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

First Interim Report (Literature Review)

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Preface

This Interim Report is based on the following National Reports:

Rik Huys & Geert Van Hootegem: The Belgian Literature Report for SOWING

Riitta Lavikka & Katja Uosukainen: The Finnish Literature Report for SOWING

Annaflavia Bianchi: Political programmes and IS strategies in Italy.

Francesco Garibaldo: The Information Society. The Italian Debate.

Maria Luisa Mirabile and Francesca Carrera: Social Exclusion in Production Context. The Italian Case.

António Brandão Moniz and Cláudia Teixeira Gomes: Literature Report - Portuguese Contribution.

Gotthard Bechmann, Günther Frederichs: The German Literature Report for SOWING.

Huws, U., Dench S., Jagger N., O'Regan, S.: SOWING Social Exclusion, Work and Information Society: Literature Review UK.

Jörg Flecker, Thomas Riesenecker-Caba, Christian Stary: Information Society, Work and the Generation of New Forms of Social Exclusion.

Nexus: Literature Report

Gerd Schienstock**:** Information Society, Work and the Generation of New Forms of Social Exclusion. A Conceptual Framework.

The National Literature Reviews were sent to the European Commission in July 1998. This "First Interim Report" therefore represents the 'state of the art' at that time. The report was prepared by Gerd Schienstock. For each chapter it is noted, when the report has drawn to a greater extent on the National Literature Reviews. After a first draft of the report was finished, it was sent to all the partners for further comments. The Interim Report should be

seen as a collective work, although the co-ordinator accepts the final responsibility.

It is the aim of the Interim Report to further develop the conceptual framework for the project. Therefore, those parts of the National Literature Reviews were taken into account which could particularly contribute to this aim. Although a common framework for analysing the available literature had been developed, it turned out that the thematic focus in each country is different. Therefore, it proved impossible to write a strictly comparative Interim Report.

1. Introduction[1]

Following the argumentation of Stephen J. Gould, we can assume that societies develop rather slowly and steadily over long periods of time. Yet at rare intervals, he continues, major events occur with great rapidity, causing dramatic socio-economic changes but at the same time helping to establish a new area of relative stability (1980: 226). Independent of whether we accept such a gradualism or not, there is widespread agreement that at the end of the twentieth century we are living through one of the rare intervals in which economy and society are being transformed fundamentally and rapidly. It is stated in the so-called 'Bangemann Report' that the changes currently taking place together with the disappearance of the industrial society may become even more dramatic than those caused by the replacement of the agrarian society through the industrial society, as the change process will take place in a much shorter period of time (High Level Group on the Information Society 1996).

Already during the 1970s and 1980s there was a prolific output of general publications proposing the notion that the world was undergoing a 'new industrial revolution', the 'micro-electronics revolution', (Forester, 1980) and entering a new phase, typically described as 'post-industrial society' (Bell, 1974), the 'information economy' (Porat, 1976), or the 'third wave' (Toffler, 1980). The notion is postulated that we are entering a new ‘techno-economic paradigm’, sometimes described as the ‘fifth information and communication Kondratieff’ (Freeman, 1987), an idea reformulated by Castells as the ‘informational mode of production’ (Castells, 1989).

In the recent years, the term ‘information society’ has taken centre stage in the international debate due to the publication of the Bangemann Report and following political initiatives in various countries. Other terms such as ‘service society’ (Gershuny and Miles 1983), ‘science society’ (Drucker 1969), ‘knowledge society’ (Böhme and Stehr 1986) and ‘learning society’ (Lundvall and Johnson 1993) have never attracted the same attention.

[1] This section is based on the British and the German reports.

The notion 'information society' is less a theoretical than a political term. It is present as a strategic aim, in order to overcome the current social stagnation. Whether the European Commission, federal governments or industrial federations; the central argument is that the 'information society' would create and secure millions of new jobs. If one extracts the bones of these many programmatic statements brought into connection with the emergence of the 'information society', it turns out that they are dominated by four main themes: The 'information society' would supposedly guarantee economic competitiveness and create new jobs; bring ecological advantages; intensify democracy; revolutionise our ways of living and working with the help of new communications technologies.

2. Basic Concepts of Information Society[2]

Within academia, the understanding of an 'information society' differs significantly. The idea of an emerging 'information society' is developed within the framework of various theoretical contexts and not as a theoretical concept in its own right. The literature is interdisciplinary; various social science disciplines such as political economy, business studies, the sociology of organisation, communication and media sciences, political and educational sciences, as well as sociology in general, but also natural and technical sciences have participated and are still participating in the discourse on information society.

One could systematise the debate on information society according to the dimensions in which social change is primarily exemplified. In this respect, one can differentiate between the following concepts:

- The Information Society as an Information Economy
- The Information Society as Post-Industrial Society
- The Information Society as the End of the Industrial Labour Society
- The Information Society as a Knowledge Society

[2] This chapter draws extensively on the German report.

- The Information Society as an Informatised Industrial Society
- The Information Society as a Learning Society

Although these concepts partially overlap, and cannot always be clearly distinguished from one another, they do emphasise the transition to an information society in a specific manner. It is possible to distinguish various aspects of the transformation process.

2.1. The Information Society as an Information Economy

The anthropologist and biologist Todao Umesao was one of the first academics to write about the information society. He assigned a key role in the modernisation process to the knowledge industry. In his study, "Joho Sangyo Ron" ("On knowledge industries"), published in 1963, he postulated that the 'electronic industries' (information, communication, education) would be just as pivotal for the structural transformation of the industrial society as the intermediary industries (transportation, heavy industry) were for the transition from the agricultural to the industrial society (Ito 1996: 13f).

Umesao's approach stands in the tradition of the – later often criticised – paradigm of linear modernisation: social progress is seen as linear evolution from a lower' (traditional society) to a 'higher' (modern society) stage (see, e.g., Rostow 1960). At the same time, Umesao adapted the three-sector theory in which national economies are defined as the sum of the agricultural, industrial and service sectors (see, e.g., Fourastie 1954).

In the US, Machlup was the key figure in studying information society. He augmented the 'three sector model' with a fourth sector: the 'knowledge industry' (Machlup 1962). Machlup’s study, together with Japanese publications (Ito 1989, 23), marks the beginning of information economy research, which drafts and tests indicators for the empirical evaluation of emerging information societies (Porat 1976; OECD 1981). Indicators such as the net product, gained by means of information activities as well as the number of information workers are used to analyse the emerging information society.

The political scientist Karl Deutsch defined information societies as national economies in which more than half of the work force is employed primarily in information-oriented occupations, and in which the net product of these activities is greater than half of the gross national product (GNP) (Deutsch 1983: 69f.). Other indicators of an information society are the expenditure coefficient, that is to say, the share of the expenditures of private households spent for information goods and services, as well as the cumulative index, in which, among other things, the circulation of nationally distributed newspapers per inhabitant, the number of computers per inhabitant, and the number of telephone calls are evaluated (Hensel 1990: 162).

However, basic assumptions underlying the information economy approach are still debatable (Löffelholz 1993: 114f, Kubicek 1995: 84f.). According to the OECD definition, all of the gainfully employed who produce, process and distribute information, or maintain the apparatus for its preparation and mediation are information workers. With this very broad definition, occupations (e.g., nursery school teachers, bookkeepers, physicists, forest rangers or restaurant proprietors) which are structurally and functionally quite heterogeneous can be subsumed under information work. However, statements about structural changes can hardly be based solely on the observation that the number of heterogeneous occupations is growing – in particular, because it is unclear, from what point on an activity combining various operations is to be classified as an information occupation.

