earlier analyses of work organisation and learning have, to a great extent, been oriented towards medical aspects in which the focus has been on the costs incurred by society for different forms of industrial injuries and stress. Industrial democracy, in which power, influence and justice are the points of departure, has been another common approach. However, the democracy approach has also been extended to include organisational issues and development issues with efficiency and competition as the objective. During recent years the focus has been on human resource development and life-long learning for both enterprises and individuals. This focus has included the employability of individuals and how the problem of long-term unemployment can be solved, as well as the development potential and economic performance of the workplace.

Another respect is *what* is measured, which is an expression of the fact that theoretical concepts such as learning and management strategies hardly allow themselves to be operationalised, i.e. made measurable. In the empirical studies made in this area, the data are often insufficient in respect of the types of economic performance that are being measured. Another aspect is *which unit at the enterprise* is being studied. Many of the earlier studies have used data that refer to a unit which is not optimal for measurement of learning strategies. Some of the strategies that we take up should be measured at as a low unit in the organisation as possible, preferably at the unit workplace. Some other strategies should be measured at the unit enterprise or at the unit enterprise group.

The FLEX-2 project's data are based partly on information received from telephone interviews and postal questionnaires, and partly on economic and employment data from Statistics Sweden's databases for the years 1990–1997.[7] The gross sample was a random selection of some 5 600 workplaces. The sample was made with the aid of Statistics Sweden's workplace and enterprise database. Statistics Sweden was also responsible for the collection of data. The population included in NUTEK's FLEX-2 database is primarily workplaces in the private sector since it is difficult to study productivity and

[7] Questions included in the telephone interview and questionnaire can be found in Appendix 2.

profitability in organisations and enterprises which do not operate on a market. A limited number, some ten per cent, is thus made up of public sector operations which have been included to enable us to study the total dissemination of learning strategies on the labour market.

In this report we study a subset of FLEX-2 workplaces that represent trade and industry and have 20 employees or more. The size of this sample corresponds to some 2,300 workplaces. Of these workplaces 80 per cent of these workplaces responded to the telephone interview component of the FLEX-2 survey, while 57 per cent also responded to the postal questionnaire. Since not all the workplaces responded to all the questions we posed, for the purposes of this report we have chosen to analyse only the 911 workplaces that submitted complete information. We have checked whether this group deviates from the net sample in some essential areas and found that this is not the case. See further Appendix 1.

The selection of unit for analysis purposes is related to the fact that the responsibility for results and the learning strategies that interest us here are determined to a large extent at the workplace and the best unit for analysis is thus the workplace. However, it should be noted that only some 40 per cent of the workplaces included in the study are single workplaces, i.e. the entire enterprise is organised in the form of just one workplace. Thus the remaining 60 per cent of the enterprises consist of several workplaces. However, for purposes of simplicity we use the well-known concept "enterprise".

The analyses of the importance of learning strategies for productivity and profitability in chapter 3 are based on a model that has traditional economic theory as its starting point. Productivity and profitability are functions of several factors (such as capital, labour force, size of the workplace, sector). The causes and driving forces of growth must be sought in the enterprise. Therefore indicators of learning strategies are included in the function in addition to factors of a more traditional nature that are considered to contribute to growth. See further Appendix 3.

In the analysis of the incidence of learning strategies in Swedish trade and industry in chapter 4 we have divided trade and industry into industrial operations and service operations. Thereafter the workplaces have been classified into capital-intensive, knowledge-intensive or labour-intensive operations. The reason for this classification is firstly the different conditions that exist in manufacturing and service enterprises. Furthermore we know that

the incidence and the significance of learning strategies is associated with whether the enterprises are capital-intensive or knowledge-intensive, and this is an important reason for the classification into capital-intensive, knowledge-intensive and labour-intensive operations. The size of operations is associated with most of the factors we intend to measure. We have therefore classified the enterprises into different size classes on the basis of the number of employees at the workplace.

A cooperation project

The FLEX-2 project is a cooperation project in which several government agencies and institutions have participated: NUTEK, the National Institute for Working Life, the Council for Work Life Research, the European Social Fund in Sweden, the Ministry of Industry, Employment and Communications, the Knowledge Foundation, and the Swedish Transport and Communications Research Board. The total cost of the project has amounted to slightly more than SEK 10 million. The project started in the autumn of 1997 and will be finalised in the autumn of the year 2000. The project has resulted in a number of publications and has contributed material for government committees and government bills within the area of responsibility of the Ministry of Industry, Employment and Communications, see Appendix 5.

Organisation of the report

Chapter 1 provides a background on why new strategies based on human resource development in enterprises have entered into focus to increase the competitiveness of enterprises. Furthermore the aims of the study are described, as are a number of methodological issues. In *chapter 2* we discuss learning strategies and give a description of the strategies we have studied and how they have been measured. *Chapter 3* contains a presentation of our analyses which show the importance of learning strategies for the productivity and profitability of enterprises. Thereafter, in *chapter 4*, we describe the incidence of learning strategies in Swedish trade and industry in 1997. We also make certain comparisons between our study and data from the survey "Sweden's workplaces" which described the incidence of new management strategies at Swedish workplaces in 1991. Finally, in *chapter 5,* there is a discussion on the importance of learning strategies for Swedish industrial policy. Chapters 2–4 are concluded with short summaries. Approaches and calculations are presented in appendices.

Chapter 2

Strategies for learning

Learning has come into focus in literature on human resource management and innovations. Even if the focus is the same, learning at work can be measured in different ways. In this chapter we describe and define a number of learning strategies that we use in our analyses of competitiveness. We show that an enterprise can, in principle, increase its learning through recruitment, cooperation with other parties, or by developing, in various ways, learning processes within the enterprise.

An enterprise's competitiveness is increasingly associated with its capacity to recruit qualified personnel, the interest and commitment of the personnel, and the capacity of the personnel to predict change and to adjust to new conditions. It is important that the work is organised in a way that permits the continuous development of new knowledge, production processes and new services and products. This capacity is associated with the enterprise's learning strategies, which are often summarised by the well-known concept "human resource management" (HRM). HRM includes measures that affect the supply and development of skills in the enterprise such as: "selection and recruitment of personnel; design of the work organisation, job description and remuneration systems; job evaluation, and various forms of personnel training/development".[8]

Research into production processes and new services and products, i.e. innovation research, is based to a great extent on the same concepts as HRM. HRM is included as an important aspect in the understanding of the influences that make up an enterprise's ability to be innovative. In the field of innovation research and HRM there is also an increasing awareness of the importance of external factors such as the market and changes in the market, cooperation and interaction with other parties and other parts of the enterprise's environment.[9]

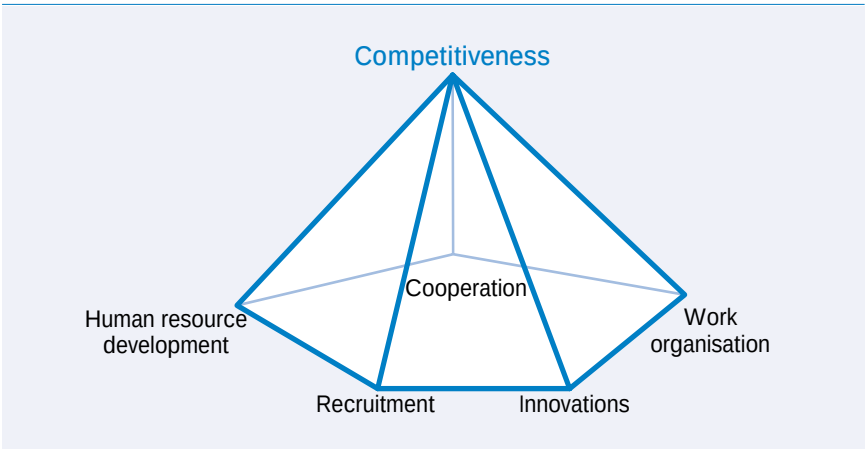
[8] Ellström (1991).

[9] Tecce (1999).

An increasing amount of attention is being given to ways of measuring learning. To be able to measure factors and processes, concepts must be categorised and classified. The total value of an enterprise is determined by the sum of its financial capital (including machines and other fixed assets) and intellectual capital. The intellectual capital consists, in turn, of both human capital and structural capital. Put simply, structural capital in this context refers to what is left in the enterprise when the personnel have left at the end of the working day. Structural capital can thus consist of databases, organisation charts, process manuals, patents etc.[10]

In brief it can be said that the point of departure of this study is research into HRM and innovations with a focus on both human and structural capital. Our intention is to measure their importance for the economic performance of enterprises and to study their incidence in Swedish trade and industry. We argue that, in principle, an enterprise can increase its learning through two types of strategies. One is external, i.e. recruiting personnel, purchasing the services of other enterprises, or cooperating with other parties. The other is internal, i.e. developing the enterprise's own learning through the design of its work organisation, human resource development in the enterprise, and working with its own innovations.

Diagram 2.1 Five cornerstones linked to strategies for learning and competitiveness



[10] Roos et al (1997).

These five cornerstones can be identified and linked to strategies for learning which, in turn, are of great importance for the competitiveness of the enterprise. In the rest of this chapter we will describe in more detail how each cornerstone has been defined.

Work organisation

There are a number of different and complementary ways of measuring learning in the working situation and measuring a learning organisation. Somewhat light-heartedly management researchers have claimed that there are more theories and variations on new working methods than the number of real examples.[11] All these can be summarised as management of knowledge. One way of examining learning at work is to measure the degree of decentralisation of responsibility in an organisation. Another way is to measure changes in the work organisation and the participation of employees in the processes of change, and to measure the changes in responsibilities and powers that have taken place. A further important component in a learning organisation is the incentives and support given for learning. One way to see what incentives and support exist is to study the pay system and whether it has the objective of stimulating human resource development and the assumption of responsibilities by the employees.

A decentralised work organisation

In this section we describe different ways of measuring learning in the working situation. We argue that learning is closely associated with the organisation of work, both in the enterprise itself and in its cooperation with other parties involved, not least suppliers and customers. *Learning at work* means that the individual employee or a group of employees is given the responsibility for identifying, interpreting and formulating a task, or examining the content of a given task, its background, desirability and other factors. It can be summarised as the capacity of the individual or group to assimilate, util-ise and transform knowledge, a type of "everyday learning". The design of the working tasks, interaction with other people, machines and for example information/data has an effect on learning.[12] In many cases learning at work is informal and is therefore also referred to as "tacit" knowledge.

[11] Buchanan (1992).

[12] Ellström (1991).

Although learning at work is regarded as an increasingly important factor in an enterprise, it is considered difficult to measure. Conceptions of learning and human resource development can be problematical. Without going into depth here, it can be important to point out that learning shall not be limited to repetitive duties but shall focus on development, i.e. a process of questioning and testing. It shall be a challenge, gradually lead to new and higher demands. If it is intended that the potential for learning in this form shall not be limited to a given product or a given context, it is necessary that the solution of problems is also made part of the working duties (continuous improvements). Another interesting aspect associated with the organisation of work is that human resource development in the form of formal education is not effective without learning at work. The understanding and use of what has been learnt in programmes of formal education increases when it is integrated with learning at work.[13]

A learning organisation has extensive learning processes in the working situation. In a learning organisation it is essential that learning take place at all levels in the organisation and that it also contains elements of developing methods for new learning. It is based on interaction between the learning of the individual and the organisation.[14]

In the discussion on new strategies, emphasis is given to management through ideas and objectives rather than through narrowly defined job-descriptions and managers who manage the work directly and in detail. Responsible self-determination within given frameworks and towards given objectives shall replace direct controls. This requires a closer relationship between different departments and functions leading to the elimination of borderlines between production personnel, support personnel and marketing personnel etc. The employees perform more different duties and are mobile within the organisation.[15]

Decentralising the work organisation is one way of developing learning at work and, at the same time, offers a concrete way for the enterprise to adapt to rapid changes in its external environment. In a situation with rapid changes it is uneconomical to plan work processes in detail. The high pres-

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[13] Ellström (1991) and the Council for Work Life Research (2000).

[14] Brulin & Nilsson (1997).

[15] le Grand et al (1993) referring to Piore and Sabels (1984), *The Second Industrial Divide – Possibilities for Prosperity,* Basic Books, New York.

sure of competition also increases the need for flexible organisational solutions. Standardised solutions and formalised procedures rarely function well when recurrent problem situations are seldom identical, which is considered to be the case in situations of keen competition. It can also be assumed that effective decision-making in situations of keen competitive pressure makes it essential to have responsibilities, to a certain extent, at levels in the organisation which have immediate knowledge of work processes.

An organisation that is managed by objectives related to the needs of its customers must organise its work in such a way that even production personnel have contacts with the customers, sub-contractors, distributors etc. An effective focus on customers also requires participation by the personnel in the planning of the work that the personnel give consideration to the resources required for production purposes and to the production process itself. This makes it necessary that the personnel participate in work relating to quality and quality improvement and that the responsibility for results, to certain extent, is placed below top management level.[16]

Participation of a more advanced character in quality improvement includes organising work on the basis of teams. All duties/stages in the production of a product or a service are put together and made the responsibility of a working team. The team is responsible for the entire process from start to finish: the team becomes an enterprise within the enterprise and plays a central role in the business process. In concrete terms learning at work can be implemented by organising work in small teams that are also given the responsibility for their own work. This stimulates discussions between employees on problems and improvements.[17]

When we focus on the design of the work organisation in this study, we study a number of *principles* that are considered to be important aspects of learning at work.[18] We examine the extent to which these principles have been decentralised in the work organisation. By this we mean the level in the organisation at which the responsibility for the performance of a number of duties is found. In addition we study whether there are elements of integration between different hierarchical levels in the enterprises. The tasks studied vary in character: it is intended that they shall be relevant for enter-

[16] Brulin & Nilsson (1997) and Docherty (1996).

[17] Docherty (1996).

[18] Brulin & Nilsson (1997).

prises working in different parts of trade and industry. In addition it shall be possible to perform the tasks at lower levels in the organisation. The first tasks studied are the daily and weekly planning of one's own work. This is assumed to show the degree of vertical integration, i.e. where responsibilities lie for preparation, decisions and execution. Thereafter a study is made of quality control and results follow-up. This shows whether there is scope for reflection on the part of the employees on the work they do. One indicator of flow-focused production or horizontal integration, i.e. that work in the production pro-cess is not completely divided into functions, is whether the employees working in production participate in the development of services and products. Finally we give consideration to contacts with suppliers and customers as a prerequisite of an effective customer focus which can also be regarded as an indicator of flow-oriented production.

In brief the duties studied are the following:

- Daily planning and weekly planning of one's own work
- Quality control and results follow-up
- Development of services and products
- Contacts with suppliers and customers.

The responsibility for performing these duties can be found at different levels in an organisation. The *most* highly decentralised level consists of individuals and teams in production, while the *least* decentralised level consists of managers, supervisors, experts or planners. We have constructed an indicator that is based on an index that has values between 1 (the lowest degree of decentralisation) and 3 (the highest level of decentralisation). In order to obtain the maximum value, an enterprise shall have responded that decisions are made at individual or team level for all given stages of the working process. If, on the other hand, the enterprise responded that the decisions for all stages are made at the managerial or supervisor level or externally, it is consequently given the lowest value: 1.

To summarise we are of the opinion that learning at work with the aid of a decentralised work organisation can be assumed to give values which can be measured in the form of higher productivity and profitability for the enterprise. Therefore a variable is included which measures the degree of decentralisation in the analysis of an enterprise's competitiveness.

Change in the work organisation

Another way of looking at a flexible work organisation is to describe an enterprise's strategy for change. Several examples of comprehensive organisational changes show that they are results of a slow process which is often broken down into different stages and which includes follow-ups and evaluations.[19] Processes of changes of this type are similar to the principle of continuous improvement that has been developed from the Japanese concept "Kaizen". The point of departure of Kaizen is that the results of production cannot be improved until the production process is improved. A strategy of this type is assumed to make a positive contribution to the fulfilment of the organisation's goals.[20]

Newly established operations have been given prominence in many contexts as good examples of new forms for organising work. Volvo's factories in Kalmar and Uddevalla are well-known examples. However, the possibility of introducing new forms of work into existing activities can require major investments. It can lead to considerable demands for change in existing plant and technologies. It can also be associated with costs that are so great that the changes must, after all, mainly take place within the framework of existing physical structures.

Modern research, which has increasingly concentrated on change in established and mature organisations, describes the role of management in learning strategies for change as providing clear information on the objective of change and creating the conditions necessary to implement and achieve lasting effects from the changes. One central factor that must be present if change is to have a sufficient impact and a lasting effect is that the change takes human behaviour and human attitudes as its starting point. In other words this strategy is based to a very great extent on participation and reflection in the personnel group. The objective of change is often formulated as a vision and the strategy is based on continuous communication between management and the group of personnel, as well as within the group. In this way considerable scope is given to the personnel to use their knowledge in different ways to contribute to the planning of a change and the implementation of the change. A learning strategy for change is based to a great extent on continuous change as well as on new ways of working and interacting, rather than on the creation of new organisational structures.

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[19] Gustavsen et al (1996).

[20] Docherty (1996) and Brulin & Nilsson (1997).

How then is it possible to measure processes of change? We measure the incidence of change in the work organisation by categorising enterprises on the basis of whether they have implemented organisational changes or not. Enterprises in the first category implemented a major change in their organisation between the years 1995 and 1997, or were implementing a change of this type at the time this was measured. The other category includes enterprises that did not implement a major change during this period. All enterprises which stated that they had undergone or were undergoing a process of change have also been categorised on the basis of whether the change has a fixed beginning and end, a fixed beginning and then has continued without a fixed end, or whether the change has been entirely of a continuous type.

We assume that an enterprise that undergoes a continuous process of change works to a great extent in accordance with strategies of learning and reflection and with continuous improvement, than an enterprise that has a specific beginning and end to its process of change. Strategies for continuous change are expected to have better prospects of creating flexibility and meeting new changes. We are of the opinion that these enterprises have a greater degree of learning than the others.

We have studied the relationships that exist between the three factors; the probability of implementing a change and the continuity of the change, and the probability of having a high degree of decentralisation. The probability that an enterprise had a high degree of decentralisation in 1997 is greater if it implemented comprehensive changes to the organisation during the period 1995 to 1997. There is a positive significant relationship between the implementation of a continuous change and a high degree of decentralisation, which supports our hypothesis that continuous change in an organisation is associated with learning. Since there is a correlation between decentralisation and continuous change we restrict ourselves to including the variable "degree of decentralisation" in the analysis of the competitiveness of an enterprise. See further Appendix 3, table A:3.1.

Participation in the process of change

A strategy for change based on broad participation by the employees is assumed to link together the effective development of the organisation with the development of the working situation of the employees. In order to achieve effective changes, the employees must participate in the process of

change. It is assumed that a change will not be lasting if it is not broad enough to establish new patterns. Breadth in this context can mean that several parts of the enterprise are involved and that a large proportion of the employees are involved in the change.

In this study we also try to describe the character of organisational change in the form of the participation of employees in the process. The employees have been broken down into the following categories: trained blue-collar workers, other blue-collar workers, white-collar workers with a university degree and other white-collar workers. We have weighed up the participation of the different groups of personnel. In this respect we have also taken into consideration the proportion of white-collar workers and blue-collar workers in the enterprise. Since we are interested in the involvement of the personnel in the process of change, we have not included the active participation of managers/supervisors in the process. However, our analyses show that the active participation of managers/supervisors follows the level of participation of the personnel, i.e. the higher proportion of personnel who participate, the higher the proportion of managers who participate. See Appendix 3 table A:3.2.

It is our hypothesis that there is a relationship between a decentralised work organisation and the proportion of the personnel who actively participate in the work of change in the organisation, for example in steering groups and working groups. Our analyses show that there is a positive relationship between a high degree of active participation among the employees and a high degree of decentralisation in the enterprises. (See Appendix 3 table A:3.3.) Since there is a correlation between decentralisation and the participation of the employees in the process of change, we have not included both variables in the analysis of the competitiveness of enterprises. We limit ourselves to including the variable "degree of decentralisation".

Greater responsibilities and powers

An analysis of a change in the division of responsibilities gives us a dynamic perspective of the decentralisation of enterprises. Organisational changes can lead to an increase or decrease in the responsibilities and powers of the employees. If an enterprise has a high degree of decentralisation, according to our indicator, but has not increased the responsibilities and powers of the employees in recent years, the degree of decentralisation has been high for a long period of time. An enterprise that has a low degree of decentralisation but which states that the responsibilities and powers of the employees have in-

creased during recent years, can be considered to have recently started making changes in its division of responsibilities. In such cases it is possible that the effects of the changes had not become apparent at the time the measurement was made. There is also a group of enterprises which have a low degree of decentralisation and which have not increased the responsibilities and powers of the employees during the period studied.

The result of our analysis shows a significant, positive relationship between the degree of decentralisation and increases in responsibilities and powers. The enterprises that have extended the responsibilities and powers of their employees during the period 1995 to 1997 more often had a higher degree of decentralisation in 1997. In addition, enterprises with a low degree of decentralisation have not increased the responsibilities and powers of their employees to any great extent. (See Appendix 3, table A:3.4.) These results may seem obvious but are a reason for concern since it is these latter enterprises that may be in need of a change. To make it easier to draw conclusions on the significance of the work organisation for competitiveness, this variable of change is included in the analysis, despite the relationship between decentralisation and the increase in responsibilities and powers for the employees.

Pay systems for assumption of responsibilities and human resource development

To permit the skills developed by individuals as well as by teams, and for skills to have an impact on operations, organisational support systems are required. The payroll system can be a support system of this type. It can be designed to support the assumption of more responsibilities and human resource development by providing incentives for individuals in these respects.[21]

Today it is considered increasingly important that wages are set on the basis of the performance of the individual or team. However, in current theory, opinions are divided on whether an incentive pay system should be based on individuals or teams. However, one main line is that different systems are suitable for different circumstances.[22]

Here we study the proportion of pay received by employees working in direct production that is based on various types of individual pay criteria. This indicator is used in our analyses of the relationship with the economic

[21] Persson (1994).

[22] Lazear (1995).

performance of enterprises. However, the indicator does not include information on which these criteria are based. Therefore we have also analysed the relationship between individual pay systems and a more sophisticated pay system that has the intention of promoting a number of different qualifications and qualities possessed by the individuals or the teams, such as:

a) working pace and volume of work

b) social skills

c) flexibility and ability to handle several tasks

d) ability to solve complicated tasks

e) proficiency

f) ability to work independently

g) quality of the result of the work

We have found a significant positive relationship between basing a large proportion of pay on individual criteria and our indicator for the use of sophisticated, incentive-based pay systems for the individual and the team. (See Appendix 3, table A:3.5.) With the aid of this correlation we know more about the contents of the individual pay systems. However, there are problems with this indicator since, for example, it can be difficult to isolate the qualifications in the pay system. Furthermore different criteria such as social skills and flexibility can be perceived in different ways. There are also differences between white-collar workers who have had individual pay systems for a long time, and manufacturing workers who are employed under a collective agreement. The latter have mostly been the subject of team-related criteria. There is no single perception of what should be included in a supportive pay system even if many analyses indicate concordance in methods and results.

Since we have found a positive correlation between the proportion of pay based on different types of individual pay criteria and sophisticated pay systems, we have not used both of the pay variables in our analysis. We limit ourselves to including the first-mentioned variable: the proportion of pay based on individual criteria.

Human resource development

The need of a labour force which can use new know-how, participate in the development of the production process and in the development of new

services and products is the major reason why continuous human resource development has come into focus. Underlying this trend there are assumptions that extended working duties, cooperation between personnel with different skills and good organisation of the enterprise's different resources are necessary to meet external demands.

Effective human resource development is associated with the organisation of work. To create effective human resource development, it is necessary to have learning at work and an organisation which ensures that skills do not disappear when personnel stop working at the enterprise. On the other hand it is claimed that informal learning in the everyday work cannot lead to a permanent and general build-up of skills if this learning process is not integrated with planned and systematic training. Often models are needed to interpret and evaluate data and information and for this a knowledge base is necessary, or formalised knowledge.[23]

Different writers have approached the concept of capacity/proficiency and human resource development from different perspectives and have given it different content.[24] Below there is a short discussion on what the concept can mean.

We argue that proficiency is the ability of the individual to solve problems and meet external demands in an appropriate way in relation to the situation in question. This definition is an expression of a focus on people as creatures that are able to interpret situations, take action and solve problems. Proficiency is expressed in the form of actions in a certain situation, with a certain meaning in a certain context and in a certain environment. Knowledge and experience are not synonymous with proficiency but are two components in the concept of proficiency. Will power and motivation are also important components of the concept. Furthermore proficiency is associated with both the individual and the situation, i.e. proficiency is defined in terms of a person's ability to take appropriate action.

The concept of proficiency shall not be confused with the concept of qualifications which describes the skills necessary to perform a certain working duty or the skills required by an employer. An individual's proficiency need not constitute a qualification in relation to a certain working task. This dis-

[23] Ellström (1991).

[24] Docherty (1996).

tinction makes it possible to identify changes in the qualifications required, for example higher levels of qualifications, which lead to requirements for human resource development of the employees. It also leads to the possibility of changing the design of the work if the employees' proficiency is greater than what is actually needed to do the job. In this context a change in the organisation of work can permit a better utilisation of the full potential of the proficiency of the employees.[25] Earlier sections on work organisation include issues relating to qualifications required for the work. In this section we focus on the individual's development.

Human resources can be developed in many different ways. One form of human resource development is learning at work which often takes place in connection with the enterprise's strategy for its work on innovations and the design of the work organisation. Therefore human resource development does not merely take place through formal education and training. An important part of learning and acquiring knowledge takes part through learning at work, not least in small enterprises which, on account of their size, have difficulties in sparing the labour force for long periods of time, even if it involves learning for the future.

How is it possible to measure proficiency and human resource development and their importance for an enterprise? Theories on the importance of learning, for example the human capital theory, state that if the return on education and training and human resource development exceeds their cost, it is profitable to invest in more education and training and human resource development. It is complicated but possible to obtain a picture of the costs of formalised learning – education and training. It is considerably more difficult to obtain information on the costs of human resource development, particularly those associated with learning at work, and therefore we have chosen to measure this phenomenon from a number of other aspects.

In the light of the discussion above, we measure the incidence of organised human resource development in the everyday work. We are of the opinion that enterprises that pursue human resource development in this form see learning as a process in which it is possible to acquire or further develop proficiency as an integral and natural part of the work. Our way of looking at competence also permits a measure in respect of formalised acquisition of knowledge. We measure the proportion of employees who participate in

[25] Ellström (1991).

formal training and courses which are paid for by the employer. The strategic development of the proficiency of the employees at an enterprise requires long-term planning since it takes a long period of time to change the structures concerned.[26] Therefore we also measure the incidence of planning of human resource development by studying whether the enterprises have a human resource development plan for all employees in production. It is our assumption that enterprises that have plans of this type have an awareness of the importance of planning for the future. Planning human resource development can also be seen as an important factor of human resource management, which we discuss further below.

