FORBA

Information Society, Work and the Generation of New Forms of Social Exclusion (SOWING)

Final National Report: Austria

FORBA Research Report 2/2001

Jörg Flecker

Manfred Krenn

Thomas Riesenecker-Caba

Christian Stary

The project is funded by the European Commission („Targeted Socio-Economic Research") and co-funded by the Austrian Federal Ministry for Education, Science and Cultural Affairs

Forschungs- und Beratungsstelle Arbeitswelt
Aspernbrückengasse 4/5
A-1020 WIEN
Tel: +43 1 21 24 700
Fax: +43 1 21 24 700-77
office@forba.at
http://www.forba.at

CONTENT – OVERVIEW

CONTENT

TABLES

FIGURES

1. INFORMATION-SOCIETY POLICY AND NEW FORMS OF WORK

In this chapter we set the scene for investigating the use of new ICT and its employment consequences by describing the political context. The main policy issues relating to the information society will be presented. This covers the areas of technology, educational and labour market policies. In the subsequent chapter we will describe the social and economic context in particular at regional level.

Policy initiatives

In the 1990s the emergence of the information society was a topical issue in Austrian politics. At national level, in 1995 several institutions set up working groups to define a homogeneous route into the information society for Austria. These were initiated by different Federal Ministries and focus on legal aspects, telecommunication, ICT and economics, research, science, education, health, public administration, and social affairs (Leitner et al. 1997:140f). Besides the lines of action defined in the final report of this project, milestones have been set, such as the development of the CNF (Corporate Network Finance) to become the Corporate Network Austria, and the technology-funding key action 'Technologies for the Information Society'.

The objectives for realising the information society have been summarised in the „Weißbuch der Bundesregierung zur Informationsgesellschaft", a government White Paper to promote the information society. One of the major activities and strategies was the „Telekom Initiative Österreich" (Austria Telecommunications Initiative) which emphasised not only technical aspects of telecommunications in Austria, but also the deregulation of the telecommunications business.

> „The discussion produced a variety of views on the new technologies and their impacts. It was generally acknowledged that ICT (Information and Communication Technology) 'can' play a crucial role in increasing productivity, improving competitiveness, creating new possibilities for employment, improving quality of life, and the like. However, there is no straightforward strategy and one best way. For example, in order to enable an increase of productivity the use of ICT must be accompanied by measures of reorganisation, investment and training. This statement holds for both the private and the public sector" (Knoll 1997:81).

Liberalisation and increasing competition should also lead to services adapted to the differing needs of the population. All citizens should be enabled to participate fully in the social and economic life in Austria. Hence, the essential features of the liberalisation have been: geographic availability, quality, and affordability (Pisjak/Schrems 1997:77).

In addition to regulations,

- the decentralised transfer of information (including local enterprises) is to be enabled
- additional workplaces are to be established through the development of novel formally defined occupations as well as the involvement of geographically/socially disadvantaged parts of the population

- local, regional and national barriers to access cultural and social activities are to be broken
- the opportunities to participate and to be informed in political discourse are to be increased
- the provision of services in public administration is to be increased for citizens through the usage of innovative technologies and the public use of electronic communication.

Overall in Austria, the information society has been envisaged as being a society that is based on the intensive use of information and communication networks as well as on a wide range of innovative products, services and information facilities. The conditions for access to and use of the information infrastructure are to be based on democratic values, targeted towards equal access to information and communication (BMWVK 1996:10).

The primary aims of the Austrian government in this context were:

- to stimulate Austrian telecommunication industry in order to stimulate other industries too
- to increase the growth opportunities of the Austrian information and technology sector
- to increase the variety of services and applications in the field of telecommunication through increased quality, availability and affordability
- to ensure the social and regional balance (BKA 1997:8).

Support structure

In technology policy, all new programmes and initiatives are basically intended to maintain and create jobs in order to maintain living standards and levels of social security in Austria. The creation and maintenance of employment is to be achieved by the same means as in previous programmes of the government. One particular, and novel, aspect is the participation of employees throughout the process of introducing technologies in enterprises. The main idea is that the knowledge and experience of employees should influence even the early stages of development and implementation of technology. The Federal Minister also announced that the approach to create targeted key actions will be strengthened when new activities are launched. Among those the creation of „Competence Centres“, the „Kplus“-programme (BMWV 1998), is a top priority. Research centres were established jointly by enterprises and universities with financial support by the state. These include a telecommunications research centre in Vienna, a software competence centre in Upper Austria and a virtual-reality centre in Vienna.

There is a strong public and private education sector that takes into account the needs of enterprises and offers a wide range of education and training courses related to ICT. In the region under investigation, particular emphasis has been placed on setting up an industry-oriented university. The Donau-Universität Krems specialises on tourism management, one of the key sectors in Lower Austria. It has a strong focus on new media and it also produces guidelines for interested business to introduce novel forms of work, such as teleworking (Edelmann et al. 1998).

State policy supported the founding of polytechnic colleges *(Fachhochschulen)* that enable a short but distinct post-secondary-school education. Several of these new polytechnics offer

studies in ICT-related areas, such as the ones in Lower Austria for telecommunications and media *(St.Pölten)* and systems and information technology *(Wiener Neustadt)*. In addition to the training, polytechnics offer technology transfer to regional companies. Courses that are offered in Lower Austria are:

- *Krems:* Management in tourism
- *St.Pölten:* Telecommunications and media
- *Wr. Neustadt:* Military Leadership, Precision and Information Technology, Business Consulting.

The regional branch of the Chamber of Commerce *(Wirtschaftskammer)* provides a variety of services in Lower Austria. It offers several training programmes besides a special service for career counselling. With respect to ICT, trend and tech monitoring seminars (together with MIT, Massachusetts, and SRI, Stanford) and business development courses using new technologies are outstanding opportunities for firms to strengthen their competitiveness (see http://www.noe.wifi.at/angebm.html). Career counselling is offered in St.Pölten, Gänserndorf, Gmünd, Mistelbach and Wr. Neustadt. In addition the chamber publishes valuable data on learning trends with respect to the information society. For instance, the motivation for lifelong learning has been analysed nation-wide (survey of 4,500 people aged over 15). Overall, Austrians are highly motivated to develop their skills continuously. About 41% of those participating in courses have been sent by their employers (http://www.noe.wifi.at/bwb/studie.htm).

Economic policy aims at fostering development and reducing the regional disparities in Lower Austria. Spending 115m ECU on economic improvements in rural areas in the period 1995-99, the regional government has set the following priorities (NÖ-Landesregierung 1996):

- Diversification and restructuring of the timber industry, agriculture and rural areas
- Development of non-agricultural sectors: modernisation of SMEs, tourism, etc.
- Development of human resources: increase in qualification through education and employment-related skill development programmes.
- 42% of the population of Lower Austria reside in an EU Objective-5b-area, which comprises the subregions of Mostviertel-Eisenwurzen, most of the Waldviertel and Weinviertel, and parts of southern Lower Austria.

Finally the Austrian Chamber of Commerce supports the 'Young Enterprise Network' for setting up new companies (http://www.wk.co.at/gruender).

A description of the support institutions in the region does not give a complete picture because the Lower Austrian economy benefits from the services and support institutions located in the metropolitan area of Vienna.

A nation-wide agency is seeking to increase the number of innovative business through location marketing: in 1998, the Austrian Business Agency ABA dealt with 3,000 requests from all over the world. Currently the ABA is in contact with 245 firms which are interested in locating in Austria. In 1998, a total of 1,725 new jobs were created in 72 projects with a total investment of about ECU 3,000m. Seven of these companies are in electronics or software production, five in medical technology, pharmaceuticals, and clinical research, for in telecommunications technology, and three in supply chain management. One third of the

companies are from Germany, others from Europe and USA. 11 of the 72 firms settled in Lower Austria (Vienna: 27, Upper Austria: 14, Tyrol: 1). Of particular interest for Lower Austria is the planned extension of the ABA operations to Eastern European countries, although Czech and Romanian partners already exist in the network (Wr. Wirtschaft 1999).

Regional policy

The discussion about regional aspects with respect to social exclusion is highly related to new forms of work and novel technologies in the field of telecommunications. In particular, several forms of telecommuting as well as universal access to services based on telecommunications are under discussion. In the report of the Austrian Ministry of Research, Transport and the Arts, which became part of the *Weißbuch der Bundesregierung* (Austrian government White Paper) regional differences as well as the costs of communication seemed to be of particular interest: the increased importance of information and communication technologies as well as the availability of corresponding infrastructure and services have to be recognised under the perspective of regional changes to develop policies and strategies for particular regions. Depending on these policies the attractiveness of locations for service providers and industries will influence the future development of regions. It has also been recognised that an infrastructure for telecommunication services that is highly developed in metropolitan areas, but neglected in peripheral regions with a low population density, has intensified migration processes. In addition, investment decisions are not only influenced by factors such as availability of transport infrastructure or research and educational institutions: The ministry concludes that the availability of telecommunications as well as the cost structure for communication are essential factors influencing development in particular regions (BMWVK 1996).

Tele-houses enabling telecommuting are considered as a means to attract or create employment opportunities in rural areas. Technological and organisational developments can then be coupled through linking rural and urban areas as well as areas with high and low population density. A limited number of tele-houses have been established all over Austria. The major task of these initiatives which have been set by the regional governments is to improve the economic structure in backward regions through high-tech-initiatives. This is intended to prevent rural areas from being de-coupled from innovations and modernisation processes of urban areas (Weinzierl 1998:208).

The tele-houses in Lower Austria are:

- *Telestube Mostviertel*: established by *Computertreffpunkt Eschenau*, Lower Austria: generation of one full-time and four part-time workplaces. The services are education and training in the field of electronic data processing and computer use, resource sharing of expensive software products, use of database and information systems, set up of a product laboratory.
- *Telehaus Tullnerfeld:* established by a local community in Lower Austria: services are hotline provision and access to information.
- *Telehäuser und Telestuben des Waldviertel Management:* The regional development initiative of the *Waldviertel* set up several tele-houses and tele-cottages with the aim of

attracting telemedia work to this peripheral region. In addition, an Internet provider was established to allow for low-cost Internet access for the local economy and for communities.

It turns out that the region with the highest density of tele-houses is Lower Austria, whereas Vienna, Upper Austria and Salzburg have not so far set up many initiatives in the field of telecommuting (Kolm et al. 1996). In Lower Austria the activities related to telework have been performed in the context of rural development. For instance, in *Bruck an der Leitha* the establishment of a telecommuting infrastructure has been closely linked to the construction of housing estates, in order to offer infrastructure for work and communications for people living in the immediate vicinity (Bardel 1996).

Trade union policy

Arguing that the term information society is still not strictly defined (Sarreschtehdari-Leodolter 1996:17), trade unions demand an „informed society", which means on the one hand that access to, and utilisation of, information is ensured for low income groups and those with low levels of education. On the other hand this means that information is provided on those aspects that reflect the interests of workers in working and private life. Hence, the introduction of new styles of work and novel technologies has to be coupled with individual education and skill development. In the view of the trade unions, the costs should be covered by the employers, since they are the ones most likely to profit from the diffusion of technology.

From the point of view of trade unions, the information society is highly related to employment and telecommuting and to interrelated technological and organisational issues. It is assumed that workers are expected to become more flexible in accomplishing tasks regardless of location and time. There is a danger that employees will work under contracts that do not ensure employment security or social security (GPA 1996:5). The trade unions estimate that novel occupations and work fields that are closely related to multimedia systems, information sensitive services and consultation will not lead to a positive overall development of employment (GPA 1996:8). It is assumed that the number of workers with high qualifications and continuous employment will decrease. An increase in the number of jobs, which has been observed previously in particular in the service sector, will continue, leading to a majority of workplaces that are low paid, require low qualifications and flexible availability of employees (Sarreschtehdari-Leodolter 1996:16). In addition, it is expected that structural changes will lead to huge social problems, in particular for elderly employees or workers with low skills. These will no longer find work after having been laid off from existing workplaces. The trade union for white collar workers (GPA 1996:8) has drawn up a list of improvements that have to be realised in order to avoid social exclusion:

- Reduction of working hours, in particular in case of flexible working hours
- Prevention of a redistribution of work and income along the lines of a „2/3 society"
- Relating flexibility to the interests of employees
- Reduction of time and work pressure since business process reengineering is sometimes tightly coupled with an increase of time pressure and workload
- Tax reforms with respect to ecology and added values

- The same legal framework ensuring occupational security should be applied for all work regardless of its location or working hours.
- Improvement of the enforcement of legal regulations.

The discussion in Austria has led not only to the awareness of positive phenomena related to information and communication technology: Decision makers have become aware that technological changes might result in splitting society into those citizens who are considered to be „information-rich" and those who are „information poor" (Kolm 1997). Owing to this danger, the required tools to participate actively in life within an information society have to be developed and become accessible to all citizens (as part of universal services). Recent developments have to be investigated as to whether they correspond to the existing state of the art. In the Green Paper on the liberalisation of the telecommunication market, the European Commission has already directed the discussion towards the needs of citizens when telephone services are extended to data services. It is not quite clear whether novel services, such as the Internet, will actually lead to a form of utilisation in the sense of participation in an active society. There seems to be no consumer demand for technologies enabling the participation in a technology-driven society (Pisjak/Schrems 1997:82).

The Austrian debate on the information society makes clear that labour law as well as social security regulations have to be adapted to novel types of work and technology. Particular styles of work, such as the one performed in „call centres" or telecommuting, will have to be addressed within the legal frameworks. For the individuals, training and skill development will have to be increased with respect to new media. Finally, an informed society as it has been interpreted by the trade unions will lead to an increased demand for information in the field of public administration.

Labour market policy

Based on support through the European Social Fund (ESF), the Austrian Public Employment Service AMS supports companies' skill-development initiatives. ESF-funding targets firms with a maximum of 250 employees. Within the programme not only is individual further training supported (with two thirds of the costs), but so are projects for company restructuring. ESF agencies in Lower Austria are provided for Industrieviertel Lilienfeld, Mostviertel, Lower Austria West, Waldviertel, and Weinviertel.

Work Foundations, which are based on the AMS Act 1994 and the Unemployment Insurance Act (1977), have become one of the most important means of coping with the negative effects of economic structural change on the labour market. They provide collectively agreed employment-related measures for persons after lay off:

> Employment foundations are established by enterprises which – within the framework of the social plan and in agreement with the works council – are proposing large-scale manpower reductions; they consist of a package of measures which, depending on individual needs, include vocational guidance, active job-search, periods of practical training, (further) qualification and support for proposed business start-ups." (MISEP 1998:108) In addition to enterprise foundations, regional and sectorial foundations have been established. In 1997 more than 3,000 people participated in one of the various work foundations in Austria. According to

evaluation studies more than 70% of the former members of work foundations find new employment (MISEP 1998:109).

The social partners are involved in setting up work foundations: If, after an agreement within the company, trade unions and the Chamber of Commerce give their approval to the establishment of a work foundation, the AMS is obliged to recognise it.

The long-term unemployed are an important target group of Austrian labour market policy. In order to improve their reintegration prospects, active and activating measures are taken, i.e. counselling, job-search, career orientation, support for training and further training and integration (MISEP 1998:96). Wage-cost subsidies are paid to non-profit organisations and enterprises if they recruit, for at least one month, long-term unemployed or persons threatened by long-term unemployment (ibid.:85).

In order to further reduce the number of long-term unemployed workers, the 1999 budget for re-integration in the course of the 'Comeback' programme was increased by 25% in Lower Austria (http://www.orf...oe/990128-1210/1210txt_story.html). The step was taken in order to ease the consequences of joining the European Union and the subsequent shifts of locations. 'Comeback99' aimed for a reduction of 13,500 older unemployed workers. Firms that employ long-term unemployed workers receive the same amount of money for one year as the worker would have received in unemployment benefit. The Lower Austria Public Employment Service AMS was optimistic of reaching its target, since the prognosis for 1999's economic growth was 3% (nation-wide 2.4%).

In particular for migrants, the Sintegra-programme is targeted on skill development and qualifications. Funded by the Austrian Public Employment Service and the European Social Fund (ESF) it aims at enhancing the labour market opportunities for people at risk of unemployment.

In April 1998 the National Action Plan for employment (NAP 1998) was announced with the objective of increasing employment by 100,000 over 5 years and lowering the rate of unemployment to 3.5% of the workforce. In addition, the access to labour market for men and women was to be equalised. One of the major issues concerns the reintegration of the long-term unemployed through education and attractive funding policies for firms (see, e.g. *Bildungskarenz*). Another aspect is the full use of existing institutions for education, e.g., as established by the social partners, and the extension of polytechnic colleges *(Fachhochschulen)*. Equal access to the labour market is to be enforced through increased qualification of unemployed women, regional agencies for women, and the implementation of gender quotas, and establishment of an attractive labour market for part time work.

With regard to older people, a bonus/penalty system was introduced in 1996 as „an additional protective instrument against dismissals and as an incentive for the recruitment of older workers. Employers who recruit people aged over 50 pay reduced contributions to unemployment insurance; their contribution is waved totally on recruitment of people over 55. Employers who dismiss workers aged over 50 who have been their employees for at least 10 years are obliged to pay a once-off penalty." (MISEP 1998:94).

2. THE REGIONAL SOCIAL AND ECONOMIC CONTEXT

2.1. The Region

The region of *Niederösterreich* (Lower Austria) is one of the nine *Bundesländer* (provinces) of the Federal Republic of Austria. Situated in the north-east of Austria, *Niederösterreich*, surrounding Austria's capital, Vienna, it borders on several European countries, such as the Czech Republic and Slovakia, as well as several Austrian *Bundesländer*, such as *Burgenland* and *Steiermark* (Styria).

Niederösterreich has an area of 19,200 sq.km, a population of nearly 1.5 million, and employment figures of some 660,000. More than 100,000 of its resident population commute to Vienna. In 1991 agriculture and forestry accounted for 11% of the working population; manufacturing industries employed 27%, and the service sector 51% of all workers.

Niederösterreich has been selected for this study due to its geographical location, diversity of market structures, and particular status as political and administrative entity:

- *Geography:* There is both a metropolitan zone (around Vienna) and disadvantaged rural areas, both mountainous regions and fertile plains. For decades the areas bordering the Czech Republic and Slovakia suffered from the existence of the „iron curtain" and, therefore, have been of great concern for regional and labour market policy. Both the integration into the Austrian economy of these regions and the cross border links emerging since 1989 are of interest for the research project.
- *Diversity of economic and labour market structures:* Agriculture is still very important in large parts of the region, and areas encompassing 42% of the population are subject to „Objective-5b" („economic diversification of rural areas") within the framework of the European Structural Funds. Manufacturing industries are located in old industrial districts as well as in core areas near Vienna and *St. Pölten*, the capital of *Niederösterreich*. The latter are also significant centres for service industries and for distribution activities in particular. Tourism is important in mountainous regions and in famous wine growing areas, such as the *Wachau* on the Danube.
- *Statistical and political entity:* A *Bundesland* (province) in Austria enjoys administrative and political autonomy in many respects. As a consequence, data on the economy and the labour market are available in considerable detail. The regional (provincial) parliament, directly elected by the population, has legislative powers according to the Federal Constitution of Austria. Policies at regional level are executed by a regional government. Within the federal structure of the national Labour Market Service AMS the organisations at the level of *Bundesländer* are quite autonomous in executing labour market policies. Despite the structural diversity, in political terms, therefore, *Niederösterreich* can be seen as a homogeneous labour market.

The region is home to businesses from the distribution, tourism, IT & telecommunications, and the metal & machinery sector, which are the sectors selected for the case-study research in

this project. The *distribution* sector covers transport, logistics, wholesale and retail trade, and employs some 20% of all workers in *Niederösterreich*. Employment has risen considerably: between 1983 and 1994 by 38% in the wholesale and retail trade and by 71% in transport. Influenced by both national and international developments the industry is undergoing major restructuring in terms of inter-company relationships, spatial division of labour, application of ICTs and personnel policies. Transport and logistics companies are mainly located in the central areas of the surroundings of Vienna and *St. Pölten*, where we also find important shopping centres. Retail chains tend to concentrate their stores departments in central warehouses thereby changing both their business processes and the division of labour with other companies. Computer-based administration, storing and manipulation of goods as well as new telecommunication technologies are leading to new skill needs in the sector with the consequence of endangering specific groups of low-skilled workers.

In 1994 the hotel and catering trade (*tourism* sector) employed some 16,000 persons, i.e. approximately 4% of all workers in *Niederösterreich*. Employment is growing in this sector too. Compared to other sectors, ICT plays a minor role in the immediate personal service activity. However, reservation systems, Internet and computers for accounting and administration, partly integrated with reservation systems or stock-keeping are of growing importance. ICTs are used also for marketing purposes, e.g. tourist information systems for particular regions. Tourism is an important employer for women, and shows a varied skill profile. An important research question is how changes in business strategies and technological practices impact on job opportunities for different groups of workers.

Business services are fast growing in *Niederösterreich*. The numbers and employees of ICT companies *(IT and telecommunications sector)* are increasing because of both rising demand and processes of outsourcing. There are over 260 companies in Electronic Data Processing in *Niederösterreich*, but in 1995 they employed between them only some 1,000 persons. Other ICT activities are difficult to represent statistically because of the dynamic development and the blurring of sector boundaries. The sector is at the core of the emerging information society as it provides the technology and infrastructure for all other sectors. Within the framework of the project, IT and Telecommunication companies are of particular importance because of the expected employment opportunities. The access to jobs in a sector with rapid changes of technologies, markets and, consequently, requisite knowledge will be one of the main research questions.

With 52,700 employees the *metal and machinery* sector is by far the largest manufacturing industry in *Niederösterreich*. Parts of the sector belong to the process industry (foundries, steelworks etc.) with computerised production processes, parts are of particular interest in their capacity as suppliers to the automobile and other consumer goods industries. Automation and new forms of work organisation are increasing the extent of 'information work' at shopfloor level too. ICTs play an increasingly important role both in production and in inter-firm networks. In most parts of the sector the skill profile of companies is characterised by a high ratio of skilled workers. Still, technological change causes problems as the basic vocational training of today's older age-groups did not cover ICT,. and it is an open question as to how technology can be designed and used in such a way that the knowledge of experienced workers is fully utilised.

Economically, *Niederösterreich* is part of the Central Region Eastern Austria, based on the data of the latest population census in 1981 and 1991 where the following Austrian regions have been distinguished:

- Central Region Eastern Austria (including Vienna and St. Pölten as well as their surrounding areas)
- Central Region Austria South (urban region Graz, Klagenfurt and Villach)
- Central Region Austria West (condensed regions Linz - Wels, Traun quarter, Salzburg, Innsbruck, Tiroler Unterland and the Rhine valley)
- Underdeveloped region Austria East (including parts of Lower Austria and *Burgenland*)
- Underdeveloped region Austria South (Upper Styria industry region, other regions in Styria and Carinthia)
- Underdeveloped region Austria West.

From the perspective of functional and sectoral structures the Central Region East, in particular Vienna, has a „deep" structure, in the sense that it provides industry and production services (including logistics and consultancy) that require a high level of qualification. Vienna has shown a sharp fall in labour- and capital intensive industries.

2.2. Economic Structures

2.2.1. Labour force

In 1997 Austria had 3,055,500 persons in gainful employment; 57% of them were men and 43% women. The number of unemployed reached 233,350 or a rate of 7.1% according to the national calculation (EU method: 4.4%). 65% of all workers are employed in the service (and public) sector and some 30% in manufacturing.

In 1997, 505,860 persons were employed in Lower Austria (occupied population), 42% of whom were women. Unemployment was 37,175, which equals an unemployment rate of 6.8%, i.e. slightly lower than the national average. In 1997, there were 35,930 employees in Lower Austria without Austrian citizenship.

Between 1997 and 1998 the employment figures in Lower Austria rose by 1.1% (Austria: 0.6) reaching an annual average of 511,587. The increase has continued in 1999, with employment figures reaching 517,297 in April (217,240 women, 198,057 men).

According to census data from 1991, in Lower Austria 44% of the labour force had completed vocational training (apprenticeship). About 28% have completed compulsory school and do not have any vocational training or higher education. Of the latter group 50% are men and 50% women. 5.4% of all employees have a university degree or a comparable education (3.9% of men and 2.7% of women).

Table 2-1: Highest education or training level of persons working in Lower Austria

	1991			change 1981 -1991 in %		
	male	female	total	male	female	total
University	12,986	6,030	19,016	35.7%	81.0%	47.4%
- comparable education	2,957	7,747	10,704	101.3%	129.1%	120.7%
Vocational post-secondary schools	18,653	10,676	29,329	61.9%	87.3%	70.3%
Post-secondary schools	8,868	7,994	16,862	5.9%	38.3%	19.2%
Vocational secondary schools	30,447	48,013	78,460	16.3%	23.4%	20.5%
Apprenticeship	180,932	66,373	247,305	15.8%	44.7%	22.4%
Compulsory school	77,478	77,509	154,987	-31.2%	-29.8%	-30.5%
Total	**332,321**	**224,342**	**556,663**	**2.0%**	**5.1%**	**3.2%**

Source: ÖSTAT 1995a, Census

Overall, between 1981 and 1991 the education level was improved, the number of persons without any education or training higher than compulsory school was reduced by one third. This decrease does not necessarily mean that the workplace characteristics actually changed. One reason was the retirement of unskilled workers and their replacement with skilled workers.

In 1991, 15% of the total labour force was self-employed, 43% were white collar workers, and 42% blue collar workers. Apprenticed white collar and blue collar workers made up about 32% of the labour force, whereas unskilled workers accounted for about 13%. In the period 1981 to 1991 the number of skilled white- and blue-collar workers remained stable, whereas the number of unskilled blue-collar workers fell by 15%.

White-collar workers with only compulsory school education decreased by 21%, whereas the number of workers with higher education increased significantly (about 30,000 additional jobs). From 1991 on no census data are available. However, other indicators have shown that the level of qualification in Lower Austria is below the national average, with subregional differences. The Viennese suburbs provide better access to education, whereas the Waldviertel and Weinviertel lack up-to-date education (ÖIR 1995:27).

The education and training qualifications of „information workers" in Austria[1] were recorded in official statistics for the first time in 1981. It is therefore possible to analyse changes at least until 1991, the year of the next census. Not surprisingly, there was a tendency towards higher levels of education and training: Among the „information workers" the proportion of persons with only compulsory school education decreased from 21% to 14% (all employees: 41% to 29%); the ratio of university graduates increased from 12% to 17% (all employees: 5% to 7%). In absolute terms: of 263,000 persons with university degrees in Austria in 1991, 228,000 were in an information occupation (Sint 1997:44).

1 National data are used here because of a lack of regional data.

33,000 to 42,000 persons are employed in the telecommunications sector in Austria. Most of these employees work for Post and Telekom Austria (19,000 employees). New providers of universal services currently make up 6%, with respect to income and to employees. However, it can be expected that this ratio increase significantly over the next years. Subsuming all different services (broadcasting, television, telecommunication, information processing) in the information sector it can be estimated that about 3.9% of all employees are working in this sector. This will increase to 4.8% of the overall employment in Austria in the year 2001 (158,000 employees) according to the Institute of Technology Assessment of the Austrian Academy of Sciences (BMWVK 1996:17).

Table 2-2: Information occupations according to qualifications (percentage) *Census* 1991

	Occupation	University	Colleges	Vocational Schools	Apprenticeship	Comp. School	
I.1	Scientists and technicians	90..7%	5..2%	1..2%	1..9%	1..0%	100%
I.2	Market specialists with search and co-ordination functions	5.7%	16.4%	13.7%	49.0%	15.1%	100%
I.3	Monitoring and inspecting occupations etc.	4.2%	7.6%	5.0%	33.2%	50.0%	100%
I.4	Advisers	44.7%	17.3%	10.1%	18.3%	9.5%	100%
I	**TOTAL: INFORMATION PRODUCERS**	29.7%	14.6%	9.9%	29.6%	16.2%	100%
II.1	Higher clerical workers and managers	19.2%	27.1%	16.1%	27.2%	10.4%	100%
II.2	Controlling occupations	1.6%	13.8%	26.4%	47.9%	10.3%	100%
II.3	Clerical workers	3.2%	20.3%	30.4%	30.9%	15.3%	100%
II	**TOTAL: INFORMATION PROCESSORS**	5.8%	20.1%	26.8%	34.1%	13.2%	100%
III.1	Teachers and educators	60.9%	16.5%	13.8%	4.7%	4.2%	100%
III.2	Other information distributors	37.2%	33.5%	6.3%	9.4%	13.6%	100%
III	**TOTAL: INFORMATION DISTRIBUTORS**	59.1%	17.8%	13.2%	5.0%	4.9%	100%
IV.1	ICT operators	1.6%	9.8%	15.1%	48.6%	24.9%	100%
IV.2	Postal and telecommunication services	0.5%	7.7%	9.4%	51.4%	30.9%	100%
IV	**TOTAL: INFRASTRUCTURE**	1.0%	8.5%	11.8%	50.3%	28.4%	100%
	total: information occupations	17.3%	17.6%	20.2%	30.8%	14.0%	100%
IB	Total: gainfully employed	7.1%	9.9%	13.0%	40.5%	29.4%	100%

Source: Sint, in: Hanappi, G. (ed.) (1997)

The number of students in ICT-related studies in Austria has increased considerably during the last decades. Between 1980 and 1990 the number of students of computer science increased tenfold. Computer science is the discipline with the largest number of students (5,245 in 1990/91), whereas both telematics and data technology attracted some 1,400 students. Until 1996/97 the number of students in computer sciences rose by 14%, in telematics by 30%.