A further objection to the information economy approach is that highly complex processes of structural change could neither be sufficiently differentiated nor even described to any acceptable degree of completeness by means of an indicator grid much more sensitive than that proposed in the studies mentioned. The limitation to technical and economic indicators characteristic of the information economy approach lures its proponents to a reductionistic argumentation: in functionally differentiated societies, social change never follows technically or economically determined rationalities alone.

2.2 The Information Society as Post-Industrial Society

In contrast to the economically deterministic information economy approach, the sociologist Daniel Bell proposed the analytical concept of a post-industrial society, in which social change is seen as a multidimensional process. In the course of this process, various 'axes' of organisation in industrial societies (economic sectors, vocational groups, fundamentals of technology, basic social principles) are so radically shifted that the result could well be called a post-industrial society.

The post-industrial society is founded on the growing importance of the information sector, as opposed to the production of goods, on production which is primarily dependent on information (rather than on raw materials and energy), as well as on a changed 'axial principle' (fundamental social orientation). In an industrial society, goods are produced primarily by machines and private property is held to be an axial principle – in a post-industrial society, acquiring and utilising information and knowledge play the key role. This is made possible by replacing intuitive decisions by algorithms, by 'intelligent technologies' based on computerised information processing. Theoretical knowledge becomes a guideline of social organisation, and the post-industrial society develops itself into a knowledge or rather, information society (Bell 1989: 112ff. 353).

The impetus for the transition to the 'information society', in Bell’s opinion, is provided first and foremost by technical innovations (particularly in microelectronics) as well as the exponential expansion and differentiation of knowledge. The quantitative and qualitative growth of our knowledge and the technological and economic growth of the information sector stand, according to Bell, in a reciprocal relationship to one another, but are induced by other factors of social change – for example, by the increasing importance of the science system (Bell 1989: 179ff.). Seen in the political context of the 1970’s, when social planning according to scientific methods was still held to be feasible, it is understandable that Bell assumed that scientifically well-founded decisions should gain greatly in influence against other means of social regulation.

A review of the introduction and spread of telematics (telecommunication and auto-informatics), however, shows that even the informatisation of society (which is held to be a basic trend) quite substantially follows the rules immanent in a market economy. Not the knowledge won, for example, by systematic technological assessment, but above all profit maximisation, competition, the pressure to adapt to new technologies and the respective national government as a focal point of individual economic interests determine the dynamics and the procedures for the 'information society' (Werle 1990; Kubicek/Berger 1990: 45ff.).

Soete recently suggested a return to the issues raised in the old 'information society debate', pointing to a shift, implicit in the notion of information society, to a post-industrial society, in which the largest part of new value added is being created in the non-industrial sectors of the economy. The growth of the tertiary (service) sector, and with that, what can be called the information service sector, is one of the most important economic and social phenomena of Europe´s current industrial transformation" (1996: 47). He stresses that it is essential to enlarge the debate on information society to the demand side and to look at those social factors that hinder the demand for new ICT-based products.

Bell's argumentation is interesting insofar as it combines the various concepts of post-industrial, service, information and even knowledge society in some kind of a 'march through the sectors' concept. Such a concept, however, also attracted a lot of criticism. Gershuny and Miles (1983), for example, have questioned Bell's de-industrialisation thesis. The continuous replacement of particular service activities by industrial products, according to them, can also be interpreted as a process of industrialisation of services. On the other hand, an 'information society', to some extent, also depends on the production of hardware and other technical equipment; therefore, we cannot characterise the 'information society' as a 'post-industrial society'.

Nor is the relationship between the concept of 'information society', on the one hand, and 'service society' on the other, as clear as is assumed by Bell. Although in many services the processing and exchange of information and knowledge is the core activity increasingly taking place through modern ICTs,

this is hardly a criterion to distinguish between industrial and service societies. There are services - mainly personal services - for which no ICTs are needed and at the same time, due to mechanisation and automation, industrial production is becoming more and more interpenetrated with processes of gathering, processing and transferring information. One can even speak of a kind of converging tendency between industrial production and particular service processes the more the manufacturing process becomes dematerialised. The distinction between manufacturing and services becomes more and more blurred as much of the value provided by the successful enterprise entails services.

From what has been said so far, we must draw the conclusion that the idea of a ‘march through the sectors’ (Lyon 1988, Miles 1988), as it has been developed by Bell and which most approaches analysing the emerging information or knowledge society are based on, must be rejected. Neither can we speak of the vanishing of the industrial society nor can we argue that 'information society' can be characterised as a 'post-industrial society' with technical knowledge as a new axial principle. Furthermore, to assume that information will become the leading sector about to supersede the industrial and the service sector, is also missing the point. What really characterises the current transformation process is the fact that all sectors and industries are increasingly interpenetrated by information work and that human work will occur more and more through the intermediary of ICTs.

Instead of arguing that 'information society' will replace industrial society, we can conclude that existing socio-economic structures will be transformed by processes of informatisation. This transformation process can be characterised more as an evolutionary than a revolutionary process. One can, of course, argue that in many ways all human societies have been information economies in that all economic activities depend upon human beings and their ability to bring information to bear on their tasks. In fact, all tasks to which human labour is applied inherently involve some measures of information processing. This might be in terms of: receiving instructions (communication); checking to see in what state the materials are (perception); performing calculations or other mental acts (transformation of information)

(Miles and Robins 1994). This would mean that in some way all societies have been information societies.

There is no doubt that the argument has some truth in it. However, when we use the notion of an information or knowledge society, we are not talking about a historical universe. The term is used to characterise a new and unprecedented kind of social and economic formation (Miles and Robins 1994). The new, however, is not a totally new society but fundamental changes within the existing society; instead of distinguishing between an industrial and a post-industrial economy we had better distinguish between two forms of information or knowledge-based industrial, agrarian and service production (Castells 1997: 20).

2.3 The Information Society as the Era of 'Post-Fordism'

This perspective describes the process of an emerging information economy in terms of the transformation from a socio-economic era called ‘Fordism’ to one referred to as 'post-Fordism'. This approach has a broad economic and political perspective, its main ideas were developed by the French ‘Regulation School’ (Aglietta 1976, see also Jessop 1991). This school characterises the current period as the ‘crisis of Fordism’. The term 'Fordism' includes the economic system as well as the social and institutional framework that have structured capitalist economies since the late forties.

Fordism is associated with a growth model, which is based on the exploitation of economies of scale in the manufacturing of standardised goods and has mass production and mass consumption as its basic requirement. The Keynsian interventionist and welfare state is seen as the key institutional element that supports this economic structure.

The 1970s are seen as the turning point of economic development. Due to a number of reasons, including a productivity slowdown, changing market demands and market saturation, Fordism both as an economic system and as a social and institutional framework became unstable and had to be replaced by a new production regime, which was characterised as 'post-Fordism'. Privatisation, deregulation and a disintegration of the welfare state are seen

as key elements of a 'post-Fordist' production regime. The following table contains a characterisation of the ideal types of 'Fordism' and 'post-Fordism'.

Fordism	Post-Fordism
low technological innovation	accelerated innovation
fixed product lines, long runs	high variety of product, shorter runs
mass marketing	market diversification and niche markets
steep hierarchy, vertical chains of command	flat hierarchy, more lateral communication
mechanistic organisation	organismic organisation
vertical and horizontal integration, central planning	autonomous profit centres, network systems, internal markets within firms; outsourcing
bureaucracy	professionalism, entrepreneurialism
mass unions, centralised wage-bargaining	localised bargaining, core and periphery work force divided, no corporation
unified class formation, dualistic political systems	pluralistic class formations, multi-party systems
institutionalised class compromises	fragmented political markets
standardised forms of welfare	consumer choice in welfare
prescribed ‘courses’ in education	credit transfers, modularity, self guided instruction, ‘independent’ study
standardised assessment (O level)	teacher-based assessment (GCSE) or self assessment
class parties, nationwide	social movements, multi-parties; regional diversification

Table 1. Fordism - Post-Fordism. Source: Rustin (1989, pp. 56-7).