We have created an overall indicator of human resource development based on the above-mentioned aspects of learning in the everyday work, courses paid for by the employer and the incidence of development plans. The indicator is an index with values between 0 and 3. However, the index does not rank the different development inputs. Enterprises with higher index values have more human resource development inputs than enterprises with lower values. To achieve the maximum value of 3, an enterprise must have responded that it has a human resource development plan for each employee, that the everyday work at the enterprise has elements of human resource development and that, in 1997, over 25 per cent of the employees participated in educational programmes or courses paid for by the employer. To achieve the value 2, the enterprise must have responded that it is running two of the human resource development inputs in question and so on. This index provides an overall indicator of the scope of human resource development run by the enterprises.

To summarise we are of the opinion that human resource development at work can be assumed to give value which can be measured in the form of higher productivity and profitability for the enterprise. Therefore a variable is included which measures the scope of human resource development in the analysis of the competitiveness of enterprises.

Recruitment

Recruitment is included among strategies for learning.[27] In a situation of shortages in the supply of personnel with certain know-how, recruitment matters are

[26] Saias (1992).

[27] Huselid (1995) and Ellström (1997).

essential for the management of an enterprise. The enterprises that have explicit strategies for this type of recruitment have better prospects of recruiting the skills in demand. Recruitment strategies, the organisation of work and human resource development at the work place are interrelated. In the section above we discussed the links that exist between the work organisation and human resource development. The development of the existing workforce in the enterprise is also affected by the recruitment of new manpower and by the knowledge and skills of new employees. To enable those who have been recruited to contribute to adding value to production, it is necessary to introduce them a number of issues that are linked to the actual job in question and the workplace. Enterprises with recruitment problems and long, drawn-out recruitment processes often have problems with heavy workloads for existing personnel and even reduced production. This, in turn, affects the possibility of implementing different human resource development programmes and further education programmes for existing personnel.[28]

Personnel turnover

In this study we have no direct indicator for recruitment. Instead we have included indicators which are intended to cover the effects of the enterprise's recruitment strategies. Initially we would describe a simple indicator which can be related to recruitment, namely personnel turnover in an enterprise. A high personnel turnover means, in addition to the disappearance of skills, also costs for recruitment, introduction and training, and possibly also production losses. The ability to retain personnel is therefore assumed to be of importance for an enterprise's economic performance. There is also a relationship between low personnel turnover and a good working environment and high productivity.[29] In this study we have included an indicator of personnel turnover that measures the proportion of employees working in the enterprise at the beginning of 1997 who were also employed at the end of that year.

Education structure

Two indicators that are intended to measure effects of an enterprise's recruitment are the educational level in the enterprise and changes in this level. The educational level is measured as the proportion of the employees in the enterprise with higher education. In principle all those with post-secondary education are regarded as having higher education. The second indicator measures changes in the number of employees with higher education.

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[28] NUTEK (2000c).

[29] NUTEK (1996b).

It is not only the number of employees, it is also the educational level of the employees which has been shown to be of significance in explaining why enterprises with otherwise similar conditions perform differently. Analyses also show a relationship between human resource development and educational level. Official statistics show that employees with high levels of education are given more human resource development than employees with low educational levels.[30] There is also a relationship between having undergone a programme of higher education, and thereby having developed the ability to learn, and not having continued to study after compulsory school or upper secondary school. At the same time as basic knowledge (reading, writing, arithmetic) is high in Sweden, regardless of level of education, compared with other countries, it is higher among those with a long education than those with a short education. The proportion of highly educated persons who have the highest levels of basic knowledge is approximately twice as high as those with lower levels of education.[31]

A number of earlier analyses show that there is a relationship between education structure and an enterprise's economic performance.[32] However it is more difficult to show a corresponding relationship between changes in the number of employees with higher education and an enterprise's economic performance. Despite this we have included a second indicator of educational level which measures change in the number of employees with a higher education between the years 1993 (in certain cases data is only available from 1995) and 1997.

Services of other enterprises

Many researchers regard the engagement of the services of other enterprises for special skills needs as an increasingly important factor in an enterprise's learning and human resource development. However there are different perceptions of whether this type of strategy is good for the enterprise or not. The critical points of view are often linked to other forms of increases in the workforce, for example temporary appointments and overtime. Here we focus on the engagement of the services of other enterprises for special skills needs since this has become a method to meet the needs of enterprises for new skills. This is shown not least in statistics on the number of enterprises

[30] Statistics Sweden (1999a).

[31] NUTEK (1999c).

[32] See, for example, Öckert & Regnér (2000) and NUTEK (1996b).

and the number of employees in the company services sector.[33] The statistics show an increase in the number of enterprises in this sector between the years 1993 and 1999 of some 56 per cent and in the number of employees of some 69 per cent.[34] During large parts of the 1990s turnover per employee in these enterprises has been several times higher than in other parts of the economy[35] and the educational levels of the employees are, on average, twice as high (see chapter 4 table 4.1). This strategy is often used when an enterprise needs access to know-how and services outside its core skills, for example specific management skills or skills linked to the introduction of a new technology.

The services we intend to study refer to the main activity since we do not wish to include support functions such as reception work or cleaning services (however, they shall be included if the enterprise works specifically in these areas). On the other hand issues relating to management and the introduction of new technology can be considered as part of the main activity. The indicator we include in the analysis of competitiveness refers to the proportion of enterprises that have engaged the services of other enterprises to meet special skills needs in their main activity.

Thus four indicators are included in respect of recruitment or the effects of recruitment in the analysis of competitiveness of enterprises. These are personnel turnover, proportion of employees with higher education, changes in numbers of employees with higher education, and the use of the services of other enterprises.

Cooperation with other parties

Human resource development takes place to a great extent through learning at work. However, it also takes place through cooperation and interaction with customers and other enterprises in development projects. Production to meet the specific needs of customers implies that employees in production have a contact network with others, for example with customers and suppliers. Cooperation with other parties results in a greater degree of learning than doing all the work

[33] Company services are defined as Computer Consultants and Computer Service Bureaus (SNI 72) and Other Company Service Firms (SNI 74) according to the Central Register of Companies and Workplaces (CFAR).

[34] Statistics from Statistics Sweden processed by NUTEK. The most recently published statistics for industrial activity 2000-07-04.

[35] NUTEK (1996a).

within the organisation: partly through the search for external contacts and partly in the creation of good relations with external parties. Moreover, cooperation with others often necessitates an extension of the freedom of action of the employees and thereby their learning increases.[36]

The borderlines for what is developed and implemented inside and outside an enterprise are increasingly fluid. The increasing pressure of international competition has led to a situation in which many enterprises in Sweden have specialised their operations and the enterprises manufacture fewer and fewer components themselves. At the same time customers are making greater demands for complete products rather than individual components. If an enterprise is to be able to supply what is requested, it must create a form of cooperation with other suppliers. This is referred to in the literature as *flexible specialisation*.[37]

Cooperation between different parties also stimulates work on innovations and product development since new know-how emerges in the interface with established know-how. Furthermore technical innovations that are supported by several enterprises are more likely to be accepted. Cooperation also leads to a situation in which the costs and risks arising from work on innovations are shared between several parties.

Long-term cooperation also leads to a reduction in the costs involved in identifying adequate partners, drawing up agreements and checking their fulfilment, i.e. transaction costs. With the aid of cooperation enterprises build up an atmosphere of trust with other parties and this facilitates the exchange of information and experience.[38]

We measure the cooperation and interaction of enterprises with other parties from several different perspectives. Cooperation in this context refers to both formal and informal cooperation since we cannot claim that one form is better than another. On the other hand the suitability of the different forms varies in different contexts and it has also been found in other studies that informal cooperation often leads to formal cooperation in the long term.[39]

The first dimension of cooperation takes up the parties with whom the enterprises cooperate. We distinguish between customers, suppliers, other

[36] Bäckström & Lind (2000).

[37] Ekstedt et al (1994).

[38] See, for example, Ekstedt et al (1994), Håkansson (1989), Johansson & Lindmark (1996) and Larsson (1998).

[39] Håkansson (1989).

enterprises, universities and university colleges, upper secondary schools, other public sector organisations and other organisations. With the aid of this information we can both study cooperation with individual parties and the number of different groups of parties with which the enterprises cooperate.

Another aspect we study is the geographical distribution of the parties with whom an enterprise cooperates. We examine whether these parties are inside or outside an enterprise's region. (We define region as the municipality within which the enterprise is located or adjacent municipalities.) Research indicates that geographical proximity facilitates personal contacts and stimulates cooperation. At the same time the degree of specialisation in trade and industry has led to a situation in which enterprises must look outside their own region to find the right partner. We are therefore of the opinion that it is important for the enterprises to cooperate both inside and outside their region. The importance of establishing contacts both inside and outside one's own region has also been given prominence by the National Institute for Regional Research.[40]

In this study we have chosen to concentrate our indicator of cooperation to the geographical dimension. The enterprises have been grouped on the basis of the geographical scope of their cooperation. The first group consists of so-called isolated enterprises that have stated that they do not cooperate at all with other parties. The next group consists of enterprises which cooperate with other parties, but their cooperation is geographically limited, i.e. they only cooperate with parties in their own region or only with parties located outside their region. The final group consists of enterprises that have broad geographical cooperation, i.e. they cooperate with other parties both inside and outside their own region.

With the aid of the indicator presented above, we can examine cooperation in a number of different areas. We have devised three categories. The first is cooperation in respect of support functions such as marketing, recruitment and the coordination of purchasing. A second area is cooperation in production itself. The third area refers to cooperation in research and development (R&D) and human resource development, i.e. relations of a developmental character or know-how networks. Since we are studying strategies for learning, we focus on the third area.

[40] National Institute for Regional Research (1999).

To summarise it is assumed that enterprises that cooperate with other parties have higher levels of productivity and profitability than those that do not cooperate with others. We include indicators of cooperation with other parties and compare cooperating enterprises with enterprises that state that they do not cooperate with others. One of the indicators measures specific cooperation with parties inside the region only or outside the region only. Another indicator includes those enterprises that have broad cooperation with parties both inside and outside the region.

Innovations

Enterprises must develop continuously in order to keep up with their competitors and make the best use of opportunities, as well as to be able to better meet changes in customer requirements. Ultimately growth depends on how skilful enterprises and individuals are in absorbing knowledge and transforming it into new ideas and products. Innovative ability is therefore a central factor in the growth of enterprises. The relationship between learning and innovations is being given an increasing amount of attention. Innovations are assumed to give two types of effects: one is the innovation in itself and the other is the process of change which the innovation leads to in respect of knowledge and skills in the enterprise.[41]

It is common to distinguish between minor changes and major changes. Innovations differ from minor changes or improvements since they involve radical changes to processes or to services and products.[42] Innovations can be measured in several ways. One method is to study the resources an enterprise invests in new ideas and in doing new things. Indicators of this type often include the costs of R&D incurred by the enterprise and the proportion of employees with higher education. In our analysis we have (as we described above) included two indicators of employees with higher education. In addition to this we include an indicator of the proportion of services and products of sales that are a result of major innovations and changes made during the period 1995 to 1997. This is an established way of measuring innovations and is used by Eurostat in the "Community Innovation Surveys" (CIS).[43]

[41] Lööf & Heshmati (2000).

[42] Brulin & Nilsson (1997).

[43] Within the framework of the FLEX-2 project we have participated in discussions on how to develop empirical analyses of factors that are of great significance for innovativeness: Scientific Follow-up of the Community Innovation Surveys (CIS) – project No 8. Analysis of Empirical Surveys on Organisational Innovation and Lessons for Future Community Innovation Surveys.

Further information on the enterprises' innovativeness is provided by an indicator that examines the organisation of the work on those innovations that relate to services and products. In this study (as stated above) two indicators of this type are included: the degree of decentralisation and human resource development.

It has become increasingly difficult for an individual enterprise to contain all the specialised and complex skills needed for innovative activity. A great majority of all innovations are, in actual fact, a result of the flow of know-how between organisations, both other enterprises and institutions focusing on research and development.[44] This is a further reason to include in the analysis the indicators of cooperation with other parties and of services of other enterprises described above. We therefore have simple indicators for a number of factors which are considered significant for the innovative capacity of an enterprise and whether and how an enterprise is part of a system together with other parties – an innovation system.

It is not meaningful to make a separate report on the proportion of sales of services and products which are a result of major innovations and changes made during the period 1995 to 1997 broken down by knowledge-intensive, capital-intensive and labour-intensive sectors in chapter 4. The reason for this is that enterprises often organise the work of developing new ideas in special units in the enterprise or in individual enterprises in an enterprise group. These would probably be categorised as knowledge-intensive. Moreover, education is sometimes used as an approximation of innovativeness and the level of education is one of the principles we have used in making the sector breakdown. However, the indicator for innovations, defined as the proportion of services and products of sales which are a result of major innovations and changes made during the period 1995 to 1997, is included in the analysis of competitiveness of enterprises in chapter 3.

Other strategies

Use of ICT

It is assumed that the use of new technologies and their links to demands for greater know-how and skills is affected if the technology is used as a strategy for automation or as a strategy for better information support. In

[44] Tecce (1999).

connection with attempts to use information and communication technology (ICT) as a form of support for information purposes, a tendency has been observed in respect of needs for higher qualifications and new qualifications where both knowledge and skills are concerned. The reason is thought to be that, in the case of new qualifications, there is a higher level of abstraction in the work, higher theoretical requirements and greater language requirements.[45]

There is a great deal that indicates that a strategic use of ICT is important for an enterprise's flexibility and development potential. One reason is that important know-how and skills can be found both internally, within the enterprise – and in the enterprise's environment. Here a purposeful use of ICT can have great significance through, for example, the possibility of storing and processing information and making this information easily accessible. ICT can be used to link together and to distribute information regardless of time and place and, in certain circumstances, ICT does away with the need for physical proximity. Today it is possible to create virtual clusters and common markets and to enjoy the benefits of cooperation without the necessity of being located in the same place, even if geographical proximity between parties is, however, still important. In a study of growth enterprises in Norrland, a province in the north of Sweden, the managers of enterprises were of the opinion that, even if ICT reduces the need for geographical proximity, physical contacts are still very important in a number of areas, particularly in cases of complex relations and exchanges of know-how.[46]

It is argued that ICT increases the possibilities of cooperation and the effective utilisation of common resources, strengthens the possibility of coordinating activities regionally, nationally and globally, and supports the development of operations by making production and logistic processes more efficient. The Internet and the use of electronic trade also offer new opportunities for enterprises to create and find new markets for their products and services. It is therefore assumed that ICT facilitates a higher degree of learning, human resource development, new forms of work and cooperation with other parties.

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[45] Ellström (1991) referring to Björkman & Lindqvist (1986), Zuboff (1988), Löwstedt (1989).

[46] NUTEK (2000a) and NUTEK (2000b).

To summarise it is of interest to know how technology is used in enterprises to support the organisation and the flow of information (and thereby production) when seeking explanations of differences in economic performance. In this study we measure information and communication technology as the use of computers and data communication for processing information. Our indicator for ICT includes the use of networks, common databases, e-mail, the Internet, and electronic conferences for internal and external communication. We compare enterprises which use ICT extensively for internal and external communication with enterprises which use ICT only to a small extent or not at all for communication purposes.

Use of temporary employees

The changes in production conditions have also increased the needs of enterprises to make rapid changes to their labour forces. Formerly the possibilities available to enterprises to maintain the level of their labour force were greater since they produced for stock when there was a reduction in demand. However, this method for evening out changes in demand is no longer considered tenable. Enterprises are making increasing use of the just-in-time method which means that they produce when an order is received. It is not merely in the manufacturing industry where this approach has gained ground. Production and services are being adapted to customer needs in a growing number of sectors. Longer opening hours in the retail sector is one example of this type.

One form of flexibility is an enterprise's ability to make simple and rapid adjustments to the number of its employees or the number of hours worked. Researchers express this form of flexibility as a reduction in the number of employees to whom the employer has long-term commitment. They agree that the ability of an enterprise to change the size of its workforce is of central importance for achieving a high degree of so-called numeric flexibility and that this ability is dependent, to a great extent, on the proportion of time-limited jobs. However, the opinions of researchers differ on two main points. One is whether personnel hired on a temporary basis from other organisations should be included in the assessment of an enterprise's ability to adjust the number of its employees. The other is whether an enterprise's ability to change the number of working hours *given* the number of its

employees, i.e. working hours adjusted to the economic cycle and the use of overtime and part-time working, shall be included in the concept.[47]

It is assumed that time-limited jobs are mainly used in times of fluctuations in demand, for increases in production levels that are considered to be of a temporary nature, and to cover the absence of regular employees. Advantages can be large variable personnel costs and a simple and reliable source of recruitment if the increase in demand proves to be permanent. However the performance and commitment of temporary employees are often considered to be lower compared to permanently employed personnel. There is also some doubt as to whether an enterprise can combine the ability to adjust the size of its labour force with the production of complicated products and services. The strategy can be perceived as defensive and it can lead to a situation in which an enterprise which has started to use this strategy increasingly focuses on products with low value-added. This, in turn, can lead to a situation in the future in which it can be more difficult for the enterprise to change its production in order to manufacture more complicated products.[48]

In this study we measure temporary employees as the proportion of personnel who are employed on a time-limited basis. Since we have access to the number of temporary employees but no explicit information on the amount of the work done by these employees, we have made the assumption that they are as productive as the permanently employed. We have also made the assumption that they have worked on a full-time annual basis. These two assumptions probably have the effect that we have overestimated the input made by temporary employees.

[47] Atkinson (1987) and Casey et al (1999).

[48] See, for example, the discussion in Casey et al (1999).

Chapter 3

Learning strategies and competitiveness

This chapter discusses the two indicators for economic performance we have used, productivity and profit. We relate our different learning strategies to these two indicators with the aim of estimating the significance they can have for the economic performance of the enterprises in trade and industry. We establish that learning strategies are significant for both productivity and profit and, in particular, that strategies for organised human resource development have the greatest effect on levels of both indicators.

What is competitiveness?

Competitiveness is a popular concept that includes all the characteristics which have consequences for the economic performance of an enterprise. The concept is also used of sectors and regions in respect of their development capacity. Strong competitiveness therefore means that the enterprise grows economically, or at least survives as an enterprise, for a further period of time. There are short-term and long-term methods to strengthen competitiveness. In the short term competitiveness is often strengthened with the aid of cost reductions which have the aim of increasing profit, since costs are a factor over which management can exert a certain influence. In the long term strengthening competitiveness is more a case of an enterprise's ability to increase value-added and sales. Then the focus is mainly on the enterprise's so-called human capital, i.e. the collective know-how of management and the employees, and the enterprise's structural capital which is usually described as the human capital which remains at the enterprise when the personnel have left the workplace at the end of the working day.

Value-added is the surplus value created specifically in an enterprise. It is defined as the production value (income) less the cost of intermediate products and services, for example semi-manufactures and raw materials from

other enterprises. Value-added is thereafter distributed in the form of wages to employees and an operating surplus. The operating surplus shall cover the costs of capital, the remainder is profit. From the perspective of economic and industrial policies the concept of productivity is the primary variable. High productivity means that value-added increases per work input which means that a greater proportion can be distributed in the form of wages and profits. Greater prosperity is associated with a general increase in productivity in the enterprises.

However, the concept of productivity is not without problems. At the macro level there are constant revisions of the national accounts, mainly since it is difficult to put a value on changes in products and services as the amount of capital in both individual enterprises and in the economy as a whole. One common example is the problem of putting a value on computerisation. In the 1980s Robert Solow coined the expression that there are computers everywhere except in statistics on productivity.[49] In particular it is difficult to measure economic growth in the services sector. A well-known economist, Zvi Griliches, expressed this by saying that, in 70 per cent of the economy of today, economic growth is taking place which existing concepts of productivity are unable to take into account.[50] Our approach in this report is to compare the level of productivity in one given year and we limit ourselves to using economic statistics on enterprises and workplaces which can be found in Statistics Sweden's databases on trade and industry.

Enterprises often have other objectives than productivity. The owners are interested in obtaining a return on the funds they have invested and are therefore more interested in aspects relating to profit. Moreover, the interests of management do not necessarily need to coincide with those of the owners unless they are the same persons. Other goals can be that the enterprise shall survive or grow in size. With the aim of comparing our indicator of productivity with indicators which lie closer to the enterprise's objectives, an approximation for an indicator of profit is included which is the ratio between operating income per employee and operating expenses per employee, i.e. the income cost ratio.

[49] Quoted in Lundgren (1998).

[50] Lööf & Heshmati (2000).

We assume here that learning strategies have an economic significance which should both lead to higher productivity and improved profit. We argue that learning involves the development of products, services and production processes, and customer relations. On the one hand learning shall improve the ability to earn money or to obtain orders and on the other hand learning shall lead to lower costs in the form of more effective utilisation of capital, i.e. small stocks and the optimal utilisation of machines and other equipment.[51]

Above all we are of the opinion that learning strategies are of significance for the achievement of higher productivity – our earlier studies indicate this. Since higher productivity can partly be explained by the incidence of higher wages, it is of interest to find out whether the learning strategies are also positively significant for an enterprise's profit and whether the learning strategies influence income more than costs or vice versa.

It is desirable to be able to draw conclusions on causal relationships in order to determine the significance of a learning strategy. This means that the analysis must be able to show that learning strategies do not only show the same variations as the studied effect but also have a causal relation to it, i.e. that the strategy has been implemented prior to the outcome. One method is to measure the outcome at a later point in time than the explanatory factors. Our information on the enterprises' strategy variables applies partly to the situation in 1997 and partly to the situation during the years just before 1997. The proportion of income resulting from innovations, changes in the number of employees with a post upper secondary education, and the proportion of employees who have worked at the enterprise since the start of the year are examples of the latter. The degree of decentralisation of the work organisation, human resource development, and cooperation with external parties are examples of variables which are based on information in 1997. Experience gained from other studies indicates that, for example, the structure of a work organisation changes slowly. Two components in our indicator of human resource development, development plans and human resource development in the daily work, can be said to be structural conditions which are changed slowly.[52] Other variables which are included in the analysis in order, for example, to standardise for change in the number of employees and growth in value-added, measure changes during the last year. As a result of this we consider that we

[51] Brulin & Nilsson (1997).

[52] Tecce (1999), Ellström (1991) and Gustavsen et al (1996).

can draw conclusions on the *significance* or *influence* of learning strategies on economic performance.

To permit other differences between the enterprises, which are not associated with learning strategies, to exert an influence the results of the analysis, we have standardised for a number of other variables. More information on methods and results can be found in Appendix 3.

Significance for productivity

Table 3.1 shows the results when we relate our identified learning strategies to the level of productivity in the enterprises. Our definition of productivity is value-added per employee at the enterprise in 1997. We have calculated value-added as income from the enterprise's main activity less operating expenses for this activity, which include depreciation of capital used. Wage costs including social costs have then been added.[53] To facilitate the interpretation of the results, the significance of a strategy variable is represented as how much more/less productivity can be obtained by making a change in the learning strategy. The learning strategies which we have included in the analysis are presented in more detail in chapter 2.

When we relate our learning strategies to levels of productivity, it emerges that almost all have a positive effect on productivity. A change in the *degree of decentralisation of the work organisation* from the minimum level to the maximum level results in an increase in productivity of three per cent. However, if we make a breakdown of our data into manufacturing and service sectors and size classes we do not obtain any statistically significant results for this strategy. On the other hand a change in work organisation between 1995 and 1997 giving *greater responsibilities and powers* to the employees proves to have a negative effect on levels of productivity in 1997. The productivity of enterprises which have recently implemented changes of this type is, on average, six per cent lower than the others. The results are the same when we make a breakdown of the enterprises into different sectors or size classes. One explanation can be that it takes time to obtain the positive results from this type of organisational change

[53] The definition of productivity we study is also referred to as work productivity. In our statistical model we standardise for capital intensity to ensure that the work productivity of capital-intensive operations is not over-estimated. See, for example, Brulin & Nilsson (1997), and the Government Official Report 1991:82 for a discussion on the concept of productivity.

and that initially it is associated with considerable costs. In the analysis of the relationship between giving greater responsibilities and powers to the employees and the other learning strategies we also find once again a relationship between these variables (see Appendix 3, table A:3.7). This can mean that the positive value of, for example, a change in responsibilities, is partly taken up by the other strategies. Another explanation of the result is that the most development-oriented enterprises implemented this type of change long before 1995. The enterprises which we actually include here have low levels of productivity and they have, for various reasons, delayed making this change but have now chosen to implement it with the aim of improving their results.

The setting of *pay based on individual criteria* is associated with lower productivity. This is not the expected result. Possibly our indicator for individual pay rates does not take into account the dimension which we have sought theoretically. In exactly the same way as the indicator of changes in responsibilities and powers, the construction of the indicator rather reflects the costs of both a new pay system and a decentralised work organisation, which this variable is associated with. On the other hand it is interesting to note that large enterprises, which probably are the enterprises in greatest need of a sophisticated pay system, obtain a positive effect from using a higher proportion of individual criteria as a base for pay.

Human resource development (HRD) is positively significant for productivity. The productivity of enterprises that pursue human resource development of one form or another is, on average, slightly more than four per cent higher. Extensive human resource development, three inputs in comparison with none at all, corresponds with higher productivity. Human resource development is the most significant learning strategy for productivity of all the learning strategies we have analysed.

The significance of *recruitment of human resources* varies, according to the indicators we have used. When we study the proportion of employees with post-secondary education, a higher proportion is linked to higher productivity. To a certain extent this effect can be explained by the fact that employees with higher levels of education have higher wages that, according to the construction of the productivity indicator, increases the productivity measured. But, as we show in table 3.3 below, a high proportion of employees with post-secondary education is also positively significant for profit. Also an increase in the number of employees with a post-secondary education in an enterprise is associated with higher productivity, but the effect is

very small. The analysis shows that it is enterprises with low productivity and a small proportion of employees with higher education which recruited most employees with a post-secondary education between 1995 and 1997, probably for reasons of competition.