In the Austrian labour market in general there is currently a shortage of people with technical education and training. According to a company survey conducted by the Association of Austrian Industrialists, 10% to 45% of enterprises dependent on industry face problems in recruiting technicians. As far as computer science and software-engineering is concerned, 12% of the companies are in need of university graduates, 23% are looking for polytechnic graduates, and 23% for school leavers from higher vocational schools (Industrie 8, 28.5.-9.6.1999).

In the year 2001 more than 2,000 people will finish polytechnic or university studies on new media, multimedia and telecommunication in Austria. 60% of theses studies are design-oriented and one third is programming-oriented. In particular, the number of multimedia and telecommunication specialists will cover the estimated demand of screen designers but there will not be enough multimedia-programmers or multimedia-managers (Hummel 1998:122f.).

It is important to note that there is a marked regional diversity within Lower Austria. The microcensus evaluation of the Public Employment Service has led to the identification of four different zones of development (AMS NÖ 1997:14ff):

- Zone 1, mostly comprising political regions surrounding Vienna, shows a high degree of expansion with respect to employment.
- Zone 2, mostly comprising urban areas, such as St. Pölten, shows a stable employment situation, with a tendency to rising employment.
- Zone 3 covers those political regions that do not show a strong bias towards and increase or decrease of employment, hence denoted as 'split dynamics'.
- Zone 4 subsumes those political regions that are showing a steady decrease in employment, such as most of the areas in the southern part of Lower Austria.

The development of employment at the level of subregions actually shows 'winners' in the St. Pölten, Amstetten, Mödling political subregions and the surroundings of Vienna (see table below). 70% of the increase in employment was concentrated to four political districts. Two of them have a close economic relationship to Vienna, since they attract locally expanding businesses (AK NÖ 1997:4).

The development of the labour market of Lower Austria was based on an increase of 4% of the population, however with local disparities according to the level of structural development of sub regions (Pastner et al. 1998:35f). Most of the population resides to the north or south of Vienna, whereas the border regions Wald- and Weinviertel are losing residents to urban areas, such as St. Pölten (regional capital) and the surroundings of Vienna. The Österreichisches Institut für Raumplanung has developed an index to identify underdeveloped sub regions. The southern part of Lower Austria is located at the lower end of the scale (i.e. low level of development), whereas the highly urbanised subregions are highly ranked.

However, the infrastructure of all subregions seems to be equally developed (ÖIR 1995). However, one out of five employees residing in Lower Austria works in Vienna. When contrasted with those employees coming to Lower Austria from other regions, a deficit of 103,800 local employees remains. Hence, on average, there are only 84 jobs for each 100 workers. The former number actually ranges from 70 (e.g., Weinviertel) to 95 (e.g., St. Pölten).

2.2.2. Industry

Having the largest population of all Austrian regions (1.5m people), Lower Austria contributes a large part to the Austrian GDP: it is the third largest contributor. While agriculture is more important than in other regions, in relative terms the service industry is quite underdeveloped, which can be explained by the geographical location of Lower Austria. Vienna is located in the middle of Lower Austria and provides services for the Lower Austrian economy. However, changes are under way, as the service sector in Lower Austria showed an increase of about 40% from 1988 to 1992 (Austrian average was 37%), and contributed about 50% of the regional gross product (Austrian average 61%) (ÖIR 1995).

Table 2-3: Unadjusted GDP at current prices by sector in m ATS

	1988	1992	1996	change 1988-1996	proportion 1996
Austria	**1,497.200**	**1,982.770**	**2,331.330**	**56%**	**100%**
Primary sector	49.020	50.040	34.690	- 29%	1.5%
Secondary sector	509.140	647.980	736.220	45%	31.6%
Tertiary sector	939.040	1,284.760	1,560.420	66%	66.9%
Lower Austria	**234.340**	**310.130**	**378.450**	**61%**	**100%**
Primary sector	16.110	15.840	10.980	- 32%	2.9%
Secondary sector	96.660	122.610	143.870	49%	38.0%
Tertiary sector	121.570	171.680	223.610	84%	59.1%

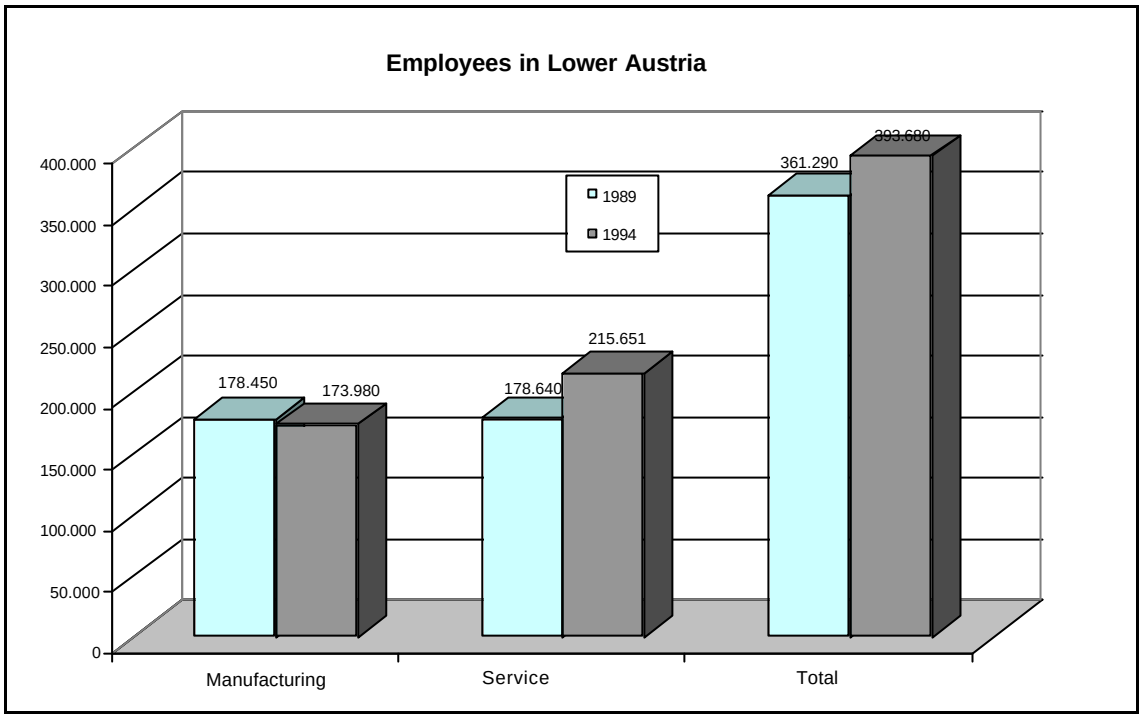
Source: ÖSTAT 1998: Statistisches Jahrbuch

The major part of business is traditionally focused on manufacturing, giving work to 27% of the workforce in Lower Austria. Metal, food, chemical, petrol, and wood industry are the main employers in this sector. 23% of all employees work in personal, social or public services, followed by retail (14%) and agriculture (11%).

Long term trends show an increase of employment in one area coupled with a decrease in others, as exemplified in table 2-4. So the overall increase of employment in Lower Austria of about 3% has been accompanied by a reduction of about 22,000 jobs in agriculture and forestry. The long-term trend towards an increase of employment in service industries is likely to hold for financial and social services. The decrease of employment is likely to continue in secondary industries. The opening of the Eastern European countries will continue the trend to

move production lines from Austria to Hungary, the Czech Republic, and other Central and Eastern European countries (Pastner et al. 1998:46ff).

Figure 2-1: Employees in Lower Austria by sectors 1989 and 1994



Source: AK NÖ (Arbeiterkammer Niederösterreich) (1995)

Table 2-4: Active population by sectors in Lower Austria, 1981 and 1991

	1981	1991	change	proportion 1981	proportion 1991
total Lower Austria	**539,380**	**556,663**	**3%**	**100%**	**100%**
Agriculture and forestry	84,862	63,017	-26%	16%	11%
Energy and water	5,675	5,238	-8%	1%	1%
Mining	5,709	3,394	-41%	1%	1%
Manufacturing industries	171,198	151,822	-11%	32%	27%
Construction	46,783	46,402	-1%	9%	8%
Wholesale and retail trades	62,784	78,270	25%	12%	14%
Tourism	19,936	24,473	23%	4%	4%
Transport and Communication	29,718	34,539	16%	6%	6%
Banking, insurance, business services	16,656	23,430	41%	3%	4%
Personal, social and public services	96,059	126,078	31%	18%	23%

Source: ÖSTAT 1995a, Census

Table 2-5: Employees in Lower Austria by sectors (NACE) 1997; changes since 1995

NACE code		Sector	Total		Men		Women	
				change %		change %		change %
A	1-2	Agriculture	6,423	*+0.5*	4,165	*-0.4*	2,258	*+2.3*
B	5	Fishery	14	*+40.0*	10	*+42.9*	4	*+33.3*
C	10-14	Mining	2,998	*-4.7*	2,714	*-4.3*	284	*-8.4*
D	15	Food & beverages	15,505	*-6.4*	8,483	*-8.7*	7,022	*-3.6*
	16	Tobacco products	194	*0.0*	137	*+3.0*	57	*-6.6*
	17	Textiles	4,487	*-13.1*	2,282	*-12.2*	2,205	*-14.1*
	18	Clothing	2,151	*-26.3*	268	*-14.1*	1,883	*-27.8*
	19	Leather products and footwear	516	*-14.0*	172	*-14.9*	344	*-13.6*
	20	Wood	12,269	*-2.3*	10,304	*-1.4*	1,965	*-7.1*
	21	Pulp, paper	3,287	*-1.8*	2,616	*-1.1*	671	*-4.6*
	22	Publication, print	4,205	*-2.7*	2,691	*-3.0*	1,514	*-2.3*
	23	Coke, refin. petrol products	1,188	*-12.3*	1,097	*-12.5*	91	*-9.9*
	24	Chemicals	4,480	*-0.5*	3,368	*-1.1*	1,112	*+1.1*
	25	Rubber & plastic products	7,913	*-13.2*	5,872	*-13.7*	2,041	*-12.0*
	26	Non metallic mineral products	6,787	*-6.7*	5,570	*-6.9*	1,217	*-5.7*
	27	Basic metals	4,789	*+0.4*	4,077	*+0.8*	712	*-1.8*
	28	Metal products	15,627	*-2.5*	12,230	*-1.7*	3,397	*-5.3*
	29	Machinery equipment	13,646	*-3.7*	11,506	*-3.7*	2,140	*-3.8*
	30	Office and computing machines	53	*+35.9*	36	*+44.0*	17	*+21.4*
	31	Electrical machinery	2,945	*-9.1*	1,918	*-6.9*	1,027	*-13.0*
	32	TV, radio & communication equipment	1,170	*-20.0*	790	*-6.6*	380	*-38.4*
	33	Instruments, medical equipment	2,350	*+11.0*	1,254	*+10.0*	1,096	*+12.1*
	34	Motor vehicles	1,396	*+10.1*	1,205	*+11.7*	191	*+1.1*
	35	Other transport equipment	1,885	*+1.9*	1,787	*+2.2*	98	*-3.9*
	36	Furniture, other manufacturing	4,136	*-2.4*	3,039	*+0.2*	1,097	*-9.0*
	37	Recycling	38	*+660.0*	33	*+1000.0*	5	*+150.0*
		Total manufacturing	**111,017**	***-5.2***	**80,735**	***-4.1***	**30,282**	***-8.0***
E	40-41	Electricity, gas & water supply	4,049	*-5.4*	3,574	*-5.2*	475	*-7.4*
F	45	Construction	48,179	*-1.7*	42,069	*-1.9*	6,110	*-0.2*
G	50-52	Wholesale, retail trade & repair of motor vehicles etc.	87,015	*+3.8*	44,054	*+3.4*	42,961	*+4.2*
H	55	Hotels & restaurants	18,604	*+2.3*	6,880	*+0.8*	11,724	*+3.3*
I	60-64	Transport, storage & Communications	39,325	*+3.1*	31,565	*+1.8*	7,760	*+8.7*
J	65-67	Financial services, insurance	12,882	*+2.9*	6,937	*+2.2*	5,945	*+3.8*
K	70-74	Real estate, renting & business services	21,301	*+9.8*	9,289	*+12.2*	12,012	*+8.1*
L	75	Public administration, social insurance	70,556	*+3.6*	40,675	*+1.0*	29,881	*+7.4*
M	80	Education	23,066	*+2.8*	8,004	*+0.3*	15,062	*+4.2*
N	85	Health care	24,443	*+5.9*	5,447	*+6.3*	18,996	*+5.8*
O	90-93	Other social and public services	17,166	*+5.4*	6,238	*+4.6*	10,928	*+6.0*
P	95	Private households	749	*-3.2*	49	*-7.5*	700	*-2.9*
Q	99	Exterritorial organisations	78	*-2.5*	60	*-11.8*	18	*+50.0*
		Military service	1,930	*-18.3*	1,930	*-18.3*		
		Parental leave	15,887	*-3.3*	120	*+4.3*	15,767	*-3.4*
		Total employees	**505,682**	*+0.8*	**294,515**	*-0.3*	**211,167**	*+2.4*

Source: Hauptverband der Sozialversicherungsträger; based on Wirtschaftskammer Niederösterreich

A trend analysis for the period 1995-97 in Pastner et al. (1998:50) showed that the decrease of employment in the secondary industry sector could be compensated through new opportunities in the service sector. Hence, the estimated increase in service production is likely to accelerate. For instance, business services showed an increase of 9.8% (i.e. 21.301 workplaces) between 1995 and 1997, the highest of the overall 0.8% increase of employment in Lower Austria.

If we define high technology sectors according to Jagger and Perryman (1997) we see an increase in employment in the high tech manufacturing sectors between 1997 and 1999 and a decrease in the medium and low technology sectors.

Table 2-6: Employment in high and low technology manufacturing sectors

	1997	3/1999	change
High/Medium Tech Manufacturing Sectors[2]	26,040	26,381	+ 1.3%
Low/Medium Tech Manufacturing Sectors [3]	84,977	82,596	- 2.8%

Source: Hauptverband der Sozialversicherungsträger; Wirtschaftskammer Niederösterreich

The distribution and development of company and employee data with respect to the size of company shows an overall increase in the number of establishments with subregional differences (Pastner et al. 1998:56ff). The highest are the surroundings of Vienna (plus 20%) and St. Pölten (plus 14%), whereas in the Weinviertel, Waldviertel and Eisenwurzen-Mostviertel subregions only 3%-5% more new companies were recorded.

In 1991 in Lower Austria 460,000 people worked in 52,000 establishments, about 25% self-employed. Most of the establishments provided work for 2-9 persons (45%). Only 200 firms employed more than 200 people (0.4%). 23% of all employees work for firms with 2-9 employees, 13% for firms with 10-19, and 18% for companies with 20-49 employees. Overall, more than half of the employees work for enterprises with less than 50 employees. 22% work for firms with more than 200 employees, and 20% work for firms with 50-198 employees.

Over 40% of all employees in manufacturing work in establishments with more than 200 employees. In the service industry 19% of the workers are employed in firms with more than 200 employees, and 40% work for firms with 20-199 employees.

The structure of the Lower Austrian economy shows a lack of employment in the service business - the service sector only employs 52% of the labour force, compared to 59% nation-wide. At the lower end of the scale is the Mostviertel-Eisenwurzen sub region with 44%. In relative terms a high proportion of the labour force can be found in agriculture (11% in

2 NACE: 24, 29, 30, 24, 29, 30, 31, 32, 33, 34

3 NACE: 15,16,17,18,19, 20, 21, 22, 23, 25, 26, 27, 28, 35, 36, 37

contrast to 6% nation-wide). The secondary sector employs 37% of the labour force (35% nation-wide).

The market for business services has a growth potential of 7-8% per year, in particular with respect to business-process re-engineering and other non-ICT services. ICT introduction and operating services will be promoted through networking (Leitner et al. 1997:37f).

Table 2-7: Employment by sectors and NUTS 3 regions in 1991

	proportion Lower Austria	Agriculture	Industry	Services
Austria		6%	35%	59%
Lower Austria	**100%**	**11%**	**37%**	**52%**
Mostviertel-Eisenwurzen	15%	17%	40%	44%
Niederösterreich-Süd	16%	7%	42%	51%
Sankt Pölten	11%	8%	39%	53%
Waldviertel	16%	19%	33%	48%
Weinviertel	7%	23%	27%	50%
Wiener Umland-Nordteil	15%	11%	36%	53%
Wiener Umland-Südteil	22%	4%	37%	59%

Source: ÖSTAT 1995, Statistisches Jahrbuch

Local employment has a positive peak in the southern Viennese suburbs, where 59% of the labour force live and work locally, and a low in the Mostviertel-Eisenwurzen subregion, where only 44% live and work in the same subregion. As a consequence, the subregions' contributions to the regional gross product per person vary significantly in comparison: Forexample, the Vienna-South subregion is above national average, and all the others (except St. Pölten) are below national average.

The increase of employment in Lower Austria was about 9.9% between 1989 and 1995 (Krajasits 1998) - almost 70% of this increase was male workers. In terms of growth the leading business was logistics and forwarding, followed by retailing and construction. The proportion of foreign workers has also increased significantly, in particular due to workers from Hungary and Slovakia. Interestingly, in regions with high unemployment the proportion of foreign workers is low, and vice versa. This observation indicates that a high level of unemployment seems to be related to economic-structural problems of regions rather than to changes in the labour force. Hence, whether or not border regions are able to catch up – not only with rates of employment but also with relevant elements and factors that are part of the information society – is heavily dependent on the potential for innovation, the infrastructure and type of business.

In comparative terms, besides agriculture, industry contributes a rather large part to the regional gross domestic product, namely 26%. About 1,000 firms are active in food production, petro-chemical manufacturing, machine and steel production, wood, textile/leather manufacturing. Due to early industrialisation of the subregions, there is a strong demand for modernisation, in particular when compared to recently industrialised areas. The EU provides funding for Objective-2-areas lacking industrial development. Objective-2-investments of 22m ECU (1995-99) are spent on subregions where 9.5% of the population of Lower Austria live. Main targets are again the economic modernisation and the development of human resources.

Overall 51.1% of the population of Lower Austria resides in objective areas of the EU structural fund, and 72% of the region is Objective-2 or Objective-5b area. In addition, the entire region is Objective-3, -4, and -5a area, to initiate improvements with respect to long-term unemployment, integration of people excluded from the labour market, employee and organisation adaptation through pre-emptive activities against exclusion from the labour market. Since EU funding has to be supplemented through regional funding, additional programmes have been launched. INTERREG II - Interregional collaboration and LEADER II - Actions for Rural Development lead to investments of about 12m ECU in 1995-99. Projects from the EMPLOYMENT, ADAPT and KMU will be completed to improve organisational structures and develop human resources.

2.2.3. Technical and Technological Infrastructure

The regions identified for Lower Austria's ICT infrastructure provision do not correspond to the political districts. They are, according to http://noe.orf.at/noe/noe/links/ regionen.hml: Mostviertel, Semmering, Waldviertel, Weinviertel, and Vienna. Each of the regions might have a set of providers. For instance, the Weinviertel is provided by Cybertron Marchfeld (http://www.weinviertel.at/dienste.htm). It offers business and private services, in particular for Lotus Notes and Domino users, as well as for business-specific ITC solutions. For Internet use, business and private rates are available. They are in conformity with the nation-wide tariffs and include all nation-wide available high speed links, such as ISDN.

Another provider, WVNet, offers a platform for job search for the Waldviertel. Currently, this platform is used mostly by female workers seeking to rejoin the business labour market. These are about 40-50 years old and have low to medium levels of skill with respect to ICT-based work.Further regions have been defined for the Waldviertel, namely Gmünd, Waidhofen/Thaya, Zwettl, and Horn.

2.3. Features and Trends of Social Exclusion

2.3.1. Unemployment Trends

According to the Austrian Public Employment Service AMS the national rate of unemployment increased by 0.6% between December 1997 and 1998. In December 1998 270,835 workers were without employment in Austria, 44,787 of them in Lower Austria. In

Lower Austria, the rate of unemployment fell by 1.5% between December 1997 and 1998, in contrast, e.g., to Vienna (plus 3.4%) or Upper Austria (plus 1.4%).

In 1998, the regional data for Lower Austria showed an unemployment rate (national calculation) of 6.9% (i.e. 44,787 persons, 26,597 male, 18,190 female). In 1998 there were 7.66 workers for each vacant position in Lower Austria. (in comparison to 9.16 in 1997) (http://www.wk.or.at/noe/zdf/usbesch/arbmarkt1.htm).

Table 2-8: Unemployment rate (national calculation) in Lower Austria 1970 – 1998 (annual average)

	1970	1980	1990	1998
Lower Austria	2.0	1.8	5.4	6.9
Austria	1.8	1.9	5.4	7.2

Source: ÖSTAT 1998, AMS

The national trend towards an increasing rate of unemployment for persons in the age groups 25-50 has not been reflected in Lower Austria (AMS NÖ 1998). The numbers remained stable compared to 1997. However, there was a 13.1% increase in the number of unemployed aged over 50 (Austria: 11.2%).

The latest data on the Austrian employment situation,cf., http://www.apa.at, show a record high for people who cannot be easily integrated into work processes. This number has increased over the last year from 82,453 to 86,863. This means that 28.9% of the unemployed (almost two thirds of them women) cannot easily be integrated into the labour market. Of particular interest is the main reason for this situation: limitations in mobility - most of the women have care duties.

The differences in the industrial development of the subregions in Lower Austria is reflected in the development of unemployment. However, there is no linear relationship between the level of industrialisation and unemployment for all subregions. The traditional industry zones in the southern subregions of Lower Austria show a significant increase in unemployment in the course of restructuring, whereas in the St. Pölten and Vienna-South regions structural change is not leading to increased unemployment.

According to an analysis of the main subregions in Lower Austria (Weinviertel, Mostviertel-Eisenwurzen-St. Pölten, Waldviertel, Niederösterreich Süd) the Mostviertel-Eisenwurzen-St. Pölten subregion shows the highest rise in unemployment and a stable to increasing total labour force, whereas the Waldviertel is still tending to lose active population (AMS NÖ 1997). The situation in Niederösterreich Süd shows a more or less stable situation which has been achieved through reducing unemployment among older people through retirement.

At the end of March 1999 41,620 persons were registered as unemployed in Lower Austria. Of these 11,170 had already been unemployed for more than six months, 5,501 for more than a year. Long-term unemployment has increasingly been reduced by activation policies. Training, counselling and placement activities have been strengthened. However, this can also

mean that unemployment periods are only interrupted, but with the effect that the person is no longer counted as long-term unemployed.

Research at FORBA commissioned by the Public Employment Service of Lower Austria showed there are several occupational groups whose employment is endangered or will be so in the near future. To mention a few examples: manual workers in warehouses or in logistics in general, where technological change and 'systemic rationalisation' has led to new work environments; female workers in accountancy who are confronted with automation of parts of their tasks; technical draftsmen and designers without knowledge of, and experience with CAD etc. These findings point to one important aspect of social inclusion or exclusion: the access to further vocational training. It has become apparent that further training measures in companies are still unevenly distributed among employees, with the lowest qualified receiving the least training. Often the burden of adaptation to new work environments is left to the individual employees, and not all of them have the capacities and opportunities to cope. The authors draw the conclusion that it is not technological change as such, but rather the reactions or non-reactions of human resource management that is decisive for the distribution of employment prospects (Papouschek et al. 1997, Pastner et al 1998). In general it can be assumed that the introduction of ICT results in an intensification of selection processes among the workforce. Among these, the „self-selection" of employees during organisational and technological change is of particular importance (cf. Volst/Wagner 1990:339).

2.3.2. Social Security and Poverty Risks

Austria's welfare state is well developed by international standards. This welfare system is geared towards employed people and families and thus reflects the corporate welfare archetype. This model is intended to maintain social status in the event of sickness, unemployment or old age. Most social benefits are based on the insurance principle, and the amount of benefit depends on the duration of employment and level of income. This has the consequence that those who are long-term employed with relatively high incomes - a situation generally enjoyed by men - are relatively well provided for, while inequalities in the labour market (and with it the discrimination of women) are being perpetuated and even exacerbated by the social security system.

In spite of multi-employer bargaining with a high degree of centralisation there are large wage differentials in Austria. The difference between the lowest and the fifth income decile was 101% in 1994, in contrast to 44% in Germany and below 40% in the Scandinavian countries.[4] Wage disparities in Austria therefore compare to North-American rather than European levels.

4 OECD Employment Outlook 1996

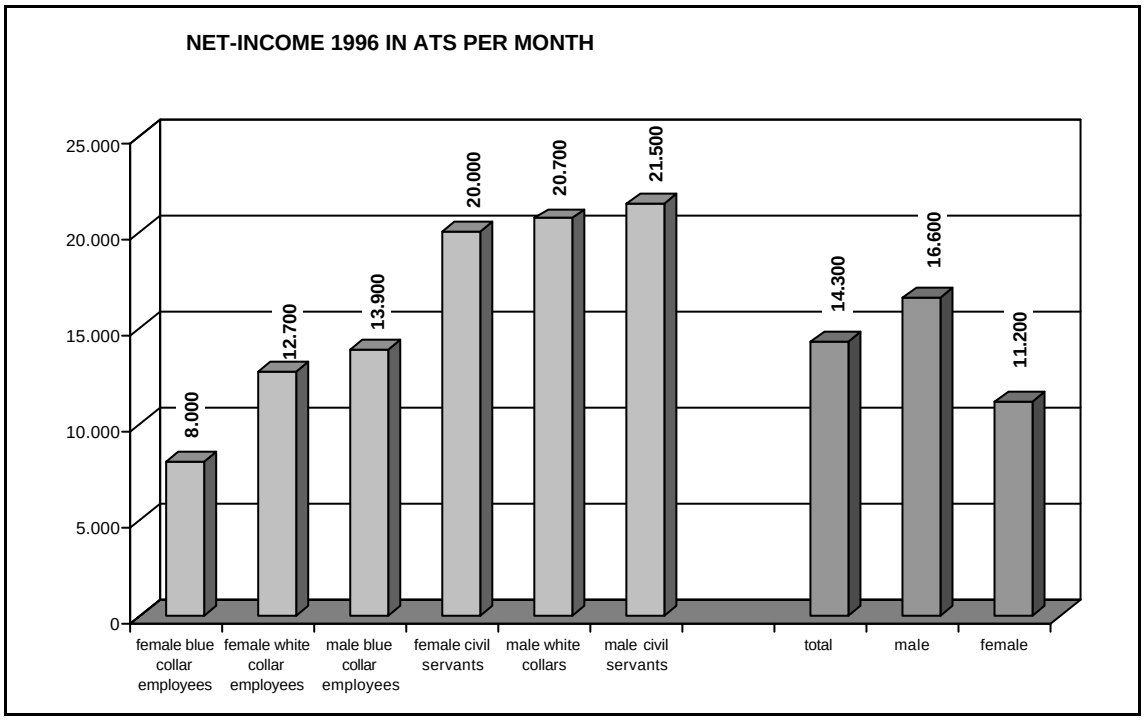
Table 2-9: Gross earnings of employees 1997

	Total	Women	Men
	50% earn less / more than ... ATS per month		
Lower Austria	22,813	17,525	26,341
Austria	23,462	18,467	27,264

Source: ÖSTAT 1998; data excluding civil servants with tenure or apprentices

The distribution of income among different group of employees clearly illustrates ranking of male and female incomes.

Figure 2-2: Mean Net Income of Employees in 1996 (Austria)



Source: BMAGS 1998, Data from Income Tax Statistics

In 1996, female blue-collar workers received only ATS 8,000 as mean net monthly income, followed by female white-collar workers with ATS 12,700. At higher levels were male blue-collar workers and above them female civil servants. The latter include an extremely high proportion of university graduates. Male civil servants and male white-collar workers are to be found at the top of the income hierarchy. For instance, an average male white-collar worker earns around two and a half times what an average female blue-collar worker would earn in a month (cf. BMAGS 1998).