At first, technology was not seen as an important factor in determining social and economic transformation. Subsequently, however, Roobeek (1987) and others have given more emphasis to the role of new technologies in the process of transformation to 'post-Fordism'. According to Roobeek, modern technologies can be seen as the main catalysts propelling the development of a 'post-Fordist' production regime. The fact that Roobeek and others have seen 'post-Fordism' in terms of the emergence of a ‘new technological paradigm’ has contributed to the critique of 'post-Fordism' being influenced by technological determinism. Furthermore, the fact that the concept of 'crisis' and 'historical shift' have been used in a very vague manner, has also been criticised. And the focus of the 'post-Fordist' approach is unclear; sometimes the object of research is reduced to the labour process and business organisation, although the French Regulation School has a much broader perspective including the economic system and even society as a whole.

2.4 The Information Society as an Informatised Industrial Society

Within the scope of the traditional concepts of industrial society, the means of production, in particular the technologies required, are seen as the central causes of social change. It is widely accepted that information and communications technologies, due to their multi-functionality, their network capabilities, the speed and breadth of their diffusion, have established themselves as base technologies. The introduction of these technologies would therefore mark the beginning of the informatisation of society, and is also known as the "Second Industrial Revolution" (Steinmüller 1981: 152f.): in a standing phrase, the automation of manual labour is now followed by the automation of brainwork. Informatisation can be defined as the adoption of information and communications technologies insofar as they have an impact on work practices. The emergence of an information society is reflected in the growing dissemination of information and communication technologies in all areas of social and individual life.

The decisive impetus for the spread of information and communications technologies, according to Beninger (1986) was a management crisis initiated

by the Industrial Revolution. With industrialisation and the growing need to distribute goods quickly and over great distances, the demand for control technologies which could direct the exchange of goods by means of information processing, also grew. For this reason, according to Beninger (1986: 20), modern media systems, as well as a system of mass feedback-technologies, for example, marketing research and opinion research are allegedly promoting sales, arose within a century on the basis of existing technologies.

Besides Beninger's hypothesis, according to which the origins of the information society are rooted primarily in the interests of industry, there are also explanations, which put a 'technology-push' to the forefront. Nora and Minc (1979) argue that the penetration of all social spheres by modern ICTs is the key characteristic of the information society. Technology is seen as the driving force and all other aspects of society have to adjust. The technology push approach is also echoed in the very influential Bangemann Report: "Throughout the world", the report states, "information and communication technologies are generating a new industrial revolution already as significant and far-reaching as those of the past" (High Level Group on the Information Society 1994: 3). In such an approach, technological development is seen as independent of society; it shapes society but is not reciprocally influenced. Rather, it exists outside society, but at the same time influences social change.

The 'technological push approach' is often based on the concept of 'heartland technologies' and in this concept, modern ICT is seen as the latest revolutionary heartland technology. A heartland technology, according to Perez (1983), is a technology which is employed across many production processes; it is typical of a heartland technology that its diffusion offers great economic benefits such as cost reduction, improvement of quality, and saving of time, which cause its wide and rapid application. Associated with the wide diffusion of a heartland technology are fundamental socio-economic changes: new methods of production, new products, new organisation forms and work regulations or new skills. Modern ICTs are seen as a heartland technology because they revolutionise those production processes which have not been

affected by former technological revolutions, as, for example, office work (Miles and Robins 1994: 9).

The 'technology push approach', which associates the development of the information society with a technical revolution of production, can only insufficiently comprehend the fundamental economic and social changes caused by this transformation process. The dynamics of this change cannot be revealed from the quantitative increase of applications of modern ICTs. It is important to analyse ICTs not as an exogenous source of impact, but as the fabric in which human activity is woven; we therefore have to stress the process-perspective of modern ICTs besides the inducing of new products (Castells 1997: 30f).

In the last few years, according to Robins and Webster, there has been a decided step away from prioritising technology as the centrepiece of change and therefore also from the 'technology push approach'. "… nowadays the focus is on information - rather than information and communication technologies - as the key source of change" (1997: 3). Informatisation is no longer seen as a technological concept, but is used to highlight the penetration of information activities into all economic sectors and industries. In contrast, the role modern ICTs play in the transformation of society is regarded as a minor one when compared to the major part played by information. Information is becoming an important asset, as the economy is becoming more and more uncertain, which - as we will argue later - is caused by increasing global competition.

2.5 The Information Society' as a 'Knowledge Society'

In the frame of reference of the 'knowledge society', the change in the basis of society's knowledge is emphasised. The coupling of science and techniques is held to be its most important characteristic, and in particular, the information and communication technologies are predestined to bring about

this linkage. Three key developments deserve mention, when we talk about the development of a 'knowledge society':

- the enormous growth of knowledge
- the development of the computer as a knowledge-based machine
- the confluence of both of these into the cognitive-technical complexes of knowledge-based techniques and types of mechanised knowledge.

The formation of a mountain of information is in the first place the result of the exponential increase in the scientific forms of knowledge, knowledge of theory and of rules. In the second place we have to mention the rapid growth of knowledge in the non-scientific areas of administration, mass media, information services, and protection facilities. This, in combination with the increase in scientific knowledge, leads to the genesis of the massively expanding information sector of the 'knowledge industry'.

Furthermore, the information implosion, which, practically from the beginning, went hand in hand with the information explosion, contributed significantly to the formation of a mountain of information. By information implosion we mean the investment of information in a technical development or an industrial product but also the fact that the course of events, political decisions for example, is influenced by a greater amount of information than in earlier times. In contrast to the "scientification" which follows only gradually and incompletely, as a result of the exponential growth of knowledge, the information implosion leads to an immediate and far-reaching informatisation of society.

Besides pointing to the immense growth of knowledge, the proponents of the 'knowledge society' concept lay emphasis on the singular importance of the computer, which has become a knowledge-based machine. Almost unanimously, the various authors make reference to the computer. But the computer did not become a 'knowledge machine' in its original but only with its transformation into a 'knowledge-based system', which incorporated the knowledge bases and conclusions of experts. Although the pretentious programme for the development of autonomous expert systems must be conceded to be a failure (Malsch et al. 1987), we should nonetheless not

overlook the important fact, that programming techniques and the products of the 'artificial intelligence technology' have already been integrated into modern software. In analogy to the self-reference of mechanical engineering production, we have, in the case of the software, not reproduced the knowledge itself, but the manner of working with the objects and tools of knowledge in the computer programmes. When the formalisation and mechanisation of a field of knowledge has made great progress, this manner of working can be emulated.

The knowledge society is characterised by the fact that all of its functional systems – and not merely a subsystem – are bound to a knowledge base in their basic manner of operation. This knowledge base establishes itself within the structure of the elements determining the system’s operation and thereby changes their quality. A knowledge society is not only characterised by the fact that its members enjoy, on average, a longer and more professional education, that more products are provided with built-in intelligence, and that its organizations transform themselves into knowledge-based entities. The importance of knowledge, intelligence, and expert opinion changes the traditional forms of operations based on a division of labour. Until now, the fact that science was solely responsible for the production, evaluation, canonisation and revision of the knowledge it generated was virtually a characteristic of modernity (Luhmann 1990; Stichweh 1987). Other functional systems, such as politics, law, education, health, etc., incorporated new knowledge by means of intermediary processes, such as asking political advisors, experts’ hearings, teaching, combining medical research and practice in university clinics, etc., and formulated their demands on science.