Buying skills externally in the form of consultants is another method for an enterprise to acquire skills. According to table 3.1 engaging the services of other enterprises is generally associated with lower productivity. However, in the manufacturing sector the situation is the reverse. Our negative result appears therefore to be linked to the importance of consultants in the services sector. Even here the extent to which our result emanates from development-oriented enterprises with low productivity which have engaged consultants with the aim of improving their activities can be discussed. The reverse side of the coin is losing skills. A high *personnel turnover* means, in addition to the loss of skills, costs for recruitment, introduction and training. According to our indicator, personnel turnover in 1997 amounted to some 15 per cent for the median enterprise. This means that 15 per cent of its personnel were replaced during the year. We measure personnel turnover as the proportion of employees who are still at the workplace, which we calculate as 1 minus the personnel turnover. The median value for this enterprise is consequently 85 per cent. In table 3.1 we have calculated the effects of an increase of five percentage units. Low personnel turnover has a positively significant effect on productivity in both the manufacturing and services sector, regardless of the size of the enterprise.

An important learning process also takes place in contacts with customers, suppliers and other parties. In chapter 2 we identified *cooperation with other parties* for development purposes as a special learning strategy. Enterprises with geographically broad cooperation have, on average, higher productivity compared with those who do not cooperate. When we make a breakdown of the results by sector and size of enterprise, we can see that broad cooperation is of greatest importance for enterprises in the services sector and for small enterprises. However, in the manufacturing sector, we have a negative effect. One reason for this can be that clearer distinctions are made between development activities and production activities in enterprises in the manufacturing sector. Furthermore the development activities in manufacturing enterprises often take place in workplaces defined as services activities.

In the light of the results which refer to cooperation in R&D and human resource development and their significance for productivity, it is interesting to study the significance of *innovations*, i.e. new products or major improvements to existing products, and their proportion of sales. In general our results for innovations indicate a negative significance for productivity. However, the effect is small. Nevertheless, this result requires an explanation since the ability to develop new products and services (and production processes) has been identified as an important source of growth.

One conceivable explanation of the negative significance of innovations is that the indicator is not suitable to measure at the work place or enterprise unit, which we have done. Several examples of the organisation of innovative work show that it is often done in independent units or even in independent enterprises which are part of an enterprise group. These units cannot always take the credit for the value they have brought to the enterprise. In an enterprise income is allocated to the unit which has the task of producing or merely selling the enterprise's products or services. Most of all R&D in trade and industry in Sweden are pursued in enterprise groups, which consists of a number of enterprises and workplaces. Some 40 per cent of the enterprises in this analysis are organised in just one workplace. Other enterprises consist of several workplaces of which we have included one or two of the enterprise's workplaces. Our data indicates that it is the enterprises with more than one workplace which have higher levels of productivity but, at the same time, they have lower values for the innovation variable. Innovation work in these enterprises can be pursued at another workplace in the enterprise or at another enterprise in the enterprise group.

If we look at the correlation between a high degree of innovations and productivity without standardising for other variables, it is positive.[54] This, in turn, can mean that the other variables take up much of the value which innovation activities provide for the enterprise, above all the proportion of personnel with a higher education "steal" the effect of the innovation variable. If we disregard the proportion of highly educated personnel in our model, there is a strong positive correspondence between innovations and productivity. This result also underlines the significance of education for the development of business operations.

[54] Lööf & Heshmati show that if growth and innovations are related there is a strong positive relationship between them.

Where the use of *information and communication technology* (ICT) for communication purposes is concerned, we have found that few enterprises have implemented ICT for both internal and external communications. Our information shows that, in 1997, 50 per cent of the enterprises had introduced only one of the following alternatives: e-mail for the personnel, internal networks or common databases. If an enterprise goes from no ICT use at all to the median values given by our ICT indicators, gains in productivity of some three per cent can be achieved. The advantages of internal ICT use are clearly apparent in both the manufacturing sector and the services sector. However, we can see that there is a negative effect where internal ICT communications for the medium-size enterprises are concerned. If we look at external communications with the aid of ICT, this generally has a positive effect, if somewhat smaller than for internal communications. Here it is mainly the large enterprises and the services sector which make positive use of ICT.

We can establish that the learning strategies we have mentioned here are significant for productivity in the sense that they correspond positively with higher productivity values. All in all the effects are so great that they cannot be ignored.

One variable which cannot be regarded as a learning strategy, but is nevertheless of interest, is the *proportion of temporary employees*. This variable has the purpose of taking into account the ability of an enterprise to make simple and rapid adjustments to the numbers of its employees. The proportion of temporary employees has negative significance for productivity. Increasing the proportion of temporary employees by a further one per cent results in a reduction in productivity of just over half a per cent. On the one hand temporary employees often have lower wages which means lower productivity by definition. On the other hand the use of temporary employees as a long-term strategy leads to a division of personnel into different groups and this can have a negative effect on the development of knowledge and increases in productivity.

Another important variable in the analysis is *economic growth* last year. We can see that this has a large positive effect on productivity. This means that activities which have had high rates of growth last year are those which also had the highest productivity in 1997.

Table 3.1 Effects of learning strategies on productivity, per cent, 1997

	All	All enterprises broken down by:				
		Manu-facturing	Services	Small	Medium	Large
Degree of decentralisation	3.1	*	*	*	*	*
Increase in responsibilities and powers vs no change or decrease	-5.0	-10.2	-3.2	-4.6	*	-12.6
Individual payrates 1–20% vs. none	-2.9	-2.0	(-1.5)	-3.3	-6.7	32.7
Individual payrates 21%< vs. none	-8.4	-4.7	-12.2	-9.9	-10.4	24.0
One HRD input vs. none	4.6	14.0	3.1	6.4	10.0	*
Two HRD inputs vs. none	*	9.1	*	*	5.2	*
Three HRD inputs vs. none	7.8	15.4	4.0	8.8	15.0	22.9
Change in number of employees with a university/university college education	0.002	-0.04	0.003	0.004	-0.03	0.00
Proportion of employees with a university/university college education	5.6	1.3	6.6	5.3	7.9	3.9
Using the services of other enterprises	-4.0	3.9	-9.7	-3.7	-2.1	-16.5
Proportion of employees still at the workplace during last 12 months	2.5	1.4	3.0	1.9	3.1	*
Cooperation inside *or* outside the region for R&D and human resource development vs. none	*	-8.0	2.5	*	-5.3	*
Broad cooperation in R&D and human resource development vs. none	4.4	-6.3	9.0	5.5	*	*
Range of innovations	-0.1	-0.1	*	-0.1	*	*
Internal ICT use for communication	2.6	3.2	1.9	*	-3.4	1.5
External ICT use for communication	1.1	-1.0	2.0	*	2.0	3.1
Use of temporary employees	-0.4	-0.2	-0.6	-0.5	*	*
Growth in productivity during the last 12 months	0.08	*	0.2	0.1	-0.1	0.8

Source : NUTEK. FLEX-2-data

Note 1: * = Estimate is not statistically significant. Estimates in brackets are significant at a level of significance of 10% and other estimates at a level of 5 %.

Note 2: The percentage effect has been calculated by multiplying a change in the strategy variable by the estimated effect and thereafter the total has been divided by the median value for the enterprises in each group (see also Appendix 3 table A:3.11).

Note 3: Small enterprises are defined as having 20–99 employees. medium-size enterprises between 100–249 employees and large enterprises more than 249 employees.

Note 4: For a complete account of the model's parameter estimates see Appendix 3 table A:3.10.

In table 3.2 we have broken down our indicator of the degree of decentralisation of the work organisation into the four different tasks which we presented in chapter 2. In general it is the case that decentralisation of the planning of work, on a daily or weekly basis, generally has a positive connection with productivity. An analysis broken down by the manufacturing sector and services sector shows that the effect is greater in the manufacturing sector. One explanation can be that the services sector is closer to the customers and is more closely governed by customer requirements. Therefore the planning of work by the personnel does not in general have the same new revolutionary effect and importance for the service sector. Decentralisation of results follow-up also has, in general, a positive connection with productivity. However, this factor is negative in manufacturing but positive in the services sector. Here the explanation can also be related to different production conditions in manufacturing and in services sectors. On the other hand the decentralisation of the development of services and products proves to correspond negatively with high productivity. The same discussion as for innovations can be of relevance here. It is conceivable that making measurements at workplace level is inappropriate since innovative work is often undertaken in independent work places or enterprises which often cannot take the credit for the value they bring to the enterprise or enterprise group. Income is credited to another unit in the enterprise which has the task of producing or merely selling the enterprise's products or services. Finally we measure contacts with customers and suppliers. Customer contacts are a natural and important part of service sector activities and this would explain why the variable does not have an impact in the analysis apart from in the manufacturing sector.

If we look instead at trade and industry broken down by different size groups, it is evident that in small enterprises, 20–99 employees, all tasks are positively significant for productivity while for the other groups it is more difficult to see a pattern. The importance of decentralisation for productivity can be compared with its importance for profitability. Even in a comparison of this type it is evident that the most important area of responsibility is the follow-up of results which is positive, even when we look separately at the different sizes of enterprises.

Table 3.2 The significance of decentralisation for productivity, per cent, 1997

	All	All enterprises broken down into:				
		Manu-facturing	Services	Small	Medium	Large
Planning work	2.6	4.5	2.7	3.3	-4.7	*
Follow-up on results/quality work	3.7	-6.4	2.9	3.9	20.3	*
Development of services/products	-3.4	-10.1	*	2.5	-6.3	*
Contacts with customers and suppliers	*	5.4	*	5.4	*	*

Source: NUTEK, FLEX-2-data

Note 1: * = Estimate is not statistically significant. The estimate is significant at a level of significance of 5 %.

Note 2: The percentage effect has been calculated by multiplying a change in the strategy variable by the estimated effect and then the total has been divided by the median value for productivity, for enterprises in each group (see also Appendix 3 table A:3.11).

Note 3: Small enterprises are defined as enterprises with 20–99 employees, medium-size enterprises have 100–249 employees and large enterprises have more than 249 employees.

Significance for profit

Table 3.3 shows the significance of learning strategies on our profit indicator. The common indicator of profit is return on capital but we do not use this indicator since our interest is in obtaining a maximisation of income per cost unit without placing this in immediate relation to capital as a limited resource. We therefore define profit as the ratio between the total income from operations (sales) and operating expenses.

Instead of going through the results in detail, which we leave to the reader, we would here mainly compare the results of the estimates of productivity with the results of the estimates of profit to see if any patterns emerge. See further Appendix 3, table A:3.10.

Table 3.3 shows that many of the learning strategies, as we measure them, are positively significant for an enterprise's profit.[55] In several cases they are also more significant for profit than productivity.

We can establish that, with a few exceptions, the same strategies show similar indications in the analyses of both productivity and profit, i.e. the effects point in the same direction. Programmes of human resource devel-

[55] The median value of our indicator for profitability is 7.8 per cent, i.e. incomes were 7.8 per cent greater than costs. See Appendix 3.

Table 3.3 Comparison of the effects of learning strategies on productivity and profitability, per cent, 1997

	Productivity	Profit
Degree of decentralisation	3.07	*
Increase in responsibilities and powers vs. no change or decrease	–4.98	16.20
Individual pay rates 1–20% vs. none	–2.91	–11.06
Individual pay rates 21%< vs. none	–8.37	–20.75
One HRD input vs. none	4.61	44.25
Two HRD inputs vs. none	*	33.75
Three HRD inputs vs. none	7.79	56.78
Change in number of employees with a university/ university college education	*	–0.02
Proportion of employees with a university/ university college education	5.55	5.34
Using the services of other enterprises	–4.00	–8.20
Proportion of employees still at the workplace during last 12 months	2.46	1.14
Cooperation inside *or* outside the region in R&D and human resource development vs. none	*	–6.53
Broad cooperation in R&D and human resource development vs. none	4.35	9.51
Range of innovations	–0.05	–0.43
Internal ICT use for communication	2.56	4.28
External ICT use for communication	1.09	1.78
Use of temporary employees	–0.44	1.27
Growth in productivity during last 12 months	0.08	*

Source: NUTEK, FLEX-2-data

Note 1: * = Estimate is not statistically significant. The estimate is significant at a level of significance of 5%.

Note 2: The percentage effect has been calculated by multiplying a change in the strategy variable by the estimated effect and thereafter the total has been divided by the median value for productivity, for enterprises in each group (see also Appendix 3 for assumed changes table A:3.11).

Note 3: For a complete account of the model's parameter estimates see Appendix 3 table A:3.10.

opment are positively significant for both productivity and profit in the enterprise. Human resource development strategies have the greatest effects and these are of remarkably great significance for profit. The profit of enterprises which have all three human resource development elements we measure is, on average, 50 per cent higher than those which do not have any human resource development at all. However, we would draw attention to the discussion on causality above in which learning is regarded as a long-term process. Despite the fact that we measure human resource development inputs in the same period of time as profit, we can assert that there is a cause and effect situation here. Likewise geographically extensive cooperation in research and development, proportions of employees with higher education, and ICT programmes to improve internal communications also have a positive effect on both productivity and profit.

We can note that our indicator for decentralisation of the work organisation is no longer statistically significant. However, the effect is calculated to have a positive value. In manufacturing and for small enterprises it is significantly positive while for the service sector as a whole and for medium-size and large enterprises it is significantly negatively. In all cases its percentage significance in respect of profit is merely a fraction of its significance for productivity.

The indicator of change in work organisation, which has a negative link to productivity, is positively correlated to profit. A change which gives more responsibilities and powers for the employees is associated with higher profit. However it is possible that the two work organisation variables, decentralisation and changes in responsibilities, eliminate each other in the analysis. As we have shown above, there is a positive relationship between them. We can also establish that the proportion of temporary employees has a positive effect on profit, even though it is small.

Chapter 4

Learning strategies in Swedish trade and industry in 1997

In general, learning strategies are given more emphasis in service enterprises than in manufacturing enterprises in Sweden. We also look more closely at individual sectors and find that the knowledge-intensive sectors (both manufacturing and services), which are characterised by work forces with high educational levels, are often outstanding. Thereafter we relate some of our results to indicators and results presented in a study made in 1991 of Sweden's workplaces[56]*. The analysis indicates a tendency towards a lower incidence of learning strategies in 1997 in comparison with 1991.*

Work organisation

A decentralised work organisation

The organisation of work is an overall strategic issue for an enterprise and one of the most important aspects to take into consideration when creating a learning organisation. As we argue in chapter 2 there are many ways of measuring work organisation. Here we have studied the levels in the organisation at which the responsibility can be found for the performance of the following tasks in the working process: planning of one's own work, reflection and consideration of work done, development of new services and products, and contacts with other parties. Diagram 4.1. shows the degree of decentralisation and is interpreted in the following way. For each sector there is a so-called box. The lower edge of the box comprises the first quartile, which shows the value attained by the 25 per cent of the enterprises in the sector with the lowest values. The upper edge of the box comprises the third quartile which shows the value which 75 per cent of the material are under. The difference between these two quartiles shows the diversion of incidence of a decentralised work organisation within each

[56] le Grand et al (1993).

sector. The box is partitioned by a median which shows the mid-value for the sector. Above the outside lines which are connected with each box the outliers and extreme values are shown. These deviate to a great extent from the other values for the sector.

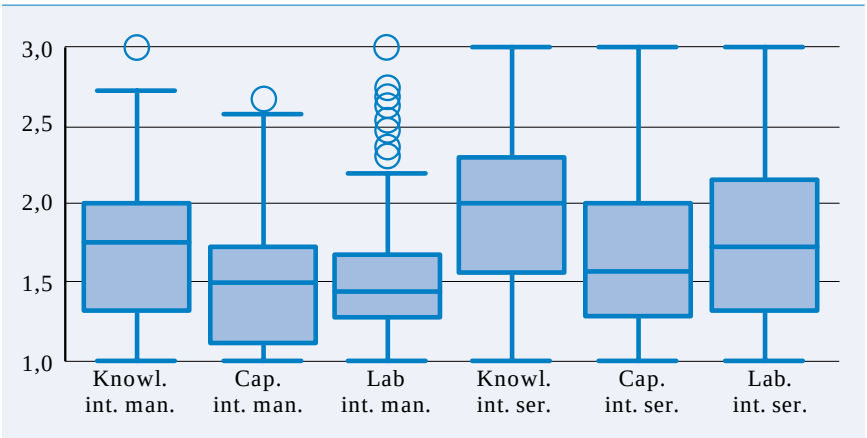
On average the service sectors have a higher median value than the manufacturing sectors. This indicates that these enterprises have decentralised the responsibility for performing working tasks to individuals and teams in production to a greater extent than enterprises in the manufacturing sectors. In the manufacturing sectors it is unusual for the enterprises to attain the maximum value of three in our decentralisation indicator, apart from certain divergent extreme values. Less than five per cent of the enterprises in the manufacturing sectors have a value of over 2.5 on our index. In the service sectors it is somewhat more common for the enterprises to have a value of three. This indicates that all tasks studied in these enterprises are completely decentralised to individuals or teams in production. In addition a considerably larger proportion of enterprises in the service sectors have an index value of 2.5 or more. In the case of labour-intensive and knowledge-intensive services some ten per cent of the enterprises have an index value which exceeds 2.5.

In all sectors there are enterprises which have the lowest value, 1, on the decentralisation index. This means complete centralisation (i.e. all tasks we have measured are performed by management or experts at the enterprise). In the manufacturing sectors between 10 and 25 per cent of the enterprises have a value of 1, while the proportion is considerably smaller among the service enterprises. See further Appendix 3, table A:3.12. The diagram also shows that the diversion is larger in the services sectors than in the manufacturing sectors.

Enterprises in the knowledge-intensive services sector have the highest degree of decentralisation. This sector has a median value which is higher than 2 which means that the tasks are performed by both individuals and teams in production and by the management of the enterprise. Knowledge-intensive manufacturing is the sector which takes second place where decentralisation in the organisation is concerned. The fact that knowledge-intensive enterprises – which are characterised by the great proportion of the staff with high educational levels – have a high degree of decentralisation indicates that there is a relationship between degree of decentralisation and the educational levels of the workforce (see Appendix 3,

table A:3.6). The least decentralised are the capital-intensive activities (both manufacturing and services) and labour-intensive manufacturing. All in all it emerges that most sectors have a median value which is lower than 2 which shows that the incidence of decentralised work organisations is relatively low in Swedish trade and industry (according to our method).

Diagram 4.1 Degree of decentralisation, box plot for each sector, 1997



Källa: NUTEK, Flex-2-data

Note: Max. = 3; complete decentralisation, Min. = 1; complete centralisation

A benchmark study recently performed by Sifo Research & Consulting has, among other things, examined innovative driving forces in the existing business culture in the Nordic countries and whether the enterprises have an innovative working climate. The study shows, in the same way as our results, that the incidence of learning organisations is relatively low. The Sifo study shows that creativeness is low and that learning has declined in comparison with previous years. According to Sifo's results, management's needs of controls stand in the way of learning, renewal and concentration of the employees. Another major problem is the lack of time for learning and renewal. However, according to the study, young enterprises, "enterprises of the future" (which are often included in the knowledge-intensive sectors) have a more innovative working climate than traditional enterprises. Work organisations which are based on cooperation and learning develop working cultures which have a higher degree of innovation.[57]

[57] Sifo Research and Consulting (2000). Cf also with NUTEK (1999b).

It is a complex task to compare our results for 1997 with the study of the workplaces made in 1991, since the indicators used in the two studies are constructed in different ways. The breakdown into sectors also differs between the studies, for example the public sector is also included in the survey "Sweden's workplaces". However, we make so bold as to relate some of our results to results from the workplace survey for workplaces in sectors which are also represented in our material.

In the study "Sweden's workplaces" the degree of centralisation of the workplaces was measured as well as the proportion of workplaces which allowed the employees to reach decisions on their working duties and working methods. The results presented in 1991 show the influence exerted by employees over the planning and performance of their work was greatest in the engineering industry compared with the service sectors, including the knowledge-intensive banking sector. This result does not correspond with the results in respect of the degree of decentralisation presented above, i.e. that in 1997 the service sectors have, in general, a higher degree of decentralisation than the manufacturing sectors. The workplace study shows that the banking sector, which is part of the knowledge-intensive service sector, had a very low proportion of workplaces where the employees themselves made decisions on tasks and methods. Our results show the opposite, i.e. that knowledge-intensive service enterprises are those which have decentralised tasks most. The difference in results can partly be explained by the fact that the indicators were not designed in the same way. However they are intended to take the same tendency into account, namely the degree of decentralisation. Another explanation of the difference in results can be that six years have passed between the studies. A great deal can have happened in the enterprises and many, completely new enterprises have been established during this period, particularly in the knowledge-intensive sector which has a large number of decentralised work organisations. For example many small bank offices have closed down during the 90´s. It has been argued that in practice the tasks in these offices were not so highly qualified.

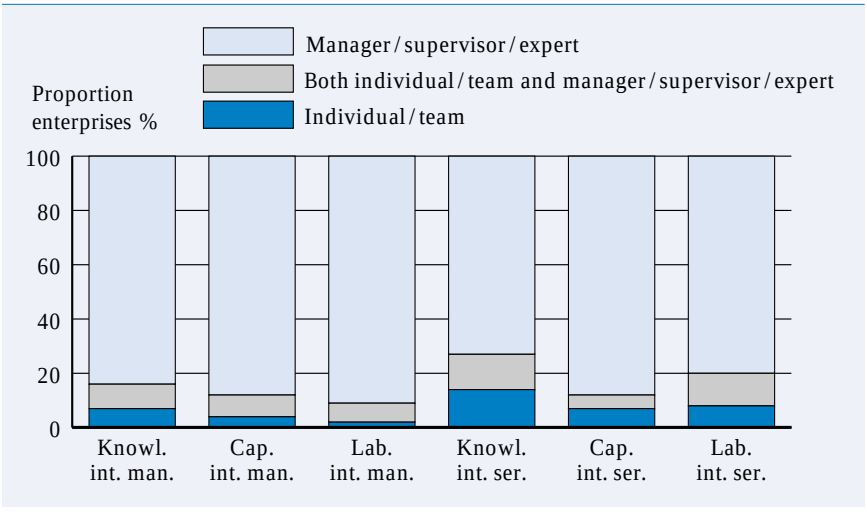
We have also studied the division of responsibilities for each of the different working tasks included in our index.

Enterprises in the knowledge-intensive sectors have decentralised the *daily and weekly planning* of the employees' work most. This result is not sur-

prising since human knowledge is the most important production factor in the knowledge-intensive sectors and decentralised planning is therefore often a natural part of the work. Where daily planning of work is concerned, we find that over 40 per cent of the enterprises in the knowledge-intensive sectors have placed the responsibility for daily planning with individuals and teams in the production. The division of responsibilities for weekly planning shows a similar pattern as above, but it also emerges that a much smaller proportion of the enterprises have given the responsibility for weekly planning to individuals in the production. In total just under 30 per cent of all enterprises stated that they have decentralised the responsibility for weekly planning to individuals and teams in the production, in comparison with some 40 per cent which gave the same response in respect of daily planning. See further Appendix 3 diagram A:3.13 and A:3.14.

According to our study there are no clear-cut differences between different sectors where the responsibility for performing quality control and results follow-up are concerned. We argue that these tasks show the extent to which there is scope for reflection on work performed, even for employees in production. If we analyse quality control and results follow-up separately, we find that it is in the sector knowledge-intensive manufacturing where the largest proportion of enterprises have stated that the responsibility for performing quality control rests with individuals and teams in the production. If we merely study results follow-up it emerges that the responsibility for this task lies to the least extent (in comparison with all other tasks studied) with individuals and teams in production. On average 80 per cent of the enterprises have stated that persons in management positions or experts perform results follow-up. This pattern is common to all sectors, but it is enterprises in knowledge-intensive services sectors which have mostly delegated the responsibility to perform this task to lower levels in the organisation. See diagram 4.2 which shows the proportion of enterprises in each sector which have given the responsibility for results follow-up to different levels in the organisation in 1997. See also Appendix 3, diagram A:3.15.

Diagram 4.2 Proportion of enterprises which have decentralised the responsibility for performing results follow-up, broken down by sector, 1997



Source: NUTEK, FLEX-2-data

The study "Sweden's workplaces" examined whether there are units at the workplace, below top management, which have their own responsibility for results. We can relate this indicator to the results we presented above where results follow-up is concerned. In 1991 it was found that this responsibility is delegated least in industry while the same responsibility in the banking sector was delegated by management in 95 per cent of the workplaces in the sector. Also in the trade sector the responsibility for results was delegated to a relatively large extent. The knowledge-intensive service sector excels in our analysis and banking is part of this sector. However, it can be seen from the diagram above that only 10 per cent of the knowledge-intensive service enterprises in our material allow individuals or teams to perform this task. There are noteworthy differences between the two studies. One explanation of the difference in results can be that "Sweden's workplaces" studied whether the *responsibility* for results was decentralised, while we have studied the persons who actually *perform* the results follow-up. The enterprises included in our study all have the responsibility for results at the workplace studied (see Appendix 2, telephone question 5).

Even if the responsibility rests with a manager, this person has the possibility to delegate the actual performance of the results follow-up to lower levels. But our results in comparison with the workplace study show that it is more common that the responsibility for results follow-up is delegated rather than its actual performance. If it is not a case of methods problems which lie behind these different results, the conclusion is that the trend in Swedish enterprises is towards centralisation of results follow-up.

A further work organisation principle which we have included in our decentralisation index is whether individuals and teams in the production participate in the *development of services and products*. If this work is linked to the performance of working duties in production, it would indicate, to a greater degree than the other factors, that the organisation is not merely decentralised but is also characterised by work flow systems. The results show that enterprises in the service sectors, mainly knowledge-intensive services, have decentralised the development of services and products to higher degree than the manufacturing sectors. One explanation can be that development work is the main activity of knowledge-intensive enterprises. Another explanation is possibly that that producers of services do not have the same opportunities as manufacturing enterprises to break down production into different functions, since the production and consumption of a service often take place simultaneously. Also these working duties are performed to a great extent at a high level in the organisation, i.e. by supervisors and managers. See further Appendix 3, diagram A:3.16.

One prerequisite for effective customer-oriented operations is that the employees in direct production have *contacts with customers and suppliers*. If a large number of employees at the enterprise (not merely managers and supervisors) have contacts with external parties, the work of meeting changes on the market and in other external environments is facilitated. According to our results the service sectors have a considerably higher degree of decentralisation where contacts with external parties are concerned. The most highly decentralised enterprises are those in the knowledge-intensive service sector, but also enterprises in the labour-intensive service sector demonstrate a high degree of decentralisation in this respect. One explanation for the high degree of decentralisation in the service sectors is that production in these enterprises is often synonymous with the performance of the service. It is then natural that employees in production, for example hair stylists and waiters, have direct contact with customers and suppliers. See further Appendix 3, diagram A:3.17 and A:3.18.