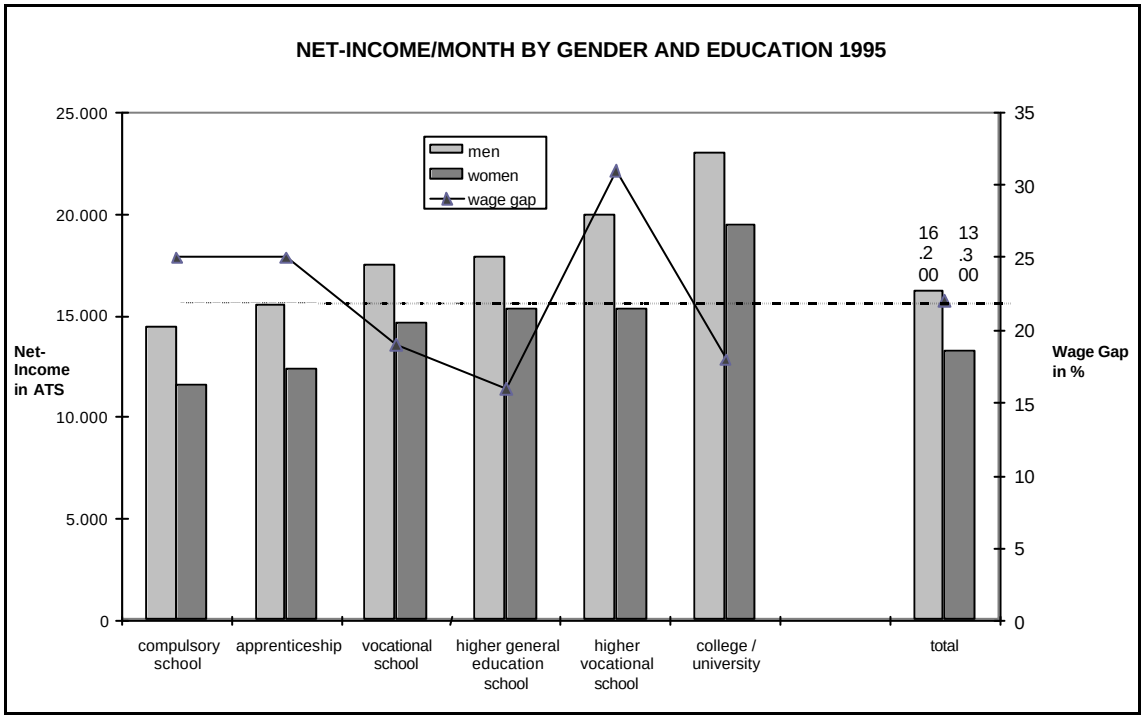
Austria belongs to the group of countries with the highest wage gap between men and women. Thus, men earn on average around 48% more than women or, in other words, women's

incomes are about 68% of men's. This gap decreased in the course of the '80s. However, the gender-specific income differential increased significantly in the first half of the '90s, especially among white-collar workers.

The data discussed up until now has not taken part-time work into account. It has been estimated that about a third of the gender-specific wage gap can be attributed to the higher proportion of women in part-time work. While income differences between the sexes are very often defended on the basis of the part-time employment of women, it should not be forgotten that women do not voluntarily choose this form of work. On the contrary, the unpaid domestic work they perform represents an important social duty, without which it would be impossible to maintain the existing male-oriented system of paid employment.

Another source of information allows us to standardise net incomes for differences in working hours. According to this compilation, men earned 22% more than women in 1995[5]. One interesting aspect is the distribution according to qualification levels: after all, the wage gap between men and women has long been attributed to women's lack of qualifications. Yet the differences in income are striking even when men and women share the same level of education and the same working hours. The average male income is around 16% (in the case of higher general school education) and 31% (in the case of higher vocational school) above that of women.

Figure 2-3: Standardised Net Income of Employees According to Gender and Education in 1995



Source: BMAGS, 1998; Microcensus Data, 1995.

5 Although the gender specific wage gap is underestimated by microcensus data (BMAGS 1998).

Differences in income are also reflected in welfare payments. The average unemployment benefits for men were one third higher than those for women in 1997. In the case of social security payments, the advantage men enjoyed over women amounted to a little over a quarter (27%) (AMS NÖ 1998). Women also get half the male pension (7.890 ATS compared to 15.450) (cf. BAK 1998).

The rate of unemployment benefit is calculated on the basis of the previous earned income. Generally, employees are entitled to unemployment benefit under the following qualifying conditions (MISEP 1998:36):

- unemployment
- availability for placement
- willingness to work
- fitness for work
- minimum period of employment with compulsory contributions to unemployment insurance: e.g. 52 weeks' employment within the 104 weeks prior to the first claim.

Unemployment benefit is paid for at least 20 weeks; the duration increases in case of longer employment before the event of unemployment. On expiry of the entitlement to unemployment benefit, „emergency assistance" is payable to unemployed persons. This support combines the principles of social insurance and welfare as recipients must be in serious need of support. Special regulations exist for elderly unemployed to facilitate the transition into retirement.

It is not possible to outline the Austrian welfare system in this report. We would like only to point out some of the risks of social exclusion. In particular, poverty risks are concentrated on some groups of the population. For example, female workers do not only have lower wages than male workers, they are also at risk of falling out of the social security system, namely, in certain cases when giving birth to children. For instance, if they agree to leave their contract before the birth of the child, not only do they lose the right to continue employment after six months, but also the right to receive emergency assistance *(Notstandshilfe)* from the Public Employment Service after being unemployed for longer than 3 years (Stuiber/Ninz 1999).

In particular, student mothers of single-parent households risk losing financial security and falling into poverty (Klien 1998). One fifth of these mothers already live below the poverty line. A larger number of children increases the likelihood of poverty.

In the *Sozialbericht 1996* (BMAS 1996), several indicators for social exclusion with respect to work have been identified (p. 189). These indicators are related to low payment, low education and skills, and low social security. Even in the case of employment, persons working under circumstances as characterised through these indicators might be excluded from material resources to make a living by their own. Six characteristic groups are endangered due to their limited opportunities on the labour market:

- foreign families
- households with unemployed people
- single-parent households
- households of small farmers and small self-employed

- families with a large number of children, in particular if women are not employed
- households of low-skilled workers.

There is a clear correlation between poverty and social isolation. In poor households the opportunities for social contacts are limited; 48% give up inviting other people to their homes (BMAGS 1998).

3. RESEARCH METHOD

3.1. The sample of the company survey

In winter 1998/1999 100 companies in Lower Austria were surveyed through telephone interviews. The aim was to collect information on the application of ICT and on related organisational aspects. Half of the sample (50 companies) consisted in SMEs.

Table 3-1: Size of surveyed companies

Number of employees	Number of companies
10 - 25	16
26 - 49	34
50 - 75	18
75 - 100	10
over 100	22
total	100

The following table presents the distribution of the companies according to sectors.

Table 3-2: Companies by sectors

Sector/Size	20- 50 employees	over 50 employees	Total
Agriculture and Forestry	1		1
Mining	1	1	2
Manufacturing	21	18	39
Energy		1	1
Construction	7	6	13
Wholesale and retail trade	8	7	15
Transport and Information	7	7	14
Real estate and business services	8	7	15
Total	53	47	100

3.2. The case study sample

The selection of case study companies aimed at a strong representation of companies in the ICT sector, i.e. producers of hardware or software and providers of ICT services. Accordingly five out of ten companies fall into this category. In addition, we were looking for companies belonging to other sectors. Here we selected three intensive ICT users and two with low or medium ICT intensity. In order to be able to analyse differences and to illustrate obstacles to the diffusion of ICT, the aim was not to select only technological practices with high level of ICT use.

Apart from an over-representation of ICT-related businesses, the general economic structure of lower Austria was taken into consideration in the selection process. As a consequence manufacturing and tourism companies are among the sample. The results of the SOWING company survey conducted in winter 1998/99 were a useful additional point of reference in making these decisions.

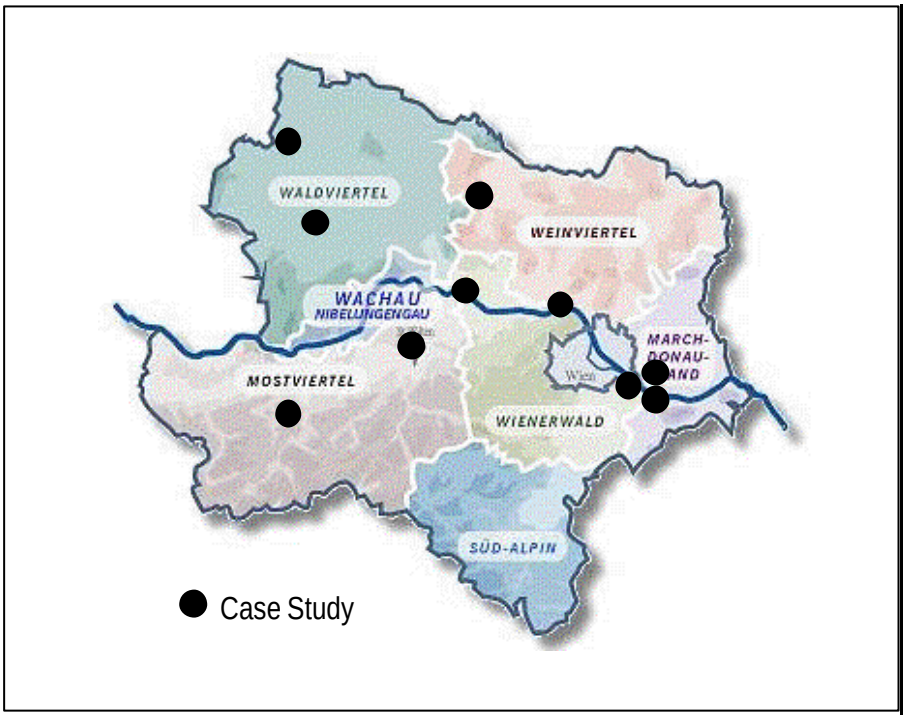
The following table gives an overview of the ten case-study companies.

Table 3-3: Overview with respect to the use of ICT

Producers of ICT and ICT service providers (Case study number)	User companies with high level of ICT usage	User companies with bw level of ICT usage
Electronics (No 3)	Metalworking (No 4)	Restaurant chain (No 1)
Software (No 5)	Bank (No 7)	Hotel (No 2)
Internet Provider (No 6)	Logistics (No 9)	
Electronics (No 8)		
Telecommunication (No 10)		

The geographical distribution of the cases-study companies shows that they are partly situated in rural areas, partly in the metropolitan area of Vienna. The northern part of Lower Austria bordering the Czech Republic has long been an economically disadvantaged region. In the south of Lower Austria there are old industrial regions.

Figure 3-1: Geographical location of case study companies



The following table gives details of the companies' size. As will be described below, to some extent, several of these enterprises are part of international groups (cases 1, 2, 4 and 9), in case 1 with the parent company being located in Austria. With the exception of case 10, all these companies have relatively low staff numbers, which is not untypical of the company structure in Lower Austria, however. Occasionally it was not possible to make a clear definition of staff numbers for Lower Austria.

Table 3-4: Sample of Case Studies in Lower Austria

No.	Business	NACE-Code	Employees
1	Restaurant chain	55.3	1,500[6]
2	Hotel	55.1	100
3	Electronics	32.1	190
4	Metalworking	29.2	270
5	Software	72.2	100
6	Internet Provider	64.2(72.6)	20
7	Bank	65.1	110
8	Electronics	32.1	202[7]
9	Logistics	64.1	120
10	Telecommunication	64.2	16,000[8]

6 nationwide

7 598 overall, 202 at the location

The companies can also be differentiated on the basis of company type and financial structure (see following table).

Table 3-5: Ownership Structure

No.	Business	Company type	Financial structure
1	Restaurant chain	fully independent	private ownership
2	Hotel	parent company	private ownership
3	Electronics	fully independent	private ownership
4	Metalworking	branch establishment	private ownership
5	Software	fully independent	private ownership
6	Internet Provider	fully independent	private ownership
7	Bank	independent in a group	private ownership
8	Electronics	fully independent	private ownership
9	Logistics	branch establishment	stockholder ownership
10	Telecommunication	fully independent	combination

All of these companies have been able to build on the basis of solid business fundamentals. Company 10 will have to make staff cuts in the next few years, conditioned by market liberalisation and its previous position as the monopoly provider.

For the selection and subsequent interpretation of case study results, it was important on the basis of telephone interviews to choose innovative and technology-oriented companies and companies with a typical company structure for Lower Austria.

8 nationwide

Table 3-6: Markets and Competition

No.	Business	Market of the product/ service	Compared with the market
1	Restaurant chain	growing	the same
2	Hotel	growing	the same
3	Electronics	growing	better
4	Metalworking	growing	better
5	Software	growing	the same
6	Internet Provider	growing	the same
7	Bank	growing	the same
8	Electronics	growing	better
9	Logistics	growing	the same
10	Telecommunication	growing	the same

The following profile of general workforce data makes it clear that the proportion of older employees was relatively low in all of these companies. The proportion of women employed was 34% at the lowest (case 3) and 80% at the highest (case 2). In cases 1 and 2, women are mainly employed in areas with low qualification requirements.

Table 3-7: Workforce profile

No.	Business	Age		Women	Education
		<25 years	>55 years		
1	Restaurant chain	10-25%	<10%	45%	low
2	Hotel	25-50%	<10%	80%	low
3	Electronics	<10%	10-25%	34%	between
4	Metalworking	<10%	<10%	40%	high
5	Software	25-50%	<10%	40%	high
6	Internet Provider	25-50%	<10%	40%	high
7	Bank	<10%	<10%	55%	high
8	Electronics	<10%	<10%	37%	between
9	Logistics	n.a.	n.a.	66%	high
10	Telecommunication	<10%	<10%	38%	in between

With the exception of companies 5 and 7, internal and/or external restructuring could be seen in all the other companies, and this will be dealt with in greater detail later.

Table 3-8: Restructuring

No.	Business	Restructuring
1	Restaurant chain	internal & external
2	Hotel	external
3	Electronics	internal & external
4	Metalworking	internal & external
5	Software	no
6	Internet Provider	external
7	Bank	no
8	Electronics	internal & external
9	Logistics	internal & external
10	Telecommunication	internal & external

3.3. The companies

No 1 Restaurant Chain: An expanding, Austria-wide group operates coffee houses and restaurants with the emphasis on industrial catering. The company provides catering for individual hotels, youth hostels and camp sites. A further important branch of business is the delivery to schools and kindergartens of over 22,000 ready-to-serve meals per day, which are prepared at two production sites. The business headquarters is in Vienna.

No 2 Hotel: The hotel part of the enterprise offers two different service products at the analysed location: a five-star hotel for business travellers and a four-star hotel for tourists. The business is marked by the particular location: as the only hotel at an international airport, it not only includes advance bookings among its customers, but also travellers who have problems with connecting flights and who book overnight, as well as airline staff.

No 3 Electronics: The electronic contracting company came out of a management buyout of an industrial company's production department in 1997. The parent company gave an undertaking to provide orders (primarily inductive elements) for 75 per cent of the turnover for a three-year period. A development department for special products was newly established in order to be able to offer customised products.

No 4 Metalworking: The company is part of the metalworking industry and involves a production plant for three different components of the end product. Manufacturing consists of mechanical production (sheet-metal working, machining etc.) and assembly, which forms the main emphasis owing to the increasing buying in of components. Over 40,000 orders are worked on and delivered annually. The individual production lines produce between 15,000 and 22,000 parts per year. Alongside production, numerous product-development activities are based at the site. These include, on the one hand, development activities for the plant as a 'competence centre' for particular products and, on the other, activities for the whole concern.

No 5 Software: The location studied, a „software projects" profit centre within a group, develops customised standard software. It is more or less the extended workbench of the customer department based in the company's Austrian headquarters. Products include dialogue-oriented applications based on databases. Recently these products have increasingly been developed as web-based software. Programming a special module for an international provider of standard business-management software plays a large role. As a result of the participation of a German concern in the company, administrative applications for special branches of industry have increasingly been developed and marketed. Alongside the project-related development of software, the company studied also operates as a service provider and supports companies in the field of computer infrastructure.

No 6 Internet Provider: The main activity of the company (better a „company network" with different sites) is in the sale of Internet access, in the design and maintenance of web sites and in training customers. In addition, various office services are also offered to companies and local authorities in the region. The operation at the centre of the study was the first local provider in one of Austria's economically weak regions (because of its proximity to the border) and derived from regional job-creation and technological upgrading policy initiatives. The provider has few staff and works closely together with other companies, regionally distributed „tele-offices" and another associated company. This co-operation is needed because the limited personnel resources mean that not all necessary tasks (e.g. training, expensive home-page design) can be carried out directly at the provider's. This interlinkage also has its origins in the regional policy initiative to which the foundation of the companies goes back, however.

No 7 Bank: The regional Bank analysed is an economically independent bank in the form of a public limited company, which however is part of an Austria-wide (largely co-operative) umbrella organisation which takes care of particular functions for all member banks. The business sector of the bank being studied is limited to a particular, regionally demarcated part of the federal province of Lower Austria. Alongside its headquarters, the bank has 13 branches. The products/services offered include the whole range of payment transactions and the further spectrum of usual banking services such as credit, leasing and factoring, deposits business, savings and loans business and insurance, securities and overseas business.

No 8 Electronics: The company is a manufacturing and development enterprise in the electronics and telecommunications sector. The company manufactures both cables and inductive construction elements as well as mains-adapter plugs, and niche products for guidance and drive technologies. In 1991 it was spun off from an international group as until then a pure production plant, and set up as an independent enterprise after a management buyout. Because of the low wage costs, two production plants were set up in the Czech Republic, which testifies to the continuous growth in the field of adapter plugs. Even though these sites were initially only conceived as an extended workshop, they are now being progressively developed into independent production plants. Product development, however, remained at the Austrian site. The central stores, situated at this site, will possibly be relocated to the new sites, as manufacturing will be stepped up there in future.

No 9 Logistics: The logistics company has specialised in the area of CEP services (courier, express and parcel services) and is the Austrian subsidiary of an international company. Since

the mid-1990s, the same product range has been offered throughout the EU; letter post and parcels up to a maximum of 70 kg are carried. The Austrian headquarters, which was at the centre of the study, is also responsible for eastern Europe. In all there are nine sites throughout Austria.

No 10 Telecommunication: The company is active in the (tele)communications sector, and as a provider and developer of infrastructure and applications, in particular telephony, radio and data transmission. Having been formed out of a state-monopoly in the course of market liberalisation for providers of this service in Austria, the company has been active on the free market with a strategic foreign partner for approximately a year, and is at present market leader. The company provides infrastructure, equipment and services for all telecommunications requirements. Its customers are businesses and households as well as private individuals.

3.4. Conducting the case studies

In a process of intensive Internet and business literature reviews and interviews with experts during a period of nine months, more than 40 companies were contacted by mail and asked for their support. These endeavours resulted in ten companies with the desired characteristics agreeing to take part in the project. Three of the case studies (cases 1 to 3) were conducted in summer 1999; the experiences and results were used in the preparation and conducting of the remaining seven case studies between autumn 1999 and spring 2000.

In the ten companies a total of 66 guided interviews were made with general managers, heads of department, project leaders, clerks, skilled workers. All case studies were conducted in pairs, i.e. by one researcher from social sciences and one researcher from computer science. All interviews were taped and transcribed. The written interviews were analysed on the basis of a case-study analysis grid which contained the main topics of the guidelines and in which results and quotes were filled in. This document was the basis for writing the case-study stories and for filling in the standardised case-study instrument.

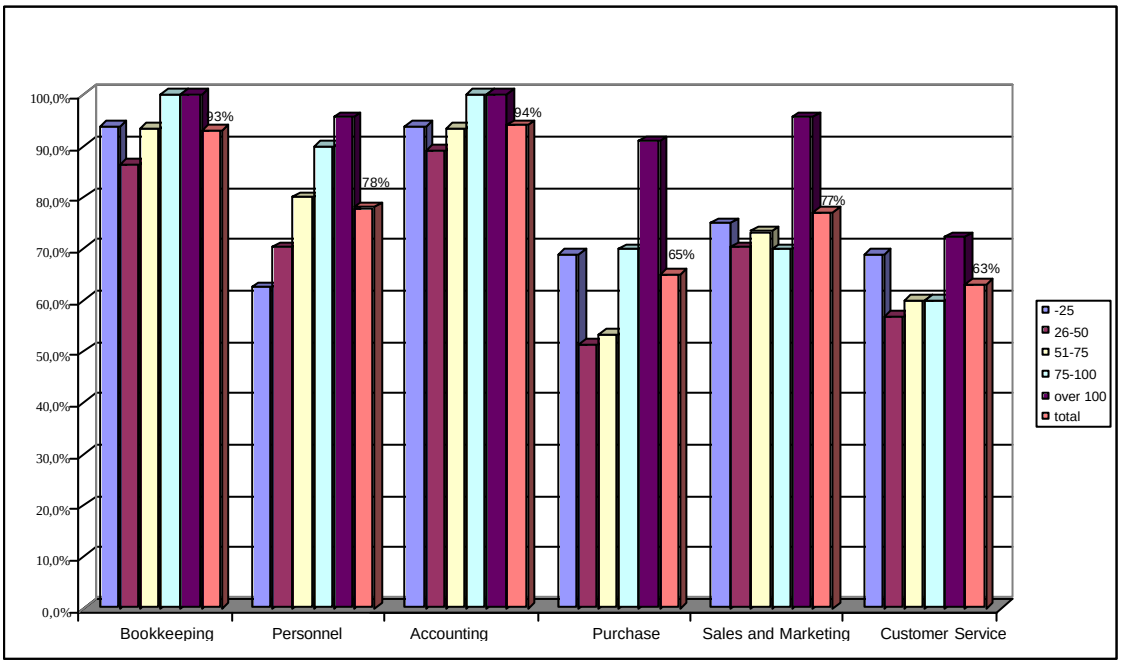
4. RESEARCH FINDINGS

4.1. ICT infrastructure and utilisation

4.1.1. ICT infrastructure

In the companies themselves there is widespread ICT penetration in all fields of business. From the survey, it was possible to ascertain the diverse application of information systems for Lower Austria as a whole. Computers were most frequently used in accounting (94%) and bookkeeping (93%). After this came personnel administration (78%) and „sales and marketing“ (77%). The following chart shows computer support for the various tasks, divided according to company size.

Figure 4-1: Computer support according to company size and sector

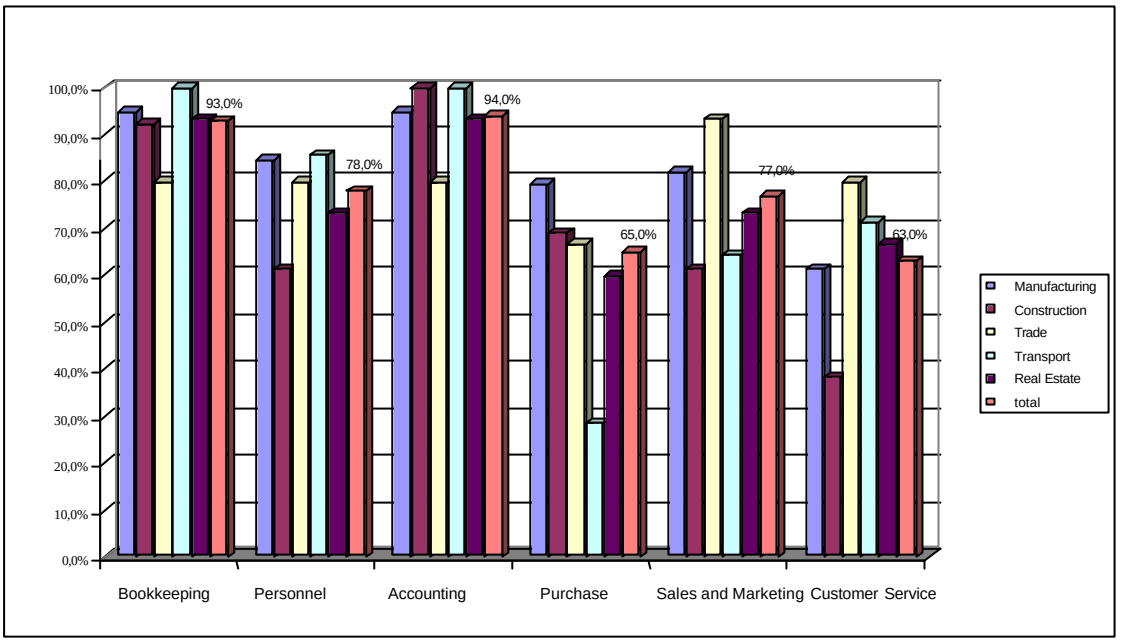


Source: FORBA company survey

These data demonstrate widespread technical support. With regard to company size, however, it was possible to establish that companies with 26-50 employees (with the exception of personnel administration) showed lower values throughout. The next chart, where computer support is presented in relation to the various sectors, attempts to clarify whether there might be a direct sectoral connection here. If one assumes in this assessment that certain forms of computer support are sector-specific (e.g. purchasing plays a limited role in

transportation) then it is clear from the typical applications such as bookkeeping, wages and accounting that that commerce lags somewhat behind.

Figure 4-2: Computer support according to sector and task



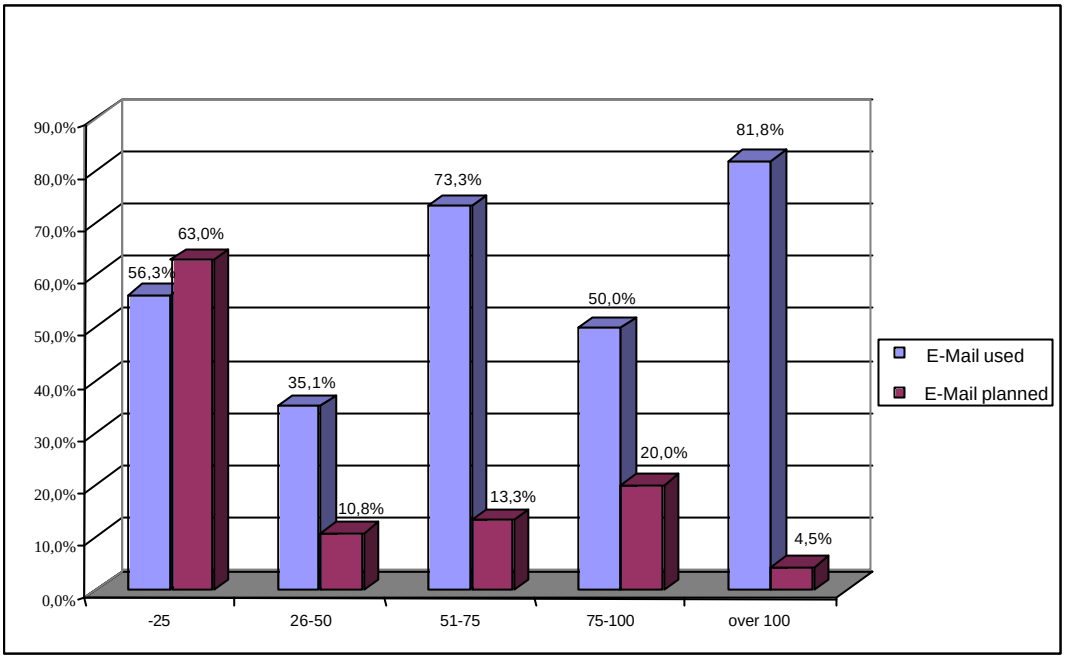
Source: FORBA company survey

4.1.2. Electronic communication

Because of the increasing importance of electronic communication and the Internet, the application of e-mail and the Internet was taken particular account of in the survey. Above and beyond this, the Austrian government had launched the „Austria on the Internet“ initiative, in short „Go on“ at the beginning of summer 1999. Whether this has contributed decisively to the fact that according to an Integral/Fessel-GfK survey there were 2.6m users (households and workplaces) at the end of 2000 cannot be said at this point.

If one looks at the interview results, it is apparent that at the end of 1998 e-mail was used for communication in 56% of Lower Austrian companies, and 10% of companies were planning to introduce it. The connection between electronic communication and size of company is interesting. Figure 4-3 shows that a connection can only be seen with a company size of more than 100 employees. Similar to support in the business fields, companies with 26-50 employees lag behind in this development.

Figure 4-3: Use of e-mail



Source: FORBA company survey

The case studies also analysed the penetration of innovative technologies in the companies. There were signs that the level of information technology use in activities is high, yet continuous support for business processes remains low. A typical case was case study 1 (catering and restaurant operator): As an innovative ICT operator and user, as well as a commissioner of new developments, the level of information technology use there is very high, but its penetration of business processes is still low. The latest ICT is a „must“ in the administration and ordering. But not every innovation on the ICT market is utilised, as the priority is rather for solid support of the work. In the last three years, e-mail communication and the use of *public folders* has developed in particular. The emphasis on communications functions also went together with equipping all workplaces with a PC. Previously, only some staff had PCs.