Today, however, we can observe a weakening of this division of labour as a result of the spread of multiple "centres of expert opinion". Knowledge is only one form of organised information among others. These are, for example, functioning technologies, expert opinion, intelligence, implicit knowledge, organised systems of symbols, organisational knowledge, and management know-how. Science is no longer able to control the production and use of specialised expert opinion, which is generated in 'foreign' contexts. But above all, the rate of the revision of knowledge has accelerated just because of this

polycentric production of knowledge, so that the tedious detour via the conventional scientific system would be self-defeating. It is striking, therefore, that expert opinion in management and new concepts for business administration are no longer developed in economics or in the theory of organisation or management, but rather either in reflected practice, or in hybrid systems of the organisational or management consultants interested in theory (Peters 1994; Senge 1990; Womack, Jones and Roos 1990).

2.6 The Information Society as a 'Learning Society'.

Castells is rather critical, attaching such high importance to information as a key factor in social transformation. “What characterises the current technological revolution,” he argues, “is not the centrality of knowledge and information, but the application of such knowledge and information to knowledge generation and information processing/communication devices, in a cumulative feedback loop between innovation and the use of innovation” (1997: 32). It is the immediate feedback between knowledge generation and knowledge application through learning by doing and learning by interacting that, according to Castells, becomes the key aspect of the 'information society'.

We can speak of some kind of a spiral movement: Through learning by doing, new knowledge occurs, which is directly applied in the production process and therefore leads to an acceleration of the innovation process. Innovation, we can conclude, becomes a normal part of work, which creates new opportunities for learning. Such an understanding needs a new learning concept. We have to reject transfer models, which isolate knowledge from practice, and develop a view of learning as social construction, putting knowledge back into the contexts in which it has meaning (Brown and Duguid 1991: 47). As the spiral movement described is at the very core of individual and organisational learning, it might be even more appropriate, instead of using the notion of information society, to talk about a 'learning economy and society' (Lundvall and Johnson 1993).

Learning takes place not only on the individual level but also through firms and organisations, on to inter-firm and inter-organisation learning, cross institutional learning, and on to the whole system - the learning economy (Archibugi, Howells, and Michie 1998: 6). Mathews (1996) differentiates between three orders of learning. First order learning is learning which takes place within a company, for example through interaction between different functions or teams. Second-order learning takes place when various companies exchange information and knowledge through the establishment of production or co-operation networks. Third order learning includes not only companies but also private and public organisations as partners in the process of knowledge and information exchange (Alasoini 1998: 1).

The learning process involves a clear interaction and collective dimension, it must be interpreted more as a dialogue between a number of centres of innovation of equal standing than as a one-way transfer of knowledge from one actor to others. It is argued that for the effectiveness of learning processes it is vital that all actors on the three different levels follow the same operating principles. In this respect Mathews (1996) uses the term ‘holonic organisational architecture’ while Riegler (1998) speaks of ‘the principle of structural correspondence.

The concept of a learning economy and society is still disputed. As Archibugi et al. (1998: 6) argue: “ …(It is hard) to ascribe collections of firms, organisations and institutions as having a single, clear cognitive process, involving both a decision-making and memory function. The notion that what is learnt will be exactly the same for each individual, firm, organisation and institution is difficult to accept.”

2.7 Conclusion

We have presented a number of theoretical concepts, all of which analyse the emerging information economy or society, however, each from a very different perspective. Although each approach sheds some light on the significance of information and information technology in the current transformation process, no single one is capable of encompassing all the different aspects of change.

It is, of course, difficult to separate the various aspects from each other clearly; they overlap to some extent and some convergence can also be seen. However, whatever attempts are made to develop a comprehensive approach, we are still far away from any general theory of information economy or society.

Do the various approaches to information society have anything in common? Obviously all proponents of information or knowledge society agree that the emerging new society will bring about change at the core of society as it initiates a new mode of production. It changes the very source of wealth-creation and the governing factors in production. Labour and capital, the central variables of the industrial society, are replaced by information and knowledge as the main variables in the new emerging society. But, as Castells argues, what may be even more important is the establishment of a new mechanism of immediately applying new information and knowledge in the production process. Here the focus is on learning.

Despite the widespread agreement that the emerging information society will cause major social changes, there is still a debate on whether we can speak of information society as a totally new society. This argument is based on a more general tendency to look at historical transformation in terms of the shift from one ‘phase’ or ‘stage’ of development to another. Often the socio-economic transformation is seen as a movement from bad times to a more promising and challenging future (Miles and Robins 1994: 15).

This linear perspective, of course, is very simplistic; it overestimates change and does not recognise continuities over time. Certain new tendencies in the present are seen as key elements of the future, while countervailing and divergent processes are not taken into account: “Rather than seeing economic and social change in this linear way, a more appropriate metaphor might be one of cumulative developments in which the new developments form as ‘layers’ across the old, with new and old always co-existing” (Miles and Robins 1994: 17). From this we can conclude that the increased use of information and knowledge in production does not necessarily include a fundamental change of the character of our existing market economy. It

seems to be more appropriate to talk about a new information and knowledge-based industrial and service production.

The role of ICTs in the current transformation process is also highly controversial. In a research area which is mainly concerned with new technologies there is always a danger of falling into a perspective of technological determinism. But while some scientists and politicians still argue that ICT is the driving force behind the emerging information society others are trying to avoid such argumentation. However, though the social is taken into account, this is often done in a more functionalist way: The argument then is that techno-economic change brings about new social structures and institutions.

Some researchers, more conscious of the temptation of technological determinism, point to global competition, changing consumer demands or deregulation as important factors that cause the transformation process. Still, modern ICTs are given a major role in the transformation process. They can, it is argued, support the development of new social structures, given a push by other drivers of change.

3. Understanding Information and Knowledge

As the former discussion has demonstrated the concepts of information and knowledge society are not very clearly distinguished from each other. Therefore it becomes necessary to acquire a better understanding of what is meant by ‘information’ compared to ‘data’ or ‘knowledge’. In the following we will try to differentiate more clearly between the three concepts. Data are, according to Bohn, “what come directly from sensors, reporting on the measured level of some variables" (1994: 61). They are “events or entities represented in some symbolic form and capable of being processed” (Earl 1996: 38).

Only when data have been organised do they become information. We can define information as “data that have been organised or given structure - that

is, placed in context - and thus endowed with meaning" (Glazer 1991). Information therefore includes a process of manipulating, re-presenting and interpreting data. The aim of developing information is to reduce uncertainty or ignorance, give surprises or insights and allow decision-making (Earl 1996: 13).

Information and knowledge are distinct insofar as it takes knowledge to produce valid and useful material and to be able to interpret this material (Miles et al. 1995: 16). While information, according to Bohn, tells the current or past status of some parts of the production system, "knowledge allows the making of predictions, causal associations, or prescriptive decisions about what to do" (1995: 62). It is important to understand knowledge as an active process; it involves the ability to interpret data. It is not just the content of a data base (Miles et al. 1995: 16). The tacit aspect of knowledge is "linked to the fact that production technology is about doing things, not only about knowing things in the form of an abstract (scientific) principle. Operating know-how is something very different and is much less transmissible (Cohendet et al. 1997).

Taking up the idea that knowledge exists in different forms, Earl (1996) suggests differentiating between three aspects of knowledge: science (which may include accepted law, theory, and procedure), judgement (which may include policy rules, probabilistic parameters, and heuristics), and experience (which is no more than transactional, historical, and observational data to be subjected to scientific analysis or judgement preference and also to be a base for building new science and judgement). The author speaks about a hierarchy of knowledge: experience can be characterised as potential knowledge, judgement as workable knowledge and science as accepted knowledge. This means that each ascending level represents an increasing amount of structure, certainty, and validation.