The *size of the enterprise* does not appear to be of any great significance for the incidence of decentralised work organisations. We have not found any noticeable differences in this respect but enterprises with a large number of employees seem, however, to have a somewhat higher degree of decentralisation in their organisations than smaller enterprises. This result can also partly be connected with the fact that there are more levels to decentralise to in larger organisations than in smaller. On the other hand we know from other studies that many managers in small enterprises choose not to grow in order to be able to retain control over the enterprise and its operations.

Change in the work organisation

External changes, not least new technologies, often lead to needs for change in the work organisation. It is therefore important that enterprises have a strategy which enables them to create appropriate conditions to meet external changes and changes in demand. We have studied whether extensive changes have been made in the organisation of enterprises during the period 1995 to 1997. Just over half of the enterprises in trade and industry have implemented changes in their organisations or were in the process of implementing change at the point of time when they responded to the questionnaire[58]. Capital-intensive manufacturing is the sector in which enterprises have implemented/are implementing changes to their organisations to the greatest extent, but due to a small number of observations in this sector we could not draw far-reaching conclusions in this particular case. On the other hand enterprises which are part of the labour-intensive sectors have responded to a great extent that they have not made any organisational changes during the period studied.

The changes can assume different forms and in this study we have mainly been interested in processes of continuous change since we argue that enterprises that implement this type of change work, to a great extent, on the basis of strategies of learning and reflection. The most common process of change is a continuous process. A relatively large proportion of enterprises have also stated that they have implemented changes which have had a specific beginning and which have thereafter been of a continuous character. Compared to other sectors, enterprises in the capital-intensive services sector have implemented continuous change most. (64 per cent of the enterprises in this sector have made this type of change.) Enterprises in the knowledge-intensive manu-

[58] Questionnaire survey was implemented in 1998.

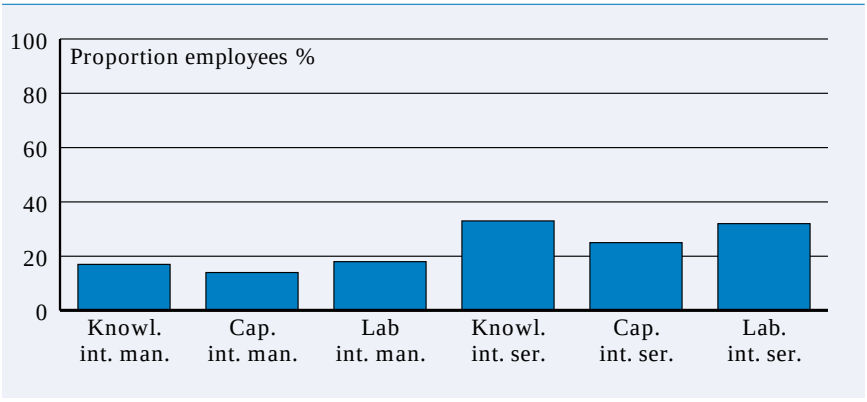
facturing sector have stated to the greatest extent that the change has had a specific beginning and end.

Participation in the process of change
The average degree of active participation in the process of change (for example in working groups and steering groups) is considerably higher in the service sectors than in manufacturing. We have found that the largest proportion of active participation in enterprises in the knowledge-intensive and labour-intensive services where more than 30 per cent of the employees have participated in processes of change. In the manufacturing sectors some 15 per cent of the employees have participated actively. See table 4.3.

Increased responsibilities and powers
The majority of the enterprises increased the responsibility and powers of the employees during the period 1995 to 1997. The capital-intensive manufacturing sector is the sector in which the largest number of enterprises has given more responsibilities to employees working in production. (However, there is not a sufficiently large number of observations in this sector to enable us to draw any far-reaching conclusions.) The two knowledge-intensive sectors have increased the responsibilities and powers of the employees to a great extent. A very small proportion of the enterprises (approximately 0.5 per cent) have decreased the responsibilities and powers of their employees during the period. Enterprises in the labour intensive services sector are those which have increased the responsibilities of their employees least. In these enterprises the responsibilities and powers of the employees have largely remained unchanged during the period.

In the light of our results in respect of increases in the responsibilities and powers of the employees, it is interesting to study the conclusions of "Sweden's workplaces" on career paths and development opportunities for the employees. A study was made of internal promotion and of extension of duties, i.e. when the duties are extended within the framework of the same job. The results show that the opportunities for personnel development were greatest in the banking sector in 1991. In the sector breakdown we have used, banking is included in the knowledge-intensive services sector which, according to our results, increased responsibilities and powers of the employees most during the period 1995 to 1997. In this respect our results and the results of the workplace study show a similar pattern in which increases in responsibilities and powers in our study can be compared with the

Diagram 4.3 Proportion of employees (not managers or supervisors) who have participated actively in processes of change, broken down by sectors, 1997



Source: NUTEK, FLEX-2-data

workplace study's examination of development opportunities at the workplace. See Appendix 4, diagram A:4.2.

Pay systems for extended responsibilities and human resource development

Pay systems can be designed to encourage the acquisition of certain desirable qualifications and the attainment of certain levels of performance by the labour force and thereby function as a form of support for the work organisation. We have limited our analysis to studies of the proportion of pay of employees working in production which is based on different types of individual pay criteria. Some 25 per cent of the enterprises have pay systems which are not based at all on individual criteria. On the other hand just over 40 per cent of the enterprises in Swedish trade and industry have pay systems in which 1-20 per cent of the pay is based on individual criteria. The remaining 35 per cent of the enterprises have pay systems in which between 21 and 100 per cent of the pay is determined individually.

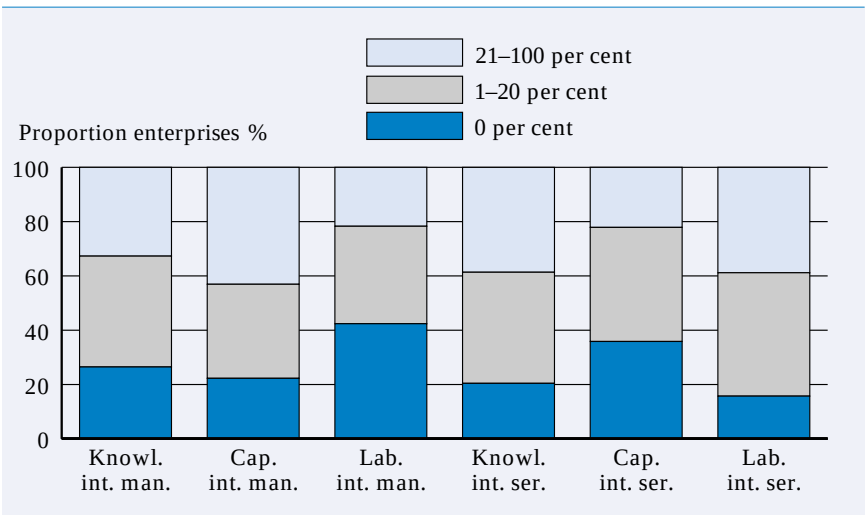
Enterprises in the labour-intensive manufacturing sector seem to use individualised pay systems least. Capital-intensive manufacturing, knowledge-intensive services and labour-intensive services are those sectors which have the most widespread use of individualised pay. Diagram 4.4 shows the proportion of enterprises in each sector which base parts of the pay on individual criteria. We use three intervals: 1) pay is not based at all

on individual criteria, 2) 1–20 per cent of the pay or 3) 21–100 per cent of the pay is based on individual criteria. In total the bars constitute 100 per cent of the enterprises in each sector.

The indicator of the *proportion* of the employees' pay which is based on different types of individual pay criteria does not include information on what these criteria are. Therefore we have supplemented the above with information on the qualifications and qualities of the employees which are encouraged with the aid of the pay system. Enterprises in which a high proportion of the pay is based on individual pay criteria often encourage many of the qualities in the labour force which we have studied. The sector which uses the largest number of the qualifications included (on average 4 out of 7) as a base for setting its wages, i.e. the sector which has the most sophisticated pay systems, is the labour-intensive services sector. Generally, enterprises in the services sector have more sophisticated pay systems than those in the manufacturing sectors.

It is also the case that the use of incentive-based pay systems varies to a certain extent according to the *size of the enterprises*. Enterprises with many employees tend to base wages more and more on individual criteria and to reward the qualifications they require when setting wages. This can possibly be related to

Diagram 4.4 Proportion of enterprises with pay systems based on individual pay criteria, broken down by sector, 1997



Source: NUTEK, FLEX-2-data

the fact that the more employees there are at an enterprise, the more complex the pay system becomes. It can also indicate that pay systems are expensive and difficult to administer in small enterprises.

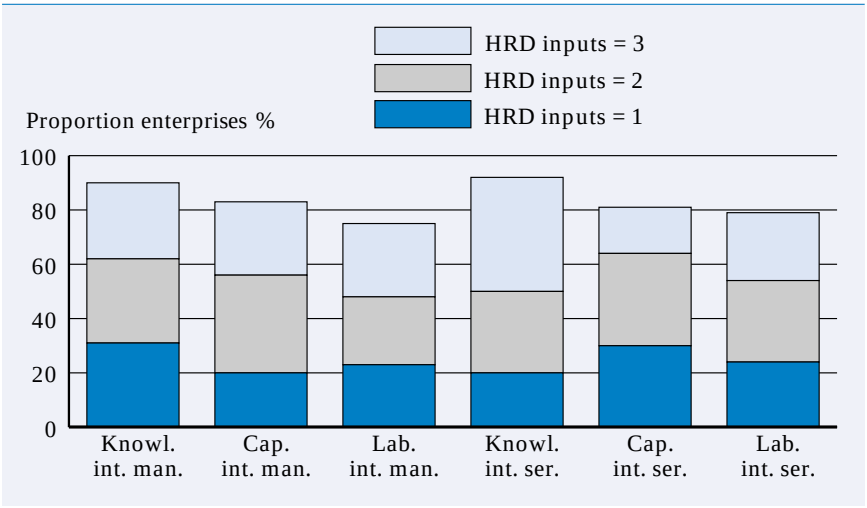
Human resource development

In this report we study and measure three different aspects of human resource development. We study whether enterprises in Swedish trade and industry have a *human resource development plan* for each worker in production, whether there are features of *organised human resource development in the everyday work*, and the proportion of the employees working in production who participate in *training paid for by the employer*. Enterprises which are given the value 3 on our index have extensive programmes of human resource development, i.e. they work with all three aspects, while enterprises with a lower value only use one or two of the human resource development inputs.

There are great differences between the sectors in trade and industry where the scope of human resource development at the enterprises is concerned. It has been known for some time that enterprises in sectors characterised by high educational levels have most human resource development. Our results also support this hypothesis. The knowledge-intensive services sector consists among other things of enterprises working with education, research, financial services and other areas where the labour force has a high level of education. This sector has the highest proportion of enterprises that have all the three human resource development inputs. In the knowledge-intensive services sector some 40 per cent of the enterprises have all the three human resource development inputs while less than ten per cent of enterprises in the sector do not have any form of human resource development. In the other sectors it is considerably rarer that enterprises have all three forms of human resource development. The sector in which enterprises responded to the greatest extent that they do not have human resource development in any of the forms we have studied is labour-intensive manufacturing. This sector is also characterised by low educational levels.

Diagram 4.5 shows the proportion of enterprises in each sector which have the forms of human resource development we have studied. It is possible to see for each sector the proportion of enterprises which have one, two or three forms of human resource development. Moreover the diagram shows the proportion of enterprises which do not run any form of human resource development according to our indicator, i.e. up to 100 per cent level in each bar.

Diagram 4.5 Proportion of enterprises which have a certain number of human resource development inputs, broken down by sector, 1997



Source: NUTEK, FLEX-2 data

Enterprise size is also a factor which affects the amount of human resource development. The more employees there are at the workplace, the more likely it is that the enterprise has extensive programmes for human resource development. However, the differences we have found in respect of the amount of human resource development seem to be greater between different sectors than between different size classes.

We have also made separate studies of the different human resource development factors. The knowledge-intensive service sector is the sector in which the enterprises have most elements of organised human resource development in the everyday work. It is also the sector in which most enterprises have stated that the employees have participated in training programmes financed by the employer.

Human resource development plans for each employee in production are most common in the knowledge-intensive manufacturing sector but also a large proportion of enterprises in the knowledge-intensive services sector have stated that they use these types of plans. Diagram 4.6 shows the proportion of enterprises in each sector which have human resource development plans for their employees and we can see that between 60 and 70 per

cent of the enterprises in the two knowledge-intensive sectors work with human resource development in this way.

A human resource development plan can be drawn up either orally or in writing. An oral plan can be likened to a planning talk between an employee and his/her supervisor or manager, and often results in a written plan of one form or another. In "Sweden's workplaces" a study was made of the degree to which the work places use development or planning talks and this is interesting to relate to our results. The workplace study shows that development and planning talks were more common among senior white-collar workers than other white-collar workers and blue-collar workers. Planning talks were most common in enterprises in the banking sector where over 95 per cent of the enterprises had planning talks with their employees in 1991. According to our sector breakdown, banking is part of the knowledge-intensive services and our results above show that this sector includes a large proportion of enterprises which have individual human resource development plans. According to our material these types of plans are most common in enterprises in knowledge-intensive manufacturing. However, in the workplace study these enterprises cannot be distinguished from other manufacturing sectors – the study has an indicator for all manufacturing which, in general, is lower for high level and low-level white-collar workers and blue-collar workers than for banking. If we combine all our different manufacturing sectors we also find a lower incidence in manufacturing than in knowledge-intensive services in 1997. See Appendix 4, diagram A:4.3.

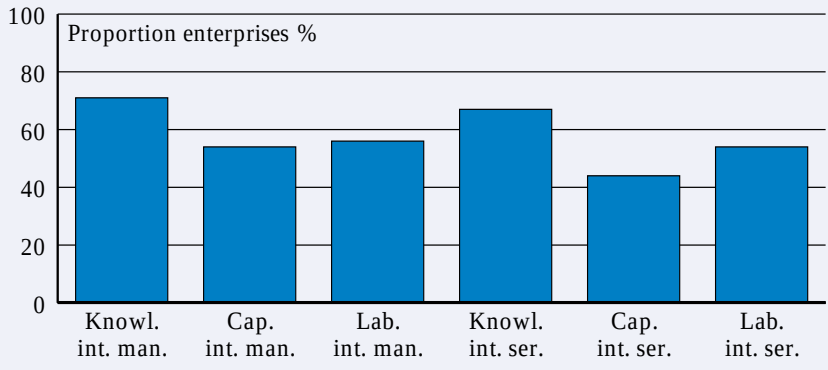
Our results can also be compared with personnel training statistics from Statistics Sweden. According to these statistics personnel training is mostly to be found in the areas of financial services, education and research which corresponds approximately to the knowledge-intensive services sector. According to the personnel training statistics, half of the employees in these areas participated in personnel training in 1999. This corresponds with our results.[59]

The NUTEK study "Kompetens – en bristvara?" containing data from 1999 shows that programmes of further education and training take place at some 80 per cent of the approximately 200 enterprises studied. Some 60 per cent of the employees in the enterprises have participated in education and train-

[59] Statistics Sweden (1999a).

ing programmes at work. The results we present here show that human resource development is most extensive in the knowledge-intensive sectors and, according to "Kompetens – en bristvara?", it also emerges that employees in these sectors are those who participate most in the planning of the further education and training programmes which are held. Furthermore it emerges that some 90 per cent of the enterprises experience difficulties in connection with education and training. Insufficient time and resources are the main problems.[60]

Diagram 4.6 Proportion of enterprises which have human resource development plans for all employees, broken down by sector, 1997



Source: NUTEK, FLEX-2-data

Recruitment

Educational structure

As a result of the increase in demand for well-educated employees, Swedish enterprises are experiencing problems today in recruiting new employees. The most common cause of the problem is the lack of applicants with a relevant educational background and adequate professional experience. The problems are greater where technical graduates are concerned. The effect has been an increase in the workload of existing personnel and even a

[60] NUTEK (2000c).

tendency to a decline in production. This affects the prospects of implementing various human resource development inputs and further education and training programmes for existing personnel.[61]

In order to show the need of recruitment strategies, we give prominence to results on changes in the proportion of persons with higher education among the employees at an enterprise. The demand for a well-educated workforce has increased in all sectors. At the same time as there has been an outflow of employees with low levels of education. The demand for labour changed in connection with the crisis of the 1990s when trade and industry drastically reduced its demand for labour with low levels of education.[62] When the economy began to improve again in 1993, the demand for labour increased, mainly personnel with higher education. Demand for personnel with university degrees in technology and science increased more than supply. NUTEK's future scenarios up to the year 2010 indicate that demand for personnel with university degrees in technology and science will continue to be greater than supply, despite the fact that the gap between demand and supply should diminish as an effect of the extension of programmes of higher education. Likewise the demand for persons with a technical-industrial upper secondary education and with an ICT education is expected to remain greater than supply.[63] NUTEK's future scenarios of demand for different skills can be regarded as a specification of requirements of the skills which will be needed to maintain high rates of growth. To meet the increase in demand for personnel with special skills, an increase in the supply of persons with a university education is required. This can be achieved through an increase in the immigration of labour but mainly through an increase in the number of applicants accepted at the universities.

An analysis of the educational structure of Swedish trade and industry, broken down by manufacturing and service operations and by knowledge-intensive, capital-intensive and labour-intensive sectors, shows that the most highly educated persons are mainly to be found in the service sectors. The proportion of persons with a university education working in the knowledge-intensive service sector is more than twice the proportion working in knowledge-intensive manufacturing. On average manufacturing industry has a larger

[61] NUTEK (2000c).

[62] NUTEK (1998).

[63] Statistics Sweden (1998) and the National Labour Market Board (2000).

proportion of employees with low levels of education. In comparison with data for Swedish trade and industry as a whole, we can see that the proportion of persons with a university education is somewhat lower in the group of enterprises studied. The difference is partly due to the fact that we do not include public sector operations and in these operations the educational level is, on average, higher than in trade and industry. The total proportion of persons with a university education in this study is 21 per cent. Studies which report the proportion in the entire economy arrive at some 26 per cent (1996).[64] Where both manufacturing and services are concerned, table 4.1 shows, for each sector, the proportions of employees who have a basic education, upper secondary education or higher education.

Table 4.1. Proportion of employees broken down by sector and educational category, 1997

	Basic education	Upper secondary education	University education	Total
Manufacturing				
Knowledge intensive	25	53	22	100
Capital intensive	35	54	11	100
Labour intensive	38	52	9	100
Services				
Knowledge intensive	11	41	48	100
Capital intensive	22	67	11	100
Labour intensive	25	59	16	100
Total	***26***	***54***	***21***	***100***

Source: NUTEK, FLEX-2-data

Note 1: The data covers all persons employed in the enterprises included in the FLEX-2 study, 1997.

Note 2: The figures have been rounded off, and not all total amount to 100 per cent.

Note 3: Upper secondary students who have not obtained a school leaving certificate are included in the compulsory school group. The university educated include all those who have obtained at least 20 university points (one-term's full-time studies) or the equivalent.

Table 4.2 shows changes in the number of employees with different levels of education in each sector in trade and industry for the period 1993 to 1995 and 1995 to 1997. It can be seen from the table that there are differences between these two periods of time. The period from 1993 to 1995 is characterised by a relatively rapid and large increase in employment in both the industry and services sectors, while the increase slackened off during the latter period. This is probably an effect of the large reduction in

[64] NUTEK (1998).

persons employed during the turbulent years at the beginning of the 1990s. We know from earlier analyses that a large proportion of persons with an upper secondary level education, who lost their jobs in the beginning of the 1990s, were re-employed when the economy began to improve again in 1993. Persons with higher education have also probably taken a large proportion of the jobs.[65] We also know that the increase in the number of employed is made up of men and that unemployment increased for women during the same period. Unemployment figures for women would probably have increased even more if the large increase in temporary hourly paid workers had not been included in employment statistics. In exactly the same way as for the economy as a whole, it is possible to see a reduction in the number of persons employed who only had compulsory, basic education as their highest level of education in the period 1995 to 1997. The changes in each sector correspond approximately to those which can be observed in analyses of the entire economy.[66]

As we can se from the table the labour-intensive manufacturing industry deviate from other manufacturing activities. In this sector, the number of persons with low educational levels increased more than in other manufacturing sectors in the first period. There is a reduction in the numbers with a low educational level in the second period, which is exactly the same as for other manufacturing activities, but to a considerably smaller extent. In the services sectors the labour-intensive activities increase their levels of employment to a much smaller extent than the other service sectors in both periods in respect of all educational groups. Many of the job opportunities which disappeared in the beginning of the 1990s were in labour-intensive activities, both manufacturing and services, and these jobs have not been re-occupied to a corresponding extent. The large increases in the numbers of employed are to be found in knowledge-intensive services even though the sector is small compared to the labour-intensive sector. It is mostly persons with higher education who were recruited. In the light of this information we draw the conclusion that many of the persons with a higher education entering the labour market have found jobs in new activities.

[65] NUTEK (1999a).

[66] NUTEK (1998).

Table 4.2 Changes in number of employed with different levels of education between 1993–1995 and 1995–1997, per cent, by sector

	Change 1993–1995			Change 1995–1997		
	Basic ed.	Upper sec. ed.	University ed.	Basic ed.	Upper sec. ed.	University ed.
Manufacturing						
Knowl. int.	3	17	19	–15	-2	7
Cap. int.	–3	9	7	–11	-5	4
Lab. int.	8	19	21	–5	1	4
Services						
Knowl.int.	23	27	30	4	10	16
Cap. int.	12	5	11	3	7	15
Lab. int.	0	14	14	–7	3	4
Total	***5***	***15***	***21***	***–7***	***2***	***10***

Source: NUTEK, FLEX-2 data
Note 1: The data covers all persons employed in the enterprises included in the FLEX-2 study.
Note 2: The figures have been rounded off, and not all total amount to 100 per cent.
Note 3: Upper secondary students who have not obtained a school-leaving certificate are included in the compulsory school group. The university educated include all those who have obtained at least 20 university points (one-term's full-time studies) or the equivalent.

During the 1990s there has been an increase in the inflow of students to programmes of higher education. However, the proportion of young people who are admitted to higher education programmes within three years of the completion of their upper secondary school is lower in Sweden than in several OECD countries with which we usually compare ourselves.[67] It is probable that the change in inflow of students is partly an effect of the fact that it is easier to obtain a job today than it was a few years ago, and partly an effect of low incentives for university studies. Higher education is totally dimensioned, i.e. a limited number of applicants are accepted to university studies. The allocation takes place on the basis of different quotas, for example applicants applying for admission directly after upper secondary school, applicants with certificates from folk high schools, applicants who have passed the university entrance examination, and applicants with experience of working life. The number of applicants is greater than the

[67] Statistics Sweden (1999b).

number of accepted for all groups. Society would thus benefit by increasing the total number of applicants accepted at the universities and particularly for those applying directly after upper secondary school, since these are young persons whose education will benefit society for a long period of time. Of those already studying at university, more are staying on longer: they are extending their education from, for example, a BA to an MA. This can be positive for the quality of the labour force but it also takes resources from new places. In addition to this Sweden has a low frequency where taking examinations is concerned compared to OECD, which is a reason for concern.[68] One conclusion is that there are efficiency problems in higher education which put Sweden's future prosperity at risk.

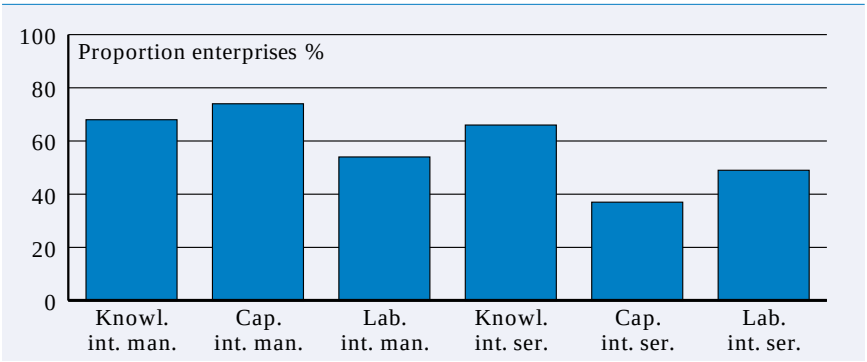
Services of other enterprises

Using the services of other enterprises within an enterprise's main activity is a way for the enterprise to obtain rapid access to know-how. We have studied the proportion of enterprises in trade and industry which used this strategy to meet special needs of skills in their main activity in 1997. Of the enterprises in trade and industry, approximately 50 per cent used the services of other enterprises during the year. It is much more common that enterprises in the manufacturing sectors use the services of other enterprises than those in the service sectors. In knowledge-intensive and capital-intensive manufacturing some 70 per cent of the enterprises used hired personnel to meet needs for special skills (however, the results for capital-intensive manufacturing are somewhat uncertain due to the small number of observations). One explanation of the stronger tendency of the manufacturing industry to use the services of other enterprises can be that these enterprises mainly use the services of service enterprises. A large proportion of the manufacturing enterprises purchases services from knowledge-intensive service enterprises.

Among the service sectors the use of the services of other enterprises is most common in knowledge-intensive services sector where enterprises purchases buy services from each other to a great extent. Otherwise it is possible that the service enterprises mainly purchase services of a more domestic character.

[68] Government Official Report 2000:7.

Diagram 4.7 Proportion of enterprises which used the services of other enterprises to meet needs of special skills, broken down by sector, 1997



Source: NUTEK, FLEX-2-data

Where the differences between *sizes of enterprises* are concerned, the analyses show that the use of the services of other enterprises increases with the size of the enterprise. Of enterprises with more than 250 employees some 75 per cent have used this strategy to meet needs of special skills. We know that the small enterprises, despite a lower incidence, have a higher proportion of their total workforce made up of persons hired via other enterprises. This is due to the fact that even if they are few, they constitute a larger proportion of the workforce in the small enterprises.