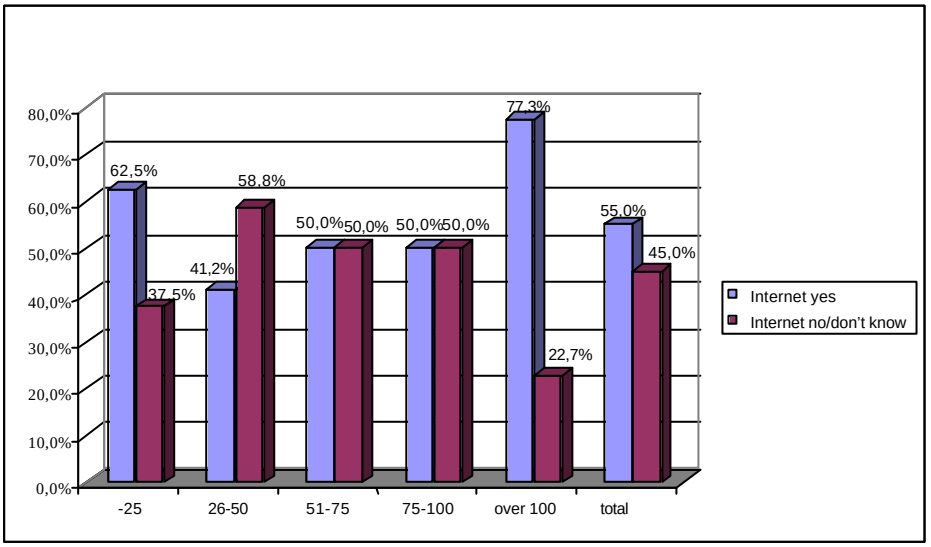
Electronic communication not only determines work in administration and to some extent in product development, it is also used for new services. Thus the company in case study 1 increasingly uses the Internet to present itself and its products to customers. In the industrial catering area, there has been an expansion into the provision of home-delivery. The relative independence of location of individual functions is made use of in this connection. Thus the logistics of home delivery are given to a plant that is approx. 300 km from the company headquarters and in a different town. There the orders for the goods advertised on the web site come in by telephone and e-mail. Delivery, i.e. the routes, are planned on this basis. The delivery of meals to the customers is carried out by drivers who are also not part of the company. Here we can thus see outsourcing in connection with the use of electronic communications.

In case study 4 (metalworking) internal e-mail is used in particular for sending texts, plans, assemblies etc. E-mail plays a very important role for communication in the group – and thus also with the customers – even if contracts come in by fax. Queries over uncertainties take place by e-mail. Orders to suppliers are also sent by fax, and in parallel open questions are cleared up by e-mail. In cooperation in „virtual" international development teams, e-mail is not in the position to replace personal contact meetings. The despatch by e-mail of specifications for products to be developed was mentioned as an example from project work. Each recipient interprets the information in a particular way. It is then apparent from the answers that understandings differ at differing sites. It then requires a lot of writing to arrive at a common perspective. In such cases a meeting is much more efficient, and often the only means of achieving the desired objective.

4.1.3. The role of the Internet and Internet-based services

Alongside electronic communication, the company survey also investigated the use of the Internet as an information medium. As of the end of 1998, 55% of Lower Austrian companies had Internet access. Divided according to company size, it is apparent that companies with 26 to 50 employees had below-average Internet access.

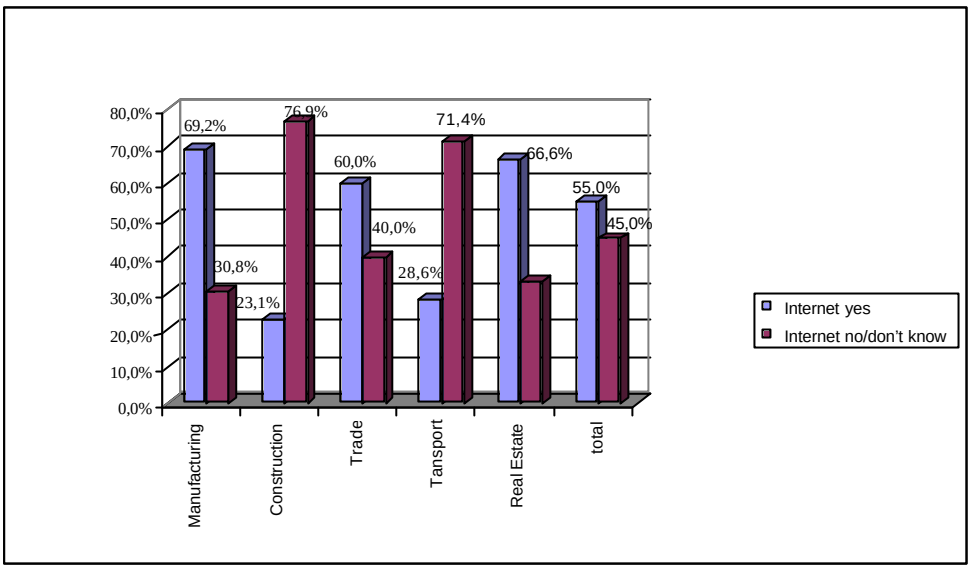
Figure 4-4: Internet access according to company size



Source: FORBA company survey

With regard to the various sectors, commodities, real estate and trade did best. The transport and building sector lagged well behind.

Figure 4-5: Internet access according to sector



Source: FORBA company survey

The companies with Internet access used it as a communications and information-finding medium (both uses over 85%). Well behind was telebanking (some 42%). Video conferencing came very low down, with only three companies planning to use it at all. Here, however, it must be borne in mind that video conferencing is primarily only significant for international companies. In addition, only 12% of these companies had their own web site.

In the case studies it was possible to analyse the use of the Internet in selected companies in detail. This revealed varying aspects: on the one hand the Internet protocol (TCP/IP) was used for standardised data exchange, that is, for example, used in a company's intranet. On the other hand, it was used for openness with regard to customers or partner companies in order to achieve improved quality and rationalised processes. The use of the Internet thus goes beyond the information seeking and electronic post functions mentioned in the survey. In the following we put forward some examples of this from the case studies.

The Internet is regarded as having great potential in banking and finance. In case study 7, for example, the service for *buying and selling securities in the Internet* (B7G1-3) was described. Two www-based possibilities (Internet- and tele-banking) are available to customers in order to initiate account activities themselves, the successive execution of which are then software-guided. Communication with customers through electronic media plays hardly any role in the bank studied, although the technological facilities for this are available. The reasons, on the one hand, lie in a management that has not so far pushed this form of customer contact. On the other, the absence of control facilities on sensitive transactions, such as granting credit, limit the application. Apart from this, at the time of the survey only a small section of the customers were using e-mail facilities.

In cast study 9, (despatch-logistics), it was evident that the use of the Internet was very definitely aimed at the automation of business processes. The use of web-based links to the

customer meant that on the one hand individual tasks were transferred directly to the customer and thereby, on the other hand, in the case of complaints (e.g. concerning the wrong form of despatch), the time and effort spent on processing them was much reduced. Here it was also possible to note that the number of incoming calls to the call centre was falling, because the medium and large companies in particular were utilising the information technology tools offered:

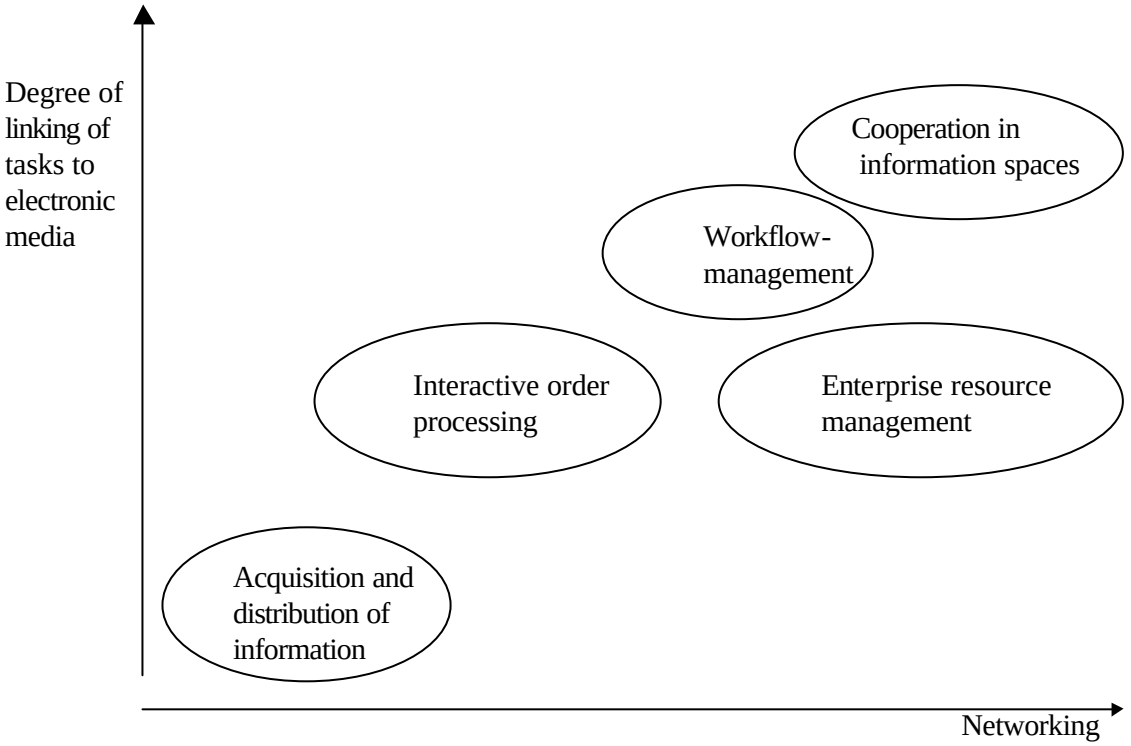
> *„And not only is the work becoming easier, but the quality is improving, too. Because certain human errors don't happen. I mean, the customer can make a mistake the same as before, but then it cannot happen that there is then a retrospective discussion of the type of delivery. When we were still filling out the consignment notes ourselves, it was possible to tick the wrong box. Now the customers do this themselves. Naturally, this also reduces complaints in the billing department, because what the customer has sent us is what he wanted. And that's what he gets."* (B 9G3f-19)

Accounting tasks have been simplified, too, through the linking of filed information, *„the point where you used to write an invoice manually no longer happens, where we collected the whole bills of lading for the week or the month, in the first stage, and then generated an invoice from them. It's all gone! So it is error-free. Communication with the customer is also essentially better as a result, because it simply prevents complaints. And it is definitely right!"* (B9G3f-19) In future, customs documents are also to be scanned in and transferred electronically, as a result of which one of the last areas with manual entries on paper will cease to exist.

4.1.4. Integrative information systems and networking of information

Current use of ICT focuses on networking processes, data and supply chains, as well as the automation of business processes. This trend is kept even for work tasks involving typical human activities, such as planning and creative design. It will lead to the complete linking of business activities to electronic media and devices, as shown in Figure 4-6.

Figure 4-6: Diffusion of ICT with respect to networking and degrees of automation



The acquisition of information does not require a high degree of networking and interactivity between machines and humans. The link to ICT is low and targets towards acquisition and distribution procedures, e.g., use of search engines in the WWW (World Wide Web), e-mailing results and processing the results in a data warehouse. Although these tasks have a certain level of complexity, they are mainly isolated at a single place and require no coordination task at the workstation level (only at the task level). The interlinking of tasks increases as soon as ICT begins to be used as coordination technology, either in terms of order processing, linking several work stations, in logistic chains coupling planning and routing tasks, or in ERP (Enterprise Resource Planning) systems, when a centralised data base supports integrated process execution. In organisations based on workflow-management systems ICT has taken complete control of processes to run a business. Where the collaboration of employees is also controlled through systems – computer-supported cooperative work (CSCW) systems – each collaborative action of an employee might occur within a socio-technical system based on a shared information space. The way ICT is used within an organisation determines both the extent of the benefits which can be gained from ICT, and the degree to which tasks/employees are linked to ICT.

The technological network and electronic data communication represent the preconditions for the integral processing of company tasks, as described above. The companies were asked about this in the company survey: 12% communicate electronically with locations that are part of the same company; 40% communicate with partners outside the company. EDI (electronic data interchange) over standardised interfaces is used in 35% of the companies, with data

primarily being exchanged with banks (30% of answering companies and 10% of the whole) and customers (21% and 7%).

The company survey also measured the penetration of the individual business areas with ICT (see section 3.1.1). The specific form of ICT use could not be derived from this, however. The case studies served for a closer analysis of ICT use. In these, it was evident that various objectives in the companies favour the integrated utilisation of ICT. Here, business policy and cost reasons are the most important. Thus for example, in case study 10 (telecommunications), there have been several restructurings in recent years in the course of privatisation. In the framework of order management, the company has had to face the challenge of no longer taking in customer orders at a range of sites, but offering as much information and service as possible „from one source". This has caused a number of problems, and among other things led to the restructuring of the company's computer landscape, as one project manager told us:

> *„Previously we were very technology oriented and since 1997 we have been in the process of making all systems and organisational units customer oriented, which means, of course, building up an appropriate customer data bank. And to guarantee the purity or accuracy of customer data, we are also integrating the whole order management with customer accounting. Thus it can be guaranteed that the customers are accurately identified and thus receive proper service."* (B10G1-2)

This strategy is by no means new, but has been apparent in an increasing number of sectors since the 1980s (Baethge/Oberbeck 1986). Now, technological integration of the companies is being driven forward on the basis of the new ICT.

In one of the case studies it was possible to see that the integrated, but dispersed data processing made certain organisational structures and processes possible for the first time at all. In case study 10, previously existing personnel and buildings spread over the region being studied, or Austria as a whole, were used to operate a call centre.

> *„In the call centre area, the introduction went as planned. If customers came in through the central access number, for example in the call centre in Vienna, and no free operators were available there, then the call would automatically be offered to all free operators in Austria. This means that it is now dependent on the load on the individual positions as to where the customer is actually dealt with – and on the skills of the individual operators. And the operator is also appropriately computer-supported."* (B10G1-3)

In the industrial company, the technical networking and integration has also been an important aim for many years. *„In 85, 86 we were already only buying automated machines if they had data compatibility, i.e. the ability to exchange programs and status information."* (B2G4-10) In this company, the production planning system (PPS), which was written in-house, is now the main element of the company-wide information architecture, forming the basis for an Intranet. The PPS covers the whole materials flow and the entire processing of a customer order. At the administration and production workplaces, either standard software packages or successful self-developed programs are used. Thus, for example, the filing system is ICT supported and the attempt is made to use this support as comprehensively as possible:

„Speaking for myself, I make do with six files, the rest are actually in the mail in Outlook." (B2G3-4)

Despite the high level of technological integration, staff at this company can set up the ICT tools at their workplaces according to their own requirements. Thus staff in the logistics and despatch department have on-line query language and reporting tools. This procedure increases the room for manoeuvre in fulfilling tasks and makes it possible to aim for high quality working results.

In another industrial company, investigated in case study 4, the integration and opening up of the whole enterprise area also took place in stages. It built on successfully tested individual solutions and on the results of previous stages of integration. The company's technological practice is thus characterised by the adaptation of the PPS, the company's information-technology backbone, to the company's processes and specific requirements. This is done with particular regard to maintaining the plant's flexibility and strict adherence to deadlines. Not only is production planned through the PPS, but the whole business process is controlled through it, including acceptance of orders and ordering of materials. The completion of tasks is cued by the PPS – whether it is manufacturing according to the weekly plan or materials ordering through order suggestions.

In addition to the PPS, some staff in this company work with additional tools, such as *MS Excel* or *MS Access*, which are not integrated into the PPS. No data exchange is possible between the PPS and the additional applications.

As regards individual peculiarities of the technological practice, namely the individually organised use of Excel or Access at some workplaces, the following attempted explanation can be derived from the interpretation of our discussions: because of the minimisation of fixed costs and because of group regulations, as few IT personnel are employed as possible. There is thus no large internal IT department to look after all the applications and all the wishes of the staff. In order to provide certain additional functions, staff have created help functions on the basis of Excel or Access. On the one hand this means a certain autonomy in the shaping and adaptation of technology in the workplace. On the other hand, it involves disadvantages with regard to software ergonomics, as differently organised desktops crop up and it is necessary to switch between a large number of applications – sometimes involving additional data input.

With regard to the issue of integration and networking as a whole, the case studies led to the finding that the new ICT opportunities are being used very intensively both for in-house and inter-company networking as well as for networking with the consumers. However, even throughout all the companies at the highest level of technology, the degree of technological integration remained behind the technological possibilities available. This is only partly due to the fact that in practice integration is a lengthy process involving implementation of technology and organisational change. A further systemic reason lies in the quite intentional „decoupling". Thus in several case studies, the fax is used for information transfer between workplaces that are also equipped with *e-mail*. There were also examples of relatively highly standardised order procedures between companies which did not take place through EDI. Rather the data were entered again, with staff at the same time checking the information for completeness and plausibility. These findings lend themselves to two interpretations: on the one hand, they can be

read as a not yet exhausted potential for rationalisation, on the other hand, the limits of the capacity for technological integration become apparent.

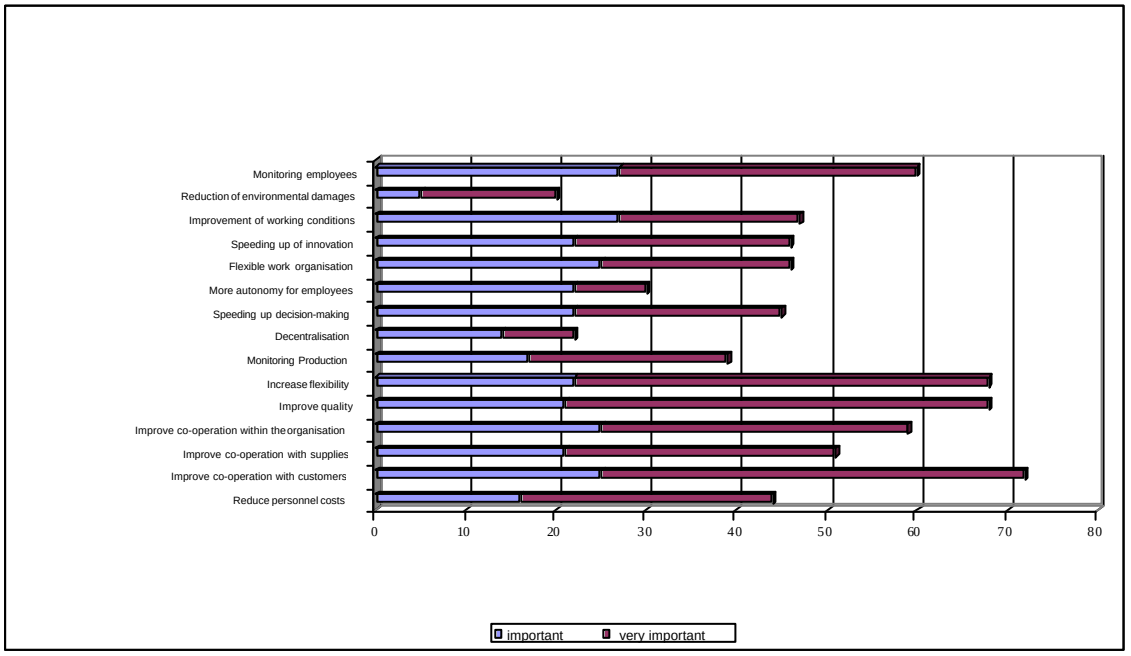
4.1.5. Objectives and obstacles to the utilisation of new ICT

The introduction of modern information and communications technology in the enterprises is connected on the one hand with a wide range of objectives, on the other hand difficulties and problems arise which may impede the spread of ICT. In the company survey, therefore, the enterprise objectives as well as the obstacles in relation to technological change in the companies were queried in a standardised form.

Important objectives: customer satisfaction, quality and flexibility

On the question of the objectives, if we take those regarded as „important" and „very important" together, it is apparent that *„improvement of cooperation with the customer"* is mentioned most frequently (72% of companies regard this objective as important or very important). Mentioned next are *„improvement or standardisation of the quality of products or services"* and the *„improvement of the ability to react quickly and appropriately to market demand"*.

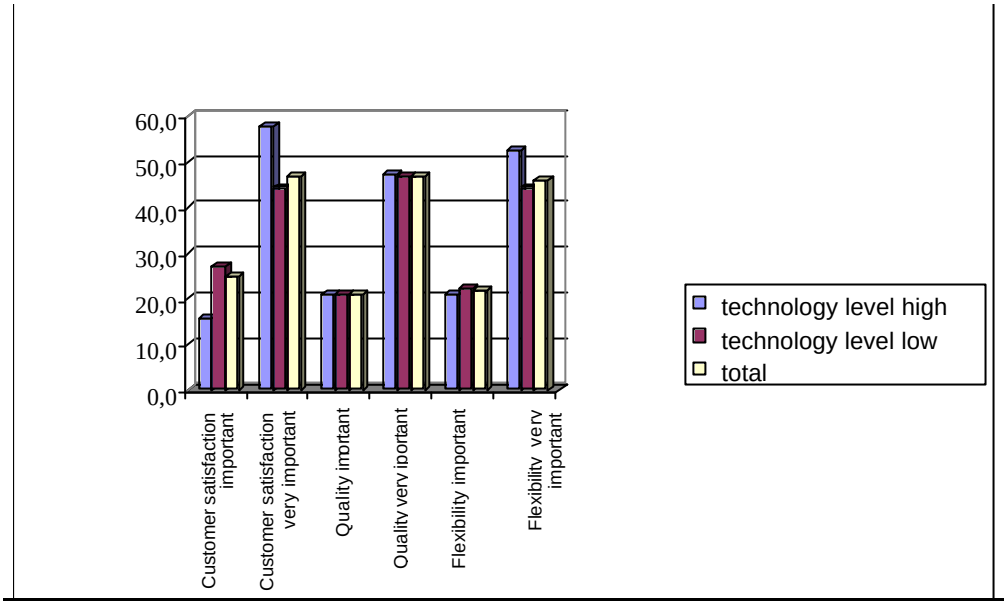
Figure 4-7: Aims/Objectives



Source: FORBA company survey

As the following chart shows, no essential differences are apparent in a differentiation of aims and objectives according to technological level either. This means that these aims and objectives are no less important for companies with a high level of technological support, nor have they already become obsolete through the previous application of technology.

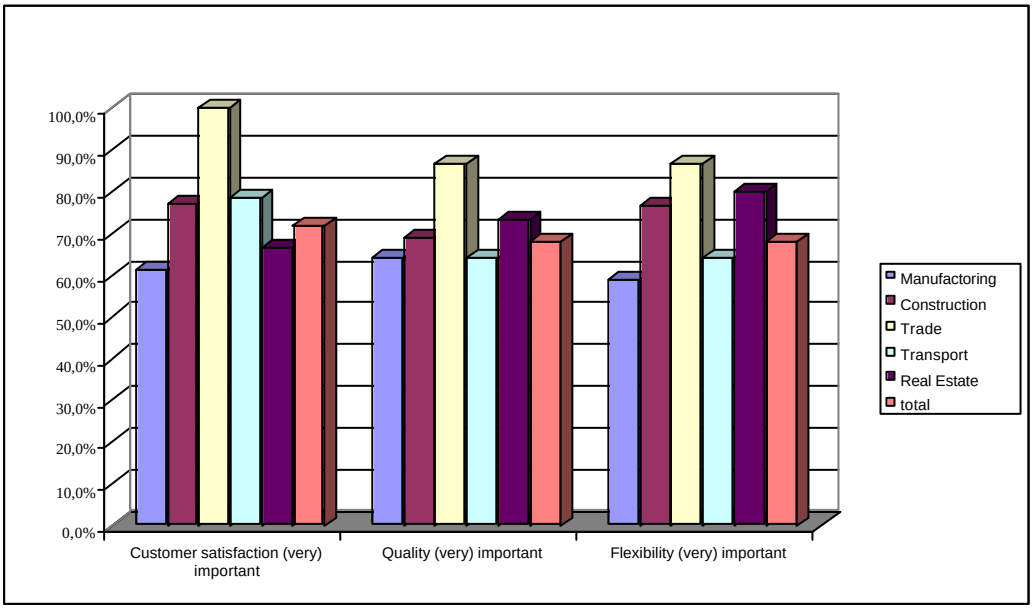
Figure 4-8: Aims/objectives by technology level



Source: FORBA company survey

In the following chart, the three most important objectives are investigated according to sector. Do these objectives vary according to sector, or is there a generalisable trend? With the exception of wholesale and retail trade, which gave the highest results in all areas, the results – apart from flexibility – are at a similar level.

Figure 4-9: Aims/objectives according to sector

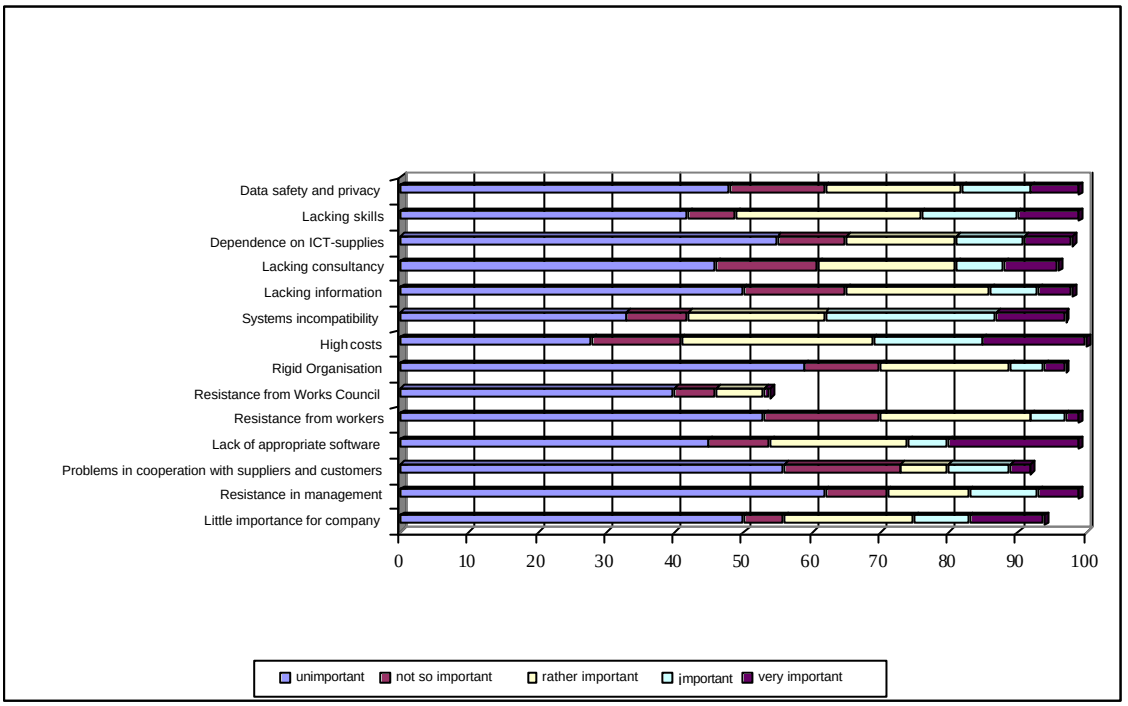


Source FORBA company survey

The most frequent obstacles: software problems, costs and lack of qualification

Alongside the objectives, companies were also questioned on the obstacles to the application of new ICT. Here, too, standardised possible answers were provided. Factors hindering the application of new information systems were seen by the companies in *incompatibility* with existing systems (25% important, 10% very important), the high *„costs of change“* (16%:15%) and in the *„difficulty of finding suitable software“* (6%:19%). Alongside these technical factors, the *lack of qualified staff* (14%:9%) was mentioned above all – see Figure 4-10.