Earl associates the three different levels of knowledge with different categories of learning. "Experience requires action and memory, judgement requires analysis and sensing, whilst science requires formulation and consensus (Earl 1996: 41). He also postulates the hierarchy of knowledge to be synonymous with the distinctions between data, information, and

knowledge. “The lowest level is the equivalent of transaction data (and transaction processing systems). The middle level is the equivalent of information in the classical sense of reducing uncertainty to make decisions (and thus equivalent also to decision support systems). The highest level is knowledge where the user is constrained only by its availability or the intellect to exploit it (and thus approximate to the classical expert system or what some call intelligent knowledge-based systems)” (Earl 1996: 41). By overlapping the two taxonomies a better understanding of the differences between data, information, and knowledge can be reached as the following figure can demonstrate:

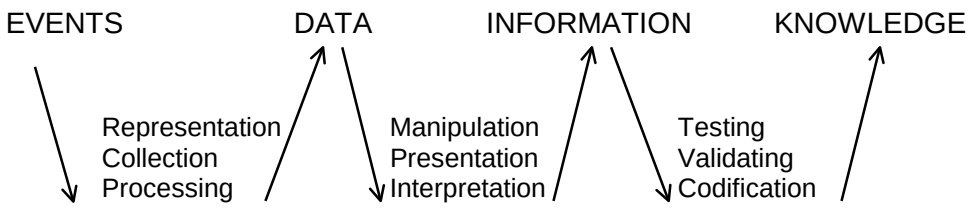


Figure 1. Towards conceptualizing knowledge. Source: Earl, M.J. (1996).

4. Perspectives on Information Technology

Information technology (IT) or information and communication technology (ICT), as it is also termed, covers a remarkable range of technologies. There are no established methods for defining ICTs. This is not surprising, as the term can be used to cover everything from the mobile phone to the personal computer, from satellite broadcasting to computer-aided design and computer integrated manufacturing, from the video camera to the supercomputer and from the pocket calculator to the colour TV. Many attempts have been made to define information technologies prior to measuring their extent and impact. Here we will not add another definition.

Information technologies have developed out of the convergence of the (microelectronic) computer with telecommunications, which has removed the long-standing distinction between the processing of information and

knowledge and its communication. To make orientation easier Miles et al. (1987: 24) have differentiated between core technologies and integrating technologies. Each of the core technologies, according to their definition, performs one of the five basic information handling functions: production or collection of data, storage and retrieval of data, data processing, data transmission, or the display or presentation of data. Integrating technologies, on the other hand, bind together several core technologies as, for example, multimedia communication.

We have good reasons not to discuss the technology and development trends in great detail (Miles et al. 1987), as it is not the given and 'unchangeable nature' of ICT itself, but the functions it has to perform that determine both the nature and extent of benefits which can be gained from this technology. In this respect, Somogyi and Galliers have identified changes in the functions ICTs have performed and are performing nowadays. "The very expression describing the activity that IT is conducting has changed from the original 'data processing' through 'management information' to the more information processing" (1997: 9). In concrete situations, various functions of ICTs can become relevant at the same time. The function that becomes relevant may vary with the organisation's purpose for using the technology and also how the technology has been used within the organisation.

Here we will discuss the following dimensions of modern ICTs: They can function as tools, as automation technologies, as control devices, as organisation technologies or strategies, as a medium which connects machines and people with each other and as a process to be developed. Finally, we will discuss the concept of technological practice.

4.1 ICTs as Tools

Like all other technologies, ICTs can first be characterised as tools to work with (Eason 1988). From this perspective technology is a machine or an apparatus, a simple artefact; it is visible and tangible. The tool approach is based on a materialistic view of technology. The introduction of modern ICTs, then, refers to single sub-processes or tasks only. As tools, modern ICTs are

intended to support people in their work; the aim is to give individuals some advantages in pursuing their tasks - to enhance the task performance, for example, or to enable people to work more rapidly and more exactly. One can argue, however, that only when the mini-computer was developed in the beginning of the 1970s, could ICTs serve the tool function; the mini was equipped for real work (Somogyi and Galliers 1997: 13). While the huge mainframes represent automation technology, minis and later on microcomputers can become useful tools in the hands of workers.

Eason gives some examples of modern ICTs as a tool: “Word processing enables the unskilled typist to produce good quality outputs because there are no messy errors corrected on the paper. An integrated work station gives the full power of a publishing house to a single operator; to present type in many forms, integrate it with tables and diagrams, vary size of the characters, etc. Planning with network control software means it is possible to vary an element in the plan and examine its impact on the whole plan. Similarly, a spreadsheet enables the financial planner to change a single estimate and quickly see its implication for overall costs. Not only does computer-aided design enable designers to build a three-dimensional model that can be examined from any angle but it makes it possible to test the effect of changing an element of the structure” (1988: 19).

According to Eason, modern ICTs can be seen as hand tools. However, the computer or the microprocessor only indirectly manipulates the material conditions of the product; in the first place, it syntactically manipulates its internal state: Data are processed and new data are created. Therefore, the computer is characterised as ‘brain technology’ (Krämer 1989). The fact that ICTs can duplicate and process all symbolic artefacts and that they can easily be re-programmed makes them a very flexible and unique tool.

In the beginning, computers were introduced to facilitate routine tasks such as administrative data processing, accounting and statistical analysis. But later on, computers could also be used to assist in design and planning and to support managers in their decision-making, making it easier to rehearse quickly various alternative solutions.

Modern ICTs are doubtless very powerful tools, as they can store a huge amount of information and process it within a very short time. Modern ICTs increase an organisation's memory dramatically, which can be defined as stored information from an organisation's history that can be brought to bear on present decisions (Walsh and Ungson 1991: 61). Sometimes it would not even be possible to conduct specific tasks without ICTs as a powerful tool. For example, simulations make is possible to manage great complexity, which would not be possible without modern ICTs. From what has been said so far, one can draw the conclusion that modern ICTs as a tool can make companies more competitive not only regarding costs and prices but also time and quality.

4.2 ICTs as Control Device and Automation Technology

Modern ICTs can become a powerful tool in the hands of the workers supporting them in their work but ICTs can also be used as a control device by management. Some academics even argue that the development and broad diffusion of ICTs can be traced back to the 'crisis of control' in the production process, which occurred already over a century ago (Beninger 1986). Nowadays, due to modern ICTs, it is becoming possible to monitor the work process and individual work behaviour directly and to control work progress continuously. Therefore, when needed, the management can immediately intervene in the work process and demand a change in the work process or in work behaviour.

However, the aspect of control is not only related to individual behaviour but to the whole work and business process. When more and more routine operations become automated, or at least supported by computer systems, effective control of interrelated operations is not possible, however, on the basis of stand-alone systems. By the end of the 1960s, it became clear that for control purposes it was necessary to develop an idea of a set of information which could be used independent of its application. "It was therefore important to de-couple data from the basic processes. The basic data could then be used for information and control purposes in new kinds of

systems" (Somogyi and Gallier 1997: 16). The advent of databases and more sophisticated and powerful mainframe computers gave rise to the idea of developing MIS (management information systems) as a key control device in the hands of top management.

Ambitious attempts to develop 'Management Information Systems' that integrate and aggregate the information from all business functions and processes, so that top management should have access to the latest information on any action in the whole enterprise at any time, have failed. Obviously, this cannot be explained by technical restrictions, such as too little storage capacity; the critical problem seems to be that of developing data models of all business processes which apply to the different tasks and views of managers on different levels and in different functions (Kubicek 1995: 77).