Cooperation with other parties

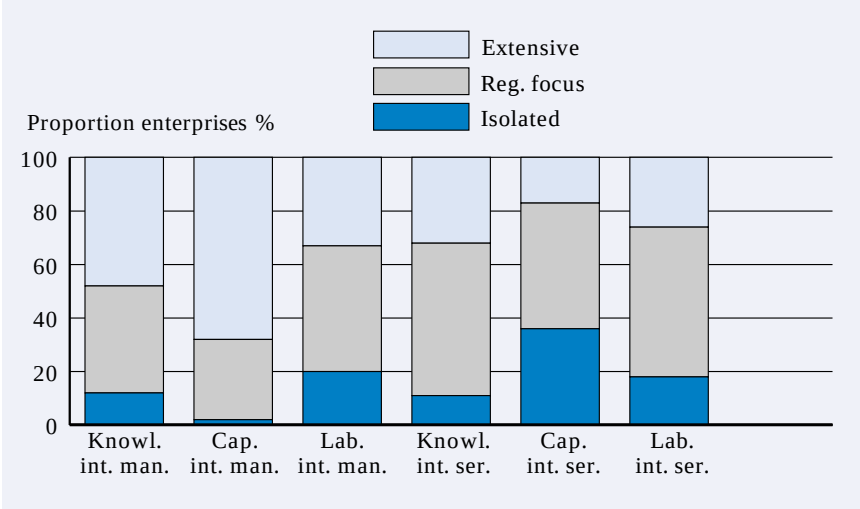
Learning in an enterprise takes place increasingly through contacts with others. Cooperation can be positive for enterprises in many different ways. Here we measure the incidence of cooperation in the areas of R&D and human resource development in the different sectors of trade and industry. Cooperation is measured through the study of three different groups of enterprises. The first group we refer to as "isolated" since they state that they have no form of cooperation with other parties at all. The next group consists of the enterprises whose cooperation with other parties has a geographic focus, either within their own region *or* outside the region. The last group consists of the enterprises which have broad geographic cooperation, i.e. they cooperate with other parties located both inside and outside their own region.

Diagram 4.8 shows the type of cooperation pursued by enterprises in different sectors. It is possible to see for each sector the proportion of enterprises which are isolated, whose cooperation has a focus, and whose cooperation is geographically broad.

In the manufacturing sectors there is a large proportion of enterprises which have a broad network, i.e. cooperate both inside and outside the region. Particularly in capital-intensive manufacturing industry the proportion of enterprises that have broad geographical cooperation predominate, but since we have fewer number of observations from this sector we will not be able to draw any definite conclusions.

The proportion of enterprises whose cooperation has a regional focus, i.e. they cooperate only with parties either inside or outside their own region, is considerably higher in the service sectors than in manufacturing industry. One reason for this can be that the production of services is often local in character, for example the labour-intensive services sector includes, for example, restaurants whose production activities focus on enterprises and households in the region. All in all the service sectors include a greater proportion of enterprises which can be characterised as isolated than the manufacturing sectors.

Diagram 4.8 Proportion of enterprises that cooperate with other parties in the areas of R&D and human resource development, broken down by sector, 1997



Source: NUTEK, FLEX-2-data

The capital-intensive services sector is the sector that has the largest proportion of enterprises which are characterised as isolated in respect of co-operation in R&D and human resource development. Over 30 per cent of the enterprises in this sector do not have any form of cooperation with other parties in these fields.

Table 4.3 shows the proportion of enterprises in trade and industry which cooperate with other parties: customers and suppliers, other enterprises, institutes of education, government agencies and other organisations in the areas of R&D and human resource development.

The most common partners in cooperation in the areas of R&D and human resource development are *customers* and *suppliers*. It is just as common that cooperation with these takes place both inside and outside the region. Other common partners in cooperation are different *organisations*. Cooperating with other *enterprises* in development work is also relatively common both inside and outside the enterprises' own regions. On the other hand, when we study cooperation with *institutes of education* and *government agencies*, we find that it is much more common that cooperation takes place within the enterprise's own region, rather than outside. In other words proximity to institutions of this type is important to the enterprises since it is less common that cooperation takes place if the institutions are located outside the region.

Table 4.3 Proportion of enterprises that cooperate with each party in the areas of R&D and human resource development, 1997

Cooperation actors	Proportion of enterprises (%)
Customers/suppliers	
- within the region	42
- outside the region	34
Other enterprises	
- within the region	33
- outside the region	29
Institutes of education	
- within the region	28
- outside the region	9
Government agencies	
- within the region	15
- outside the region	7
Other organisations	
- both within and outside the region	38
Total	***82***

Source: NUTEK, FLEX-2 data

Where differences between *sizes of enterprises* are concerned, a greater proportion of large enterprises has a broad geographical network than small enterprises. The larger the number of employees the enterprise has, the more common it is that the enterprise cooperates with other parties both inside and outside its own region. The differences between the size classes are particularly great where cooperation with education institutes such as universities, university colleges and upper secondary schools is concerned. One reason for this can be that small enterprises do not have the time that is necessary to build up relations with universities and university colleges. A further explanation can be that there are differences in educational backgrounds between small enterprises and universities. Communications are made difficult if there are few persons at the enterprise with higher education and who therefore speak the "same language" as university employees. Also, small enterprises that possibly have few employees with a higher education do not have the same opportunity to benefit from employees who have contacts with educational institutions at which they have studied, since fewer employees with a higher education leads to less communication with these institutions.[69]

[69] Larsson (1998).

Chapter 5

Concluding remarks

The focus of this study has been on learning and its importance and incidence in trade and industry in Sweden. Research into management and innovations underlines that enterprises can, in principle, increase their learning by recruiting skilled personnel, by cooperating with other parties and by developing learning processes in the organisation. In this chapter we link the significance of learning strategies for productivity and profit with the incidence of these strategies in Swedish trade and industry. Finally, with the aid of our results, we discuss the challenges to the policy for competitiveness and growth.

Importance and incidence of learning strategies

Of great importance for competitiveness

Competitiveness is a concept that is often used to include all the characteristics that have consequences for the financial development of enterprises. From the economic, and therefore the industrial point of view, increased productivity is the main objective. High productivity leads to an increase in value added per work input. Value added is the additional value that is created specifically in an enterprise. High levels of value added means that more can be distributed in the form of wages and profits. The prospects of achieving higher levels of prosperity are therefore closely associated with increases in productivity in trade and industry. However, the management and owners of enterprises have other objectives than merely increasing productivity. Therefore we have also made a profit analysis. The indicator we use for profit is gross profit. Even if it is a simple measure it focuses on overall effectiveness in the operations of enterprises, not merely the effectiveness of capital.

The learning strategies we have studied are of great importance for both productivity and profit. Of the different strategies, human resource development has the greatest effect on profit and productivity. The profit of enterprises that invest in human resource development is, on average, more than 50 per cent higher than enterprises that do not make investments of

this type. The difference in productivity is smaller, some eight per cent, but nonetheless significant.

Other strategies that have a positive effect on the performance of enterprises are a high degree of decentralisation in the work organisation and cooperation with other parties in the field of research and development. We can also show that the use of ICT to facilitate more effective internal and external communications is positively significant for both the productivity and profit of enterprises.

Learning strategies have also proved to be positively significant for the performance of enterprises in the separate analyses of the manufacturing and service sectors. However, human resource development inputs appear to be of more importance in the manufacturing industry than in the service sector.

Investments in what we call learning strategies are good for employees. We have shown in earlier analyses that a decentralised work organisation and human resource development in the everyday work are also related to a good working environment and higher levels of employment.[70] In addition we know that long-term growth in productivity is a prerequisite of greater prosperity. In this study we have been able to show that there is some alignment in the causes of, and driving forces behind, high levels of productivity and profit in the enterprises. It is of great importance that both decision-makers and enterprises (employers together with employees) improve their knowledge of these relationships.

Potential for increasing learning in Swedish trade and industry

There are examples in all sectors and size classes of enterprises whose work is based to a great extent on learning strategies. These demonstrate that it is possible for enterprises in all parts of trade and industry to invest in development strategies of this type. However the incidence of the strategies is relatively low. Therefore there is great potential to increase the incidence of all the identified learning strategies in Swedish trade and industry.

In generally learning strategies are mostly given emphasis in enterprises that are part of the service sectors. However, there are two exceptions. In the manufacturing industry it is more common to have geographically broad

[70] NUTEK (1996b) and NUTEK (1999a).

cooperation with other parties and to use the services of other enterprises where needs of special skills are concerned.

We can also see that the learning strategies we have studied are related to the knowledge-intensity of production. In most cases the knowledge-intensive sectors (both manufacturing and service) are outstanding in comparison with other manufacturing and service sectors. To a greater extent than enterprises in other sectors, enterprises that are part of the knowledge-intensive sectors have a decentralised work organisation, set wages on an individual basis, and have extensive human resource development. Enterprises in the labour-intensive manufacturing industry stand out in particular as having a low incidence of, in principle, all the learning strategies presented in this report.

Learning strategies are also more often to be found in large enterprises than in small enterprises, even if the difference between size classes is not as great as that between sectors. The difference between large and small enterprises is most distinct where human resource development is concerned.

Where the structure of the work organisation is concerned, the follow-up of results is the task that is most often centralised. On average 80 per cent of the enterprises stated that this task has not been decentralised to individuals or teams in production. In these enterprises results follow-up is not even organised in such a way that it is the joint responsibility of those working in production and their supervisors or managers. This is the case in both the manufacturing and the service sectors. The other working tasks studied (for example daily and weekly planning of work, contacts with external parties) are, in general, more decentralised, but there are still many cases where the responsibility for these tasks rests with management level.

In some 80 per cent of the enterprises there is human resource development of one form or another (according to our indicator). Enterprises in the labour-intensive sectors make least use of programmes of human resource development. Furthermore just over 80 per cent of the enterprises stated that they cooperate with external parties in the fields of R&D and human resource development. On the other hand the proportion that cooperate with educational institutions is relatively small.

Lower incidence of learning strategies in the 1990s?
We have also related the incidence of some of our learning strategies in 1997 to the incidence of new management strategies in 1991. This analysis indicates a tendency towards a lower incidence of decentralised work organisations and personnel development, in the form of planning talks or planning in 1997 compared to 1991.

At the same time as there are signs that indicate a lower incidence of new learning strategies in trade and industry in the end of the 1990s, formal demands in respect of education and skills of the labour force are still high. Comparisons of the periods 1993–1995 and 1995–1997 show twofold increase in the number of employees with higher education in the first period compared with the second period. The sectors that stand out where substantial increases in the demand for labour are concerned are the knowledge-intensive and labour-intensive service sectors. On the other hand the increase in the number of persons with a university education has slackened, particularly in the labour-intensive sectors. This is probably partly an effect of the turbulent years at the beginning of the 1990s when a large proportion of employees (mainly employees with low educational levels) had to leave their jobs. Statistics also show that, even during the most turbulent years when the number of employed decreased by some 14 per cent, the number of persons with a university education working in trade and industry increased by some 4–5 per cent. We also see that the sectors that accounted for economic growth are the knowledge-intensive sectors.[71]

In the light of the increased need for mobility on the labour market and the need for collaboration between different categories of employees and enterprises, there is good reason – from the perspective of labour market and industrial policies – to counteract the growing division of the labour market. This study also shows differences between sectors with a high and low degree of learning. Large parts of the labour force are divided up in the same way. There is a risk that increased mobility between enterprises and sectors in the economy may be counteracted.

Of great importance in manufacturing industry
and a high incidence in the service sectors
Learning strategies are positively *significant* for productivity and profit in all trade and industry. Human resource development inputs have the great-

[71] Eriksson & Ådahl (2000) and NUTEK (1999c).

est significance in this respect. The separate analyses we have made of the manufacturing and services sectors also show a positive significance that appears to be greater in the manufacturing industry than the service sector.

These strategies can mostly *be found* in enterprises in the service sector rather than in manufacturing industry, with the exception of broad geographical cooperation with other parties and the use of services of other enterprises for special skills needs. In both the service and manufacturing sectors the incidence is highest in knowledge-intensive operations, which are characterised by high educational levels.

In the light of the fact that learning is of great importance for manufacturing industry and that some 30 per cent of the total value of the Swedish economy is generated in these sectors, a higher incidence of these strategies in manufacturing industry would lead to higher productivity and profit. This in turn would lead to greater prosperity in the society as a whole. Despite the fact that the incidence of learning strategies is high in the service sectors, it is of great importance for the economy that learning is also developed here. The reason for this is that the services sectors account for most employment and most of the total value of the economy.

Learning – a challenge to trade and industry

In this study we have shown the importance of learning strategies for the development of enterprises and society. Another reason to increase knowledge of the importance of learning is that traditional explanatory factors such as access to airports, universities and raw materials are increasingly unable to explain the different performance of different regions. Studies show that different learning strategies contribute to explaining the differences in performance between regions despite similar basic conditions for production.[72]

Challenges to industrial policy

It is a challenge to industrial policy to develop a policy for learning. We have identified a number of areas where action should be taken, areas in which the government has a clear-cut responsibility to increase learning or where the government can contribute, directly or indirectly, to increase learning and long-term economic growth. Even if we give prominence here

[72] See, for example, NUTEK (2000b) and Lööf & Heshmati (2000).

to the challenges faced by industrial policy, education policy decisions must also include industrial policy considerations to a greater extent. We would also emphasise here that the employers and trade unions, as well as enterprises and individuals, have a responsibility in these matters. The objectives of the employees, i.e. greater influence, stimulating work, and a good working environment with high wages, are compatible with the objectives of employers in respect of greater productivity and profitability. There should therefore be good prospects of engaging both employers and trade unions in pursuing these issues further.

One area is *the supply of human resources.* Several studies have shown that there is an imbalance in the supply and demand for persons with different types of educational backgrounds. Regardless of the state of the economy, region and sector, a transformation of demand is taking place from persons with a low education to persons with a high education. However, the labour market is characterised by imbalances between the supply and demand of persons with different types of education. Educational statistics show clearly that, despite a number of reforms in the compulsory and upper secondary school, the proportion of students who leave school without a school-leaving certificate is high. Furthermore analyses of growth indicate that, in order to maintain high rates of growth, it is necessary to ensure that there is a supply of labour with the right qualifications.

Another area in which action should be taken is *human resource development*. It should be pointed out that the employers have the principal responsibility for human resource development at the workplaces. Government can promote human resource development, for example by supporting programmes such as the recently implemented Objective-4 programme and the new Objective-3 programme. These programmes are particularly important in the light of the fact that the sectors in trade and industry which employ most persons, the labour-intensive sectors, stand out as having the lowest incidence of, in principle, all the learning strategies presented in this report. Government also has a responsibility to develop measures which contribute to strengthening incentives for education and training, for example through individual skills accounts, and strengthening the incentives for greater mobility on the labour market.

Another issue where action should be taken is to increase *cooperation* between enterprises, on the one hand, and between enterprises and educational and research institutions on the other. Inputs should focus in particu-

lar on the small enterprises that often have limited resources and where cooperation is relatively small. Here new technology, in the form of *ICT*, can constitute an effective aid. The differences between large and small enterprises are particularly great in respect of cooperation with organisers of education and training programmes such as universities, university colleges and upper secondary schools. The reason for this can be a lack of time in the small enterprises, but differences in educational background can also make communication difficult. The cooperation has to be build up to a larger extent on the needs of the enterprises than of the perspectives of the educational and research institutions.

Government also has a responsibility to *synthesise and disseminate knowledge* on learning and to develop better methods for the assessment of the importance of learning for enterprises, individuals and society. Another aspect of this is that programmes are in progress that are intended to stimulate the use and development of accounting systems for intellectual capital, i.e. knowledge linked to the personnel and the enterprises' structural capital. It is important that these programmes are completed. To facilitate both the dissemination of information and research and development on learning in working life, improved statistics on the area are essential. They can also be supplemented by benchmarking programmes which make it possible for the enterprises to make their own analyses, for example with the aid of ICT and the Internet. The employers and trade unions also have a great responsibility to contribute to both the dissemination of information and to develop proposals for measures to increase learning.

Towards a splendid future

It is possible to further improve the capacity of Swedish trade and industry to make full use of the advantages and opportunities offered by, for example, greater international competition, changing markets and a rapid rate of technical innovation. The decisive factors for an increase in competitiveness in the long term can be the skills of the Swedish labour force and its experience of working in developmental and productive work organisations. The educational level of the labour force must be at least as high or higher than that in several major competing countries. The high levels of basic skills, in the form of reading, writing and arithmetic, act as a springboard for increased learning, even for those with a low formal education. It is possible that vigorous investments in education and human resource development can, in the short term, give Sweden a leading position in the welfare league.

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Appendix 1

Description of data and non-response analysis

Data collection

In 1998 NUTEK commissioned Statistic Sweden to collect data from Swedish workplaces[1]. The assignment included a cross section survey which consisted, in principle, of three stages. First the management of the workplace was contacted by telephone to identify those workplaces which were responsible for their own results.[2] A telephone interview was then made with workplaces which were responsible for their own results and which had been active throughout 1997. The telephone interview included questions which were regarded as being of particular significance in respect of, for example, the work organisation, human resource development and wage-setting procedures. See further Appendix 2. Thereafter a postal questionnaire was sent to the workplaces which contained questions concerning co-operation with external parties, development work, use of ICT, the situation with regard to products and competition, and organisational development for the period 1995 to 1997.

The cross section survey was supplemented with data from Statistic Sweden's databases for the years 1990 to 1997, partly data on the workplaces and enterprises from the company statistics database (BASUN), and partly data on employees from the database LOUISE. The financial information on the workplaces and enterprises are only available for major workplaces and enterprises for the years 1990 to 1995, while the information available for 1996 and 1997 covers all sizes of workplaces and enterprises.

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[1] In the report we use the well-known concept "enterprise" but since the units of analyses actually consists of workplaces we use the concept workplace in this appendix. Workplace is defined as geographically limited place where a permanent activity is carried on. A workplace is not always identical with an enterprise. An enterprise can consist of several workplaces at different places.

[2] Since the aim of the study is to relate different learning strategies to indicators of competitiveness it is a prerequisite that the workplaces we examine have responsibility for results.

Sample and response frequency in FLEX-2

A stratified random sample was taken from Statistic Sweden's central workplace and company database (CFAR/FDB file) covering the first quarter of 1998. The sample was stratified by sector and number of employees at the workplace. The survey included a gross sample of 5,681 workplaces which represents a population of work places with 5 employees and more corresponding to some 80,000 workplaces in Swedish trade and industry. Table A:1.1 shows the number of observations in FLEX-2, broken down by the different sub-samples which were made. The reason for this type of survey, and the fact that more samples were made, is that it was intended that FLEX-2 should also be a point of departure for an analysis of small enterprises/workplaces which are participating in the EU Objective 4 programme. The sample of Objective 4 workplaces (sub-samples 3 and 5) and the control groups for these (sub-samples 4 and 6) were therefore included in the survey. In addition the analysis of regional growth required an additional sample for some regions which were of specific interest. The FLEX-2 database also includes all workplaces which participated in the FLEX-1 survey, implemented in 1995, to enable so-called panel analyses to be made.

A:1.1 FLEX-2 survey: sub-samples

Sub sample	Gross sample	Number of responses*	Response frequency
1 Observations made earlier in FLEX-1 *Stratified Random Sample*	430	355	83
2 Workplaces 50 employees or more	1 663	1 366	82
3 Workplaces 5–49 employees – participating in Objective 4	1 099	699	64
4 Workplaces 5–49 employees – control group to the above	1 293	887	69
5 Public sector workplaces – participating in Objective 4	154	88	57
6 Workplaces in public sector – control group for the above	359	194	54
7 Regional additional sample Karlskrona–Ronneby, Gnosjö, Bergslagen	683	409	60
Total	***5 681***	***3 998***	***70***

Note:* Refers to the number of observations for which there is data from telephone interviews and questionnaires, or only data from telephone interviews.

The sub-samples in the report

In this report workplaces with 20 employees or more are the subject of analysis. Tables and non-response analysis in Table A:1.2 describes this population only. Despite the fact that we have information on almost 80 % of the workplaces which were selected for in the survey, we can say that the proportion of workplaces which responded to all questions in our survey is not as high, but comprises some 40 % of the net sample.

With the aid of database information we have rejected workplaces which are head offices, auxiliary workplaces and workplaces which, according to the databases, were not active in 1997 (390 workplaces). Contact interviews were used to exclude the workplaces which are not responsible for their results (114 workplaces). The non-response component consists of the workplaces with which Statistics Sweden failed to establish contact when collecting data, workplaces that did not wish to participate in the survey, and workplaces which did not return the postal questionnaire. For a number of workplaces we thus have information from telephone interviews and databases, but not the information which the questionnaire would have provided (Table A:1.2).

In this report we wish to be able to determine with absolutely certainty whether a workplace has, or does not have, a learning strategy and therefore we have chosen to analyse only the workplaces which have responded to all questions. This means that observations containing partial non-response have been excluded. Our net sample is consequently broken down into two parts, one part consists of our analysis data of 911 observations, and the other part the non-response component of 1,411 observations. This results in two disadvantages, one is that we risk losing representativeness which has the effect that the population we analyse can deviate from the net sample. Conclusions drawn from the net sample population are thus in danger of being marred by systematic errors or "bias". We study whether this is the case or not in detail below. The other disadvantage with the smaller amount of data is that a small number of observations result in an increase in variances and therefore statistical precision is reduced. If we assume there are no systematic differences between our analysis data and the net sample, this means, in statistical terms, that we lose in effectiveness but not in bias.

A:1.2 Summary of the analysis sample

Gross sample according to the company database	2 826
Overlap	390
Overlap since the workplace was not a profit centre	114
Net sample of profit centres only	2 322
Non-response: telephone interview not held	454
Number of interviews	1 868
Response frequency: telephone interviews, per cent	80
Number of responses to postal questionnaire*	1 357
Response frequency: postal questionnaire, per cent	57
Number of observations with complete answers	911
Proportion of observations with complete responses, per cent	38

Note:* For some enterprises which consist of one workplace all data has been collected with the aid of the postal questionnaire.

Non-response analysis

In the non-response analysis we intend to investigate whether the analysis data of 911 observations can be regarded as representative of the population that the net sample represents (workplaces with 20 employees and more in trade and industry). We perform the analysis by comparing the differences between the number of analysis data observations and the non-response represented by other observations in the net sample. If we cannot find differences between these groups we draw the conclusion that the number of analysis data observations can also be representative of the net sample's population.

We test for differences by estimating a model which is only based on file information. This means that we have information about the entire net sample. We use the following probability model:

Prob (analysis data)= f (sector, size group, multi-workplace, Objective 4, productivity, profitability, proportion with higher education; B) + u

in which *Prob* is the probability that the observation is part of our analysis data. This probability is regarded as a function of a combination of parameters and variables. The variable *sector* gives the sector to which the workplace belongs according to Statistic Sweden's industrial classification (SNI92) and which the sample is stratified in accordance with, *size group* gives the size and number of employees and is also a stratifying variable, *multi-workplace* informs whether the workplace is one of several in an enter-

prise, *Objective 4* informs that the workplace is participating in the EU Objective 4 programme, *productivity* and *profitability* are the indicators of financial results which are defined in chapter 3, and finally the *proportion of employees with university education* is included in the model since we know that this is highly correlated with the probability of having a decentralised work organisation. B is a vector of coefficients which states whether a higher or lower value of a variable results in a higher or lower probability that an observation is part of the analysis data. Finally the term u is a random term which is made up of non-specified differences between the groups which we assume we have expected value of zero.

These variables cover several important structural differences which we feel can exert an influence, above all on our analysis in chapter 3. We have chosen to estimate these coefficients with a logistic regression, and expressed coefficients in so-called odds ratios. In somewhat simplified terms if the odds ratio is equal to one there is no difference between the two sets of data. If the odds ratio is two this means that the probability that the observation is part of our analysis data is twice as high, and if the odds ratio is three the probability is three times as high etc. An odds ratio which is lower than one indicates analogously a lower probability that the observation is part of the analysis data.

We test whether the coefficients for productivity and profitability differ from the value 1 with the odds ratio. If the value was higher/lower than 1, the productivity values are on average higher/lower in our analysis data in comparison with our net sample. We also wish to know whether the coefficients of the other variables provide information on whether there are deviations between our analysis date and the non-response data. If this is the case this means that corresponding variables in the estimated statistical models in chapter 3 not only include differences between sector and sizes, they also standardise other estimated coefficients for differences in sectors and size classes which exist between the analysis data and the net sample.

Table A:1.3 shows that the coefficients of three variables are statistically significant (p-value is less than 0.10), this is the stratification variable which states that the workplace is in the trade sector and corresponding indicator for business services and other services. For this the estimate states that the analysis data have a lower proportion than the net sample. Neither productivity and profitability nor the proportion of employees with higher education differ between our analysis data and the net sample.

A:1.3 Estimated coefficients for logical regression

Variable	Coefficient	Standard Error	p-value
Workplace is one of several in the enterprise	1.083596	0.146004	0.551
Participates in Objective 4	1.134365	0.158833	0.368
Building sector compared with manufacturing	1.204951	0.276899	0.417
Trade sector compared with manufacturing	0.656154	0.112633	0.014
Communications compared with manufacturing	1.205883	0.251226	0.369
Business services compared with manufacturing	0.643492	0.147784	0.055
Other services compared with manufacturing	0.479173	0.118074	0.003
50–99 employees compared with 20–49	0.930978	0.12870	0.605
100–199 employees compared with 20–49	0.876247	0.14312	0.419
200–499 employees compared with 20–49	0.845475	0.141279	0.315
500 and more employees compared with 20–49	0.78618	0.160785	0.239
Productivity	0.999886	8.47E-05	0.179
Profit	1.004095	0.004028	0.308
Proportion with university education	1.005842	0.003812	0.124

Note: n = 2299: A number of observations are not included on account of incompleteness in the financial statistics.

The observations are weighted with weights based on sample probability but are added with a component which is intended to compensate for different response frequencies in the stratum. Estimations with only sample probabilities as a weight neither affect coefficient values nor significances.

Wald chi2 (14) = 26.70 Prob chi2 = 0.0211 Psuedo R2 = 0.0201

We draw the conclusion that our analysis data do not differ from the non response component in respect of economic performance, higher education intensity or workplace size and that therefore, in these respects, the data also represent in a reasonable way the population reflected by the net sample. We can establish that there is a deviation between the analysis data and the non response when we look at differences in the sectors. The non-response analysis show that the analysis data cover manufacturing industry to a greater extent than the services sector. In the report however this breakdown of sector and size is not used as an instrument of analysis. A sector breakdown based on capital and knowledge intensity is used instead.

Sector breakdown in the report

In the analysis of the incidence of learning strategies in Swedish trade and industry in chapter 4, we have broken down trade and industry on the basis of whether the activity is manufacturing or service, and thereafter whether the activities are capital intensive, human capital intensive or labour intensive. This differs somewhat from the sectors used in the stratification and has the

aim of taking into consideration the differences in knowledge intensity and use of capital. Earlier studies have indicated that higher knowledge intensity resulted in a higher probability that a decentralised work organisation had been introduced. In other words this alternative sector breakdown varies the analysis and describes differences in the manufacturing industry and services sectors which otherwise would not have been visible.