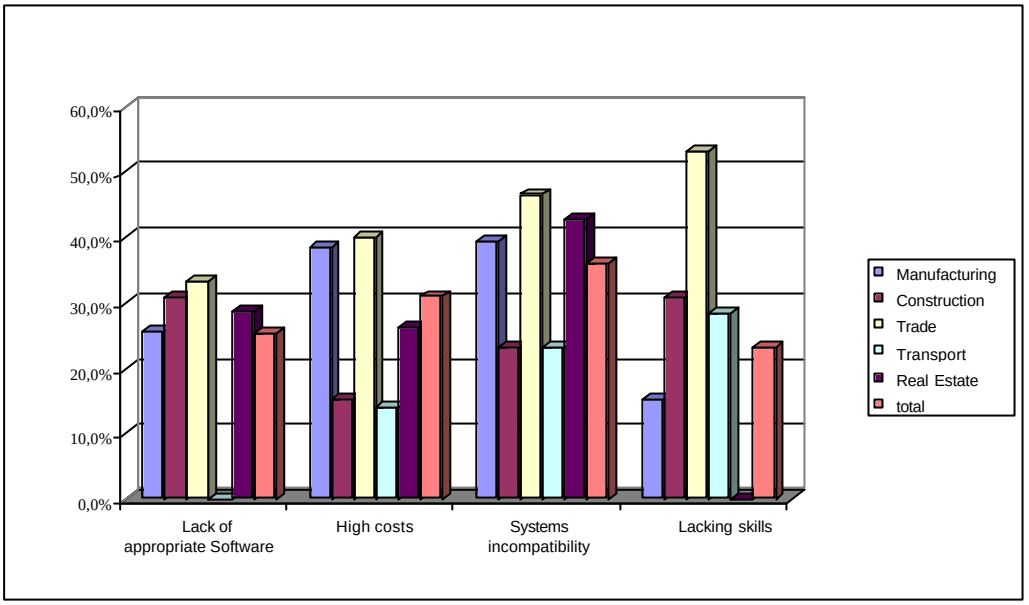
Figure 4-10: Obstacles to ICT introduction



Source: FORBA company survey

The sectoral influence was investigated in this question too. Relatively large differences were apparent here, with wholesale and retail trade companies in particular appearing to lack the necessary qualified staff for the utilisation of new information systems.

Figure 4-11: Obstacles by Sectors



Source: FORBA company survey

4.1.6. Conclusions

For the purpose of our analysis we made a distinction between different functions new ICT can fulfil: ICT as a tool at the work station, ICT as automation technology, ICT as control and monitoring instrument, ICT as organisational technology and ICT as communication media.

Table 4-1: Functions of ICT

Metaphor	Function	Aim
tool	supporting work process	increase quality, speed up work process, cope with increased complexity
automation technology	elimination of human labour	cost cutting
control instrument	monitoring and steering the work process	adjustment to changes, avoiding defects
organisation technology	co-ordination of work processes	transparency, organisational flexibility
medium	setting up of technical connections for communication	quick and intensive exchange of information and knowledge

For each of the metaphors aimed at the integrated use of ICT in organisations (all of the above shown except „tool“), several technologies are fundamental: network (management) systems and centralised information repositories equipped with intelligent data management systems. One of the basic networks has to be considered to be the Internet, in particular its TCP/IP protocol and services (enabling e-mail, file transfer etc.). Not only does this make it possible

to link the market and the customer to an organisation, but it also provides an isolated ICT solution within an organisation.

But it is not the technological infrastructure itself that is decisive for achieving the objective of the utilisation of the technology. In the survey, no less than 74% agreed with the statement that „the advantage of these technologies does not arise so much from the technology itself, as from the way in which the organisation is changed as a result of its introduction". An important objective in this context is technological centralisation of data storage, which supports the rationalisation of company processes.

The utilisation of new ICT, and above all the integration of processes on the basis of it, does not take place overnight, but happens in what is to some extent a lengthy process. Starting from isolated supports, networked ICT applications with an integrated content develop. They base themselves on an infrastructure which at least facilitates data exchange, mostly however envisaging central data storage. At the moment, the utilisation of ICT applications envisaged as organisational instruments, which for example include process support using workflow-management systems or components (e.g. Lotus Notes), can be regarded as advanced.

An essential finding of the survey on the subject of ICT infrastructure and ICT utilisation can be seen in the fact that the utilisation of new ICT, even in companies with a very high technological level, also does not correspond to the form and intensity of the technological possibilities available on the market. From this it follows that the effects of technology utilisation with regard to the organisation of work, qualification requirements and employment chances, should not be derived form the technological potential. Rather, they arise only from the specific forms of technology utilisation.

4.2. The interplay of organisation and ICT

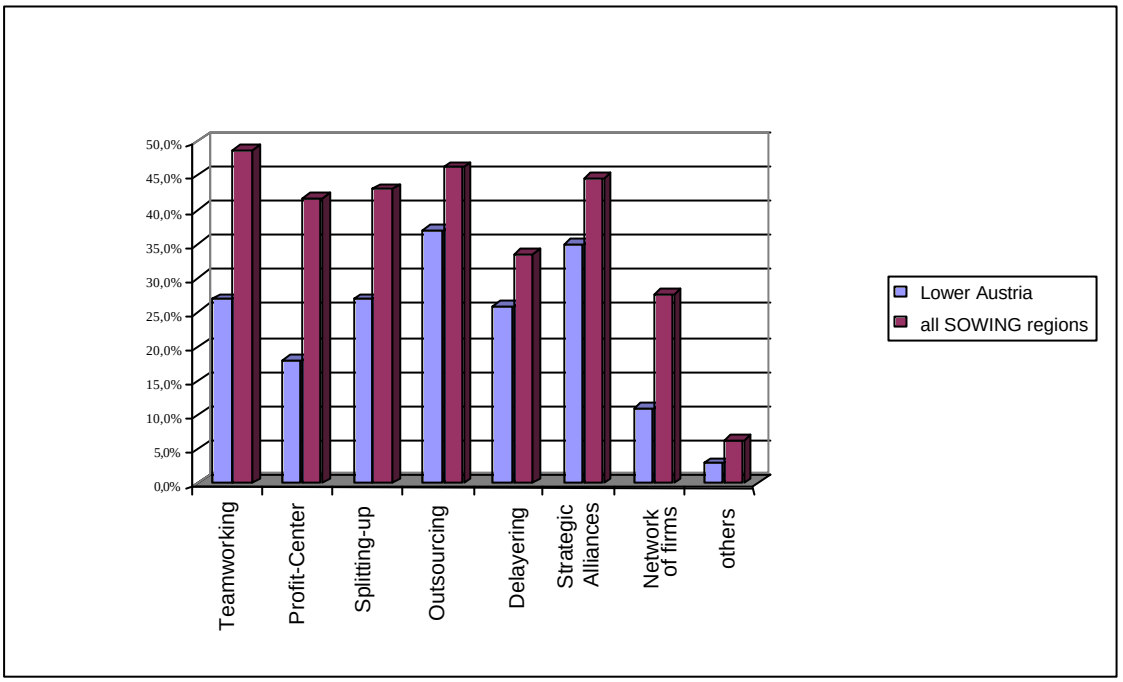
In the literature, new ICT is often ascribed a decisive role in the transformation of companies and economic structures. Thus for Castells (1996), it represents the foundation for new forms of work and networking between companies, even for a „network society" as a whole. ICT makes new forms of organisation possible and thus sets off far-reaching changes. In contrast to this perspective, which forms the mainstream of the current discussion, one of the initial hypotheses of the SOWING project was that information and communication technology (ICT) is as a rule utilised within existing organisational conditions and is thus adapted to the organisation. Once in use, however, ICT changes forms of work and thereby influences decisions on company and work organisation (Brousseau/Rallet 1998:245).

In the company survey and in the case studies we investigated organisational changes in connection with ICT. Both the level of connection between companies and the level of company organisation was recorded.

The survey results showed a continuing trend to *outsourcing*. Thus 37% of the Lower Austrian companies interviewed said they had *placed outside contracts* or *outsourced activities to other locations*. As further organisational changes, 35% of the companies interviewed gave *strategic company alliances*, 27% of companies *split themselves into smaller, independent units*, or went through a *slimming-down process*. In 27% of

companies *team work* had been introduced, and in 26% the *reduction of hierarchies* could be observed. A comparison with data from other European regions showed that the changes in Lower Austrian companies were less frequent than the average for all regions.

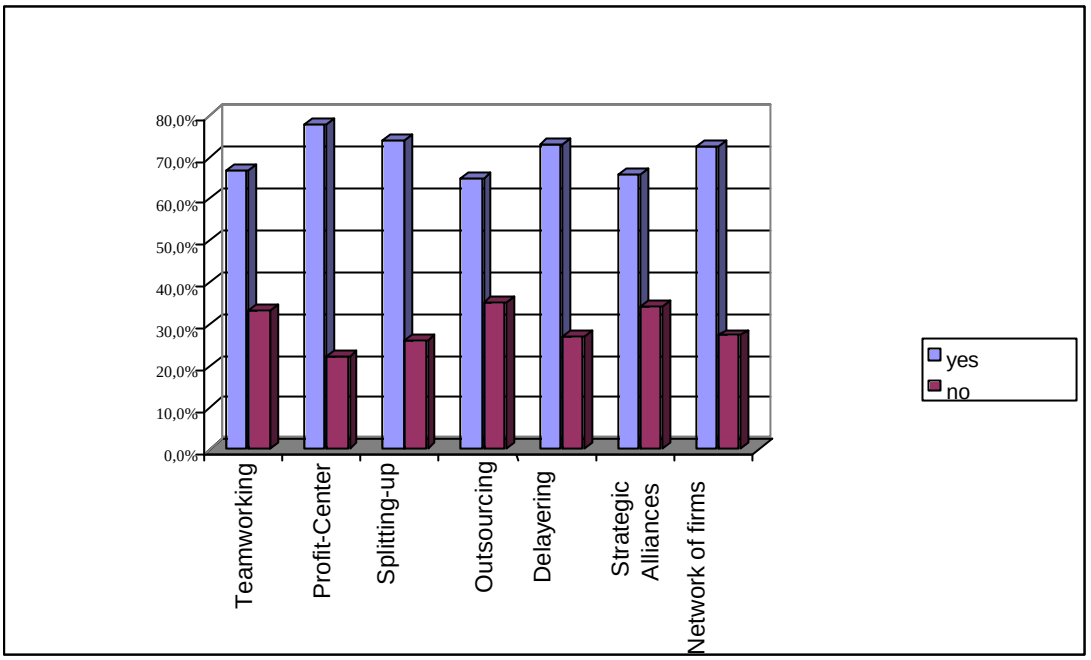
Figure 4-12: Have the following basic organisational changes been undertaken in your company in the last five years? (comparison, Lower Austria – all regions) (N=800)



Source: SOWING company survey 1998/1999

In the view of the interviewees, information and communication technology (ICT) often plays an important role in the organisational changes introduced. No less than 48% of companies admitted such a connection between ICT and organisational innovation. The highest values here were the establishment of *profit centres* and *slimming-down* the company, the *reduction of hierarchies* and the *establishment of company networks.*

Figure 4-13: Would you say that the use of information and communication technology has played a role in these organisational changes? (N=100)



Source: FORBA company survey

The case studies carried out as part of the project were intended to analyse the link between technological and organisational change more closely. The specific forms of ITC utilisation, the interaction with organisational change and the effects on work in the companies were given particular attention.

The following account of the research findings begins with the subject of inter-company networking. In this connection, our thesis guiding the research related not just to the discussion around the increased use of information and communication technology, the oft-mentioned easing of cooperation between companies on the basis of ICT. We also attempted to test the further-reaching belief that on the basis of (partly) world-wide networking it is possible to outsource tasks that are not part of the company's „core competences" or to centralise them within the framework of group structures, and thus to save costs. In the following, we wish to investigate the extent to which the outsourcing of tasks is possible, that work thus actually is becoming „location-independent", and to which new forms of cooperation between companies are to some extent necessary.

4.2.1. Networking of companies and location-independence of work

Call centres are frequently mentioned as examples of the possibility of free choice of location for organisationally divisible services. The reason lies in the new technical possibilities in telecommunications and in the automatic distribution of incoming calls (ACD – automatic call distribution). A case study into a logistics company in the courier, express and parcels service

(a CEP service provider), clearly illustrates the role played by the (relocation of) call centres in the framework of company strategies. The company studied is the Austrian subsidiary of a worldwide group, which was linked from the beginning into an integrated multinational organisational structure. The despatch of documents or parcels was carried out by a highly standardised process with clearly defined distribution of tasks and interfaces. The customers place their transportation orders mainly by telephone to a *call centre*. This is located in Ireland for the whole of western Europe. The necessary customer data is recorded and the relevant transport data is then faxed to the most conveniently situated regional site. It will be surprising in this context that the data is not sent by e-mail, as one might assume in view of the company's high technological level. One reason for this form of communication may be the immediately visible result, i.e. a sheet of paper that is printed out automatically without any contribution on the part of the recipient.

In urgent cases the local manager responsible for route planning phones the information on to the driver, who has a mobile phone. The driver then collects the consignment from the customer. As far as it has not already been recorded by the call centre, the electronic recording of delivery and collection information takes place directly at the customer's on portable information terminals. The information forms the basis for the further transport. The data for this is sent to the central data bank, which on the one hand makes it possible for the customer to track the consignment through the Internet (which we will go into later) and on the other hand makes it available to the bookkeeping for later invoicing or quality control of the driver.

For cost reasons, the actual transport of documents, letters and parcels – a strategically important area for the customers – is outsourced to subcontractors. This may be surprising at first glance, as the driver has business strategic importance: he represents the logistics company to the customer, which is why he is characterised in the interviews as the „the company's shop window" (B9G1-13). For the customer, the *outsourcing* is not immediately noticeable, as the vehicles carry the transport company logo. Thanks to the comprehensive recording of all transport relevant data, the company's quality-control department can check all drivers at all times on the basis of this data. This means possible weaknesses can be rapidly recognised owing to the comprehensive records. As all relevant despatch data on collection, delivery or transfer is immediately recorded and processed, this can at any time provide a standardised assessment of the extent to which the documents and parcels transported are delivered to the destination within the guaranteed time or if there has been any transportation damage or if the customer is unhappy with the service. Here the information systems also serve as monitoring instruments for controlling and ensuring the quality of company processes. In this example, the outsourcing of work has led to an increased need for monitoring.

> *„We check it every evening. (...) If errors creep in then we approach the company, the sub-contractor, and it has to make sure that it is remedied."* (B9G1-13f)

A further outsourcing of activities using the Internet is particularly noticeable in this company and according to experience in the company will have long-term effects on the job opportunities in the call centre. This is because customers have, since very recently, increasingly been offered tools over the homepage giving them the ability to carry out particular

stages of despatch preparation themselves and thus to speed up the actual despatch processing. Thus, order data can be entered through the Internet and the despatch documents or labels can be printed out by the customers themselves using software available for downloading. For the customer this leads to the quicker hand-over of despatched documents, and to less work for the service provider.

> *„And not only is the work becoming easier, but the quality is improving, too. Because certain human errors don't happen. I mean, the customer can make a mistake the same as before, but then it cannot happen that there is then a retrospective discussion of the type of delivery. When we were still filling out the consignment notes ourselves, it was possible to tick the wrong box. Now the customers do this themselves. Naturally, this also reduces complaints in the billing department, because what the customer has sent us is what he wanted. And that's what he gets."* (B 9G3f-19)

Accounting tasks have been simplified, too, through the linking of filed information, *„the point where you used to write an invoice manually no longer happens, where we collected the whole bills of lading for the week or the month, in the first stage, and then generated an invoice from them. It's all gone! So it is error-free. Communication with the customer is also essentially better as a result, because it simply prevents complaints. And it is definitely right!"* (B9G3f-19)

In future it is also intended to scan in customs documents and transmit them in electronic form, which means that one of the last areas in which manual entries on paper have to be made will have disappeared.

The Internet tools available are primarily used by „young entrepreneurs" who also „use *e-mail* more often" (B9G1-9). One consequence of this is that the number of calls to the call centre is falling despite rising turnover figures. In this connection the question therefore arises of whether jobs will continue to arise in this and similar companies' call centres, or whether employment in call centres will fall as a result of technical innovation and customer self-service. The company just described – but also insurance companies, banks and commerce – have highly standardised work processes that, supported by telecommunications and software, can partly be carried out by the customers themselves.

A second example also clearly shows the possibilities of outsourcing tasks and the frequently linked rationalisation effect. An industrial catering restaurant chain is increasingly using the Internet in order to present itself to customers better and to offer part of its range of products. Customers can order meals over the Internet through the home delivery service. The technical processing takes place via an external logistics company. All customer-relevant data are either transferred over the Internet by the customers themselves, or put into the information system through a phone call. The acceptance of customer orders does not take place at the company's location but approx. 300km away in another town. The delivery of the goods, too, is carried out by external transport companies, which are spread over the whole sales area and only employed (and paid) as the occasion demands.

In this example, too, a certain location-independence of the work is evident. At the same time, the aspect of rationalisation of tasks through the utilisation of new technologies, in this case the Internet, is clear. What should not be overlooked in this connection, however, is how in the

first example the standardised nature of the order process allows these tendencies in the first place. ICT thus facilitates new forms of organisation in particular in the area of cooperation between companies and between companies and consumers, but its application is conditional on the existence of a particular organisation.

The aspect of location-independence shows itself in another form in the case study on a software-development company. This concerns the geographical distribution of functions without such a high level of integration of business processes as in the previous examples. The Austrian company studied had already built up a site exclusively dedicated to data input in a structurally weak border region 30 years ago. As this branch of the company became increasingly meaningless as a result of automated data recording, it developed over the years into a profit centre for software development. Direct customer contact is, as always, still looked after by the company headquarters in Vienna.

The actual programming and design of software tools takes place in the framework of the projects, with there being a close connection to the Vienna site and regular reports to the management there. Above and beyond this, the precise recording of all cost-relevant aspects (above all the tangible-asset costs or personnel) in standardised input templates facilitates clear cost accounting, which makes remote monitoring easier and makes the organisational function as a profit centre possible. As all tasks in the framework of project planning and execution (including continuing maintenance) are kept in a central data bank, the customer-care staff in Vienna can get a picture of the various projects at any time. Customer requests and requirements are accepted at the respective departments at headquarters and transferred by electronic media (Lotus Notes for both communication and administration) to the departments responsible for carrying them out, i.e. tasks are put into a data bank where they can be called up by staff in the geographically remote software plant.

The biggest department in the software plant occupies a special position. This is developing a special module for an international provider of business software, i.e. working for a major company in the sector that has *outsourced* a particular part of its development activity to the company being studied. As part of this, there is telecooperation with the client's development department on a shared technical platform, i.e. staff at the site studied can directly access the client's computer several hundred kilometres away. This saves investment in hardware and software for the necessary development environment.

This close contact at technological level is not reflected at organisational level however. Here, the development department of the company studied has considerable freedom in the organisation of its activities as long as quality is maintained and deadlines are adhered to, which has so far always been the case. The reason for this is to be found in the history of the cooperation: through *outsourcing*, the existing expertise of the software company we studied is actually being used by the client to complete their product range.

This example thereby illustrates two different forms of inter-location networking: within the company studied, the software site in a border region is controlled and monitored from the headquarters using ICT. In relation to a major client, on the other hand, a purely technical networking is paramount, while organisationally there is a great deal of relative autonomy.

In our case studies we also came up against the limits of „location-independent“ work using ICT. Cooperation can very often not rely on technical media alone and communication cannot be primarily electronic. In most working contexts, the tasks are not even sufficiently standardised and informal communication is too important for information-technology supported outsourcing. We would like to illustrate this with an example of international cooperation in product development.

In the new and continuing product development of the general machine-tool company studied, there is close cooperation between the companies' development centres in various European countries as well as overseas. The international cooperation in a common project relies on central data banks for the „official“ versions of the plans and on communication by phone and e-mail. Despite this well-developed technological support, business trips are necessary up to twice a month for the project leaders in particular in order to get together with the other developers for coordination and fine-tuning. This experience shows that the use of communications technology cannot replace meetings involving travel. A project manager gave us an example of the practical limits of tele-cooperation: „If product specifications are only circulated and discussed via e-mail, misunderstandings may occur because the information is understood differently. Only face-to-face communication in a group meeting is seen as effective under such circumstances.“

In summary, it is clear from our case studies that the trend to outsourcing of tasks and long-distance cooperation has been strengthened by ICT. The new technological possibilities undoubtedly make the realisation of particular organisational options easier. Here, as the case-study examples clearly show, it is not only the function of technology as a communications medium that plays an important role. In many contexts it seemed to us that its utilisation as an organisation technology and as a monitoring instrument was of more importance. The case studies have also clearly shown that it is not the technological potential that determines the new organisational patterns. Rather, on the contrary, technological networking to a great extent only takes place on the basis of organisational conditions: only the high standardisation of business processes allows information-technology integration of processes beyond company boundaries and at geographical distance. In addition, strategic business decisions play an important role in this context. In the euphoria over *e-commerce* and *network enterprises*, the limits of outsourcing, relocation and telecooperation should not be lost sight of. Highly complex tasks and dynamic development of products and of customer relations are disadvantageous to the possibilities for close technological linkages. Our findings, that the standardisation of business processes is a precondition for the actual utilisation of technological networking possibilities may indeed be hardly surprising for everyday practicians. It is, however, in clear contrast to the popular discussion of „networkers“ and the „network society“.

4.2.2. ICT use in the field of organisational change in companies

In the following, we look at the level of internal organisational change in companies. In the use of new ICT, it appears to us that three topics are particularly important in this context: rationalisation through the automation of individual information processing activities, changes in

work organisation or ICT support for particular forms of work organisation, and changes in communication relations as a result of electronic media.

The new ICT's very great potential with regard to the possibilities for rationalisation could be seen in the case studies. New technological links lead to considerable savings wherever information is transferred on paper and re-entered into an information system by the recipient. We would like to illustrate this aspect with the examples of a bank and an industrial company. In the bank, a range of job stages have been automated, aiming at rationalisation effects both in the *front office* and in the *back office*.

In the back office, the processing of receipts is an area where the work has undergone many changes in recent years. Previously, receipts were processed by hand. Now the relevant bookkeeping data are processed and saved electronically. Every day the receipts are recorded at headquarters on a scanner and the data filed in the system. Subsequently all receipts have to be checked for accuracy at headquarters, i.e. the statements on the receipts are compared with those in the system. As most customer receipts are still filled out by hand, the level of subsequent processing, using data masks, is very high, at 90 per cent. Nevertheless, jobs have been cut and activities centralised as a result of this automation. Tools such as Internet banking or pre-printed transfer slips will lead to a further reduction in the amount of additional processing necessary in future.

The receipts from the individual branches come into the headquarters by courier every day. It takes four staff a whole morning to scan in the up to 800 receipts that come into the headquarters every day (or 1200-1300 at the end/beginning of the month). The introduction of information systems had led to no great time savings in these jobs, as the receipts from almost every branch are now recorded and processed centrally.

A second area where the introduction of new information systems has led to changes is the front-office area. Here, tasks such as counting of cash, printing of statements and cash withdrawals have been increasingly assigned to customers' self service.

And not least, Internet banking considerably reduces the internal administrative costs (processing of receipts, transfers, account queries) and leads to more efficient processing. But here, too, it holds true: the clearer the business processes can be represented, the more strictly standardised they are, the easier is the application of ICT tools for automating business processes. Whenever customer uncertainties arise about the right procedure, the use of ICT comes up against organisational limits.

These limits can be illustrated in the example of an industrial company in which the ordering of materials and intermediary products has been automated by ICT. The information system provides the order proposal, which however has to be checked and usually revised by a member of staff. One intention here is to reduce storage costs and the related capital tied up in them to a minimum.

There are thus also very good reasons against technological links without human input. This not only affects ordering, but fundamentally all interfaces within the company and between companies. This does not, however, imply an absolute limit to automation, because companies can indeed also make the decision to accept the disadvantages that go with a technological link.

Alongside automation, the use of ICT as an organisational technology should be highlighted. This means, for example, the changing of processes by the use of information technology.

An electronics industry company studied has for some time been pursuing the strategy of situating business processes „closer to the customer". Two performance centres have been formed, each covering all the functions for a product group.

Customers' first contact is with sales and marketing and the developers, and then with the developers and the production staff. This is not only to support sales and marketing, but also in order to provide customers with the opportunity to communicate directly with the developers, and thus minimise the information-loss that occurs in traditional organisational structures: *„Sales and marketing go to purchasing, and purchasing goes down the other side of the house – but these 'Chinese whispers' can only give rise to problems"*, as one of the two performance-centre managers put it (B2G1-2f). True, this procedure is against the trend to one-stop shopping (one employee with prime responsibility to the customers for a contract), but it permits specialist communication with customer representatives, in particular when the product specifications are being directly laid down in the contract.

Now the company has set the objective of designing open information systems wherever it is important to be compatible with the customer. This applies to the industrial design systems, for example. It is an ambitious objective, because the PPS, the central element of the company information system, is something they have written themselves. The PPS covers the whole materials flow. It is thus already activated as the order comes in. In this connection, the computer manager describes the principle of open information as follows:

„We are planning the following in our data processing: we want to speak in the words of the customer. That means that the customer's order number is also our contract number. Thus, if a customer rings up and says I have placed an order with you under No. 4711, then the person dealing with it now goes into our system and looks for contract 4711. He will find the customer order because we haven't converted [it] into an internal manufacturing order." (B2G3-3f) Simple protective measures are intended to prevent customers being confused with one another.

In this example, the interplay between an organisational desire for transparency (customer number = order number) and the link between information systems and organisational change can be clearly seen. The organisational solution found is, so to speak, technologically fixed so that one can no longer deviate from it.

The most lasting changes in recent years have been in company work organisation and the working situation in the workplace, very much through the increased use of electronic communications media and the Internet, as individual examples from the case studies underline. Here, tools like Lotus Notes or MS Outlook not only influence staff cooperation and communication, but above and beyond this are used to shape working activities organisationally.

> *„My favourite example: Before, if I was away from the office for a day and came back, there was a pile of memos – call that, call them. What do you do? You take the bits of paper, put them to one side, and the way it goes, I open the window and they are blown away and somehow you then forget about it.*

> *Today, I know when I come in I have five e-mails: call, call, call, call, call, and I can't throw them away."* (B6G2-6)

Alongside the much-quoted speed, the advantages of electronic communication, which in the companies studied is also very much used for internal communication, are the certainty of not having to „chase people up" on the phone.

Precisely the aspect of „no longer having to think about it" but simultaneously being certain that the information has got through to the right place, gives staff the feeling that work has become easier. Linked with the possibility of electronic information distribution and electronic filing, the forms of work and communication patterns are being deeply affected, as one employee in another company told us, e-mail has been a matter of course at headquarters for five years.

> *„What I have noticed is that essentially I can pass on information much faster. We have different working hours. If it happens, for example, that I only begin to sort out my documents in the evening, then it might be that a colleague isn't there any more. Then I send him an e-mail. The next morning he reads it and I have the information straight away. Otherwise I would have to wait until the next day."* (B1G3-10f.)

It was also possible to observe in the case studies that the simplification of communication through e-mail often did not occur in the desired form, as e-mail has proved to be an effective medium only for largely standardised, clear information. In several case-study discussions it was emphasised that a good communications structure can only be achieved if the limits of electronic communications media are also taken account of. Staff do indeed use the speed of electronic communication, but additionally pick up the phone, because written messages can easily lead to misunderstandings – misunderstandings that can be avoided by verbal contact. The following observations are confirmed:

> *„The problem with [an electronic message] is that it is very easy to think of it as a form of conversation, and yet it is also a written record, and people can easily write something down in [an electronic message] that they later regret. In a verbal situation, an oral situation, people tend to be a bit more accepting of people saying something inappropriate, and if they say something inappropriate often the cues of everyone else will protect them."* (Kock 2000:110)

Many of those interviewed pointed to the limitations of the medium. These lie in the flood of information with a lack of selectivity in the passing on of information, and in possible misunderstandings. Users also have the experience that the markedly different style of electronic communication in comparison to ordinary letters can lead to upsets, irritation or even conflicts. The reason could be the brevity and message formulations that imitate verbal communication but which lack the non-verbal communication component necessary for interpretation of the explicit message. Recipients often ask themselves how something is supposed to be meant. In a number of case studies interlocutors point out that efficient and conflict-free use of electronic communication cannot be taken for granted. Appropriate media competence must also be learned, but the training, so far as it exists at all, is everywhere limited to the technical aspects of e-mail use.

The use of new media here not only concerns computer communication. Filing and computerised marketing are further intensively utilised applications. *„E-mail is very gladly and intensively used here. Personally I also find the way it is organised is very good – sending bulletins by e-mail, because it quite simply saves a mass of paper … and everyone can get the information they need.“* (B1G3-10-f.) The e-mail system is based on a directory system that reflects the departmental structure of the enterprise and further organisational elements. For example, it supports target-oriented filing and tracing of reports.