The idea of integrated MISs seems to have presented an unrealistic goal for several reasons:

- difficulties in deciding about the data needed for an efficient control system
- unclear use for decision-making
- backward orientation of data.

The MIS activity, as Keen and Morton (1978) argue, was not really a focus on management information but on information management.

ICTs are also characterised as automation technologies. Actually, computers were first used to automate the routine clerical work of large administrative departments. They make it possible to transfer the knowledge of skilled workers into machinery and thereby to eliminate human labour. “The most important impact of new ICTs,” according to Soete, is that “they move the border between tacit and codified knowledge. They make it technically possible and economically attractive to codify kinds of knowledge which so far have remained in tacit forms” (1996: 49). Codification of knowledge leads to the automation of production functions and processes. Calculable operations are taken over by machines and they can, for example, be integrated into process-overlapping computer-integrated manufacturing (CIM) architectures.

To codify tacit knowledge is often difficult, because it is complex and it is especially difficult and costly to codify knowledge when the reality it refers to or on which it operates is changing rapidly (Ernst and Lundvall 1997: 8). So far, automating human skills has proved to be economically successful only in relation to relatively simple tasks, but increasingly attempts are also being made to transfer expert knowledge into data and expert systems. The greater the capability of modern ICTs to perform production functions on their own the more human labour will become redundant.

Ernst and Lundvall, however, also argue that the elimination of human labour is only one aspect of the automation process; the codification of tacit knowledge and its transfer into modern ICTs also creates a demand for new activities and skills. “The very growth in the amount of information which is made accessible to economic agents increases the demand for skills in selecting and using information intelligently (1997: 28). Modern ICTs, although they depend on codified knowledge, at the same time create new demands for tacit knowledge.

The use of modern ICTs as automation technology supports the change from traditional services to self-servicing (Gershuny 1983) where the customer does what in traditional services paid employees would have done. Home-banking or home-shopping are typical examples of self-servicing.

4.3 ICTs as Organisation Technologies.

Furthermore, ICTs are conceived as organisation technologies. They become an objectivation of the work organisation as they incorporate elements of social relations between various actors. As such they integrate work processes conducted by human beings and machine processes into one total process (Brandt et al. 1978). “The growing convergence of technologies, especially in the area of micro-electronics, offers a great technological potential to integrate or merge functions, processes and divisions (van Tulder and Junne 1988: 82f).

Particularly when it was stated that technological systems should become more user-friendly, the wide-ranging organisational effects of IT systems

became more visible. During the 1980s, several researchers developed far-reaching ideas about letting systems evolve within organisational environments, at the same time challenging the traditional engineering view of system development. It was pointed out that computerised information systems were, so to speak “one side of a two-sided coin, the other side being the human organisation where these systems perform” (Somogyi and Galliers 1997: 23).

The fact that modern ICTs can be perceived as organisation technologies is taken up by the concept of 'systemic rationalisation'. While traditional models of rationalisation can be characterised as precise and applied to single functions, the systemic form of rationalisation aims at restructuring a plurality of functions, processes and departments and even includes inter-organisational relationships (Baethge and Oberbeck 1986, Altmann et al. 1986). However, forms of organisational restructuring are not designated as 'systemic' primarily because they include database network systems which can be used by management for long-range strategic planning and for the purpose of control (Wittke 1990: 23f). Furthermore, systemic rationalisation does not mean the restructuring of an organisation as effectively as possible in relation to a specific goal. What is new concerning the 'systemic type of rationalisation' is that it comprises an enlarged perspective of restructuring affecting the means and ends simultaneously.

By abstracting from the specificity of a single work process, the computer can systematically integrate various work processes. The real advantage of ICTs, it can be argued, is not that they improve existing processes, but that they allow companies to follow new working methods due to their potential to integrate functions and processes. Indeed, due to their integration potential, ICT’s in principle allow everything to go faster: faster product development, faster production, faster delivery, faster service. The integration function of modern ICTs was first realised through large mainframe-based technology concepts. In this case, access to the database is regulated centrally. Users can no longer decide how to proceed in their work process; instead, the sequence of their actions is unequivocally prescribed by the technology, as they are integrated in an automated production process.

Technological integration may also cross company boundaries as, for example, in just-in-time (JIT) systems. The integrative potential of new ICTs is intensively used in the car industry. Concepts of logistics for planning, manufacturing and supply processes have been drawn to the centre of management strategies. Due to the set-up of a computer-based network system, the technical integration and control of all information and manufacturing processes relevant to such a complex product as a car is possible. Thereby the undesirable risk of stoppage, blocking and waiting periods among various co-operating departments but also among various organisations can be reduced to a minimum, although they cannot be eliminated totally (Doleschal 1991: 254). Modern ICTs thus become the core of systemic forms of business restructuring. Instead of focusing on single workplaces, a holistic approach is applied, which means that the business organisation as a whole and particularly its governance structures are the target of restructuring.

Again, high targets of integrating business processes associated with Computer Integrated Manufacturing cannot be reached. For this various reasons can be given, including “the impossibility of developing a comprehensive universal data model, the problem of data maintenance for such a big system, and last but not least the problem of vulnerability of such highly integrated and tightly coupled system” (Kubicek 1995: 78). A more sceptical perspective on the nowadays very popular Inter-organisational Information Systems can be based on similar arguments.

Often ICTs are interpreted in a more dynamic way, not as organisation technologies but as a strategy to structure production processes. To stress this strategic aspect one can use the term ‘technisation’ (Barley 1986). Technisation means that social relationships become incorporated into technologies; then technologies govern the reproduction of social relationships. We can also speak of ICTs as configurations, this term emphasises that developing technologies, setting goals, and developing business strategies are processes which take place simultaneously and have reciprocal influence. Technisation, however, is only one strategy to structure production processes and to secure reproduction of social relationships; the

establishment of organisation rules and norms can be seen as an alternative. But in general technisation and organisation only form two aspects of one and the same restructuring process.

Besides technisation and organising, we can identify enculturation as a third strategy to stabilise social relationships in work. This indirect way of influencing workers to continue existing forms of co-operation becomes particularly important in decentralised organisation structures in which agency is to a great extent freed from organisation norms and the dictating control of machine pace and in which self-organisation and direct co-ordination dominates. In such a structure there is always the risk that organisation members pursue departmental or subgroup aims and interests without taking the overall goal of the whole company into account. To establish a ‘strong’ business culture is seen as a possible strategy to socially integrate workers, to make them share the overall values and to see the “world with the eyes of the company” (Berger 1993: 16).

Common values are seen as the core of business culture. The aim of creating a strong business culture is in the first place to commit workers to the company; they should identify themselves with the company and see the company's aim as supporting their own interests. Building up trust relationships may be seen as the most important function of a strong business culture, but the intention is also to give an organisation a clear and coherent identity.

4.4 Connectivity and the Media Function of ICTs

The fact that computers and other ICT devices can be linked to each other can be characterised as connectivity. Real time connectivity is of particular importance; as a consequence of this, information can be distributed to various locations as it is created. We can conceive of modern ICTs as media that make various types of interaction and communication possible: machine-machine interaction, man-machine interaction and particularly man-man interaction.

The media perspective of ICTs becomes important, since more and more communication within and between companies is technically mediated. The role of ICTs as media is seen as enabling, facilitating or supporting information flows. The increased interest in problems of interconnectivity and information exchange in different forms and at different places is related to the development of telecommunication. Concerning the media function, ICTs change from an inwardly oriented technology forming islands of information and automation to an outwardly oriented technology supporting the formation of networks electronically.