Capital-intensive activity in this context means activities in which proportion of the value of the wear and tear on capital (buildings and machines) is at least 25 %. Knowledge-intensive means activities where the proportion of employees with a university education of three or more years exceeds 5 %. Other sectors are included under labour-intensive activity. In the sector capital-intensive manufacturing only a few observations are included and therefore no significant conclusions can be drawn in respect of this sector, see table A:1.4 for more information. However, we have chosen to present the result of this sector since these workplaces are included in the total result for all sectors.

A:1.4 Sector breakdown

Manufacturing industry is broken down into following sectors	
Capital intensive:	Pulp, paper and paper products industry, steel and metal manufacturing, quarrying and petrochemical industry, and nuclear fuel industry.
Knowledge intensive:	Machinery, electrical, communications, instrument, and chemical industries and publishing.
Labour intensive:	Food, textiles, wood products, rubber and plastics, non-metallic mineral products and other manufacturing.
The service sector is broken down as follows:	
Capital intensive:	Real estate, transportation, postal services.
Knowledge intensive:	Financial services, insurance and industrial services, recreation and telecommunications etc. and education, research and development; health and medical care in the private sector.
Labour intensive:	Wholesale and retail, hotels and restaurants, refuse collection and disposal, other services, building.

Table A:1.5 shows how our analysis data, non-response and all observations are broken down by the sector classification which we use in the analysis. It can be seen from the table that the analysis data consist of a somewhat smaller proportion of workplaces in the services sector, as indicated by the first non-response analysis.

A:1.5 Sector breakdown used in the report's analyses, breakdown of analysis data and non-response

Alternative sector breakdown	Analysis data	Non response*	All
Manufacturing industry			
Knowledge-intensive	15	12	13
Capital-intensive	3	5	4
Labour-intensive	14	13	14
Services sector			
Knowledge-intensive	18	21	20
Capital-intensive	16	14	15
Labour-intensive	33	36	35
Total	100	100	100
n	911	1 411	2 322

Note: * The non-response consists of the net sample minus the analysis data.

When we make corresponding tests as above with this alternative sector breakdown, we find that there is *no* difference between the analysis data and the net sample, table A:1.6. The differences which existed in the sector breakdown we used in the sample are not repeated in this sector breakdown. The difference cannot therefore be explained by the fact that the number of sectors into which the material is divided has increased (i.e. a smaller number of observations in each group).

Our conclusion of this non-response analysis is therefore that we do not have a systematic deviation between the population of the analysis data and the population of the net sample. We can therefore use the analysis data to make statements on trade and industry for the size groups and sector aggregates which we use in the analysis.

A:1.6 Estimated coefficients from logistic regression sector breakdown as used in the analysis

Variable	Coefficient	Standard Error	p-value
Workplace is one of several workplaces in the enterprise	1.109093	0.148061	0.438
Participates in Objective 4	1.140833	0.15892	0.344
Capital-intensive manufacturing compared with knowledge-intensive manufacturing	0.707352	0.300014	0.414
Labour-intensive manufacturing compared with knowledge-intensive manufacturing	1.01082	0.240782	0.964
Knowledge-intensive services compared with knowledge-intensive manufacturing	0.659168	0.160166	0.086
Capital-intensive services compared with capital-intensive manufacturing	0.898513	0.221036	0.664
Labour-intensive services compared with knowledge-intensive manufacturing	0.74801	0.15691	0.166
50–99 employees compared with 20–49	0.945228	0.129506	0.681
100–199 employees compared with 20–49	0.880703	0.143199	0.435
200–499 employees compared with 20–49	0.877846	0.14803	0.44
500 and more employees compared with 20–49	0.848723	0.182649	0.446
Productivity	0.999891	7.84E-05	0.163
Profit	1.002984	0.003988	0.454
Proportion with university education	1.003893	0.003957	0.324

Note: n = 2299: A number of observations are not included on account of incompleteness in the financial statistics.

The observations are weighted with weights based on sample probability but are added with a component which is intended to compensate for different response frequencies in the stratum.

Estimation with only sample probabilities as a weight neither affect coefficient values or significances.

Wald chi2(14) = 11.70Prob chi2 = 0.6305 Psuedo R2 = 0.0201

Log likelihood = –1523.0916 Pseudo R2 = 0.0114

Appendix 2

Telephone interview and questionnaire

NUTEK
Swedish National Board for Industrial
and Technical Development

Change in Enterprises

Thank you for your participation in this important study!

The capacity of an enterprise to predict and take advantage of the changes occurring in the world around us is of great interest today. This is of crucial importance if Sweden shall attain high levels of economic growth once again. It can be done by improving and developing new services and products, introducing modern technology and new ways of organising work.

In 1995/96 NUTEK carried out a study about the ability of enterprises to change within the framework of a larger OECD project. The results showed interesting links between work organisation and productivity. We are now making a broader and deeper study with the aid of a questionnaire addressed to different enterprises on the Swedish labour market. We wish to come into contact with a person who has an overview of how the work is organised at the enterprise and how you work with change.

Those who answer this questionnaire will receive a summary of the most important results of the study. You can also order free of charge, comparative data (*bench marking*) between the enterprise/workplace and the sector. If you are interested please fill in the form at the end of the questionnaire.

Your answers will be handled confidentially and in accordance with the Official Secrets Act chapter 9 § 4. In formulating the questionnaire we have conferred with The Board of Swedish Industry and Commerce for Better Regulation. Your participation is voluntary but in order for us to be able to draw correct conclusions, it is necessary that everyone answers.

If you have any questions about the questionnaire, please contact Annette Nylund at NUTEK. If you have questions about the collection of the questionnaires, please call Susan Blomé-Pettersson at Statistics Sweden.

We would appreciate your answer within ten days. Please use the enclosed pre-paid return envelope.

NUTEK

Swedish National Board for Industrial
and Technical Development

NUTEK will process and present the results together with the National Institute for Working Life. The study will be completed in the autumn of 1999. Other participants in the project are: the Swedish Council for Worklife Research, the Swedish Transport & Communications Research Board, the Swedish EU Programme Office with the programme Objective 4, the Foundation for Knowledge and Competence Development and a number of Sweden's most prominent experts in the field.

Those who have worked on the questionnaire are: Annette Nylund, Jasmina Hopstadius, Cecilia Sjöberg, Ann-Marie Strand and Pernilla Öhrström from NUTEK and Anders Wikman from. the National Institute for Working Life

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Statistiska centralbyrån
Statistics Sweden
Intervju

PLEASE FACILITATE THE PROCESSING OF YOUR ANSWERS!

The answers will be read optically by a scanner.
It is therefore important to consider the following when you answer the questions!

– Use a blue or black ball-point pen

– Try to mark within the squares
– **like this** ☒
– **not** like this ☒

- If you need to change your answer, cover the whole square
– **like this** ■

If you wish to write more than there is room for in the square or if you want to explain something/be more specific, use the back of the paper - please do **not** write between or near the squares.

PLEASE KEEP IN MIND

- It is important that the answers are complete and correct but approximate amounts and estimates are sufficient.
- Please give full percentages.
- *Does not apply*. If any of the answer categories do not apply to the work place, please put a cross in this square. See for example question 2.

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Telephone interview questions for the workplaces

The telephone interview below includes all the questions that were asked in the interviews. Certain questions relating to large workplaces only were excluded from the telephone interviews with the smallest workplaces (5–9 employees). After the interview a questionnaire was sent to the workplaces.

THE WORK PLACE

1. Did your enterprise have more than one workplace in 1997?
By *workplace* we mean business activity at a specific address. If the enterprise has several workplaces, this means that there are activities at several addresses.
1 Yes 2 No

2. How many employees were there on average at the workplace during 1997?
The owner/owners are to be included if he/she/they work at the workplace and receive a salary.
[ ] number of salaried employees

3. When did business activities start at your workplace?
1 in 1996 or earlier 2 in January 1997 3 after January 1997

4. Was your enterprise owned, wholly or partly, by another enterprise in 1997? 1 Yes 2 No

FINANCIAL RESPONSIBILITY

Questions 5-6 only apply to multiple workplaces, i.e. enterprises which conduct their activities at more than one specific address. If the enterprise has several workplaces, this means that it conducts business activities at several addresses. If your enterprise is one workplace and operates at one address, → go to question 10.

5. Does your workplace have financial responsibility, i.e. it is responsible for the income and costs of the workplace?
1 Yes 2 No

6. If *No*, at question 5,
Do you nevertheless receive regular information about the income and costs of the workplace?
1 Yes 2 No

In order to be able to carry out the principal analysis of the productivity of the workplaces, information below about income and costs is required. For the majority of workplaces data on income and costs is obtained from official registers. For a small number of workplaces this type of data is not available since they constitute one of many workplaces within an enterprise. They are so-called multiple workplaces in a service enterprise.

Questions 7-9 only apply to multiple workplaces in the service sector. If your workplace does not belong to this category, → go to question 10.

7. Give the total *sales income* (including the value of products and services sold to other workplaces in the enterprise) in 1997. Answer in million SEK (one decimal maximum)
[ ] million SEK

8. Give the total purchases of products and services, i.e. the total costs of the workplace (including the value of products and services purchased from other workplaces within the enterprise) in 1997.

Answer in million SEK (one decimal maximum) ☐ million SEK

9. Give the total *wage costs* (including social costs) for the workplace in 1997.

Give answer in million SEK (one decimal maximum) ☐ million SEK

10. What proportion of those employed at the workplace work with the production of services (excluding administration)?

Proportion of the total number of employees. Answer in round figures. ☐ per cent

11. What proportion of those employed at the workplace work with the production of goods?

Proportion of the total number of employees. Answer in round figures. ☐ per cent

12. Is the enterprise/workplace a subcontractor to other enterprises/work places?
1 Yes, mainly to one 2 Yes, to several 3 No

THE ORGANISATION OF THE WORKPLACE
Organisation at the whole workplace

13. Is the work at the whole *workplace* organised so that people with different professional functions or positions carry out work together? *(one X per row)*

	Yes, Normally	Yes, in special cases	No, not at all	Does not apply
In the production of services and goods	1	2	3	4
In planning the work	1	2	3	4
In follow-ups of the results and quality control	1	2	3	4
In selection of production technology	1	2	3	4
In service and product development	1	2	3	4

Organisation in direct production

Direct production refers to the main activity of the workplace, that is to say separate support functions and administration are excluded. Use the examples of employees which best fit your particular workplace/enterprise.
For service enterprises for example: retail salesmen, drivers and salesmen in transport services, bank employees in banking, consultants in the consultancy sector, teachers in schools and other educational institutions, and nurses and doctors in health care.
For industrial enterprises for example: persons employed in manufacturing in the engineering industry, builders and skilled tradesmen at construction sites, persons engaged in developing services and products in development enterprises.

14. How many persons work in direct production? *(Give the number for respective group)*

number covered by collective agreement ☐ number of salaried employees ☐

15. How many organisational units is direct production at the workplace divided into?

1 1 2 2 3 3 or more

16. If direct production is organised in several organisational units, do personnel from different units co-operate with each other? *(one X per row)*

	Yes, Normally	Yes, in special cases	No, not at all	Does not apply
In production of services and products	1	2	3	4
In planning the work	1	2	3	4
In follow-ups of results and quality control	1	2	3	4
In selection of production technology	1	2	3	4
In service and product development	1	2	3	4

17. Which of the personnel normally carry out the following tasks in direct production? *(several X per row possible)*

	Individual employees	Work teams	Local manager/ supervisor	Somebody else, e.g. an expert, planner	Does not apply
Daily planning of one's own work	1	2	3	4	5
Weekly planning of one's own work	1	2	3	4	5
Quality control	1	2	3	4	5
Follow-up of results	1	2	3	4	5
Planning of training related to work	1	2	3	4	5
Introduction/training of employees	1	2	3	4	5
Personnel administration	1	2	3	4	5
Service and product development	1	2	3	4	5
Selection of production technology	1	2	3	4	5
Maintenance of technical equipment, e.g. machines and computers	1	2	3	4	5

18. Which staffs at the workplace usually have contacts with the following external parties? If you belong to a group of enterprises, the other enterprises in the group are considered to be external parties *(several X per row possible)*

	Individual workers in direct production	Groups of workers in direct production	Local manager/ supervisor	Somebody else, e.g. an expert, planner	Does not apply
- Suppliers	1	2	3	4	5
- Customers	1	2	3	4	5
- Other enterprises	1	2	3	4	5
- College/university	1	2	3	4	5
- Other public sector organisations	1	2	3	4	5
- Sector organisations	1	2	3	4	5

TRAINING AND PLANNING OF TRAINING

19. Does the work place have a human resource development plan for every employee in direct production?

1 Yes 2 No

20. Does the everyday/normal work in direct production contain elements of organised skills development?

1 Yes 2 No

21. If you answered yes to question 20,
What proportion of the everyday/normal work in direct production could be considered organised skills development? Answer in round figures. ☐ per cent.

22. Is the everyday/normal work in direct production organised so that: *(several X possible)*

- 1 the employee alternates between a number of different working tasks/operations
- 1 the employee is continuously assigned new working tasks
- 1 the supervisor continuously makes higher demands in respect of existing working tasks
- 1 the employee himself further develops existing working tasks
- 1 the employee himself develops new working tasks
- 1 does not apply
- 1 other

23. What proportion of the employees in direct production participated in training/courses which were wholly or partly paid for by the employer in 1997?

1	2	3	4	5
0 %	1-25 %	26-50 %	51-75 %	76-100 %

24. Have the employees in direct production participated in any of the following types of training/courses?

(one X per row)	The majority participated in this training	Some participated in this training	No training takes place in this field
Production technology specific to the enterprise	1	2	3
Other training specific to the enterprise	1	2	3
Sales and customer relations	1	2	3
Quality work	1	2	3
Environmental training	1	2	3
EU studies	1	2	3
Project leader or management development	1	2	3
Personnel welfare	1	2	3
IT (e.g. computer licence/Internet course)	1	2	3
Languages	1	2	3
Accounting , administration	1	2	3
Other training/courses	1	2	3

PAY SYSTEM

25. What proportion of the wages for the employees in direct production is based on different types of individual wage criteria?

1	2	3	4	5	6
0 %	1-20 %	21-40 %	41-60 %	61-80 %	81-100 %

26. Specify if you apply any of the criteria below as the basis for determining the wages of the employees in direct production: *(several X per row possible)*

	Based on individual performance	Based on group performance	Does not apply
Pace and volume of work	1	2	3
Social skills	1	2	3
Flexibility and ability to handle several working tasks	1	2	3
Ability to solve complex tasks	1	2	3
Skills/qualifications	1	2	3
Ability to work independently	1	2	3
Quality of work results	1	2	3

Now a question about wage dispersion. By proceeding from the highest and the lowest full-time wages at the work place it is possible to calculate the wage dispersion. See the example below.

27. Give the wage dispersion between the highest and the lowest wage expressed as a proportion of the highest wage for employees in direct production:

1	2	3	4	5
0-15 %	16-30 %	31-50 %	51-70 %	71-100 %

Example: Marianne is a group manager at the Electricity Enterprise. She has the highest salary and earns appr. SEK 26,000 per month.
Klas is a newly recruited electrician and has the lowest salary. He earns appr. SEK 12,000 per month.
26,000 - 12,000 = 14,000
*14,000 / 26,000 = 0.54 * 100 = 54 % (in order to obtain per cent, multiply by one hundred)*

OBJECTIVE-4 ENTERPRISES

Below there are a number of questions about how you have worked/are working with step 1 in the EU-programme Objective 4.

28. Has the enterprise participated/is it participating in the EU-programme Objective 4?
1 Yes 2 No,→ the interview ends 3 Do not know,→ the interview ends

The following questions are *only* for those enterprises who have participated/are participating in the EU programme Objective 4.

29. How have you worked/are you working with the analysis/plan of action? *(one X possible)*
1 on your own without consultants and guidance programmes
2 on your own with the aid of guidance programmes
3 with the aid of consultants and guidance programmes
4 with the aid of consultants who have their own concepts

30. Who has been/is the driving force in the work on the analysis, i.e. action plan in step 1 in Objective 4? *(one X possible)*
1 an external consultant/consultants (if such were engaged)
2 management
3 member(s) of the staff

31. If you have not co-operated/are not co-operating with a consultant in your work on the analysis/the action plan, what was the reason? *(one X possible)*

1 have not felt the need for a consultant and therefore not tried to engage one
2 have not tried to engage one (lack of time /lack of information, etc.)
3 have tried to engage a consultant but have not found anyone suitable

If you have not co-operated/are not co-operating with a consultant, → the interview ends.

32. Who initiated the contact with the consultant(s)? *(one X possible)*

1 our enterprise 2 the consultant contacted us and offered his/her services

33. How useful do you feel the work of the consultant(s) on the analysis/the action plan has been? *(one X possible)*

1 very useful 2 useful 3 not very useful 4 no use at all

Questionnaire for the workplaces

The questionnaire was preceded by a telephone interview. The questionnaire was sent to the workplaces that participated in the telephone interview and also consented to respond to the questionnaire. The questionnaire below includes all the questions. However, the questionnaire distributed to small workplaces (5–9 employees) did not contain all the questions included in the questionnaire sent to the large workplaces.

STRATEGY OF THE WORKPLACE

The first question is on the strategy of the workplace for long-term development and profitability. The alternatives in the first question provide an idea of what the questions in the questionnaire are all about. The "workplace" refers to business activity at a specific address. If the enterprise has several workplaces, it means that it has activities at several addresses.

1. Put a cross beside the alternatives which best describe your strategy for the long-term development and profitability of your workplace. (*not more than three*)

01 improve and develop new services and products
02 grow on existing market
03 establish the enterprise on new markets
04 develop contacts with customers, suppliers and other organisations
05 introduce new or develop existing production technology
06 introduce new or develop existing technology for exchange of information and knowledge
07 flexible forms of employment
08 decentralise responsibility at the workplace
09 invest in training and human resource development
10 develop a salary system which promotes quality and flexibility
11 create stability in the organisation
12 continuous change in the organisation
13 other

MARKETS

Below there are a number of questions about the markets of the workplace. Here we use the term *locally/regionally*. By this we mean your municipality and the neighbouring municipalities.

2. How large was the market share of the services and products of your own work place in each geographical market compared with other enterprises in 1997?
If you are not active in any of the markets mentioned below, mark *Does not apply*. *(one X per row)*

	0 %	1-9 %	10-19 %	20-29 %	30 % or more	Does not apply
locally/regionally	1	2	3	4	5	6
the rest of Sweden	1	2	3	4	5	6
outside Sweden	1	2	3	4	5	6

3. What proportion of your turnover did your largest customer account for in 1997? (*only one X*)

1-20 %	21-40 %	41-60 %	61-80 %	81-100%
1	2	3	4	5

4. What is the general price level of your services and products in relation to the price level of your most important competitors? (*only one X*)

1 Lower 2 About the same 3 Higher

CUSTOMERS

Below there are a number of questions about the customers of the workplace. Here too, the term *locally/regionally* is used and by this we mean your municipality and the neighbouring municipalities.

5. What proportion of your turnover in 1997 was standardised or customised services/products (*customised* - the customer participates in the design of the service or the product)? *(one X per row)*

	0 %	1-20 %	21-40 %	41-60 %	61-80 %	81-100%
Standardised	1	2	3	4	5	6
Customised	1	2	3	4	5	6

6. If you had customers who ordered *customised* services and products in 1997, what was the proportion of such customers: *(one X per row)*

	0%	1-20 %	21-40 %	41-60 %	61-80 %	81-100%
Local/regional	1	2	3	4	5	6
Total in Sweden (incl. local/regional)	1	2	3	4	5	6

7. If you had customers who ordered *standardised* services and products in 1997, what was the proportion of such customers: *(one X per row)*

	0%	1-20 %	21-40 %	41-60 %	61-80 %	81-100%
Local/regional	1	2	3	4	5	6
Total in Sweden (incl. local/regional)	1	2	3	4	5	6

SERVICE AND PRODUCT DEVELOPMENT

Now a number of questions about the development of services and products at the workplace.

8. How much did *the workplace* invest in service and product research and development, measured as a proportion of turnover in 1997? *(only one X)*

0 %	0.1-2 %	2.1-5 %	6-10 %	11-15 %	16-20 %	21-50 %	>50%
1	2	3	4	5	6	7	8

9. State the proportion of the services/products below in the sales of the *workplace* in 1997.

Services/products which have not changed in 1997. ☐ per cent

Services/products with minor changes in 1997. ☐ per cent

Services/products which are the result of major innovations/changes in 1997. ☐ per cent

total 100 per cent

Services/products which are the result of major innovations/changes 1995-1997. ☐ per cent

10. If your services/products are a result of minor or major innovations/changes made in 1997, what proportion of these was the result of your innovation or development work? *(only one X)*

0 %	1-20 %	21-40 %	41-60 %	61-80 %	81-100 %
1	2	3	4	5	6

11. Where did you get the ideas for <u>your</u> minor and major innovations/changes? *(one X per row)*

	Principal source	Contributing source	Does not apply
Own research and development	1	2	3
Employees at the workplace	1	2	3
Newly recruited personnel	1	2	3
Other workplaces or the management in the enterprise/group of enterprises	1	2	3
Purchase of external operations or other enterprises	1	2	3
Manufacture under licence/franchising	1	2	3
Customers	1	2	3
Competitors	1	2	3
Consultants	1	2	3

12. The use of information technology *) can lead to the development of services or products. Has the use of information technology resulted in you having: *(one X per row)*

	Yes	No	Does not apply
developed new services or products	1	2	3
developed existing services or products	1	2	3
customised services or products	1	2	3

*) By information technology we mean the use of computers and data communication for handling information.

CONTACTS OF THE WORKPLACE

The following questions are about co-operation between different parties. In the following questions we make a distinction between the exchange of ideas and experience, and more formalised co-operation. By *non*-formalised co-operation we mean the exchange of ideas and experience and by more formalised co-operation we mean co-operation which includes an agreement on a joint activity.

13. Specify if you co-operate at *the workplace* with customers, suppliers and/or other enterprises in the fields of marketing, co-ordination of purchases, etc. *(several X per row possible.)*

	Customers		**Suppliers**		**Other enterprises**		Does not apply
	local/ regional	other	local/ regional	other	local/ regional	other	
Marketing							
- *exchange ideas and experience*	1	2	3	4	5	6	7
- *more formalised co-operation*	1	2	3	4	5	6	7
Co-ordination of purchases							
- *exchange ideas and experience*	1	2	3	4	5	6	7
- *more formalised co-operation*	1	2	3	4	5	6	7
Human resource development							
- *exchange ideas and experience*	1	2	3	4	5	6	7
- *more formalised co-operation*	1	2	3	4	5	6	7
Recruitment							
- *exchange ideas and experience*	1	2	3	4	5	6	7
- *more formalised co-operation*	1	2	3	4	5	6	7
Research and development							
- *exchange ideas and experience*	1	2	3	4	5	6	7
- *more formalised co-operation*	1	2	3	4	5	6	7
Production of goods/services	1	2	3	4	5	6	7

This is a similar question to the previous one, with the difference that here we are interested in how you co-operate at the workplace with other parties than enterprises.

14. Specify if you co-operate at *the workplace* with colleges/universities, other public sector organisations, etc. in the fields of marketing, human resource development, etc. *(several X per row possible.)*

	Universities and colleges		**Upper secondary school**	**Other public sector organisations**		**Other org., e.g. trade org.**	Does not apply
	local/ regional	other		local/ regional	other		
Marketing							
- *exchange ideas and experience*	1	2	3	4	5	6	7
- *more formalised co-operation*	1	2	3	4	5	6	7
Human resource development							
- *exchange ideas and experience*	1	2	3	4	5	6	7
- *more formalised co-operation*	1	2	3	4	5	6	7
Recruitment							
-*exchange ideas and experience*	1	2	3	4	5	6	7
- *more formalised co-operation*	1	2	3	4	5	6	7
Research and development							
-*exchange ideas and experience*	1	2	3	4	5	6	7
- *more formalised co-operation*	1	2	3	4	5	6	7
Practical experience/apprenticeship	1	2	3	4	5	6	7

PERSONNEL AND ORGANISATION

Now a number of questions about the staff and organisation at the workplace.

Number of employees at the work place

15. Give the number of full-time and part-time employees at the workplace in 1997 (including those permanently employed and those employed in projects, but not consultants)

☐ number of full-time employees ☐ number of part-time employees

16. Give the number of employees covered by collective agreements and salaried employees at the work place in 1997.

☐ number covered by collective agreements ☐ number of salaried employees

17. Give the number of people in management positions at the workplace in 1997.

☐ men ☐ women

18. Was the top manager at the workplace in 1997 a man or a woman? 1 Man 2 Woman

Temporary employment

19. Did you employ personnel on a temporary basis in 1997? 1 Yes 2 No 3 Does not apply

20. If you employed personnel on a temporary basis in 1997, what was the proportion of this type of personnel? ____ per cent

Working hours

21. What proportion of the personnel had the following forms of working hours in 1997?

Fixed working hours	____ per cent
Flexible working time between certain hours	____ per cent
Free disposition of working hours	____ per cent
Total	100 per cent

22. Did you adjust working hours to business cycles in 1997? By *adjusting to business cycles* we mean adjusting working hours to peaks and slumps on the market. 1 Yes 2 No 3 Does not apply

23. If you adjusted working hours to business cycles in 1997, what proportion of the personnel was involved?

____ per cent

Services of other enterprises

24. Did you use the services of other enterprises in order to pursue your core business in 1997? If so, state the type of personnel that was used and for what reasons *(several X per row possible)*

	Peaks in work	Special requirement for skills	Other reasons	Does not apply
Production staff	1	2	3	4
Computer consultants	1	2	3	4
Other experts/consultants	1	2	3	4
Other personnel	1	2	3	4

25. If you used the services of other enterprises to pursue your core business in 1997, how large was this input compared to that of your own labour force?

____ per cent

Telework

26. Did any of the employees carry out their working tasks at optional locations outside their workplace (telework) in 1997? (e.g. in their homes, summer homes)

1 Yes 2 No 3 Does not apply

27. If some of the employees carried out some of their working tasks at optional locations outside the workplace (telework) in 1997, what proportion of the personnel was involved?

[ ] per cent

INFORMATION TECHNOLOGY

Below there are a number of questions concerning the introduction of information technology: who uses it and what it is used for. By information technology we mean the use of computers and data communication for handling information.