Personal conversation on the phone or in direct conversation is not fully replaced by the use of *e-mail*. Thus, for example, in the banks and in production companies, the role of electronic communication is also judged critically. On the other hand, it is becoming ever more difficult to establish direct contact. In sales and marketing above all there can be severe limitations, as is shown by the accessibility problems in dealing with customers:

> *„It is a catastrophe when I listen to our sales engineer over there [meaning in the US] during breakfast, who in principle does nothing for an hour except listen to voice mails and then send voice mails. In some circumstances it takes three or four weeks before he can speak to this woman or that man personally. So it's a catastrophe. People sit at their desks and have the voice mail turned on, otherwise they would be continually interrupted. So this is the quintessence of the whole thing.“* (B8G3-7)

On new contacts the marketing worker thereby gets no answer at all in up to 20% per cent of cases, although contact has demonstrably been made using voicemail. Making contact thereby appears as the actual problem, as the relevant person cannot be reached despite new information technology. Making personal contact thus becomes the centre of attention and is the main activity in sales. One member of staff consequently says, „the piece of paper is coming back“ (B8G3-7), as information sent in written form is supposedly more readily received, and even then only if it is kept very short, i.e. contains a maximum of five sentences. Only then can the required contact be made.

The success of electronic communications media in the sense of their rapid spread and intensive use is thus also beginning to reduce their usefulness. In all, it is evident that electronic communications media are used for relatively standardised applications and alongside this, direct, personal communication is rated very highly indeed.

If one observes the interactions between work organisation and ICT, then it can be said in summary that new technology supports organisational changes such as decentralisation, centralisation, outsourcing or re-location. It makes the realisation of organisational options possible, easier or cheaper, and thus has indirect organisational effects. The direction of the organisational change cannot however, according to our experience, be ascribed to the technological potential, but is due to economic calculations, policy objectives or fashionable management concepts. The case-study results show that the technical potential is widely used to support decentralised organisation with a large proportion of self-organisation and direct horizontal cooperation, with the simultaneous strengthening of control and surveillance by the central authority. The further decentralisation and outsourcing is driven, the more important do the opportunities for the accompanying control of business processes become. In the application of new ICT – our first conclusion can be – the facilitation of decentralisation,

horizontal cooperation and self-organisation only represents one side of the coin. Without the potential for control and surveillance which continued to be provided by ICT, the outsourcing and decentralisation would largely not be realised to the same extent.

4.3. Qualification and training: „Everyone has got used to everything being on computer", or, „Hey Joe! Can you come here a minute . . ."

4.3.1. ICT and qualification requirements

The change in qualification requirements as a result of technological change is at the centre of the discussion on the effects of information and communication technology on the world of work. The speed of technological change, in particular, places great demands on the adaptability of companies, educational establishments and the workforce. The research in this field has concentrated on the changes in qualification requirements for jobs associated with the application of new information and communication technology (ICT). We proceed from the hypothesis that the ICT-related qualifications so much emphasised in the general public discussion are not the main issue for companies. On the contrary, in the enterprises talk is of the importance of social qualifications, which are currently becoming more important but which it is more difficult to teach. A further research question concerned forms of learning. In this regard we started from the assumption that learning in the process of work is gaining in importance vis-à-vis course-oriented training. Furthermore, in particular when it is a matter of coping with technical changes in their working environment, workers rely on the networks of social relations and mutual support. Quite generally, on the basis of our research findings, we also wanted to test the assumption that is often expressed in the discussion of the information society, namely that the dynamic of technological change is leading to rapid change in qualification requirements, so that much knowledge is becoming obsolete and thus bringing new labour-market risks for workers who could not adapt quickly enough.

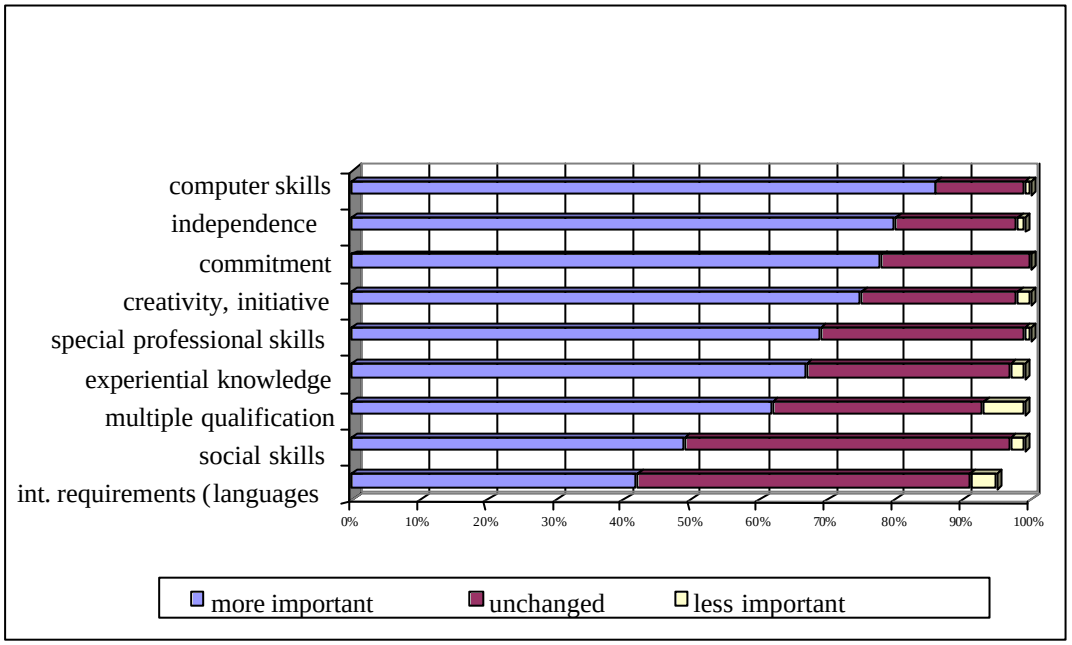
In the research we covered a wide range of working processes. The qualification requirements, their changes and forms of adaptation vary accordingly. In the following we want on the one hand to make statements on companies that develop or produce ICT or offer ICT services. On the other hand, we look into companies using ICT, which again vary at a technological level. The differentiation according to technological level is not always meaningful with regard to the company as a whole. Technology plays a varying role according to the section or the activity.

The company survey showed the great relevance of ICT skills. For one thing, „lack of employee qualifications" was indeed not the most common reason, but was nevertheless mentioned by many companies when they were asked about the factors hindering the introduction of new information and communication technology. Of the companies questioned, 9% considered this to be „very important", a further 14% as „important".

For another, in the opinion of the companies questioned, the „qualification for information processing" was at the top of the abilities that have increased in importance in the last five

years. This was put first by 86% of the companies. Key qualifications occupied the following places, namely, for 80% of companies, the ability to plan and organise one's own work (independence), and for 78%, commitment to achieving optimum results in the prescribed tasks. The lowest significance was accorded to international requirements, such as languages and knowledge of other countries.

Figure 4-14: Which of the following abilities/skills has become more important or less important for the core employees over the last five years? (N=100)



Source: FORBA company survey

Answers to the question concerning computer skills vary somewhat according to the size of the company. ICT qualifications have indeed become more important in the majority of all sizes of company. But the increase in importance is mentioned most frequently by companies with more than 100 employees and by small enterprises with less than 25 employees. The striking result is that companies with a high technological level do not report the increased importance of ICT skills any more often than companies with a low technological level.

Equally interesting is the finding that in this regard there is hardly any difference between sectors. In every branch of industry, between 80% and 90% of companies said that computer skills had become more important in the last five years.

Agreement with the following statements put forward in the survey point in the same direction. In the context of their experience in the company, 92% of those questioned agreed with the statement that „information and communications technology increases the need for employees constantly to be learning something new". The assessment of changes in qualification demands as a whole was also queried in the following way: „These technologies create routine work for low-qualified workers". The majority of those questioned, 65%, rejected this statement. But, on the basis of their experience in the company, 33% nevertheless agreed. It can be concluded

from this that the application of ICT is also allowing the emergence of new simple tasks in a minority of companies.

In the case studies we pursued the question of what influence the innovations in information and communications technology are having on the change in qualification demands. These computer-processing or ICT-related skills are only one aspect here. Just as much regard should be taken of shifts in vocational qualifications as of demands on social competences or key qualifications.

4.3.1.1. Changes in activities and ICT skills

We then go into the question of the ICT skills necessary. The case-study results show that comprehensive and constantly renewed understanding of ICT is by no means necessary for all employees. The requirements that are emphasised in public discussion and also confirmed by our company survey thus do not affect all employees and groups of employees to the same extent. As a further result, which can be illustrated by examples, it can be stated in advance that the nature and extent of the necessary ICT skills is not dependent on the technology, that is, the technical infrastructure in place, but on the technological practice of the company, that is, on the organisational embedding and specific utilisation of the ICT.

The ICT users

We would like to highlight two examples from the user companies studied which in our opinion illustrate the overall situation very well. It concerns companies in different sectors which, at least in important sections, operate at a high technological level. The first company, the restaurant chain studied, represents a good example of the great variations in the importance of ICT within a company, as for the work process in the cafes and restaurants ICT remains marginal, and technological changes are not leading to changes in qualification requirements for the service staff. On the other hand, the work processes in the administration departments have been computerised throughout.

A few years ago the restaurants converted the computer tills, as a result of which the receipts system was somewhat changed. Staff qualification requirements have not been affected by such changes – here, professional experience and abilities such as „social competence“ are primary.

For accounting and planning purposes, restaurant managers are responsible for providing headquarters with data on personnel deployment and on sales. They use MS Office for compiling and presenting these data, which was previously transferred on disk. The new system currently being developed will allow the monthly data to be „hoovered up” by headquarters. The managers of the businesses must be familiar both with the till system and the administration software. In contrast to the restaurants and coffee houses, activities in the headquarters, i.e. accounting, personnel administration etc., is computer supported throughout. The work is thus determined to a large degree by task-specific programs and computer-communications media and filing systems. The degree of computerisation of work is thus very

high. The core activity, for example personnel administration, takes place with the help of specific programs. In addition, some communication is by electronic media. And finally, documents and reports are stored in electronic form.

In the opinion of the managers, the ability and readiness to use new technology varies greatly:

> *„There are certainly objectors who find it hard, and only after considerable training and repeated instructions about what the system is – and here that is a working instruction. It's clear, that they then start using it. Then there are people who we actually employ as instructors because they are a bit like computer freaks. You only have to convince them not to continually develop their own systems. That wouldn't be in our interest. I think it is a question of age. Anyone who has children of a certain age can get a lot of help at home and also has fewer problems. Then there are many for whom it is in some sense a hobby. Then there are, I would say the majority, over 50%, who work on it because it is the system and they know it and use it. It is no longer a big thing. Everyone has got used to it, because, as it is so nicely put, nowadays everything is on computer."* (B1G1-4/5)

In the second example illustrating the situation in user companies, the majority of employees at a general machine-tool company are heavily dependent on ICT applications in their work. There is a wide range of vocational qualification requirements, with complex product development activities on the one hand and routine information processing on the other.

Projects are defined in the company for the development or further development of products, or, more often, of their components. These may concern the company itself or the whole international group. When a development or alteration has been completed, the technical data are filed in the product planning system (PPS) for the processing of the orders. Customer-specific developments are rare and these, too, can be derived from variant constructions of previous products. The use of CAD in the development department has been standard for many years. More recent developments include engineers in different locations in Europe and overseas cooperating on the same project. ICT provides support for this. Thus a central technical-drawings databank containing the current state of developments and the „official" versions of product plans is maintained at the group headquarters. Electronic communication is also intensively used for coordination and cooperation in the international project teams. For the ICT skills of the technicians, this means that electronic communications media and the company-wide intranet as a source of information have been added to CAD applications. The inputting into the central drawings databank is supervised by staff who previously distributed the technical drawings on paper to other companies in the group and to customers. As this now requires much less time than it previously did, the employee in question has been given a completely different task area. This detail shows two things: for one thing, the retention of the job in a conversion from conventional to electronic forms of documentation and distribution; for another, the specialisation of individual people in a particular ICT function, as a result of which other employees do not need to be familiar with it.

Whereas the development department usually works over a longer period on solving a problem or achieving a technical objective, jobs in the departments for processing orders are much more routine.

Orders mainly arrive by fax and are entered in the PPS by people in the order processing department. In cases of uncertainty, obviously incorrect orders etc, enquiries are usually made to the customer by e-mail. Checks on consistency and integrity are carried out in the PPS.

The more than 40,000 customer orders that come into the company per year are processed by three employees. This means that each of these employees processes something like 50 orders per day, and thus that less than 10 minutes is required per order, including all queries. The high level of standardisation is a good example of the theses referred to in the chapter on organisational changes, according to which a high degree of technological networking between enterprises is likely if the business process is heavily standardised. The activity thereby has a routine character and thus by no means corresponds to the popular image of the „net worker" (Castells) in the Information Society. Nevertheless, even if technological training is not necessarily required for this work, there is a high requirement for company-specific knowledge and experience both with regard to the products as well as the very important organisational contexts. Precise knowledge of the PPS and complete command of electronic communications media are preconditions for coping with the demands of the job.

The ICT skills of some employees, however, go beyond this: In order to make work easier and cover certain additional functions not provided by the PPS, the employees have created aids based on Excel or Access. The background for this is the company strategy of minimising fixed costs as well as the group rule of employing as few as possible IT personnel decentralised in the companies. There is therefore no large internal IT department able to take care of all the applications and all the wishes of the staff. This means on the one hand a certain independence in the design and adaptation of technology in the workplace. On the other hand, it entails disadvantages with regard to software ergonomics, as it involves differently designed surfaces and changing between a large number of applications, to some extent including additional inputting of data.

It is not only in the case of order processing that the intensity of the utilisation of ICT in the work process means that ICT skills are extremely important for clerical workers.

IT experience is very important in the white-collar area. Here it is primarily a question of the application knowledge of the PPS, through Office programs, e-mail, and/or CAD. IT specialists need both technology experience and company-specific experience. But the required confidence with the company-specific IT applications or networks for example, does not necessarily rule out outsourcing. Because of the rarity of network crashes, network specialists are used for other tasks. *„And then there is an emergency, which happens only once in a blue moon, and then he doesn't know what to do either. If the nets are so stable, we can certainly get a better service from companies that deal with such interruptions on a daily basis."* (B4G2-S6)

The way in which the PPS is used represents a good example of the fact that despite the advanced application of ICT, the previous knowledge and experience of the employees has not been devalued. As described above, the PPS is the information technology backbone of the enterprise.

Not only is production planned through the PPS, but it also directs the company process as a whole including taking of orders and materials provision. The completion of orders is initiated through the PPS – whether it is manufacturing through the weekly plan or materials provision

through orders. This does not mean, however, that work would be determined by instructions provided or generated by the system. Rather, in all jobs there is room for manoeuvre to change or omit plans or tasks from the PPS on the basis of one's own experience and in view of current requirements. *„Production planning actually takes place in the PPS, but one doesn't keep to these deadlines. There is an incredibly wide grey area that the master craftsman controls himself."* (B4G8-S4)

If, for example the managing clerk has heard from another department that large orders that are not yet registered in the PPS are expected, then this will enter into the optimisation of order quantities. In exactly the same way, impending changes to drawings that one has learned of informally are borne in mind, as they will make the outsourced components manufactured according to previous drawings worthless. Experiential knowledge and informal communication therefore remain important, often unrecognised reasons for the smooth running of the enterprise. Whether this is actually recognised and taken into consideration in management decision-making is obviously another question.

With regard to the ICT-related qualifications demanded, we have therefore come to the following conclusions: The administration departments in the companies we studied cannot be imagined either without computers or without the new ICT: „Everything is on computer". This means, for one thing, that ICT skills in the sense of knowledge and experience of the application have become a requirement for almost all activities. Looked at in this way, they are of great importance. For the same reason, being able to master information technology working and communication tools is not on the other hand rated as a particular qualification. In this sense, the argument of additional „culture technology" applies. This should on the one hand be a reason to regard ICT use more soberly from the outside. On the other hand, there is the danger in this perception that the important changes arising from the transfer from earlier computer processing to the new ICT will be overlooked and that coping with the qualification requirements will be regarded as a matter of course and non-problematical.

The results of the case studies make it possible to consider the changes in ICT and the qualification requirements in a differentiated way. The first difference here concerns the level of command of ICT demanded by the respective work situation: whereas in some jobs it is a case of mastering the basic functions of relatively user-friendly programs „for home use", in other cases the most complete command of the working and communication tools is called for in order to be able to produce the required results under pressure of time and in direct contact with the customer. The new level of ICT here as a rule means, in particular, that functions of electronic communication and information access over the intranet and Internet have been added.

A second difference arises out of the fact that the knowledge demanded, as the case studies have indicated, is dependent on the specific technological practice of the company. The specific utilisation of technical functions, the organisational embedding, etc, have a considerable effect on the extent of ITC skills demanded. The informal level assumes great significance here. As described in case study 4, for example, the staff were occasionally being called on to design additional applications in order to cope with their tasks. This presumes knowledge of programs that are indeed available as standard in the workplace – such as MS Excel, for example – but do not represent part of the departmental information system. Mutual

support and assistance by informal specialists should be mentioned here, as it may make it possible for staff with less detailed knowledge to cope with the information system.

A third difference relates to the differing groups of employees. Thus for example the workplaces in production are linked to the company-wide information system, and staff can obtain information on the stock situation of components etc. Nevertheless this is sporadic querying of information which a colleague can also undertake if someone is shy of going near the terminal. For other staff, almost every activity is involved with the information system, because, as it is said, „everything is on the computer". Nevertheless for these, too, the possibility of specialising so that particular ICT applications or functions can only be used by particular individuals, but then also for the benefit of others.

For which groups of employees do things change very much as a result of ICT? In the present phase of technological development, which in public discussion comes under catchwords such as *e-commerce*, customer-relations staff and other field workers require additional ICT qualifications. Both in industry, logistics and service companies, they have to offer customers ICT applications for electronic communication with the companies. Even if IT specialists are available for support or ultimately install the software at the customer's premises, customer-relations staff have to know the way in which the respective programs function and are used, and the possible application in the customer's information system.

Finally, two problems that we noticed in most of the companies studied should be particularly highlighted: the problem of the constant change in information technology tools and communications media, and the problem of the rare utilisation of individual programs or functions. The gradual change that among other things means installing new versions of existing programs seldom offers the opportunity for training. Often companies even forget to inform staff in time that their working and communications tools are changing. This creates particular pressure for staff who are not „computer freaks". The second problem – of rare use – consists in the fact that the majority of programs, functions and user surfaces, which in the meantime have „accumulated" in the workplaces, means among other things that some of these media find an occasion for utilisation only at great intervals. Despite all the claimed user-friendliness, this raises difficulties for the user who has not been able to use it as a matter of routine. If one cannot delegate the task or pass it on to someone else, the solution usually lies in going in search of help: „Hey, Uli, can you tell me how I do this again . . . ."

In our case studies we were able to find many indicators of this, which supports one of the hypotheses of our research. This is, that in coping with new technology, users have to fall back on social networks of mutual support. We will return to this below, when we present the forms of learning and training.

ICT developers and service providers

If in our previous examples we have dealt with ICT user companies and users, here we wish to turn our attention to ICT manufacturers and service providers. Here, the case study of a software producing company brought a surprise: the dynamic of the transformation of technology and qualification demands generally ascribed to this sector was not consistently to be observed here. The company has long-standing relations with major customers, with one department for each of these. The technology to be developed and maintained thereby changes at the pace of these customers' technological innovations – and not according to the

development dynamic of ICT as a whole. This has, for example, the consequence that staff who have taken parental leave of one, two or three years, can be taken on again in the respective department without being faced with any fundamentally new demands. By the way, it should be noted that, above and beyond this, shorter working hours with little variation favour the employment of women with children in this company.

But in this company, too, tendencies are increasingly noticeable that are usually associated with the software-producing sector: project work under high deadline pressure, long and variable working hours, a short life-time for knowledge, and further training on one's own initiative. The cause lies in particular in the company's recent incorporation into an international group.

As the company being studied is a pure software producer, technical expertise is of immediate importance. Here two major areas should be differentiated: on the one hand knowledge of the various technologies (e.g. programming languages and their structures), and on the other hand the methods how these technologies can be utilised within the context of a project.

Staff require *„a very profound knowledge of the subject, i.e. people also have quite deep specialist knowledge"*. (B5G1-6) This includes the respective programming languages and the mastery of analytical tools for project definition.

The type of programming language used is very dependent on the clients and their technical infrastructure, but also on the length of the client relationship (e.g. longstanding projects are still based on an „older" technology) and, as in informatics as a whole, changes are frequent. This means that staff *„don't learn something and assume that you will be using it for five years. In programming there is certainly not a tool that you use now and will be using for the next five years. So we are really developers. And not some kind of user, if you want to put it like that."* (B5G2-13)

In the actual project work, i.e. working as part of a team, key qualifications like continuous learning ability, knowledge and information acquisition and, above all, practical experience in running and implementing projects are of decisive significance. How comprehensive these demands can be is very well illustrated by the following assessment:

> *„People have to acquire their experience in project work, i.e. they have to learn that the mastery of technology alone is not sufficient to run a project successfully . . . In the final analysis it is not a question of passively acquiring knowledge, but of being actively involved in making something out of it. Of informing myself from various sources, of looking at how others are dealing with technologies, what sort of experience the others have, how we can profit from it. . . . And on the other hand it is actually what I call process knowledge. To know how software development projects run. What is important in project management, what is important at the non-technical level of projects. Of course, that's another factor again."* (B5G1-13)

This example shows that specialised technical knowledge in the narrow sense is embedded in organisational knowledge, in social competence and experience.

The ICT service providers, that is the application providers, Internet providers etc., are subject to very rapid technological change. Specialised technical knowledge and its constant renewal is thereby among the most important demands on the staff. A large part of the requisite knowledge must be honed and further developed at the workplace, as the example of

the Internet provider company studied shows. This is particularly true of the *first-level support* for customers and *web-site* design.

> *„If I want to get into the Internet, our people simply have to know the problems that can arise from A to Z. If someone has difficulties with e-mail queries, you have to be able to deal with it, that is, they must know what's going on if this or that isn't working on someone's web site. And these are just things that are standard queries we get. If the line goes down then you're the first to notice that anyway."* (B6G1-14)

The private use of these media has proved itself in that *„the error messages come in just the same, and then you more or less know, what I did at home might work. That is learning by doing."* (B6G6-2)

Alongside technical expertise, which is needed to answer customer queries, key qualifications such as social skills (sensitivity, understanding of people, communication skills) are necessary. These requirements are being increased by the fact of the non-homogeneous customer structure, as a result of which the nature of the queries and requirements can vary widely.

> *„If it is someone who knows more, then you notice after the first five words that he knows what he is doing, or if it is really only a user who gets his mails once a week."* (B6G6-4)

Not only in customer service (support), but also in web-site design, direct customer contact with the appropriate sensitivity is paramount: *„Because they want to know what they have just paid for. It's not as if you can just wave something or other in front of them. It must also have a point."* (B6G3-4)

4.3.1.2. Higher qualifications? Changes in specialist qualification requirements

The tendency towards the integration of tasks is leading to wider specialised qualification requirements on staff. The connection with ICT consists in the fact that the technology can make such organisational change easier in that it offers new opportunities for data storage and access to information. These forms of reorganisation have been recognisable since the mid 1980s. As we were able to establish in our case studies, similar strategies are also being pursued today on the basis of new ICT.

A good example of this are the organisational changes in the telecommunications company studied. The company is characterised by several business areas, with customer care representing the one in which significant changes have been made in recent years. Customer Care covers three areas: Call Centre; service and project management; Telecom-account. The core objective is the realisation of a customer-friendly one-stop/one-shop solution, which is distinguished by offering just one contact partner for customers wherever possible and providing minimum delivery and service times for business and private customers. This concept is based on the recognition that until now there have been too many service points and contact partners for various customer concerns. Above and beyond this, customers in different regions were treated differently. A solution to this problem is currently being worked on in the order management project. This aims to support planning and create transparency. In any case, significant changes in the content of work and organisation are involved in this project.These in turn are leading to broader specialist qualification requirements and mean in particular that

organisational abilities and knowledge of various processes in the company become more important.

Who is experiencing a shifting of tasks and qualification requirements as a result of the current phase of reorganisation on the basis of ICT? In the case study on the bank, we were able to identify a group of employees who are experiencing major changes in their activities as a result of the increasing technological integration of customers on the basis of the Internet and electronic communication. This concerns the field workers who will get new tasks if theirs are partly carried out by the customers themselves.

To what extent does the current thesis of higher qualification in industrial production hold true for our results? In the electronics companies, but also in the metal-working company, one cannot speak of higher qualification throughout the production staff. Quite the opposite – the companies continue to employ and to some extent have even increased their reliance on semi-skilled staff. Thus in assembly areas in the electronics industry, semi-skilled women are employed in the hand-assembly of printed circuits, whereas male skilled workers are often employed as machine minders for the automatic assembly machines. In the B3 company, some women workers have been successfully trained to replace the skilled workers on the assembly machines. Nevertheless, management basically prefers skilled workers in these jobs. As a whole this company employs more or less the same number of semi-skilled as skilled workers. In the second electronics company the ratio of semi-skilled female workers in the whole workforce has dropped significantly. But this is mainly the result of the transfer of most production work to the Czech Republic. Technological developments, however, are having similar results:

> *„Every six months we write off half of the hardware – we don't need it any more. On the other hand, software is exploding to double the amount every three years. That means that the trend is away from purely manual production, that this is becoming ever smaller, though it is also being exported to the east. On the other hand, a great number of jobs are arising . . . where software is generated.“* (B3G1-9)

In the general machine-tool production company studied, the ratio of semi-skilled workers has increased in recent years. While skilled workers have been engaged in mechanical finishing and on the automated systems, semi-skilled workers carry out the majority of routine assembly work that takes two or three days to learn. The group strategy of increasing outsourcing has led to the reduction of in-house manufacturing. This has meant a reduction in work on mechanical finishing, and workers have been transferred to assembly. For recruiting this has meant that more semi-skilled and fewer skilled workers are taken on. In the production department the formal qualification level is thus falling. However, the recruitment of semi-skilled workers does not mean that that people without a vocational qualification are taken on.

"We are looking for young and determined people who do have a certificate as mechanics or carpenters. People with a related occupation are employed as semi-skilled workers and they do actually have prospects of promotion here" (B4G9-6).

The examples from the production department thus serve to qualify the current thesis of higher qualification. Even if qualified staff are preferentially employed in highly automated production areas, the tendency to mass production in the context of new forms of division of labour

between the companies and the geographic concentration of production sites can nevertheless lead to highly routine jobs. This is obviously not caused by the introduction of ICT. But as has been described above, the latest ICT applications facilitate and make the reorganisation of inter-company division of labour easier.

4.3.1.3. Social competences and key qualifications

If one looks at the criteria for the choice of employees, these do not reflect the findings of the survey, according to which ICT skills have acquired considerable importance. Because, in the search for personnel, formal qualifications, social competence and appropriate personality features are very much to the fore. The new staff must have certificates and be able to demonstrate that they can get on with people well, are talented communicators and fit in well with a team. Little note is taken of ICT skills, however. Even if knowledge of standard software is assumed, many promising applicants are not as a rule rejected because of lack of ICT skills. These, as many personnel departments are convinced, can be acquired relatively easily. The case studies thereby confirm the hypothesis according to which social competence is much more highly appreciated than ICT-related qualifications. This is not to say that ICT skills are not to a very great extent necessary for the work. Rather, this finding reflects the experience in the companies that most applicants are familiar with standard software as a result of school education, Labour Market Service courses or working practice.

The new ICT has changed the requirements for communication skills in a way that can be described as additional media competence. Communication by e-mail can easily give rise to misunderstandings, and conflicts can escalate more easily because formulations are kept brief and less considered than in a letter. In comparison to verbal communication, the recipient lacks the additional information from tone of voice or body language, and above all the opportunity to register the effect of a communication and possibly correct it. An amplifying effect of technology can also be spoken of with regard to communications behaviour: if there was an existing tendency to impersonal forms of communication, then e-mail is used beyond the bounds of efficiency with the result that any related problems intensify. This makes it appear all the more important for staff to acquire additional media competences.

In addition to communication skills, there are also basic qualifications such as reading and writing. *„The fact that a lot of people have massive writing weaknesses has nothing to do with the PC. It just expresses itself in this area."* (B1G1-10). According to this statement, spelling and the ability to express oneself in writing, and reading ability, too, are lacking to a surprising extent. With the spread of electronic communication this lack of qualifications becomes more obvious and can lead to disadvantages.

4.3.2. Qualification changes and training

The extent to which the altered qualification requirements are reflected in training measures is dependent on company personnel policy. In several of the companies studied, there are annual discussions with staff and training plans are drawn up. In such an environment, adapting qualifications to technological change is accorded more attention than in companies that do not engage in any form of personnel development.

The introduction of new ICT systems is usually accompanied by (brief) training or instruction. To be able to use the systems effectively workers have to practice on their own (partly in their free time) and to get support from more experienced colleagues. In order to save on training costs some of the companies under investigation send only one employee to a course and expect him or her to pass on the acquired knowledge to the others.