When in the beginning of the 1980s 'personal computers' appeared on the market, the need for connectivity soon became obvious. The small dispersed machines were unlikely to be used effectively without a connection between them. The new focus of development in ICTs changed from computer technology to telecommunication. Separate technologies such as telephony, telecommunication office equipment and computer started to converge.

The media perspective is dealing primarily with communication that is not formalised. Here the focus is not upon the capability of modern ICTs to substitute for tacit knowledge; from this perspective the emphasis is on their potential to reinforce human interaction and interactive learning, as Ernst and Lundvall argue, and on how they can support and mobilise tacit knowledge. "E-mail systems connecting agents sharing common local codes and frameworks of understanding can have this effect and broad access to data and information can further the development of common perspectives and objectives for the firm. Multimedia exchange may be helpful in transferring elements of tacit knowledge, for instance, by using combinations of voice and picture in an interactive mode" (1997: 28).

Modern ICTs are specific insofar as it is a communication device that bridges both time and space. Electronic communication technologies are enablers of changed forms by offering capabilities to overcome constraints on time and distance, key barriers around which organisation forms have traditionally been designed (Fulk and deSantis 1995: 337). By increasing peoples´ accessibility to the work environment from home, and by redefining how employees can perform their duties across time-space boundaries modern ICTs are changing

the traditional notion of a workplace (Sahay 1997: 248). In this respect telehomework is a good example.

Connectivity means that modern ICTs can form a platform for people to work collectively, they are developing as a collective tool (Baukrowitz 1996). In the beginning connectivity was confined to information exchange on the basis of computer to computer communication. But soon technologies developed that solved the problem of interconnecting large numbers of computers. We can here distinguish two different strategies: one which integrates the single computer into a centralised control system; the computer is then reduced to an output device and the other, in which all computers are ‘equally entitled’ and can interact directly among each other.

R&D and manufacturing bases dispersed globally may be connected with each other as well as with a central corporate file through the database network system. In this system researchers may interact with each other globally for discussion and consultation through electronic mail. Designers may retrieve information from the central file about the availability of parts with derived specification for product development. Any engineering change occurring at a certain factory is fed back and incorporated into the original design stored in the central file and made available to any factory which uses the same global design (Aoki 1989: 18).

In the case of a decentralised workgroup computing model, jointly working on a complex task and directly co-ordinating reciprocal sub-processes will be possible. For example, workers, even if they are spatially separated, can jointly develop a new product or a new market strategy. ICTs are also used as a collective tool when a maintenance problem cannot be solved on the spot by the service technician responsible and he needs to ask specialists working somewhere else in the company for support. Co-ordination in electronic space is easier because the medium allows exchange of information and decision-making without co-presence of participants. Jointly utilised artefacts, such as electronic documents, support co-operative work processes; a terrain is created for collective activities on the basis of interrelations between previously segregated actors. In all these cases, the aim of the system development is not to replicate technically whole work processes but to

support collective work behaviour through a collective tool and access to information. However, as Wagner argues, co-ordination by way of new electronic media also involves the risk of misunderstanding and deception (1994:34ff).

For technology as a medium the following aspects are particularly important:

- the dramatic increase in the speed of communication, with high volumes of data moving from one location to another at rates unimaginable even a decade ago
- a sharp rise in communication bandwidth, with more information of multi-frequencies travelling at the same time down a common line
- the possibility of combining text, voice, video, data, and/or graphics within a multimedia communication system (Fulk and deSantis 1995)
- increasing mobility as connected ICT devices can be made small enough to be carried around. Their use is not limited to certain fixed locations (Lillrank 1996).

One of the major impacts of modern ICTs as a medium is a further acceleration of the innovation process, as knowledge can easily be distributed. Furthermore, ICTs provide workers with a technical infrastructure on the basis of which they can continuously reshape their relationships with each other and also with machines. In some way we can argue that modern ICTs can replace organisation rules. Their function is to create stable relationships between people and between people and machines to secure continuous production. However, in a technical network, working people can continuously produce, reproduce and also change their relationships at the same time. There are, however, limits for modern ICTs to function as a medium that connects workers. The exchange of distance-sensitive knowledge, for example, still needs face-to-face contacts.

The latest trend concerning the media perspective is the integration of company internal digital information systems into a public information structure. Two technological developments are important here: interactive multimedia telecommunication applications on the one hand, and the use of

the Internet for commercial purposes, including the development of new services, on the other hand. From the viewpoint of companies, the Internet offers an interesting platform for advertising their products and services. At the same time, a great demand for new information and communication services is developing. The disadvantage of the Internet so far is that the problem of protecting access to the companies' internal information systems does not yet appear to have been solved. The actual answer to this problem can be seen in Intranets, which are company internal nets on the basis of the Internet. They use the services of the Internet but at the same time they are protected against the public like private nets. We can expect that, in future, interactive multimedia applications will be developed which will support tele co-operation within companies, co-operation within supplier networks and increasingly communication and co-operation with customers.

4.5 ICTs as a Process to Be Developed and the Social Shaping Approach

It is because of the great flexibility potential of modern ICTs that Castells talks about new ICTs as a process: "New information technologies" as he argues, "are not simply tools to be applied but processes to be developed" (1997: 32). Computing systems are typically developed and extended over a long time period of years (Kling 1987). This on the one hand means that software programmes can be improved and optimised but it also means that the programmes can be extended and new connections can be created and integrated.

If ICTs are seen as a process to be developed, Castells continues, then "users and doers may become the same. Thus users can take control of technology as in the case of the Internet…. It follows a close relationship between the social processes of creating and manipulating symbols … and the capacity to produce and distribute services" (ibid. 32). While producing things or providing services, people simultaneously develop their technology. "For the first time in history", Castells continues to argue, "the human mind is a direct productive force not just a decisive element of the production system" (ibid. 32).

The fact that Castells conceptualises ICTs as a process characterises him as a representative of the social 'shaping approach'. This approach has developed out of a confrontation with the 'technological determinism' approach. Technological determinism not only assumes that technology development takes place outside society, that it is socially exogenous and follows an inherent logic, but it also presupposes that the technological artefacts determine the social consequences of their application.

The criticism of the 'social shaping approach' relates to both aspects of technological determinism (Wyatt 1998):

(1) It is taking up the argument that technical artefacts are 'neutral'; that they themselves do not determine the social. Contrary to technological determinism, the 'technology as neutral' concept does not assume that technologies have straightforward social effects, it therefore leaves space for human choice and intervention. According to the 'social shaping approach', there always options to decide differently. The 'technology as neutral' approach, however, only considers the second part of 'technological determinism' argument.

(2) The 'social shaping' approach also argues that technology itself is not neutral. Technological development according to this approach takes place within society; it is shaped by social, ecological and political factors. Furthermore, new technologies do not develop according to an inherent technological logic, they do not follow a predetermined development path but are constructed by human beings and influenced by their needs and interests.

Wyatt has nicely summarised the main aspects of the social shaping approach. Therefore, we will quote her at greater length:

> "Technologies are social constructions, the outcome of negotiations between relevant social groups. To explain technological developments we need to identify who is involved and what their interests are. In any innovative effort, actors form alliances. A project often has a certain interpretative flexibility when there exist competing meanings. The selection of one of many possible solutions is also a social process. Often there is a key actor/entrepreneur who is instrumental in enrolling other actors and defining the scope of the technological frame. A successful mobilisation of arguments, interests or resources may result in closure; the artefact becomes stable and enters a wider world. But

> users of technical artefacts and systems also possess a degree of what could be described as interpretative flexibility, what I have termed earlier as malleability. New artefacts may or may not work, and may or may not be used. Some might fail or be used in unforeseen ways. If the technology fits within the technological frame of its wider community of users, it might acquire momentum. In this way, successful technologies give the appearance of autonomy:" (Wyatt 1998: 17)

Although Castells can be seen as a representative of the 'social shaping approach', he distinguishes himself from the traditional concept insofar as he does not differentiate between the process of technology generation and the process of technology application. Instead, he emphatically stresses both generation and application of technology being one and the same process. While applying ICTs users also develop the technology; not only the technology, as we will argue later, but whole technological practices.