28. Did you use information technology at your work place in 1997?

1 Yes 2 No, → go to question 37

29. Indicate the proportion of *employees* at the work place who used information technology in their work in 1997:

1 0 % 2 1-25 % 3 26-50 % 4 51-75 % 5 76-100 %

Major implementations

30. Have you implemented any major installations of information technology during 1995-1997?

1 Yes 2 Ongoing 3 No

31. If you have implemented any major installations of information technology during 1995-1997, what were the reasons? *(several X per row possible)*

	Main reason	Contributory reasons	Does not apply
To meet demands from customers	1	2	3
New/changed services and products	1	2	3
Increased demand	1	2	3
Reduce costs	1	2	3
New forms of co-operation with other enterprises	1	2	3
Decentralised work organisation	1	2	3
Make the technology more user-friendly	1	2	3
Improve computer security and secrecy	1	2	3

Fields of application for information technology

32. Who uses information technology for:

(several X per row possible)	Individual employees & groups of employees	Somebody else, e.g. an expert, planner	Local manager or supervisor	Does not apply
Accounting, administration and personnel	1	2	3	4
Stores, orders and invoicing	1	2	3	4
Material and production control	1	2	3	4
Systems for development of services/ products (e.g. CAD, simulation)	1	2	3	4
Systems for development of production processes	1	2	3	4
Training (in-house training material)	1	2	3	4

33. Are the information systems in question 32 at the work place integrated, i.e. do they allow the exchange of data and information (data warehouse)?

1 Yes, all are integrated 2 Yes, some are integrated 3 No 4 Does not apply

Contacts with the help of information technology

34. Does the exchange of information or knowledge take place with the aid of: *(several X per row possible)*

	Yes, internally within the work place	Yes, with other work places (within the enterprise/group of enterprises)	Yes, with other enterprises, customers, suppliers, etc.	No
Networks	1	2	3	4
Common databases	1	2	3	4
E-mail	1	2	3	4
Internet	1	2	3	4
Electronic conferences	1	2	3	4

35. Indicate if you at your workplace use information technology in co-operation with other enterprises within the following fields: *(several X per row possible)*

	Customers	Suppliers	Other enterprises	Does not apply
Research and development	1	2	3	4
Marketing	1	2	3	4
Co-ordination of purchases	1	2	3	4
Recruitment	1	2	3	4
Human resource developm.	1	2	3	4
Production of goods/services	1	2	3	4

36. Did you use electronic commerce in 1997? Electronic commerce refers to ordering, paying or supplying services and products via data communication, e.g. Internet. *(several X possible)*

1 Yes, for purchasing services or products
1 Yes, for selling services or products
1 Yes, for distributing services or products
1 No

CHANGES IN THE ORGANISATION

These are a number of questions concerning changes in the organisation at the workplace.

37. Have you carried out any significant changes to the organisation of *the workplace* during 1995-1997?

1 Yes 2 Ongoing 3 No, → go to question 44

38. If you have made an organisational change during 1995-1997, has this been: *(several X possible)*

1 a change with a clearly defined start and end?
2 a change with a clearly defined start and then of a continuous nature?
3 of a continuous nature?

39. If you have made organisational changes in 1995-1997, what were the reasons for such changes? *(several X per row possible)*

	Main reason	Contributing reasons	Does not apply
To meet customer demands	1	2	3
New/changed services/products	1	2	3
Increased competition	1	2	3
Increased demand	1	2	3
Declining demand	1	2	3
Cost reduction	1	2	3
Changed forms of co-operation with other enterprises	1	2	3
Problems with working environment	1	2	3
Introduced new information technology	1	2	3
Introduced new production technology	1	2	3

40. Who has contributed initiatives in the work of change in the organisation? *(one X per row)*

	No initiatives	Few initiatives	Many initiatives	Most initiatives	Does not apply
Top management at the workplace	1	2	3	4	5
Personnel and planning department	1	2	3	4	5
Lower and middle management	1	2	3	4	5
Personnel affected by the changes	1	2	3	4	5
Trade union representatives	1	2	3	4	5
Consultants	1	2	3	4	5

41. Which groups of the staff were involved in the change of the organisation of the workplace? *(several X possible)*

Managers/ supervisors	Salaried employees with university education	Other salaried employees	Skilled workers	Unskilled workers
1	2	3	4	5

42. What percentage of each group of staff participated actively in the change process, e.g. in working teams, control groups etc.?

Managers/ supervisors	Salaried employees with university education	Other salaried employees	Skilled workers	Unskilled workers
☐ %	☐ %	☐ %	☐ %	☐ %

43. What forms of co-operation have been used during the organisational change of the workplace and to what extent? *(one X per row)*

	Considerable use	Have taken place	Have not taken place
Regular control and planning groups	1	2	3
Special project groups consisting of management and experts	1	2	3
Special project groups with directly involved personnel	1	2	3
Direct meetings with all personnel concerned	1	2	3
Referral process in which personnel have been able to submit their views for consideration	1	2	3

ACTUAL CHANGES

Below there are a number of questions about actual changes at the workplace.

44. How have the following changed during 1995-1997? *(one X per row)*

	Decreased	Unchanged	Increased	Does not apply
Customers and services/products				
Number of customers	1	2	3	4
Number of services/products	1	2	3	4
Responsibility and powers				
Responsibilities and powers of employees	1	2	3	4
Number of working tasks per employee	1	2	3	4
Number of newly appointed, internally recruited managers	1	2	3	4
Organisation				
Support/services which are carried out at another location than the workplace (e.g. telephone switchboard)	1	2	3	4
Central functions for activities which are carried out at another location than the workplace	1	2	3	4
Telework using IT	1	2	3	4
Personnel and skills				
Number of temporary employees	1	2	3	4
Personnel hired from other enterprises	1	2	3	4
Overtime	1	2	3	4
Skills requirements for the employees	1	2	3	4

45. Have any of items the below decreased or increased during 1997? *(one X per row)*
Estimate the change in per cent:

	Decreased by:						Increased by:	
	-30 or more	-20	-10	0	+10	+20	+30 or more	Does not apply
Delivery times/queuing times/waiting times	1	2	3	4	5	6	7	8
Time required for performing services/ producing goods	1	2	3	4	5	6	7	8
Complaints/dissatisfied customers	1	2	3	4	5	6	7	8

46. Have any of the following been a problem during organisational changes, introduction of information technology or development of services/products? *(several X per row possible)*

	Yes, for the organisation	Yes, for information technology	Yes, for services/products	No
Lack of capital	1	2	3	4
Lack of skills	1	2	3	4
Lack of time	1	2	3	4
Attitude of the employees	1	2	3	4
Regulations and standards	1	2	3	4

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Appendix 3

Parameter estimates

Correlations

The correlation gives the degree to which a variation in one variable is related to the variation in another variable. The correlation coefficient varies between –1 and 1 where 0 = no relationship, 1 = perfect positive relationship and –1 = perfect negative relationship.

A:3.1 Correlation between degree of decentralisation in 1997 and the incidence of continuous change in the organisation of the workplace during the period 1995–1997.

	Continuous change
Degree of decentralisation	0.048*

Source: NUTEK, FLEX-2-data

Note. * The correlation is significant at a level of significance of 10 %.

A:3.2 Correlation between active participation among employees and active participation among managers/supervisors in 1997.

	Active participation among employees
Active participation among managers/supervisors	0.281*

Source: NUTEK, FLEX-2-data

Note. * The correlation is significant at a level of significance of 10 %.

A:3.3 Correlation between degree of decentralisation and active participation among the employees in the process of change in 1997.

	Active participation among employees
Degree of decentralisation	0.296*

Source: NUTEK, FLEX-2-data

Note. * The correlation is significant at a level of significance of 10 %.

A:3.4 Correlation between degree of decentralisation in 1997 and increase in responsibilities and powers of employees during the period 1995–1997.

	Greater responsibilities and powers
Degree of decentralisation	0.113*

Source: NUTEK, FLEX-2-data

Note. * The correlation is significant at a level of significance of 10 %.

A:3.5 Correlation between the proportion of the wages of employees which are based on individual criteria and sophisticated pay systems which reward a number of relevant qualities in 1997.

	Sophisticated pay system
Proportion of pay	0.063*

Source: NUTEK, FLEX-2-data

Note. * The correlation is significant at a level of significance of 10 %.

A:3.6 Names of variables.

Variable	Definition
Nydec	Decentralisation index
Shrttime	Temporary employees as per cent of number of employees
Consult	=1 if business services engaged due to lack of professional skills
Skill1	=1 for incidence of one Human Resource Development (HRD) input
Skill2	=1 for incidence of two HRD inputs
Skill3	=1 for incidence of three HRD inputs
Lon1	=1 for individual pay criteria up to 20 % per cent of pay
Lon2	=1 for individual pay criteria more than 20 % per cent of pay
Nv2	=1 for geographically limited cooperation in R&D and HRD
Nv3	=1 for geographically broad cooperation in R&D and HRD
Itintern	Index of internal ICT use
Itextern	Index of external ICT use
In9597	Proportion of turnover in 1997 represented by new products and services
D_eg9597	Change in educational structure between 1995 and 1997
Staff97	Number of employees in 1997
Staff297	Number of employees in 1997, squared
Stff9697	Percentage change in number of employees between 1996 and 1997
Univ97	Proportion of employees with university education
Retent	Proportion of employees in 1997 who were also employees in 1996
Koncern	=1 if the enterprise is part of a enterprise group
Flerab	=1 if the enterprise has several workplaces
Under1	=1 if the enterprise is a sub-contractor to a main customer
Under2	=1 if the enterprise is a sub-contractor to several customers
Mal4	=1 if the enterprise is participating in Objective 4
Sasong	=1 if the enterprise makes great use of seasonal labour
Kapint	Total fixed assets per employee
Invkvot	New investments in relation to value added
Expkvot	Index if the enterprise exports more than the median enterprise in the sector
Dnetfve	Change in productivity between 1996 and 1997
D_ao9597	=1 if responsibilities and powers increased between 1995 and 1997
Ov_agg1 industry	=1 if the enterprise is part of knowledge-intensive manufacturing
Ov_agg2	=1 if the enterprise is part of capital-intensive manufacturing industry
Ov_agg3	=1 if the enterprise is part of labour-intensive manufacturing industry
Ov_agg4	=1 if the enterprise is part of knowledge-intensive service sector
Ov_agg5	=1 if the enterprise is part of capital-intensive service sector

Source: NUTEK, FLEX-2-data

A:3.7 Covariance between different learning strategies. Beta elasticities and relative risk ratios (rrr).

Nr		1	2	rrr 3	rrr 4	rrr 5	rrr 6	rrr 7	8	9	10	11	rrr 12	rrr 13	14	15	16	17
1	Degree of decentralisation	0.00	1.20	1.23	1.20	0.89	0.00	1.13	–0.02	0.13	0.00	–0.08	1.67	1.66	0.10	0.09	0.00	–0.04
2	More responsibilities and powers vs no change or reduction	0.18	0.00	1.50	1.28	1.94	4.04	5.22	0.03	–0.15	1.49	–0.11	0.79	0.69	0.48	0.13	0.00	0.21
3	Individual pay rates 1–20 % vs none	0.05	1.68	0.00	0.00	0.00	1.49	0.80	0.00	–0.14	0.88	–0.21	1.80	1.78	0.24	–0.09	0.21	0.00
4	Individual pay rates 21 %< vs none	0.00	1.42	0.00	0.00	1.45	3.15	2.08	0.00	0.13	0.00	–0.12	0.00	0.00	0.00	0.00	0.00	0.00
5	One HRD input vs. none	0.00	1.76	0.00	1.62	0.00	0.00	0.00	–0.12	0.00	0.74	0.14	1.36	0.00	0.26	0.16	–0.05	0.00
6	Two HRD inputs vs. none	0.10	3.82	1.88	4.01	0.00	0.00	0.00	–0.05	0.25	0.59	0.12	1.77	1.77	0.24	0.00	0.00	0.09
7	Three HRD inputs vs. none	0.24	4.86	0.00	2.63	0.00	0.00	0.00	–0.13	0.37	0.51	0.16	2.28	3.16	0.25	0.09	0.00	0.00
8	Change in no of employees with univ education	0.10	1.19	0.00	0.00	0.39	0.69	0.45	0.00	0.25	0.00	–0.13	0.00	0.00	0.13	0.11	–0.06	0.10
9	Proportion of employees with univ education	0.27	0.73	0.73	1.26	1.37	2.54	2.88	0.10	0.00	0.00	0.00	0.74	0.83	0.27	0.21	0.18	–0.29
10	Use of services of other enterprises	0.06	1.49	0.00	0.00	0.62	0.49	0.45	0.00	0.00	0.00	0.09	1.40	1.92	0.06	0.00	0.23	0.00
11	Prop employees still at workplace last year	–0.11	0.85	0.72	0.82	1.26	1.21	1.24	–0.04	0.00	1.13	0.00	0.00	0.76	–0.22	0.04	–0.03	–0.36

A:3.7 (continued)

12	Collaboration inside or outside region in R&D and HRD	0.29	0.87	1.66	0.00	1.26	1.61	1.93	0.00	-0.13	1.51	0.06	0.00	0.00	-0.17	0.38	0.00	0,12
13	Broad collaboration in R&D and HRD	0.20	0.75	1.76	0.00	0.00	1.69	2.80	-0.04	-0.08	2.05	-0.13	0.00	0.00	0.35	0.51	-0.12	0.00
14	Range of innovations	-0.05	1.19	0.00	0.00	0.00	1.13	1.15	0.00	0.10	1.13	-0.12	1.34	1.52	0.00	0.04	0.02	0.07
15	Internal ICT use for communication	0.06	1.24	0.81	0.89	1.27	0.00	1.14	0.03	0.16	0.00	0.04	1.89	2.34	0.59	0.00	0.31	0.07
16	External IT use for communication	0.03	0.00	1.57	1.11	0.88	0.00	0.00	-0.02	0.14	1.47	-0.04	0.00	0.87	0.12	0.30	0.00	0.00
17	Use of temporary employees	-0.02	1.14	0.91	0.00	0.00	0.00	0.00	0.02	-0.07	0.00	-0.20	1.13	0.00	-0.11	0.00	0.00	0.00

Source: NUTEK, FLEX-2-data

Note 1:HRD = Human resource development

Note 2:With the aim of estimating the learning strategies which have the highest degree of covariance we have made a number of regressions.. We have estimated so-called beta elasticities by standardising each continuous variable so that the mean value =0 and the standard deviation =1. Each column in the table is then a regression in which the number indicates the variable that is dependent. For regression purposes, use is then made of the other learning strategies as well as variables (see table A:3.6) which shall be kept constant for differences in production conditions. Where learning strategies which are categorical are concerned, (e.g. cooperation with other parties) a multinomial logistic regression has been used and relative risk ratios have been calculated in order to deduce which learning strategy has the highest covariance with the dependent variable. In other words each column the highest (absolute) value gives the variable which, in our data, has the highest covariance when a number of other factors are held constant.

A:3.8 Descriptive statistics of explanatory variables in the regression model. Minimum, median, mean and maximum values. n=915 weighted data.

Variable	Mean value	Standard deviation	Minimum	Maximum
Nydec	1.70	0.49	1.00	3.00
Shrttime	7.80	13.20	0.00	100.00
Consult	0.53	0.50	0.00	1.00
Skill1	0.24	0.42	0.00	1.00
Skill2	0.31	0.46	0.00	1.00
Skill3	0.28	0.45	0.00	1.00
Lon1	0.39	0.49	0.00	1.00
Lon2	0.31	0.46	0.00	1.00
Nv2	0.52	0.50	0.00	1.00
Nv3	0.30	0.46	0.00	1.00
Itintern	2.68	2.54	0.00	8.00
Itextern	1.35	1.68	0.00	8.00
In9597	14.81	23.46	0.00	100.00
d_eg9597	1.26	1.90	0.00	82.00
Staff97	80.53	148.29	1.00	3017.00
Staff297	28448.95	278808.50	1.00	9102289.00
Stff9697	11.35	148.83	-99.75	7646.15
Univ97	15.94	19.19	0.00	90.21
Retent	80.83	13.75	2.75	100.00
Koncern	0.50	0.50	0.00	1.00
Flerab	0.60	0.49	0.00	1.00
Under1	0.07	0.25	0.00	1.00
Under2	0.37	0.48	0.00	1.00
Mal4	0.09	0.28	0.00	1.00
Sasong	0.04	0.20	0.00	1.00
Kapint	218.01	293.29	0.00	2085.85
Invkvot	0.13	0.39	0.00	5.65
Expkvot	0.92	0.37	0.00	2.00
Dnetfve	0.12	0.49	-1.05	6.27
d_ao9597	0.60	0.49	0.00	1.00
Ov_agg1	0.13	0.33	0.00	1.00
Ov_agg2	0.02	0.14	0.00	1.00
Ov_agg3	0.18	0.38	0.00	1.00
Ov_agg4	0.17	0.37	0.00	1.00
Ov_agg5	0.13	0.34	0.00	1.00

Source: NUTEK, FLEX-2-data.

A:3.9 Descriptive statistics of dependent variables in the regression model. Minimum, median, mean and maximum values.

	Productivity	Profit
N	911	911
Lowest value	–4.30	–19.40
Percentile		
5	125.92	-1.77
10	166.48	-0.02
25	208.78	2.67
50 median	280.31	5.78
75	378.61	11.28
90	528.05	17.96
95	762.01	23.28
Maximum value	5171.64	242.76
Mean value	348.86	7.88
Standard deviation	317.22	9.75
Skewness	6.72	7.07
Kurtosis	73.56	150.16

Source: NUTEK, FLEX-2-data

Statistical model and estimation method

The statistical model we use is linear regression. We intend to explain the variance in the dependent variable, for example productivity, through a number of variables that, internally, can have a different degree of importance/significance over the variance. The total of these is that part of the variance which we can determine with the aid of the model. The remainder consists of a non-specified heterogeneity in the observations. This can be a result of factors that are not possible to measure or that are possible to measure but which we have not had the knowledge or resources to measure. Finally this can be a result of errors in the measurement of the variables we have included.

In table A:3.9 it can be seen that both indicators productivity and profit can be described as variables with positive skewed distribution of values (the mean value is larger than the median). We can also see that a number of extreme values affect the distribution so that assumptions in respect of a normal distribution must be rejected (this is also confirmed by statistical tests). We have therefore chosen to estimate the coefficients of our model, see table A:3.10, with a so-called robust regression method (see STATA statistical package rreg). This method attaches less importance to extreme values in the calculation of estimates than the method of ordinary least squares.

A:3.10 Regression results, estimates and standard errors. (n=911, weighted data N=11 208)

	Productivity		Profitability		Return on capital		Income per empl.		Costs per empl.	
	Coeff.	Stand Error	Coeff.	Stand Error	Coeff.	Stand Error	Coeff.	Stand Error	Coeff.	Stand Error
Decentralisation index	4.298	1.675	–0.028	0.123	–0.381	0.492	69.749	8.963	69.489	8.582
Proportion temporary employees	–0.620	0.061	0.037	0.004	0.022	0.018	–2.034	0.328	–1.756	0.314
Business services due to lack of skills	–11.198	1.563	–0.474	0.114	0.149	0.460	10.107	8.365	0.352	8.009
One HRD input	12.914	2.439	2.560	0.178	5.637	0.716	–47.955	13.070	–56.280	12.515
Two HRD inputs	1.949	2.432	1.952	0.178	4.076	0.712	12.644	13.013	0.007	12.460
Three HRD inputs	21.824	2.555	3.284	0.187	4.444	0.754	9.598	13.740	–4.532	13.156
Individual pay criteria 1–20%	–8.158	1.879	–0.640	0.138	–3.817	0.553	23.435	10.054	24.121	9.626
Individual pay criteria 21%<	–23.460	1.993	–1.200	0.146	–2.779	0.586	–71.368	10.690	64.642	10.236
Geographic limited cooperation in R&D and HRD	1.131	2.111	–0.377	0.155	–0.172	0.623	13.709	11.301	22.791	10.821
Broad cooperation in R&D and HRD	12.200	2.413	0.550	0.177	2.149	0.710	10.965	12.917	21.238	12.368
Internal ICT use	3.585	0.362	0.124	0.027	1.490	0.106	8.404	1.941	6.941	1.859
External Internal ICT use	3.063	0.496	0.103	0.036	–0.532	0.145	32.700	2.654	31.168	2.542
Range of innovations 95–97	–0.154	0.033	–0.025	0.002	–0.067	0.010	0.441	0.175	0.374	0.168
Change in employees with univ education	0.006	0.003	–0.001	0.000	0.000	0.001	–0.094	0.014	–0.095	0.013
Number of employees in 1997	–0.083	0.010	–0.001	0.001	0.004	0.003	–0.249	0.053	–0.280	0.051
Number of employees. squared	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Change in no. of employees last year	–0.008	0.006	0.003	0.000	0.003	0.002	0.123	0.031	0.124	0.030
Proportion of university graduates	3.112	0.054	0.062	0.004	–0.102	0.016	8.020	0.290	7.407	0.278
Proportion of employees employed throughout last year	1.382	0.057	0.013	0.004	0.144	0.017	4.607	0.308	4.543	0.295

A:3.10 (continued)

	Productivity		Profitability		Return on capital		Income per empl.		Costs per empl.	
	Coeff.	Stand Error	Coeff.	Stand Error	Coeff.	Stand Error	Coeff.	Stand Error	Coeff.	Stand Error
Part of a enterprise group	14.228	1.585	–1.724	0.116	–3.383	0.469	53.271	8.506	53.754	8.145
Several workplaces in the enterprise	3.411	1.671	–1.596	0.122	–8.460	0.492	39.492	8.940	42.821	8.560
Sub–contractor to one customer	–0.267	3.032	0.398	0.222	0.356	0.888	–57.596	16.231	–58.148	15.541
Sub–contractor to several customers	18.932	1.688	0.379	0.124	2.209	0.497	15.046	9.032	16.860	8.648
Participating in Objective 4	–18.739	2.694	–0.919	0.197	–1.148	0.793	–54.592	14.420	–52.257	13.807
Seasonal operations	–9.211	3.931	0.420	0.288	4.405	1.152	47.598	21.036	55.580	20.142
Capital intensive	0.145	0.003	0.005	0.000	–0.011	0.001	1.482	0.016	1.392	0.015
Investment ratio	–7.824	2.158	0.520	0.154	0.106	0.616	–177.597	11.260	–163.031	10.781
Export index	29.204	2.173	–2.767	0.159	–0.675	0.639	312.611	11.668	311.171	11.172
Growth in value added last year	10.643	1.640	0.010	0.001	–0.008	0.006	0.335	0.103	0.198	0.098
Change in work organisation	–13.949	1.628	0.937	0.119	–4.577	0.480	–32.365	8.713	–30.735	8.343
Profitability							–8.747	0.427	–13.243	0.408
Knowledge intensive industry	29.511	2.690	3.674	0.197	14.726	0.789	–207.717	14.411	–198.472	13.798
Capital intensive industry	31.869	6.100	–0.338	0.446	–1.736	1.785	–110.170	32.631	–164.950	31.243
Labour intensive industry	16.055	2.423	2.873	0.177	6.444	0.712	–167.118	12.980	–184.092	12.428
Knowledge intensive services	–43.389	2.612	0.705	0.191	1.520	0.766	–613.806	13.979	–589.109	13.385
Capital intensive services	–19.673	2.541	3.486	0.186	–7.049	0.750	–549.518	13.632	–530.889	13.053
Constant	65.866	6.269	4.023	0.459	10.845	1.845	39.387	33.603	51.384	32.174

Source: NUTEK, FLEX–2–data

Note 1: Extreme values in productivity, profitability, capital intensity and growth have been excluded.

Note 2: Estimates for sub–groups in industry and services can be obtained from the authors.

Note 3: HRD = Human resource development

A:3.11 Assumed changes in the calculation of percentage effects.

Learning strategy	Assumed change	Explanation
Decentralisation index	2	Change means that the enterprise goes from minimum value=1 to maximum value=3 in degree of decentralisation. This difference has been selected in order to make comparisons with earlier NUTEK studies from 1996.
Increase in responsibilities and powers vs. no change or reduction	1	Compared to no change or reduction in responsibilities, i.e. 0
Individual pay criteria 1–20% vs. none	1	Compared with no individual pay criteria at all, i.e. 0
Individual pay criteria 21%< vs. none	1	Compared with no individual pay criteria at all, i.e. 0
One HRD input vs. none	1	Compared with no HRD at all, i.e. 0
Two HRD inputs vs. none	1	Compared with no HRD at all, i.e. 0
Three HRD inputs vs. none	1	Compared with no HRD at all, i.e. 0
Proportion of employees with university education	5	Change required to permit median value to be closer to average value.
Change in number of employees with university education	1	If the enterprise was to implement the change corresponding to the median.
Engage services of other enterprises	1	Compared with value 0 i.e. external services not engaged.
Proportion of employees employed throughout last year	5	Corresponds to half the difference of the value of the first quartile and the median value.
Broad cooperation in R&D and HRD	1	Compared to no development cooperation at all, i.e. 0
Cooperation inside or outside the region in R&D and HRD	1	Compared to no development cooperation at all, i.e. 0
Range of innovations	1	Since a large proportion of the enterprises do not pursue development work according to this variable, a change of one percentage point is assumed.
Internal use of ICT for communications	2	Since a large proportion of the enterprises do not use ICT internally, a change is assumed which corresponds to achievement of the median value.
External use of ICT for communications	1	Since a large proportion of the enterprises do not use ICT externally, a change is assumed which corresponds to achievement of the median value.

A:3.11 (continued)

Learning strategy	Assumed change	Explanation
Use of temporary employees	2	Since a large proportion of the enterprise do not use temporary employees, a change is assumed which corresponds to the achievement of half the median value.
Growth in productivity last year	0,02	Assumption of increased growth of two percentage points.

Source: NUTEK, FLEX-2-data
Note: HRD = Human resource development

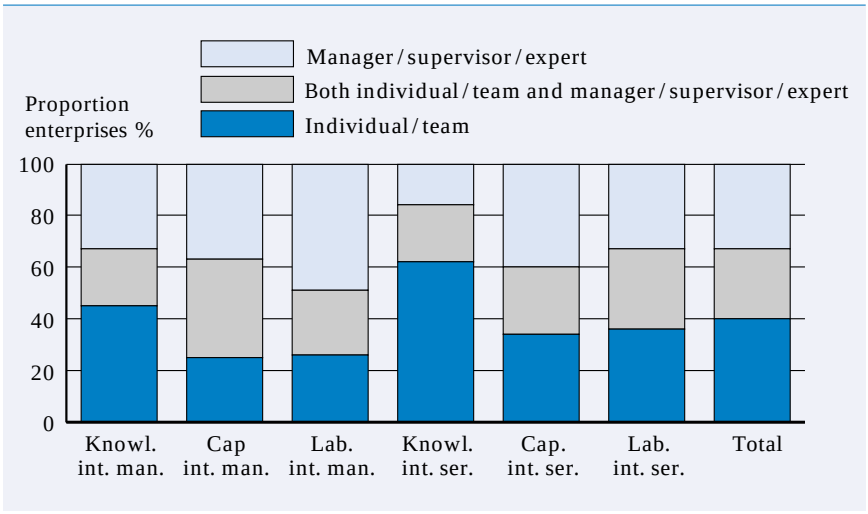
A:3.12 Proportion of workplaces with different degrees of decentralisation (six intervals), broken down by sector, 1997.