System changes and the introduction of new features put pressure on staff as the ICT changes often take place under time pressure, so that time for training is too short. Maintenance measures can also be perceived by staff as pressure. In this area, communication with users is currently being worked on: *„So we are not managing to communicate the corrections, and actually only get nothing but stress among the staff."* (B2G3-4).)

Another problem relates to technology that is perceived as standard in a particular occupation and, therefore, no training is provided. In case 1, the restaurant chain, this relates to technology service workers face: Staff in catering are hardly trained at all in the use of computerised tills or drinks dispensers. It is expected that staff will be able to use such equipment regarded as standard to the sector. *„They have to be able to do that straight away. Because to learn it … we are open 17 hours a day in the cafe. It would be impossible to take a day to learn it. Actually, you have to make sure you can do it quickly."* (B1G4-3)

The situation is different if such technology is updated and thus all staff have to deal with a change. In the same company a few years ago there was a conversion from electronic tills to computer tills, as a result of which the way of handling receipts changed.

„All staff received training first, so it wasn't so much of a problem." (B1G4-3)

The situation was similar in the hotel that was investigated. If staff are recruited for reception, however, it is expected that they are already familiar with the Fidelio standard system. But here too, lack of experience is not an insuperable hurdle: *„It is not necessarily a precondition. I think they should have basic computer skills, because the development goes through the keyboard not the mouse. They should know where „enter", „cursor" and things like that are. They learn that anyway"* (B2G2-8). As far as standard procedures are concerned, one can already carry out check-in and check-out after the first day. It takes two to three months, however, until one is familiar and completely confident with all the ins and outs.

Something similar is true for standard programs like MS Office in the office area. Knowledge of these programs is taken for granted, usually rightly. But this means that training that in some circumstances would have been necessary for the efficient use of program functions significant to specific work organisation in the company or the department has not taken place.

Previously we have referred to the differing procedures with standard software on the one hand and company-specific software on the other. On the basis of our case-study results, a further differentiation can be made with regard to training for ICT applications. Thus a training requirement is seen as being more necessary for the systems or programs that are primarily envisaged for the work process in the department or workplace. Learning to use additional programs which can be just as necessary for dealing with the tasks is often left to the responsibility of the individual employee.

In the cases tudy company 4, once a year in the course of drawing up the budget a training plan is produced which lays down the further training aims and measures. Training is provided in connection with technical changes, if a new system is introduced or additional software is used in the workplace. Instruction is also provided over one or two days where the need for it becomes apparent. In other cases, if for example it is a matter of additionally mastering Excel, *„our motto is 'learning by doing'. What I need in Excel I taught myself or my son [taught me] at home."* (B4G6-S14)

In case study 3, too, an electronics manufacturer, management emphasises the staff's own responsibility for their training. They have to identify the lack of qualification themselves and suggest specific courses to attend. After checking the need and the possible time available, the company then provides the funds for attending the course. On this, the personnel officer says:

> *„For me it is just that each worker is responsible for their promotion in the company or for their knowledge. He is the one who can say, there I still need something, or there I know enough, there I don't need it. That means he must actually say, good, I should do that but I don't have the background. Then the training will be chosen and discussed with him, how he can do it as regards time. Then it will be carried through."* (B2G5-9)

The dynamic of technical change and of the market conditions makes it ever more difficult for companies in the ICT branch, i.e. for ICT manufacturers and service providers, to estimate future qualification requirements. This leads to a tendency to make staff responsible for the know-how themselves, or to buy in the qualifications required for a new project. Thus the paradoxical situation arises that less and less attention is paid to active personnel development, while at the same time there are complaints about the shortage of qualified personnel. This is intensified by the fact that at the same time the companies always want to cover their current need for expertise in a specific current area of ICT through recruitment or outsourcing.

On the ICT-user side, too, their own responsibility and need actively to ask for training measures can have disadvantages for those who are not very keen on training measures, whether because they do not value courses or because they cannot imagine how they will get through their work if they are absent for a few days. The age and gender of the staff can also give rise to differences. It was not possible to go into this question in greater depth in the framework of the case studies, however. In one interview the supposition was expressed that younger people attend courses more readily, but older people need prompting to do so.

A quite decisive question for coping with the demands of the work is when introduction, training or further training takes place. The obvious answer, that this should preferably take place before the new or upgraded ICT is to be used is, as already indicated, not so easy to implement in company practice as it might sound. Thus our case studies showed that training does not always take place when it is needed. Both if it is started too late or too soon, that is, when there is a long pause before the actual utilisation of the programs, staff have to fall back on individual coping strategies. They learn on their own, partly at home, partly through trying things out. And it is very important to be able to ask someone when one „gets stuck": „Hey, Uli! Can you just have a look at this . . ." Mutual support is thus not only necessary if someone is confronted with a new function or something similar, but also if a program is too unfamiliar because of infrequent use.

> *„. . . and then for a year you don't do anything, and then you forget what it was you did." „And who do you ask then?" „Yes, then there are these two or three people who know Access anyway."* (B4G7-S11)

Usually there are unofficial specialists for ICT or for particular software among the users. Partly the support is one-sided, partly it is mutual. Official and unofficial „key users" or „user specialists" do play a very important role in most of the cases. Social and spatial proximity seem to be important prerequisites for effective support although the telephone is also used to get help. Only software developers seem to circulate queries via e-mail when they face a problem they cannot solve. This makes the mutual support less dependent on location and co-presence.

To our surprise, at an internet provider we discovered that the decisive form of learning for the acquisition of the necessary qualifications was one where the emphasis is on the traditional company apprenticeship. Learning, training on the job, is specifically emphasised for customer support on the telephone. *„So, sitting behind Mr Auer and watching what he does – more or less . . . if you are at your own workplace and a colleague is sitting opposite you, then you just have problems explained to you – what could happen if – and that's actually the quickest way to learn."* (B6G5-3)

In summary, on the question of learning on the job versus training courses, the following can be said: The dynamic of change, the diversity of the requisite knowledge, the unpredictability of future qualification requirements, etc., favour the increased importance of learning on the job – *learning by doing* and *learning by earning.* In this way of looking at things, however, the tendency expresses itself to delegate onto the staff or to externalise the responsibility for qualification. Additionally, it was quite clear in the case studies that in the working process, as a rule, there is insufficient time available for learning.

Generalisation of the thesis of the increased importance of learning at work are thus additionally problematic because, on the other hand, course-based training has not become less important. Precisely the unpredictability of future qualification needs makes „surplus" knowledge, in the sense of basic knowledge and knowledge of related specialist areas necessary. The recognition that learning on the job has become more important should thus not be misused as an argument for savings on training and delegation of responsibility to staff. Rather it should lead to checking work organisation for the preconditions for learning processes.

The results of our survey provided no indication that the courses in the various further educational institutions were inadequate and that there was a bottleneck in the adaptation of qualifications here. However, the difficulty in reaching course locations is a problem in some areas of Lower Austria. Alongside the regional disadvantage, gender-specific inequalities arise from this, because it places an additional difficulty in the way of women who have family obligations and wish to attend the course.

5. ICT, TECHNOLOGICAL PRACTICE AND EMPLOYMENT EFFECTS

5.1. Research questions and hypotheses

Not for the first time, a revolution in forms of work is expected as a result of new technology. The new information and communications technology (ICT) – it is said – is tending to make work and co-operation independent of time and place. Not only would the previous spatial distribution of work and the predominant forms of cooperative work thereby be called into question, but also, ultimately, so would the factory/workplace as a social unit and the "standard employment relationship". The independent, highly qualified activity of knowledge workers working in world-wide information space is being styled as the labour form of the future. Are these predictions derived from analysis of current developments in work, or rather from a fascination with technical innovation? For a critical examination of the popular theses, it is necessary to make the interaction between technology and organisation the subject of renewed study.

In the SOWING research project, commissioned by the European Commission to survey the application of ICT and its consequences for work and employment in eight member states, we studied the question of how organisational arrangements and forms of work are currently changing. This is done to draw conclusions on the employment opportunities for different groups of people in order to provide insights into possible new forms of social exclusion. In this chapter we summarise the findings from the research in Austria.

When analysing the technology and its usage, a difference was drawn between the various functions of ICT: ICT as a tool for particular activities, as a means of rationalisation, as organisational technology, and as a medium for communication. In the assessment of the interaction between organisational and technical change, the guiding research hypothesis was that ICT is indeed being applied in the framework of existing organisational processes, thus organisation initially determines the design of technology, but subsequently the technical potentials and restrictions develop their own effects on organisation. New technological possibilities arise in particular with regard to the availability of information (e.g. through central data storage), the distribution of information (e.g. through workflow applications) and the technical support for communication and cooperative work (through world-wide networking and *groupware*).

One aim of the empirical investigation was to map the current use of new ICT. Therefore the technical infrastructure as well as the actual use of the technology were analysed on the basis of the enterprise survey and the case studies research. Another aim was to analyse the technology related organisational change, that is to say, the transformation of communication and cooperation, the spatial aspects of work, skill needs and changing contractual relationships.

Hypotheses on changing work

In general it is assumed that together with economic globalisation ICT is the major driving force of current changes in working life. New ICT facilitates new patterns of chronological and spatial distribution of work. Above and beyond this, it is widely interpreted as an impetus for deep-going changes in the organisation of companies and working processes. Thus Castells, for example, describes the "informational paradigm" as follows: "Notwithstanding the formidable obstacles of authoritarian management and exploitative capitalism, information technologies call for greater freedom for better-informed workers to deliver the full promise of its productivity potential. The networker is the necessary agent of the network enterprise made possible by new information technology" (1996:242).

The optimistic expectations with regard to the organisation of work are derived from the presumption that companies will have to train their staff and grant them extensive room for manoeuvre if they wish to exploit the potential for increased productivity inherent in the technology: "The nature of the informational work process calls for cooperative work, team work, workers' autonomy and responsibility, without which new technologies cannot be used up to their potential" (ibid. p. 246). Naturally, Castells refers to the dark side in the form of disappearing employment opportunities for lower qualified workers and to the extensive influence of social conditions on the actual realisation of new forms of the organisation of work: "The social context ... drastically affects the actual shape of the work process and the consequences of the change for workers" (p. 249).

Now computer technology and its connection with telecommunications is by no means so new that one can unconditionally characterise it as the agent of the changes that fully began to come into play only from the mid 1990s. Greenbaum (1998) argued that the shape of computer systems has changed fundamentally since the 1970s. Then, automation was the model. It was a question of the mass processing of large amounts of data. This demanded the rationalisation and standardisation of work and the centralisation of information processing, as it existed in the high degree of vertical and horizontal division of labour in the strictly bureaucratic organisation of insurance companies, banks, ministries etc. The centralised automation of routine transactions was thus the aim of data-processing design.

Although the talk in the 1980s was of the decentralisation of organisation and reduction of division of labour, and personal computers were increasingly widespread, the paradigm of "office automation" still held true for a long time. "In the area of technology, the gap between older centralised mainframe processing and totally decentralised PC-based computing had to be filled with networked systems, at least in the form of local area networks (LANs)" (ibid. p. 136). Only in the 1990s, with the increase in direct communication and cooperative work, did the softening of the bureaucratic organisation of work begin. This led to the development of net-based computer systems which allow users to use computers as a means of communication as well. The emphasis in systems design on cooperative work was intended technically to support cooperative work in place of the extensive division of labour. Under the slogan of *computer-supported cooperative work* (CSCW), software for non-routine working processes was developed which, alongside the explicit support of communication between staff, made it possible to work on common documents and to access common

databanks. According to Greenbaum, this system architecture implied the option of coordinating temporally and spatially distributed work.

Central data storage represented a further characteristic of innovative ICT use in companies. This means that all data on the structure and elements of organisations, as well as company processes, are saved in one databank. Thus the new situation arising from data changes can simultaneously be assessed by cross-polling of the central databank, and company processes can be altered where necessary. This type of mechanism is supported by special categories of program systems, namely *workflow management systems.*

The nature of modern ICT facilitates a qualitative change in the forms of work: work *in* information space emerges in place of work *on* mainframe systems (Baukrowitz 1996:70f). Whereas automation-oriented mainframes are still characterised by "rigid, closed function chains" and "clear, pre-defined input-output relationships", work in information space is characterised by "the variability of informatic references". The specific characteristics are:

- Openness – the possibility of variable action; links that are not predefined but set up by the deliberate action of those working with them
- ICT does not necessarily have a single logical structure; data are not statically available, but are generated dynamically from various data sources
- Variable structures and thus greater adaptability to changing market demands and customer requirements, etc.
- Integration of internal company information systems in worldwide information space (Internet)
- Access can be through various media applications; a number of enabling technologies are employed

An essential characteristic of new ICT is that it makes it possible to realise the technical integration of business processes in the enterprise and, what is more, in a new quality, with the links between functions not being rigidly predefined but only being activated by the specific demands of the working process. The second essential aspect lies in the fact that the vertical flow of information recedes into the background in comparison to horizontal cooperation and communication. Possibilities for the technical support for communication are available (*groupware*, CSCW etc.). In these features of the latest ICT, the demands arising from new forms of work organisation can be clearly recognised: a higher level of self-organisation, flexibility of the working process, little division of labour and intensive cooperation. A typical example is the application of electronic mail systems, which increasingly develop into administrative tools for electronic document filing, and mostly under the organisational control of the employees.

As far as "knowledge work in information space" is concerned, the activity of *information brokers* can be mentioned as a typical example, as the search strategies in the www are just as little predefined as the information space accessible has a logical, unified structure. Rather it depends on the "ability to cruise and navigate in this whole big room full of information" using experiential knowledge in a complex, iterative procedure (Pfeiffer 1999). This image of navigation which cannot be planned in advance in an information space, which because of its very nature cannot be completely described, is an additional part of the profile of creative

knowledge work, for example in research and development. On the whole, optimistic expectations for work in the "information society" are derived from this: independent, highly qualified staff in self-organised, cooperative and increasingly location-independent working processes and with considerable influence on the design of their working materials and working environment.

The question arises of the extent to which reality approximates to this picture. Is there a recognisable trend in the design, organisational embedding and application of information technology that will end up with the dominant form of work being in the self-determined activity of knowledge workers in information space? That is to say, is technological development and organisational change running in parallel in this sense, or do the empirical data favour Greenbaum's (1998) thesis that the technological preconditions for decentralisation and horizontal co-operation will not be used in the organisation of work and the shaping of employee status at all? Put in more general terms, it is a question of the relationship between the design principles and potential of information and communications technology on the one hand, and the development of organisation and management strategies on the other.

5.2. Emerging technological practice: the research findings

5.2.1. ICT infrastructure and applications

The survey findings indicate that information technology is used in nearly all business functions in nearly all companies. However, not all companies use new ICT such as the Internet, EDI, electronic mail or workflow management systems. Between 30 and 40% of the companies surveyed utilise, for example, electronic data interchange with other companies or with customers. It is important to note that as soon as companies use new ICT as a communication medium all workstations are equipped with PCs. Therefore the new characteristics of technology use lead to a further spreading of ICT also within companies.

In most of the case study companies one aim of the introduction of ICT is to reduce the expenses for data input. Raw data are either provided by machines directly, by the employees (if not available otherwise), by the customers or the suppliers. ICT serves as a medium to transmit and arrange that data for the different purposes. This strategy is mainly motivated by the general tendency towards outsourcing and application service consumption. The enabling factor is the availability of a reliable intranet – with WAN connections in the case of global players. The trend to outsourcing is supported through application service providers which leads to outsourcing of complete processes and infrastructures and, as such, to wide-ranging dependencies on LAN/WAN connections, services and externally located resources with respect to elements and/or processes of the core business. Consequently, the controllability of core processes might not necessarily be facilitated.

Networking was one of the reasons for introducing browsing and web applications, but was only found in a few cases. Although typical Internet applications are maintained, it seems that only a small number of them have led to a noticeably more efficient organisation of company

operations. A typical application of this kind is Internet banking, a www-based product which facilitates account activities such as transfers, statement requests etc. online through the usual browsers. However, most of the user interfaces in companies operate on traditional GUIs (Graphical User Interfaces) or GUI-like solutions. Besides the technical centralisation of core tasks, www-applications support the optimisation of company operations. For some sectors, such as service providers like banks, the Internet is of major significance for work.

In some sectors, communication with customers via electronic media plays a crucial role, in some others its does not. Engineering companies increasingly rely on technical communication, e.g., for exchanging design ideas and configurations of products. Other sectors, such as banks, are not pushing the exploitation of the Internet as a communications medium for customer service. The reasons lie on the one hand in the management, which has so far not promoted this form of customer contact. On the other, however, there is also a certain timidity in the application of computing on the part of the staff. Finally, the absence of controls in sensitive issues such as granting of credit, also impose limitations.

All case study companies are networked through an intranet, such as a virtual LAN – with WAN-connections in the case of global players.. Work is mainly carried out on PC infrastructures within LANs. In case of reporting to external/global headquarters, there are site-net links to headquarters. When enterprise resource planning systems such as SAP are used, permanent connections allow instant access from external locations to internal processes and data. Some companies tend to outsource complete processes and infrastructures. They are not only potential customers of application service providers but also of high performance providers. For instance, a production company plans to reduce equipment, data processing skills and operation at the location to a minimum through direct links to an external data processing provider in Brussels. In these cases, the infrastructure at the company site will be reduced to dumb browsing terminals (network computers), making the current infrastructure obsolete.

Turning to ICT applications, these can be grouped into support for administration, including office work, support for production, engineering and service processes, and support for communication.

(i) With respect to support for administration most of the companies relied on standard software packages. In some cases tools had to be used that were required to produce compatible data for network-wide use, in particular in the case of branches of global players. These mainly concerned reporting. In the field of back office work a tendency was observed to use tools for communication as devices for personal(ised) data storage, in particular, where paper-based information has been reduced and input for tasks and/or information is provided exclusively by electronic means.

(ii) Most of the companies heavily rely on all kinds of ICT with respect to support for production, engineering and service processes. Production planning, monitoring, product management, human resource management, and electronic procurement were among the major areas supported either by proprietary or internally developed applications. Successful companies tend to rely on in-house solutions, when they are not forced by partners or parent companies. In the field of engineering and product

management there seems to be a lack of both support for the creative part and support for smooth integration into the product development and production cycle.

(iii) With respect to communication, we can distinguish between person-to-person communication and unit-to-unit communication. Person-to-person communication requires solutions such as e-mail or electronic fax, whereas unit-to-unit-communication can be supported through a remote solution, such as background processes based on EDI. E-mail is used throughout most companies for person-to-person communication. If not otherwise required otherwise for task accomplishment (e.g. procurement), its use is mainly restricted to in-house or enterprise communication. In the field of unit-to-unit communication EDI was only applied when working solutions existed (which were found only rarely), otherwise dedicated solutions were developed, or data were even exchanged manually and/or in paper-based form. The latter holds in particular for low-usage profiles (see below).

5.2.2. External restructuring and spatial aspects of work

At first sight our research findings, in particular from the case studies, confirm the theses of the independence of location of ICT-based work. Working processes can be dispersed over various locations and brought together by telematics, with the most favourable location being chosen for each function or activity. And it is one of the characteristics of work in information space that, given a suitable telecommunications structure, it can be carried out anywhere in the world.

The company survey showed that *outsourcing* and alliances with other companies are frequent organisational changes. And the majority of the respondents argued that organisational change is closely related to the use of new ICT. In the case studies we were able to follow these leads.

A wide variety of ICT related external restructuring was found in the case-study sample. The logistics company (case-study 9) maintains only one central call centre in western Europe for all EU countries. The telephone orders and enquiries are recorded and the necessary information is transmitted to the local sites concerned. At the Austrian regional bank (case-study 7) individual services (data storage and provision, www applications) are processed by a central computer centre in western Austria with the banking institute and its customers being "pure" users. Case study 4 shows that dispersed product development in a transnational enterprise is heavily reliant on information and communications technology. Not only are e-mail and file-transfer of decisive importance for cooperation between developers in different locations. Just as important in the meantime are central databanks where current versions of technical drawings or specifications can be accessed.

In case-study 8 we studied a manufacturing company in which the company management, administration and development was based in Lower Austria while a large part of production had been transferred to the Czech Republic. The production plants on the other side of the border are controlled from headquarters using ICT. Without the ICT systems and the data

transfer possibilities (via satellite), the "virtual factory" would hardly be possible in this form and the re-location abroad would have been correspondingly more difficult.

In case-study 5, a department of a software development company works as a subcontractor for an international IT company. It is independent with regard to its competence and project management, and also has direct customer contact. From the technical point of view, it works on computers and in the development environment of the headquarters of the contracting company many hundred kilometres away. What is special about this type of long-distance work is that it is only the technical capacity that is used, in order to save investment and to develop the software in the right "environment".

In two case studies the ICT potential was used to create jobs in less-favoured regions or to disperse employment regionally. The initiative for regional development, which runs an Internet provider, has established a range of "tele-cottages" in rural areas. Communication between the widely dispersed units of this organisation is largely by e-mail; the cooperation is based on the possibility of common access to documents. To a certain extent, in this case ICT has "caused" the organisational structure, as the aim of setting up "tele-houses" and "tele-cottages " was to use ICT for job creation in less-favoured regions. The project was not successful in its original teleworking objective, however, which was to create employment in structurally weak areas with contracts from the conurbations. Rather, the "tele-cottages" have offered all kinds of services to local businesses and the local authorities (e.g. mass mailings or brochure design). To some extent this relates to ICT, as in the case of web-site design. The telecommunications company studied (case-study 10) operates a spatially dispersed *call centre*. When this business area was set up, personnel were taken on from shrinking areas of the company and trained as call-centre agents. In order to be able to employ them at the same location as previously, call centre workplaces were set up in several towns and cities. The technology made the spatial dispersal possible. Thus calls are automatically routed to the local call-centre unit with the least pressure of work.

To briefly summarise: The advanced infrastructure for telecommunications, the connection of company computer networks with the internet and the increasingly common use of electronic post (e-mail) have considerably extended the opportunities for the spatial dispersal of company functions and activities. Currently, according to our case-study results, Austrian enterprises are using the following opportunities:

- Relocation of production to neighbouring countries while planning and management functions remain at the company headquarters in the home country
- Software developments for customers abroad with long-distance work taking place on the customer's computer system
- Cross-border cooperation in development teams using central databanks and electronic communication
- Use of computer-centre capacity in remote locations and the outsourcing of the maintenance of the company's own ICT infrastructure
- Use of call centres abroad and the operation of dispersed call centres
- Intranet applications among other things for central information storage and decentralised access to information

Alongside these examples of relocation and site-independent work, in the case studies we also came across clear limitations on working at long distance. According to this experience, there are limitations on locational independence, particularly with regard to learning processes, knowledge and forms of co-operative work.

It is precisely in connection with ICT and changes in it that the significance of *learning* in the working process should be emphasised. As a rule, official training during a system or program change is brief. It is increasingly made a precondition that employees should already have mastered standard software. Learning-by-doing and mutual assistance thereby become deciding strategies in the coping with technical changes. Help is frequently very urgently required when difficulties in the application of information and communications technology occur. As a rule, companies and departments have unofficial specialists for ICT or for particular applications, who repeatedly help out those in need of assistance. Often the assistance is mutual, because knowledge and experience complement each other. For learning and mutual support, and thus for dealing with difficult working situations, social and spatial proximity is necessary. Official and private hotlines are indeed utilised, that is, people one assumes can help are rung up. But we found that in many areas "looking over the shoulder" and questions now and then across the desk represent extremely important components of the learning process in technology-intensive areas of work.

Also the requirement for different forms of *knowledge* limits independence of location. Thus remote maintenance of technical equipment by ICT may indeed in the meantime have acquired great significance, but empirical findings on work in highly automated, computer-controlled production processes clearly show that connection with the equipment through technical media such as ICT is not sufficient for the central tasks of preventing or minimising crashes and maintaining quality standards. For this, spatial proximity to the equipment is needed, for example in the form of direct contact on the rounds. This is because information that is taken in directly, through multiple, physical sensory perception provides a more complete picture of the actual state of the equipment than information on a screen in maintenance control, which is purely visually perceived, transmitted by ICT and abstracted from the process. The significance of these forms of knowledge and work summed up in the term experience-based work, limits the possibility of isolating work from its social-spatial context.

A woman working in the order-processing department of a manufacturing company reported that the transfer to another office (in the same building) in the course of the fusion of the order-processing of three product lines involved considerable adjustment. Previously she was in the immediate proximity of the production line for which she was responsible and saw the components and products day in and day out. In the open-plan office, too, there were discussions with developers or other staff working on the same line, or in the course of conversation she heard things that might later be important. Even if order processing is extensively standardised, and data-input work in the production planning system and coordination with customers all takes place by e-mail, it obviously makes a difference where in the factory the workplace of the employee responsible is located (to say nothing at all of relocation to a remote site).

On the subject of *cooperative work*, it should be noted that new forms of work organisation such as team work or the formation of temporary project teams function badly or not at all on

a purely "virtual" basis. As numerous studies have shown, the functioning of these forms of working are dependent, alongside the professional abilities, on the social skills of the participants. To develop the productivity of a group or team, emotional engagement, social exchange and "feeling" for social relations are necessary. In spatially fragmented, electronically linked, i.e. "virtual" teams, such elements can hardly develop. Regular meetings and personal communication is necessary in order to develop the emotional basis for (tele)cooperation.

What is noticeable is that in most cases technological networking does not replace travel and face-to-face discussions. Although, for example, the "virtual" development teams use information systems and electronic communications facilities intensively, their members working at various places in the world have to meet regularly in order to clarify important questions. One person responsible for a project explained it with the example: After despatching specifications for a project by e-mail, it can be that the information is differently interpreted by the respective recipients. This can be read from the answers. It needs a lot of writing to come to a common understanding. In such cases it is more efficient to get all those involved around one table.

In conclusion: One of the main aspects of new ICT is that it provides new options for the technical integration and networking over distance and across company borders. The company survey showed that only a minority of companies use electronic data interchange with other companies or customers. Of course, progress in that area is very rapid, but our research findings indicate that there are also systemic reasons for a looser coupling in technical terms. One reason is that technical integration requires highly standardised business processes to be cost efficient. We found close links and electronic data interchange only in those companies or networks of firms that were highly integrated in organisational terms. And even there the interfaces quite often consisted in human activity: Workers transferring the information and thereby checking the content. In contrast to Castell's image of the autonomous "networker" we found that information workers at the interfaces between different establishments of companies to be part of a highly standardised workflow. Therefore they enjoy little discretion regarding their work process and they may see their jobs being automated in the future. Whether this part of the information processing is done by clerical or technical workers or by information systems depends to a lesser extent on the available technology. Rather it depends on strategic decisions on acceptable risks and on the acknowledgement of tacit knowledge on part of management.

5.2.3. Internal restructuring and changing forms or work

In the case studies for the SOWING project we proceeded from the assumption that, as a rule, ICT is employed within the existing organisational structure and is therefore adapted to the organisation. Once employed, however, ICT changes forms of work and influences decisions on the organisation of the company and of work (Brousseau/Rallet 1998:245).

Initially we observe ICT in its function as an organisational technology, that is to say, its utilisation in controlling production or general business processes. A typical example are production planning systems in which customer orders are translated into production guidelines which control the manufacturing process. In all three manufacturing companies studied, the

production planning systems were either developed in-house or represented the extensive adaptation of standard software to company requirements. The organisation and organisation technology are shaped by the product range and the company's relations with the customer. Internal flexibility in the sense of higher reaction times to customer demands can only be achieved, our interlocutors were convinced, by using "customised" information systems. Technical integration of order processing, production planning and production is indeed indispensable for rapid business processes, but the limitations that the information system imposes on the working processes in dealing with exceptional orders must be kept as low as possible. In case-study 4, however, a complete change stands out as a result of the group headquarters' decision to opt for a standardised outsourcing solution. The room for manoeuvre for in-house design of technology and work was thereby reduced.

For all the room for manoeuvre allowed in the working process, it remains work *on* the information system inasmuch as, for example, order data are entered which trigger a predefined information processing. Craftsmen and production workers use the production-planning system to check on the availability of material and components, on the basis of which to undertake detailed planning of the work. Nor does the activity in individual, in-house design of the technology conform to the "work in the information space" type, as the logical structure and the possibilities for processing, once adapted to the company, are fixed once and for all. In addition, the room for manoeuvre in production, which makes it possible to fulfil exceptional customer demands, results from the fact that the information system only outlines the framework for production and leaves the detailed planning of the work open. Furthermore, and equally important, divergences from the plan that are not covered by the information system are by no means unusual.

There is also a kind of ICT-based production planning in software development. Thus in case-study 5, all working guidelines for the various projects (programming of new procedures, error tracking, additional evaluation requests, template design) are administered in a central demand databank. Project workers or those responsible thus have a continuous overview over work due and the status of the individual project tasks. In this case, too, the utilisation of the technology is oriented on previous organisational decisions, but also opens up new possibilities.