Sector	Degree of decentralisation (dec)					
	dec = 1	1< dec < = 1,5	1.5< dec < = 2	2< dec < = 2,5	2.5< dec < 3	dec = 3
Know. int. ind.	11	22	44	18	3	2
Cap. int. ind.	25	26	43	4	2	-
Lab. int. ind.	10	49	33	4	2	-
Know. int. ser.	1	22	38	27	11	1
Cap. int. ser.	7	39	36	12	5	1
Lab. int. ser.	5	31	39	17	5	4

Source: NUTEK, FLEX-2-data

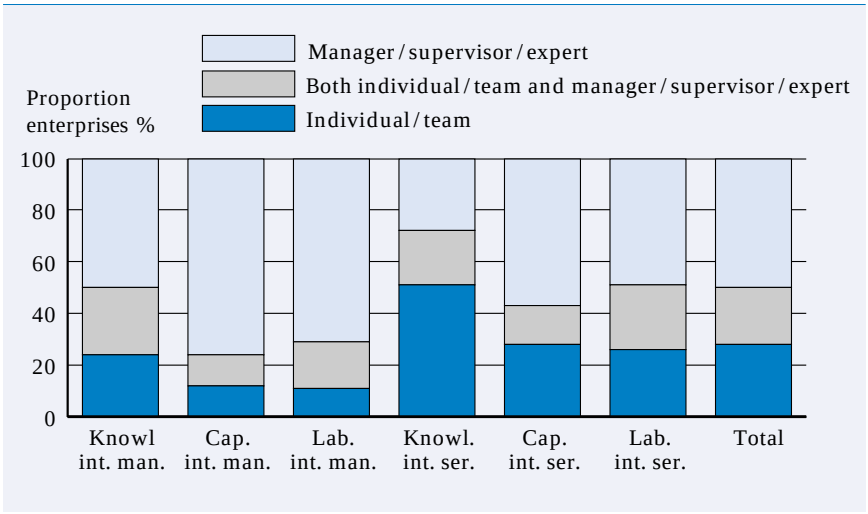
Note 1: The figures have been rounded off and therefore do not total 100 per cent.
Note 2: The decentralisation index consists of a continuous scale between 1 and 3, on which 1 = complete centralisation and 3 = complete decentralisation.

A:3.13 Proportion of enterprises where the daily planning of the employees' work is carried out at certain levels in the organisation, broken down by sector, 1997.



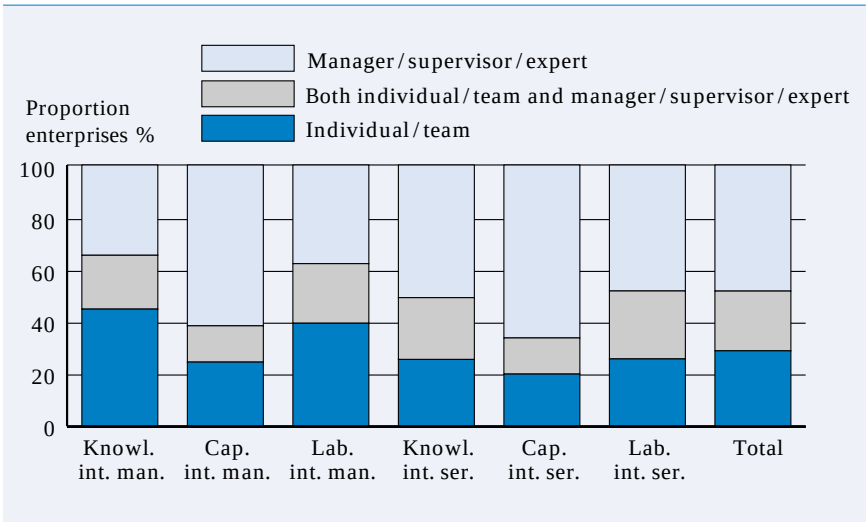
Source: NUTEK, FLEX-2-data

A:3.14 Proportion of enterprises where the weekly planning of the employees' work is carried out at certain levels in the organisation, broken down by sector, 1997.



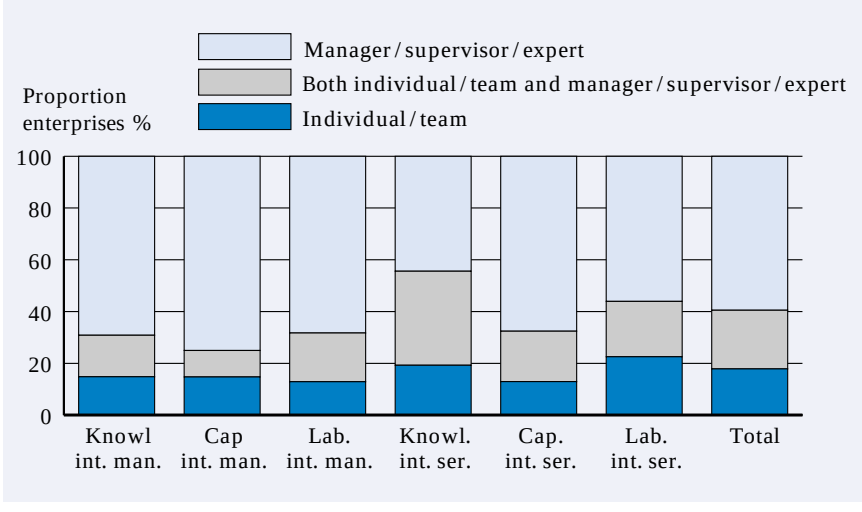
Source: NUTEK, FLEX-2-data

A:3.15 Proportion of enterprises where quality control is performed at certain levels in the organisation, broken down by sector, 1997.



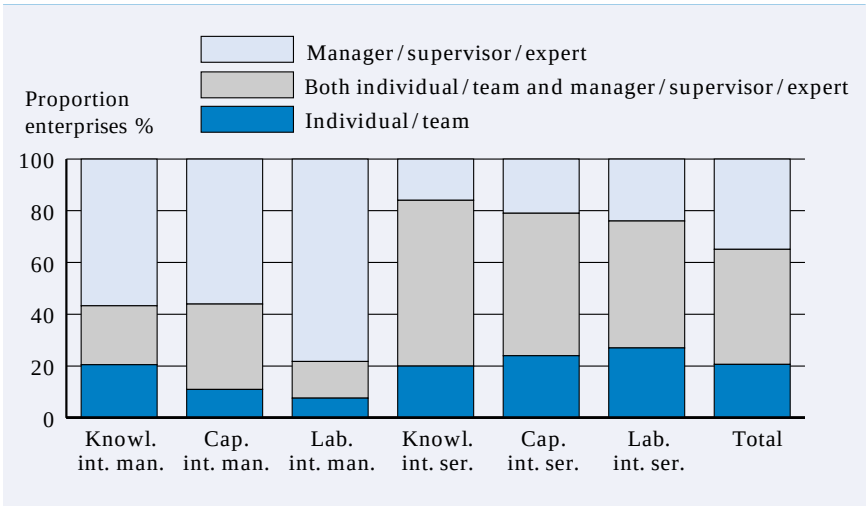
Source: NUTEK, FLEX-2-data

A:3.16 Proportion of enterprises where the development of services and products is performed at certain levels in the organisation, broken down by sector, 1997.



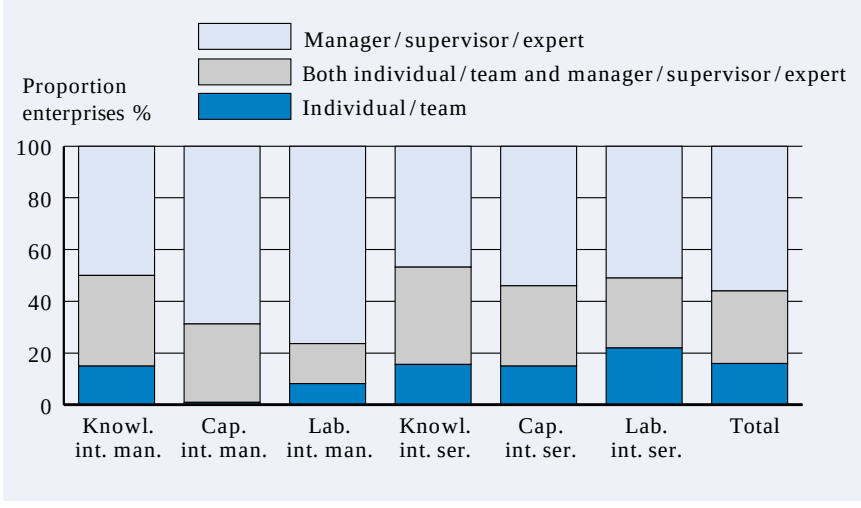
Source: NUTEK, FLEX-2-data

A:3.17 Proportion of enterprises where contacts with customers are the responsibility of certain levels in the organisation, broken down by sector, 1997.



Source: NUTEK, FLEX-2-data

A:3.18 Proportion of enterprises where contacts with suppliers are the responsibility of certain levels in the organisation, broken down by sector, 1997.



Source: NUTEK, FLEX-2-data

Appendix 4

The study "Sweden´s workplaces"

In chapter 4 in this report some of our results are related to the study "Sveriges arbetsplatser – organisation, personalutveckling, styrning" by le Grand, Szulkin and Thålin (ed) with data from 1991. In English we call the study "Sweden's workplaces". This study analyses factors that explain the structure of organisations, personnel development and management at Swedish' workplaces. The study is based on 2 135 randomly selected workplaces with at least ten employees from the private and public sector. The material on which the report is based consists of 1,988 workplace interviews conducted by Statistics Sweden.

One major conclusion of "Sweden's workplaces" was that, in the beginning of the 1990s, the prevalence of new management strategies in Swedish enterprises and workplaces was fairly limited. In the first place these strategies were limited to the engineering industry and to enterprises that were working on markets with a high degree of competition and whose production was therefore specially adapted to customer requirements. It was also shown that new management strategies usually correspond with good working conditions for the employees.

In "Sweden's workplaces" the authors used several indicators for organisation, personnel development and management. Even if these indicators differ from ours, they are intended to measure the same types of characteristics. It is therefore meaningful to make a comparison of the results, even if it is somewhat complicated. Below a presentation is provided of the construction of the indicators used in the workplace study and discussed in our report. Moreover results are provided in tables and figures taken directly from "Sweden's workplaces".

There are differences between the sector classification made in our study and the study "Sweden's workplaces" since the latter also includes the public sector. In the tables and figures below, the sector classification used in the

workplace study is shown. This can be compared with the sector classification we use which is presented in more detail in Appendix 1.

In chapter 2, "Organisationers struktur" by Ryszard Szulkin, measurements are made of the degree of decentralisation at the workplaces, i.e. the hierarchical level at which decisions are made. The measurements are of a more overall character and of decisions relating to working duties and working methods of employees. The proportion of workplaces with different degrees of decentralisation is shown in table A:4.1.

A:4.1 Different indicators of centralisation based on workplace sector and composition of the personnel.

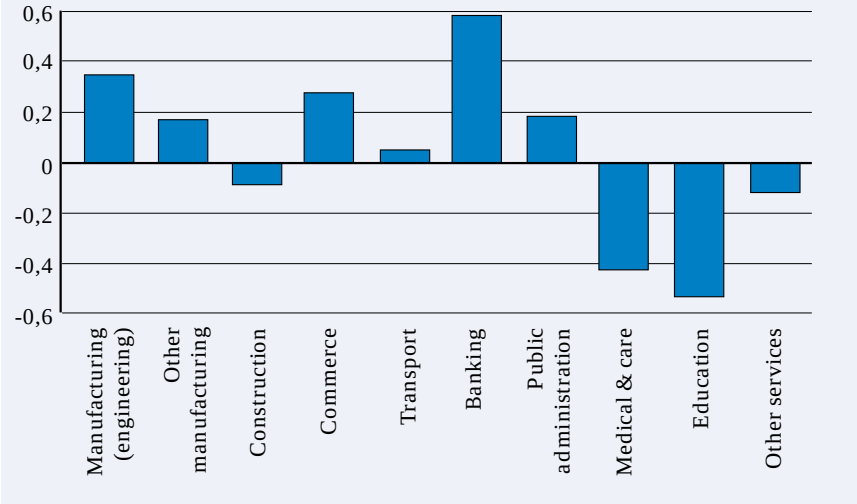
	Overall decisions made outside the workplace	Centralisation of overall decisions at the workplace	Decisions on duties and working methods made by the employees themselves
Sector			
Private	0.37	0.01	0.21
Public	0.86	–0.03	0.24
Sub-sector			
manufacturing (engineering)	0.28	–0.23	0.25
other manufacturing	0.38	–0.02	0.13
construction	0.28	0.17	0.22
commerce etc	0.38	–0.05	0.15
transport etc	0.65	–0.02	0.16
banking etc	0.51	0.05	0.17
administration	0.75	–0.08	0.20
medical & care	0.92	–0.10	0.28
education	0.85	0.10	0.32
other services	0.54	0.09	0.28
Proportion of blue-collar workers at the workplace <25%	0.63	–0.14	0.22
>75%	0.58	0.13	0.21
Mean value	0.62	0.0	0.22

Source: "Sveriges arbetsplatser – organisation, personalutveckling, styrning" chapter 2, Table 2.2.

Career and development opportunities for employees are taken up in chapter 3, "Karriär- och utvecklingsmöjligheter på de interna arbetsmarknaderna" by Carl le Grand. A study is made of internal promotion by measuring the proportion of employees at the workplaces who have been promoted during the last three years. A study is also made of how working duties have been extended, i.e. the incidence of personnel being gradually

given increasingly responsible and qualified duties within the framework of the same job. Figure A:4.2 shows differences in development opportunities between different sectors.

A:4.2 Differences in development opportunities between sectors.

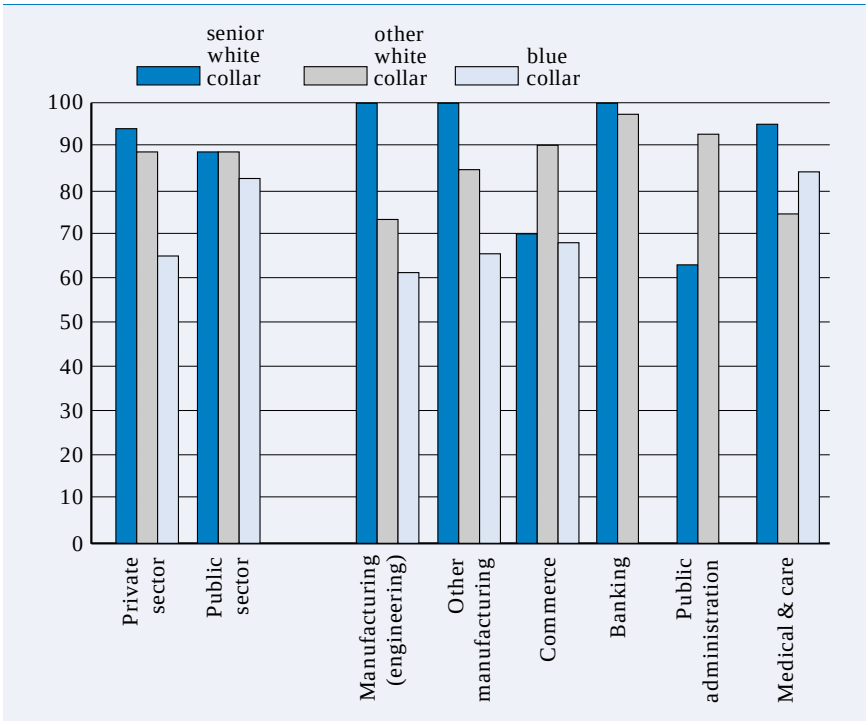


Source: "Sveriges arbetsplatser – organisation, personalutveckling, styrning" chapter 3, Figure 3.1.

In chapter 6, "Är Taylor död och pyramiderna rivna? Nya former för företagsledning och arbetsorganisation" by Christoffer Edling and Åke Sandberg, a study is made of how development and planning talks with the personnel are used as a form of contact between management and the employees. Figure A:4.3 shows the extent to which the workplaces use development and planning talks for their employees and the proportions of blue-collar workers and white-collar workers participating in these talks.

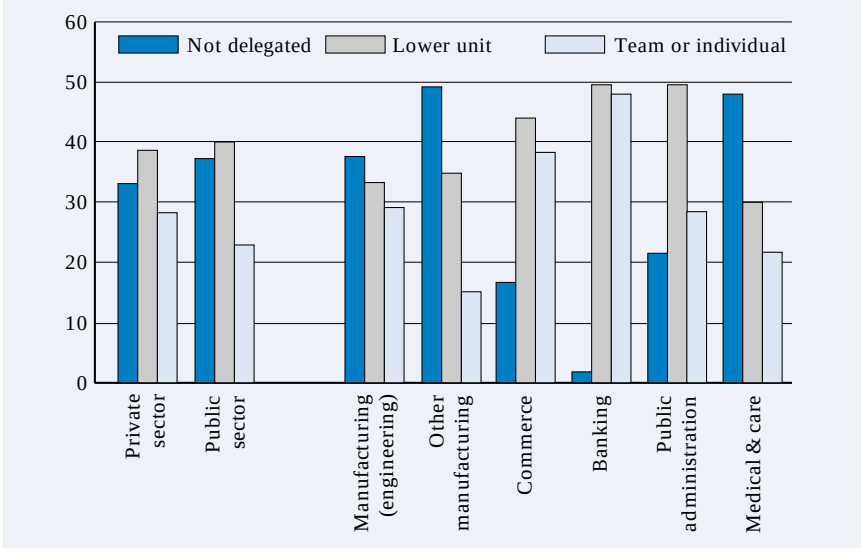
Furthermore, in chapter 6 a study is made of whether there are units or persons at the workplaces, below top management, who have their own responsibility for results. Figure A:4.4 below shows the proportion of workplaces where the responsibility for results has been delegated.

A:4.3 Workplaces with development and planning talks (per cent).



Source: "Sveriges arbetsplatser – organisation, personalutveckling, styrning" chapter 6, Figure 6.3.

A:4.4 Delegated responsibility for results.



Source: "Sveriges arbetsplatser – organisation, personalutveckling, styrning" chapter 6, Figure 6.5.

Appendix 5

Completed analyses

The project has produced a number of publications that are presented in this appendix. Furthermore the population used in FLEX-2 provides a framework for analysis for a number of other studies, including individual studies made by students and researchers. In addition to this, the project has contributed data for the work of government committees and for government bills under the area of responsibility of the Ministry for Industry, Employment and Communications, for example:

- IT-propositionen (The Government's ICT bill)
- Byggkostnadsdelegationen (The Building costs delegation)
- Arbetsbetingad ohälsa (Occupational illnesses)

Towards Flexible Organisations, NUTEK B 1996:6
The first study on flexible work organisations made by NUTEK, FLEX-1, is based on data obtained with the aid of a questionnaire and from databases at workplace and enterprise level from some 700 randomly selected workplaces and enterprises (with at least 50 employees) in Swedish trade and industry in 1995. The point of departure of the analysis is traditional economic theory in which the level of production, measured as value added per employee, is a function of several factors (e.g. capital, the workforce, size of the workplace, sector). Growth theory states that the causes of growth must be sought in the enterprises. Therefore the analysis includes *one* indicator that refers to the type of work organisation and learning in the working situation. The main result of the analysis indicates that there is a relationship between flexible work organisations and high levels of productivity at the workplace. It also shows a relationship between flexible work organisations and a good working environment at the workplace measured as a low rates of personnel turnover and low rates of absence due to sickness.

Flexibility Matters – Flexible Enterprises in the Nordic Countries, NUTEK B 1997:7
NUTEK has also made a comparative analysis of the flexibility of work organisations and its importance in the Nordic countries. The study is based

on data obtained from national questionnaires that are presented in four topical reports on flexible work organisations in Denmark, Finland, Norway and Sweden. The Swedish material is taken from the first FLEX-1 study. The aim of the study is to provide an overall picture of the incidence of flexible work organisations on the labour markets in the Nordic countries. The results show that there is a Nordic model for flexibility of work organisations. Flexible work organisations lead to greater productivity and higher levels of employment, as well as lower levels of absence due to sickness.

Flexibility Increases Productivity and Employment – Manufacturing Industry 1990–1995, NUTEK B 1997:8
This is a study of changes in value added and employment at workplaces in manufacturing industry. We also show trends in changes in productivity or rates of growth during the first half of the 1990s in both flexible and traditional work organisations. The data was taken from the first FLEX-1 study. The results of the analysis show that there is a relationship between flexible work organisations and economic growth in manufacturing work places. We were also able to establish that changes to the work organisation are indirectly of significance for employment through the positive effect they have on the income of the workplaces. The selection of work organisation is therefore of strategic importance for both the individual workplace and for society as a whole.

Fuel for Economic Growth in Small Enterprises – a Comparison between Workplaces in the Objective 4 Programme and other Workplaces in Swedish Trade and Industry, NUTEK info 026-2000 (A summary of the Swedish study "Utvecklingskraft i små företag – En jämförelse mellan arbetsställen i EU programmet Växtkraft Mål 4 och i övriga näringslivet" NUTEK info 069-1999)
This study uses the indicators that have been developed within the framework of the FLEX-2 project in order to describe how the workplaces that are participating in the EU Objective 4 programme differ from other parts of trade and industry. Objective 4 is a EU programme which has the aim of improving the skills of employees and thereby the competitiveness of enterprises. The ambition of the study is to establish a foundation for evaluations of the effects of the programme. The main results of the analysis show that the workplaces that are participating in the Objective 4 programme have, to a greater extent than other workplaces in trade and industry, a

strategic approach that coincides with the intentions of the Objective 4 programme. Among other things they have a higher incidence of human resource development inputs, a higher degree of decentralisation, they have implemented considerable changes to the work organisation compared with other workplaces, have more extensive forms of cooperation with other parties, and they use ICT to a greater extent for internal and external communication and for electronic trade. The results also show that trends in respect of employment and economic growth at the Objective 4 workplaces were more positive than in other parts of trade and industry, even before the start of the programme.

Företags flexibilitet och den regionala miljön, NUTEK info 079-2000 (The report will only be available in Swedish)
Earlier analyses have shown, among other things that there are certain regional differences in respect of the degree of flexibility of workplaces. Therefore analyses have been made which compare the flexibility of enterprises in different types of regions and study whether differences in regional development, measured as GRP, can be explained by differences in flexibility. Finally knowledge is further extended by in-depth studies of five regions: Stockholm, Karlskrona/Ronneby, Gnosjö/Värnamo/ Gislaved, parts of Bergslagen and the interior of Norrland. The report is an appendix to "Regionalpolitiska utredningen 2000" (the regional policy report).

Betydelsen av IT-användning för svenskt näringsliv, NUTEK info 078-2000 (The report will only be available in Swedish)
In the FLEX-2 main study, an analysis is made of the relationship between the use of ICT and the financial results of the workplaces. ICT is included in the analysis as one of several variables. The main purpose of this indepth study of ICT is to acquire a general understanding of the extent to which ICT is used in different sectors, as well as to intensify the analysis of the relationship between ICT and the incidence of networks, work organisation and innovative work at the workplace.

Samverkan för konkurrenskraft, NUTEK info 067-2000 (The report is only available in Swedish)
The aim of this study is to make an in-depth analysis of the forms of cooperation of enterprises with other parties. We develop the indicators used in earlier analyses by studying more profiles of cooperation and making an

in-depth study of the individual parties in the network. We also intend to analyse how cooperation is related to the other learning strategies and other factors specific to the enterprises.

Företag i förändring, Sammanfattning och benchmarking av lärandestrategier för ökad konkurrenskraft, NUTEK info, 076-2000 (The report is only available in Swedish)
Concrete examples from the above-mentioned benchmarking reports are given prominence in order to show the importance of human resource development, cooperation and ICT in enterprises with different activities and in different sectors.

Surveying Organisational Innovations: An extension of the Community Innovation Survey (CIS) Project no. 8. It is commonly recognised that organisational innovation plays a major role in improving an organisation's and consequently a nation's competitiveness. Yet organisational issues are hardly covered at all in statistics. Therefore this project aims at collecting and summarising different surveys on organisational innovations in Europe and, with the aid of this experience, forming the basis of the development of proper, possibly alternative or complementary methodological approaches to examine organisational innovation Community-wide.

ICT-O-Skills. Benchmarking Competitiveness Study:
The overall aim of this European Bench marking project is to contribute to the understanding of how to increase the use of IT, particularly in small and medium-size enterprises in the EU.

The Swedish contribution to the ICT-O-Skill project consists of both a qualitative analyses of policy mechanism and a presentation of good examples of enterprises in Sweden, as well as analyses based on a large random sample of enterprises from the Swedish trade and industry. This will permit conclusions of ICTs impact on competitiveness and correlation with other factors, such as human resource development and work organisation. The analyses will also permit conclusions of incidence of the use and implementation of ICT in the trade and industry.

In the analyses indicators for government policy activities are included to a limited extension. Therefore conclusions of their impact on ICT or competitiveness will be limited. Anyhow, the discussion will try to answer key questions like – do the "best" enterprises use ICT and do they train their

personnel more than others? Do they use public systems for education/training? Is it a good idea to offer government support for ICT-O-skills? The Swedish report will include a discussion on how effects of policy can be measured.

This study shows that the causes of growth and the driving forces behind it must increasingly be sought in the enterprise. Therefore learning process in enterprises is in focus in research programmes on management and innovations. In this report we therefore identify a number of conditions associated with learning in an enterprise. We call these conditions learning strategies. Strategies of this type involve organising the work of enterprises, human resource development, and cooperation with other parties and the use of ICT. The study shows the significance of these strategies for the competitiveness of trade and industry and describes their incidence in Swedish enterprises.

The study was previously published (in September 2000) in a Swedish language version by the Swedish National Board for Industrial and Technical Development (NUTEK). On January 1, 2001 a reorganisation was made of a number of central government agencies. The responsibility for analyses of the driving forces of growth was then taken over by the Swedish Institute for Growth Policy Studies (ITPS), which is now publishing the study in an English language version.

The report is intended for entrepreneurs, employees, employers' organisations and trade unions.

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