What are the influences of technology on organisation? These arise from the fact that ICT makes the realisation of certain forms of organisation easier, or for the first time makes them possible at all. One aspect is well illustrated in case-study 9: The logistics enterprise does not maintain its own transport fleet; transport is outsourced to independent companies. Thus customer contact on collection and delivery of consignments takes place through the subcontractor's driver. The outsourcing of such an important function for the company is made easier by the surveillance possibilities offered by ICT. Punctuality and damage are checked daily by means of assessment of the data that are continuously recorded during transport. The rationalisation strategy of developing customer "self-service" is also based to a large extent on the possibilities offered by ICT. Thus the customers of the above logistics company increasingly enter the data relevant to their order into standard forms on the company's Internet homepage themselves and can follow the progress of their consignment there too.

In case-study 7, central data storage (in an Austria-wide accounts centre) and the networking of its branches in other federal provinces, makes the efficient use of the Internet possible for an Austrian regional bank and allows its customers to make account transfers and enquiries online. In a restaurant chain studied (case-study 1), the application of ICT made it possible to concentrate the previously dispersed administration and management functions at the company headquarters. Many other examples could be mentioned of the extent to which ICT makes the realisation of particular forms of organisation possible, easier or cheaper. The choice of organisational form itself is not, however, determined by technical requirements but goes back to rationalisation or market strategies.

With the increased penetration of ICT, it is not surprising that ways of working are now to a great extent shaped by the technology. Large parts of office work take place using information systems and software "tools" – in many cases not much can be done without access to the computer. This occasionally even affects services. Thus receptionists in a hotel (case-study 2) describe the problem that when the system is down, they can carry out neither check-ins nor check-outs. Nor when large groups of guests arrive can they speed up the processing simply by deploying more staff, because only two VDU workstations are available at the reception. In the administration in case-study 1, a restaurant chain, documents and files are held in the information system by using the software for internal e-mails. In this way, the experience is, "a mountain of paper can be saved", because all those involved only call up the information that immediately concerns them. This case shows that the technology has indeed been adapted to the organisation in that the structure of electronic filing follows the departmental structure, but that the immediate working process has changed considerably through the intensive use of new ICT.

In this regard, the most noticeable changes are those in communication through the use of e-mail, and the acceleration of business processes which is to some extent connected with this. Initially it was interesting that e-mail in the enterprises studied was not employed first and foremost for communication with colleagues in more remote locations or with those outside the company, but for communication between staff inside the same building. Thus, in the restaurant chain (case-study 1) e-mail has been used intensively at the headquarters for five years, whereas communication and information exchange with cafes and restaurants spread all over the country takes place by telephone or fax. The restaurant managers fax the information on working hours, necessary for staff accounts, to the personnel department at the headquarters, where they are typed in on the appropriate program. In contrast, in the logistics company (case-study 9) e-mail is used both inside the company as well as in communications with other locations of the worldwide enterprise. Electronic communication offers great advantages simply because of the various time zones and the associated difficulty of reaching colleagues on the telephone (e.g. abroad). In other cases the reason for the limited use of e-mail for external communications is that the customers make too little use of the medium.

For internal communication, the electronic route for distributing information to several or many addressees takes preference – for short messages, for which the telephone has the disadvantage that the desired person has to be caught at the workplace and for leaving behind messages which on paper are easily lost. Electronic post, however, does not replace the phone or personal contact: the speed and chronological independence of e-mail is utilised, but

at the same time the phone is resorted to when it is a question of talking something through or solving problems.

But the limitations of the medium also became obvious. The flood of information with a lack of selectivity in the passing on of information and possible misunderstandings or irritations call for media competence on the part of the users. Although the efficient and conflict-free use of electronic communication cannot be taken for granted we did not come across any specific training for this aspect of ICT use.

5.2.4. Institutional and regional aspects

It can be assumed that the regional labour market impacts on the technological practice within companies. In particular, the availability of IT-skills can be seen as a pre-condition for the take-up of new ICT. In the survey nearly a quarter of the companies reported that lack of skills on part of the employees hampered the introduction of new ICT. This left open the question as to whether the bottleneck is seen in the skills of IT-specialists or in the skills of IT users. The case studies in a wide range of companies makes it possible to answer this question. The companies reported few problems regarding user skills. In general the education system provides basic computer skills and knowledge of the usual standard software. Therefore school leavers can adapt quite easily to the ICT related requirements. A second 'pillar' is the labour market training provided by the Public Employment Service. Job seekers have access to training courses, and computer training seems to be quite popular. At least the employers in our sample had the impression that labour market training provides sufficient user skills.

The availability of ICT specialists is of course a different issue. In general our case study findings reflect the public debate. Companies find it difficult to recruit experienced ICT specialists. Interestingly, we found differing reactions to this problem. A software company in a remote area has a long tradition of in-house training. Due to a lack of training institutions in the region the local labour market has never provided ICT specialists such as programmers, system analysts or network specialists. For years the company has taken on carefully selected school leavers who have undergone an outsourced six months initial training. This is complemented by a period of on-the-job-training in a software development project. In spite of the even higher demand for ICT specialists such an approach is probably less likely to be found in a metropolitan area.

It became obvious from our investigations that the location impacts on the accessibility of further training. Remote areas are disadvantaged in this respect because taking a course usually means travelling by car for one or two hours. Such regional differences have not as yet been overcome by tele-learning. The difficult access to training could be a special disadvantage for women who have less time at their own disposal and who do not always have a car of their own.

Regional policies aim at providing ICT infrastructure and at creating jobs. In this respect the region of Lower Austria shows a high density of tele-houses that were established in the 1980s to link the periphery with metropolitan areas and to create ICT-related jobs in disadvantaged

regions. In our series of case studies we took a closer look at one of these measures. A regional policy initiative set up an Internet access provider in a rural area to make low-cost access available for local companies and communities. This initiative was successful, and the local Internet service provider still exists although in the meantime the Internet can be accessed from any location at the same price. The setting up of tele-houses and the creation of telemedia jobs was less successful however. The technological infrastructure has not helped disadvantaged regions to attract jobs from the economic centres.

By way of conclusion we can state that the emerging technological practice in the companies investigated is not in line with the popular discourse on the information society. Of course ICT plays an important role in the external and internal restructuring of companies. But work neither becomes fully delocalised nor does the labour processes resemble that of the prototypical "networker". The skills base of the region would provide the basis for a high-skill, high-trust work organisation. But in many areas we find contrasting organisational solutions that are quite familiar from previous stages of technology usage: organisational standardisation as a forerunner of automation. Call centres are very good examples of this. The work is partly highly standardised and can be rationalised through customer self-service via the Internet. There is of course a considerable diversity of forms of technological practice. Different forms of ICT usage can be observed depending on sector, type of ownership, business processes and company tradition. In its enabling and facilitating function ICT is an important driver of change. Organisational homogeneity however is fostered by the spread of ICT only in conjunction with other powerful drivers of change, namely economic forces and transnational companies'' strategies.

5.3. Consequences for employment

5.3.1. New forms of work, skill needs and training,

As our case studies and other relevant literature conclude, even with well advanced ICT penetration in production, distribution and consumption, creative "knowledge work" is not becoming the dominant, let alone the only form of work. Counting against this are both the necessary forms of knowledge as well as the nature of the tasks – in particular as far as qualification requirements, independence and cooperative work are concerned. A large part of the information processing work is not carried out by "knowledge workers" but by "data workers", whose duties are the routine work (Huws 1999). Despite automation and relocation to low-wage countries, such activities will also remain in Austria in the foreseeable future. Examples for this are the input of customer orders in the company information system. If with increasing networking the necessary data are directly transferred (business-to-business applications), this means a considerable saving in jobs. Nevertheless, as our case studies show, there will still have to be employees who can carry out plausibility checks and deal with customer queries. We find even more routine activities in call centres, in particular if it concerns simple information and data recording tasks. The time allowed for each call is very limited, the activity is subject to a high degree of surveillance and the information system

prescribes the sequence and the execution of the communication. However, our findings are not in line with the image of call centres as "bright satanic offices". What was interesting in the call centre studied as part of one of the case studies was that training was carried out with great care. Furthermore, within the call centre there were three "service levels", through which promotion was possible after appropriate training. Call-centre employees' training in social and communicative skills and their intensive customer contact were additionally mentioned in the case study as a reason for the possibility of a transfer to supervisory positions in other company areas.

ICT based activities thus, both now and probably in the future too, will include a wide spectrum of working processes. At one pole is creative work, for example in the first stages of the software development process or in graphic design of Internet web-sites. At the other end, is the Taylorised information work of coding programs or data input in call centres. At the repetitive, routine activity pole, a mass of work is indeed always being dissolved into automation (thus the days of many call centre activities are numbered because of customers' direct input and querying of data over the Internet), but new working processes are continually emerging that have very little in common with the popular image of the highly qualified, independent knowledge worker.

What can be said in conclusion concerning the spread of "work in information space" as a specific form of shaping and utilisation of ICT? In our case studies we surveyed a heterogeneous area of the economy and in particular activities that did *not* resemble those of the *information brokers* mentioned at the beginning. The question was thus, whether in the meantime the various ICT applications and industry and services have shown signs of producing this type of work. From the results of the case studies, we find that ICT-based work is work *on* information systems (with prescribed input and query possibilities and a fixed logical structure of links), with the determination of activities by information systems (in the sense of computer-supported *workflow management*) and with cooperative forms of work which are very heavily based on electronic communications media.

Furthermore, in our view, the reason why there is little widespread empirical evidence for this type of work in information space is not because companies are not yet so far advanced in the deployment and application of technological possibilities. It is rather that there are systemic reasons against it spreading more extensively. Because, fundamentally, the objective of the design of organisation remains that of standardising and limiting employees' options for action. This is easily overlooked in the discussion, in as much as it concerns the company's increased flexibility in coping with greater turbulence in its environment. The latter by no means leads to the dismantling of organisational and technical restrictions on freedom of action in the greatest number of jobs. The technological and organisational openness addressed in the type of work in information space neither makes economic sense nor is it necessary for the fulfilment of the task. In many jobs, because of the job description and the integration into prescribed company processes and management control strategies, no great "creativity" is desired, but rather it is much more a matter of carrying out relatively closely defined tasks. It should also be noted that the distribution of standard software for companies is an indicator that the application of ICT is going in the direction of greater standardisation and control.

Our case studies clearly indicate that neither ICT in general nor the intensity of usage determines the skill needs. This even applies to ICT-related skills such as the knowledge of how to use information systems or communication media. The actual skill requirements are shaped by the particular technological practice which also includes informal practices of work and ICT application. As described in detail above (see chapter 3.3) there are differences between groups of employees, work situations, forms of organisational embedding of ICT etc. In order to support the adaptation of employees to new skill requirements it is very important that learning opportunities and training provision are tailored to the special needs of different groups of employees.

In the public debate the training problem is often reduced to a lack of ICT skills in the sense of "computer literacy". For the companies in Lower Austria this is certainly not the main concern. Of course many people are not familiar enough with standard software packages, and to cope they have to rely on their children or partners at home. So access to basic training is crucial for workers. But thanks to school education and labour market training initiatives companies can take user knowledge of widespread standard software for granted. As "everything has been on computer" for some years if not decades already, being able to master information technology is not rated as a particular qualification. The talk of a basic ability in addition to numeracy and literacy has found its way into management thinking. There is the danger in this perception that the important changes arising from the transfer from earlier computer processing to the new ICT will be overlooked and that coping with the qualification requirements will be regarded as non-problematical.

In fact, however, there are considerable problems which do not relate to basic user skills. Rather, problems arise from a failure to adapt to the constant change in information technology tools and communications media: when new versions of existing programs are installed, opportunities for training are seldom offered. Often companies even forget to inform staff in time that their working and communications tools are changing. This is made worse by rare utilisation of individual programs or functions. This relates to the fact that the majority of programs, functions and user surfaces, which in the meantime have "accumulated" in the workplaces, means among other things that some of these media find an occasion for utilisation only at great intervals. Despite all the claimed user-friendliness, this raises difficulties for the user who has not been able to use it as a matter of routine. If one cannot delegate the task or pass it on to someone else, the solution usually lies in going in search of help: "Hey, Joe ...."

In general, training is provided if a new information or communication system is installed which changes the ways of working. And training is provided for ICT that supports the main task in a particular job. In contrast, gradual changes of ICT applications or auxiliary software are usually not subject of any instruction. To a large extent employees have to learn on their own and to look for support from colleagues or partners and children at home. Training problems are to a certain extent individualised, and they are often perceived as differences in the individuals' capabilities to cope with ICT or with work demands in general. If in individual cases a worker cannot cope and his or her employment is threatened, probably a whole bundle of factors is involved and the problem can rarely be attributed to ICT.

5.3.2. Contractual relations and threats to employment

In terms of employment, the case studies show little immediate rationalisation effects in the sense that particular jobs disappear because of ICT. One reason is that the companies hardly employed any data-input typists; other clerical workers carried out the entry even of large amounts of data. However it became obvious in nearly all cases that ICT does increase productivity considerably. To give just a few examples: In the engineering company (case 4) volumes and turnover have increased enormously. As compared to the early eighties the volume of production is eight times higher but the number of personnel has only doubled. Of course outsourcing of production has played a role, but it is very indicative that only the number of blue-collar workers has increased whereas the number of office workers has remained stable. Orders, which have risen to 45,000 per year, are handled by only four people. The fictitious saving on personnel is therefore considerable. Further rationalisation is expected when orders are no longer sent by fax but entered directly into the information system by customers.

This point can also be illustrated with case 1, the restaurant chain. The utilisation of ICT has had clear rationalisation effects. This also concerns computerised communications and filing: „All the work of copying and binding, etc has disappeared." (B1G3-11) In all, a given task can thus be fulfilled by fewer staff. Due to the low degree of division of labour one cannot derive a threat to the employment of any individual, possibly not properly qualified employee. Thus in this regard the ICT can be accorded relatively little immediate effect. Other factors are far more important in this respect. For example, the company points to the process – recognisable in the labour market in general – of the displacement of employees with low formal qualifications by those with higher qualifications. Jobs that were previously occupied by people who had been to commercial school are now being applied for by *Matura*-(Baccalaureate-) level school leavers, business-college graduates or even university graduates. (B1G1-9) The emphasis on „social competence", „personality" and „readiness to learn" may likewise have a greater effect than the increased significance of ICT skills.

Nor can the company's pending rationalisation plans be seen as an immediate threat to jobs of any particular group of employees. This is due in particular to the organisation of work in the administration. Thus, for example, particular employees in the personnel department are responsible for particular restaurants and coffee houses, *„from wage slips through to final accounting for a colleague,"* (B1G3-4) and they carry out all of the required tasks with regard to this. Now rationalisation effects are expected as a result of technical integration because „double tasks" are disappearing. (B1G3-6) The fact, however, that there are no staff who previously only put in data means that technical integration is indeed leading to savings, but is not threatening data processors' jobs.

Interestingly, call centres, which have only recently emerged as a result of cost-saving attempts, are also subject to rationalisation. First, the technology applied in call centres allows for high levels of productivity. Second, the number of inbound calls are reduced by offering customers Internet-applications for the entry of orders. In the case of the logistics company (case study 9) the number of calls is already going down as a result of data input by customers and of the customers tracking their consignments themselves using a www-application. So in this case increased volumes are being handled by a reduced workforce.

Outsourcing and relocation work which is made easier through ICT also impacts directly on employment. The case of an electronics company (case study 8) is very illustrative in this respect: large parts of production are located in the Czech Republic while other functions including some production are kept in Lower Austria. It could be argued at first sight that jobs have moved abroad. However, management maintained that only the competitive advantage stemming from the utilisation of low wage costs in the Czech Republic has allowed for the rapid expansion of production. As a consequence the relocation can be said to have saved and created jobs not only abroad but also in Lower Austria. It has to be noted however that the reduction of production activities in Lower Austria reduced the number of jobs for semi-skilled female blue-collar workers while the new jobs on the site are for skilled, mainly male engineers.

Many of the companies under investigation showed a high level of employment security. Partly this was a result of deliberate management strategies of internal labour markets, partly it was a consequence of the status of workers in previously state-owned companies. In the telecommunications company (case study 10), the high level of employment security can be seen as the reason for the establishment of a dispersed call centre. In this respect, the ICT potential was only used because the company was forced to offer jobs in various locations. Among our cases studies, this is probably the most direct relation between technology utilisation and the avoidance of social exclusion. It is noteworthy that the cause was not the technology but the contractual or political constraints on management.

Casual labour is not very widespread in the core sectors of the Lower Austrian economy. In our cases we were able to find an increase in atypical forms of employment. However, this is not necessarily a sign of casualisation, nor are the workers always used as „flexible labour". As can be illustrated with case study 4, a metalworking company, agency workers are taken on when the business expands but management is uncertain about the long-term need for personnel. Because of the policy of employment security they are careful not to expand the core workforce. Rather than the aim of casualisation, it was the strict employment security policy that has led to the increase in temporary workers. After the expansion proved to be sustainable the workers were taken over in ordinary, permanent employment relationships. Exactly the same story could be found in case study 3, one of the electronics companies.

The telecommunication company (case study 10) showed a high level of agency workers in the call centre: 20% of the call centre agents are temps. The reason is that top management of the company had issued an overall „recruitment stop" when the call centre business expanded. Local management therefore had to take recourse to agency labour for staffing a whole new call centre. As can be seen from the strategy to retrain workers who had become redundant in other parts of the company (including construction units) as call centre agents, the use of temporary labour cannot be seen as going hand in hand with ICT-based jobs.

5.3.3. Conclusions

Popular theses concerning the relationship between technology and organisation, such as those presented by Castells (1996), which maintain a congruence and mutual reinforcement between the market-driven tendency to decentralisation and self-organisation on the one hand and, on

the other, higher qualification and expansion of room for activity as a precondition for the utilisation of the potential of modern ICT, should be treated with some scepticism. Our findings rather support Greenbaum's (1998) thesis, according to which the *design* of computer systems is indeed oriented on the management discourse concerning decentralisation and self-organisation, which leads to the corresponding technical potential for such forms of organisation. But the description of the technical possibilities still says very little concerning the reality of work. The development of the organisation of work by no means exhausts the potential for innovation as far as it relates to this direction at all.

As far as the thesis of work in information space is concerned, also with relation to locational and temporal independence of work, the intensive exploitation of modern ICT has in fact led to considerable changes. As a result of the new technological infrastructure (Internet) and the new design of the technologies (groupware, work in information space) conditions have been created for the relocation of work and cooperative work over long distances. This has already led to a new spatial distribution of work. But in this respect, too, the limitations of the relocation of particular activities and of cooperative work over great distances should not be overlooked. Whereas routine activities can be relocated more easily, knowledge management, the necessary learning processes and the social preconditions for cooperative work mean that complex and creative ICT-based tasks are much more closely tied to one place.

Regarding networking across company boundaries, the case studies have also clearly shown that it is not the technological potential that determines the new organisational patterns. Rather, on the contrary, it is high standardisation of business processes that allows information-technology integration of processes beyond company boundaries and at geographical distance. In addition, strategic business decisions play an important role in this context. In the euphoria over *e-commerce* and *network enterprises*, the limits of *outsourcing*, relocation and *tele-cooperation* should not be lost sight of. Highly complex tasks and dynamic development of products and of customer relations are disadvantageous to the possibilities for close technological linkages. Our findings, that the standardisation of business processes is a precondition for the actual utilisation of technological networking possibilities may indeed be hardly surprising for everyday practicians. It is, however, in clear contrast to the popular discussion of "networkers" and the "network society".

ICT's potential to rationalise work is enormous, particularly in the case of standardised business processes. It was very indicative to find that call centres, only recently established as a consequence of companies' cost cutting strategies, are becoming subject to rationalisation: Highly standardised sales or customer care activities are being replaced by self-service based on the Internet. This means that the much heralded role of call centres as job machines is questionable. The lower end at least, with standardised and repetitive work, may turn out to be a temporary phenomenon.

The gender implications are that both in manufacturing and in the service sector many women's jobs are still endangered by relocation and rationalisation –although jobs that would be directly endangered by new ICT, such as data typists, hardly exist any more. Typing in data is usually integrated in clerical tasks and therefore technical integration that reduces the need for data entry does not affect a particular group of employees. Still there is a considerable labour saving effect. Those disadvantaged in the workplace and on the labour market – because of

low formal qualifications, restricted availability for the employer etc. – will suffer the consequences. Again, ICT seems to strengthen tendencies rather than having clear effects on its own. Various processes of exclusion from employment may therefore be accelerated in an ICT-intensive environment even if rationalising particular jobs or demanding particular ICT-related skills is not a major problem.

As a consequence, the policy implications are more general than one would expect. Securing access to the Internet and training in ICT-skills are certainly helpful. However, these are probably not the most important measures to cope with the challenges of changing technological practices. Rather, it is necessary to provide learning opportunities in a wide sense, that is to say, pro-active personnel development and a work organisation that provides opportunities for adapting one's knowledge to new requirements. The most important resources for this are precisely the ones that are becoming increasingly scarce in modern workplaces: time and mutual support. So dealing with ICT and the question of social inclusion brings us back to the question of sustainable workplaces in more general terms.

REFERENCES

AK NÖ (Arbeiterkammer Niederösterreich) (1995): Beschäftigung in NÖ 1994

AK NÖ (Arbeiterkammer Niederösterreich) (1997): Die regionale Beschäftigungsentwicklung in Niederösterreich 1983 – 1994, Unveröffentlichtes Papier

AMS NÖ (Arbeitsmarktservice Niederösterreich) (1997): Der Arbeitsmarkt in Niederösterreich, Arbeitsmarkt-Extra, August 1997, Wien

AMS NÖ (Arbeitsmarktservice Niederösterreich) (1998): Der Arbeitsmarkt in Niederösterreich, Oktober

Baethge, M./Oberbeck, H. (1986): Zukunft der Angestellten. Neue Technologien und berufliche Perspektiven in Büro und Verwaltung, Campus, Frankfurt/New York

BAK (Bundesarbeitskammer) (1998): Wirtschafts- und sozialstatistisches Taschenbuch 1998, Wien

Bardel, A. (1996): Studie zur Telematik-Initiative des Landes Niederösterreich, Pilotprojekt Telearbeitszentrum Bruck an der Leitha, Wien

BKA (Bundeskanzleramt) (1997): Informationsgesellschaft. Bericht der Arbeitsgruppe der österreichischen Bundesregierung, Wien

BMAS (Bundesministerium für Arbeit und Soziales) (1996): Informationsgesellschaft und Sozialpolitik, Abschlußbericht des Arbeitskreises, Wien

BMAGS (Bundesministerium für Arbeit, Gesundheit und Soziales) (1998): Bericht über die soziale Lage, Analysen und Ressortaktivitäten, Sozialbericht 1997

BMAGS (Bundesministerium für Arbeit, Gesundheit und Soziales) (1998a): Der Arbeitsmarkt im 2. Quartal 1998. Analysen, Prognosen, Forschungsergebnisse, APF Team, Wien

BMWVK (Bundesministerium für Wissenschaft, Verkehr und Kunst) (1996): Information und Kommunikation: Schlußbericht des Bundesministeriums für Wissenschaft, Verkehr und Kunst im Rahmen der Initiative der Bundesregierung, Österreichs Weg in die Informationsgesellschaft, Wien

BMWV (Bundesministerium für Wissenschaft und Verkehr) (1998): Kplus. Forschungskompetenz plus Wirtschaftskompetenz, available via email michael.stampfer@bmv.gv.at, 1998

Baukrowitz, A. (1996): Neue Produktionsmethoden mit alten EDV-Konzepten? Zu den Eigenschaften moderner Informations- und Kommunikationsysteme jenseits des Automatisierungsparadigmas; in: Schmiede, R. (ed.), Virtuelle Arbeitswelten – Arbeit, Produktion und Subjekt in der 'Informationsgesellschaft', edition sigma, Berlin

Brousseau, E./Rallet, A. (1998): Beyond Technological or Organisational Determinism: A Framework to Understand the Link Between Information Technologies and Organisational Changes; in: Macdonald, S./Madden, G. (eds.), Telecommunications and Socio-Economic Development, Elsevier, Amsterdam

Castells, M. (1996): The Information Age, Volume 1: The Rise of the Network Society, Blackwell, Malden, Mass./Oxford

Edelmann, D./Staubmann, M./Tanner, E. (1998): Telearbeit, Donau-Universität Krems

GPA (Gewerkschaft der Privatangestellten) (1996): Informationsgesellschaft oder Informationswirtschaft. Wohin steuern wir?

Greenbaum, J. (1998). The Times They Are A'Changing: Dividing and Recombining Labour Through Computer Systems; in: Thompson, P./Warhurst, Ch. (eds), Workplaces of the Future, MacMillan, Houndsmill and London

Hummel, R. (1998): Kommunikationsberufe im 21. Jahrhundert, Studie des Graphischen Bildungsverbandes, Wien

Huws, U. (1999). Material World: The Myth of the 'Weightless Economy'; in: The Socialist Register 1999, Merlin Press, Woodbridge

Industrie (1999): Journal published by the Association of Austrian Industrialists

Jagger, N./Perryman, S: (1997): Measurement of Employment in High Technology Sectors at the Regional Level, IES Report 318

Klien, R. (1998): Arbeitsmarktpolitische Rahmenbedingungen für Frauen, Kontraste, February, pp. 2-3

Knoll, N.G. (1997): Austria's Way to the Information Society; in: Borrus (ed.)

Kolm, P./Kral-Bast, C./Reifinger, I./Tallafuss, W. (1996): Telearbeit von A bis Z. Tips für die Praxis, Verlag des ÖGB, Wien

Kolm, P. (1997): Lebensqualität in der Informationsgesellschaft; in: Kompetenz 3/97, 32+33

Krajasits, C. (1998): Ökonomische Entwicklungstendenzen in den österreichischen Grenzregionen; in: Kontraste, März, pp. 19-21

Leitner, K.-H./Ohler, F./Hölzl, W./Paier, M. (1997): Information Technology Outlook Österreich, ÖFZS

MISEP (1998): Arbeitsstiftungen; in: Beschäftigungsobservatorium MISEP, Basisinformationsbericht Österreich, European Commission

NAP (1998): Nationaler Aktionsplan für Beschäftigung; in: Kontraste, June, p. 4-9

NÖ-Landesregierung (1996): Niederösterreich in der EU

ÖIR (1995): Österreichisches Institut für Raumplanung, Handbuch der Regionen, Niederösterreich

ÖSTAT (Österreichisches Statistisches Zentralamt) (1995): Statistisches Jahrbuch für die Republik Österreich

ÖSTAT (Österreichisches Statistisches Zentralamt) (1995a): Volkszählung 1991. Hauptergebnisse II für Niederösterreich, Wien

ÖSTAT (Österreichisches Statistisches Zentralamt) (1998): Statistisches Jahrbuch für die Republik Österreich

Papouschek, U./Flecker, J./Krenn, M./Pastner, U./Riesenecker-Caba, T./Angerler, E. (1997): Vorausschätzung der Entwicklung des Arbeitsmarktes und des Bedarfes an beruflichen Qualifikationen in Klein- und Mittelbetrieben, FORBA- Forschungsbericht 6/97, Wien

Pastner,U./Flecker, J./Papouschek, U./Riesenecker-Caba, Th./Nebenführ, E. (1998): Qualifikationsbedarf und -nachfrage in Klein- und Mittelbetrieben Niederösterreichs, FORBA-Forschungsbericht Nr. 4/98, Wien

Pisjak, P./Schrems, A.(1997): Elemente und Ansatzpunkte einer neuen Universaldienstkonzeption für den Telekommunikationssektor in Österreich; in: Wirtschaft und Gesellschaft 1/97, S.77-92

Sarreschtehdari-Leodolter, S. (1996): Chancen und Risiken für Arbeitnehmer und Arbeitnehmerinnen; in: OeIBF (1996), 16-19

Sint, P.P. (1997): Eine empirische Analyse des Informationssektors in Österreich; in: Hanappi (ed.), Der Informationssektor in Österreich, Endbericht, Österreichische Akademie der Wissenschaften, Wien

Stuiber, P./Ninz, L. (1999): Frauenthema: Böses Erwachen; in: Solidarität, No. 809, February, p. 14-16

Volst, A./Wagner, I. (1990): Kontrollierte Dezentralisierung, edition sigma, Berlin

Weinzierl, R. (1998): Die Arbeitswelt in der Informationsgesellschaft; in: Wirtschaftspolitische Blätter 2-3/97, 201-208

Wirtschaftskammer Niederösterreich: Wirtschaftsdaten (monthly)

Wr. Wirtschaft (1999): Gefragter Standort Österreich, Wiener Wirtschaft, 29.1.1999, p. 10