Kling (1987) stresses the conflict element in this development process. Participants in this process including users, system developers, the senior management of the company, and any other individuals or groups who are affected by the computer-based information system. Some of them are interested in the development process because it can result in leverage such as increased control, speed, discretion over work or bargaining power, while others will oppose specific computing arrangements, as they fear to lose control and bargaining power. They will try to push alternative systems, which serve their interests better.

From a process perspective, modern ICTs can be described as ‘configurations’ (Fleck 1993) which are shaped by social actors taking into account the particular requirements of the application situation. The process perspective identifies modern ICTs as social facts insofar as they are the products of previous social actions, but it does not take into account that they can also exert constraints on social actors; they cannot be changed voluntarily by single actors.

Wyatt has criticised the social shaping approach in a very similar way. "In the enthusiasm to provide evidence to challenge widely held notions of the inevitability and naturalness of technical developments ... questions about the way in which these technical developments become part of the world in which

we live, and subsequently condition or even structure our daily activities have been neglected.... Also, in stressing the social nature of the process of technical design and choice, the notion that 'anything is possible' has taken hold" (1998: 18).

Table 2. Various perspectives of ICTs

metaphor	function	aim
tool	support work process	increase quality, speed up work process, cope with increased complexity
automation technology	elimination of human labour	costs cutting
control instrument	monitoring and steering 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
process	improve information system	continuous learning

4.6 The Concept of Technological Practices

ICTs, we can conclude, can be understood both as process and as structure. This means that there are two different research perspectives that lead to very controversial results. On the one hand it is assumed, that ICTs as a technical artefact will determine work processes to a great extent, while on the other hand the need to develope the technology is stressed. This also means that the use of ICTs does not determine the work process but this is open for deliberate design. The question then arises how to integrate the process and structure approach to avoid such controversial research results.

In a general 'theory of structuration' Giddens (1979, 1993) has made the attempt to resolve the dualistic grouping of objective conditions and subjective action and interaction and to integrate the actor and structure perspective in one theoretical framework by introducing the concept of 'social practices'. His particular interest is related to the question of how to explain the recursive character of social practices. According to Giddens, agents and structures represent a duality, they are not independent sets of phenomena, but a dialectic relationship exists between them. Structures are the product of but also a medium for social action; they are not only barriers but also generating moments of social action. When reproducing specific social practices, actors have to draw on existing rules which at the same time structure social practices.

Structures, according to Giddens, do not exist in reality they only exist as memory traces in human minds. People internalise the rules that are made manifest only in the instances when they are drawn on in social action and interaction (Walsham 1993: 61). Structures exist insofar as they are produced and reproduced in social practices. Therefore, we can also speak of ‘virtual structures.’

Social rules and structures, on the other hand, enable people to act in a competent and context-adequate manner. In acting according to the rules human agents not only reproduce existing social practices but they also confirm their institutional character. However, there is always the option of ‘doing otherwise’; every social actor controls some resources which give him the power to influence existing practices. Although the disposition of social actors is primed to act in a specific way, they always have the option to change social practices; they do not have to reproduce them schematically. Human agents always monitor their own conduct and its results in a reflexive manner and if they do not produce the expected results, they can either act differently, changing existing rules, or they have to adjust their goals and expectations. This reflexivity together with the concept of unintended consequences of purposeful action implies "that all action carries within it the seeds of change" (Walsham 1993: 61).

The basic concept of Giddens' structuration theory can be illustrated by the following figure:

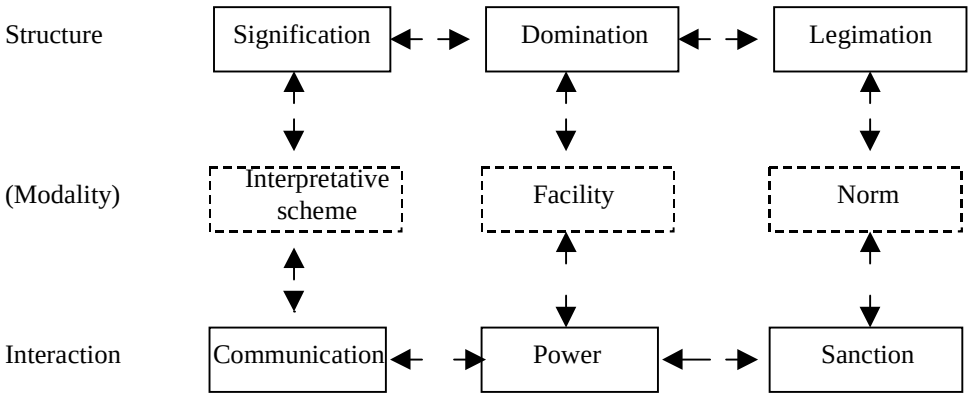


Figure 2. Structuration theory: analytical dimensions of duality of structure. Giddens, A. (1984), in Walsham, G. (1993, p. 61).

Here, both social structure and social action and interaction are broken down into three dimensions and then interlinked by three modalities: Human communication always involves the use of interpretative schemes; they represent stocks of knowledge which help human agents to make sense of their own and others' action. At the same time, social actors produce meaning or, as Giddens terms them, structures of significance.

In processes of interaction, human agents also utilise power by drawing on facilities to allocate material and human resources and thus create, reproduce or change structures of domination. And human agents sanction their actions by drawing on norms or standards of morality and in so doing they maintain or modify social structures of legitimation. This breakdown of structures and interaction into three dimensions is done only for analytical reasons; in reality they are very much intertwined.

Giddens' general theory has a great disadvantage insofar as he does not pay a great deal of attention to the role of technology in the production and reproduction of social relationships (Wyatt 1998: 20). But when dealing with

ICTs there is, of course, a need to specify the relationships between the 'technical' and the 'social'. Some representatives of 'social constructivism' deny any difference between the two, characterising technology as a seamless web (Bijker and Law 1992: 201).

Against this perspective we can argue that modern ICTs are not mere social constructions that can be reduced to a set of social relations. While social relations are undoubtedly present, they do not comprehensively or essentially describe what those technologies are. ICTs possess an objective set of rules and resources that both enhances and constrains the roles of workers within organisations, they have an influence on the social fabric of the organisation (Sampler 1996: 10). To conceive of a social order as resting solely on interactions between human beings is to ignore the role that material resources play in shaping and substituting social relationships (Kavangh and Arujo 1997).

In technology research the concepts of 'technological practice' (Pacey 1983) and 'technology frames' (Bijker 1993) represent approaches that also claim to be helpful in transcending the duality of structure and process or the 'social shaping of the technology approach' and the 'impact analysis' of technology on society. 'Technological frames' include a variety of different aspects that influence interaction within and between individuals but also collective actors involved in innovation processes to improve technical artefacts. Bijker mentions goals, key problems, problem solving strategies, theories, tacit knowledge, testing procedures, design methods, users' practices, and the perceived substitution function of the new artefact as an element of a 'technological frame' (1995: 123-4).

According to Wyatt (1998), the notion of 'technological frames' has two advantages compared to the 'structuration approach': it takes the material nature of technologies more seriously and it has space for collective actors such as organisations. However, Wyatt continuous to argue, the 'technology frames approach' is too narrow, as it only analyses how relevant social groups involved in the process of innovation perceive users' practices. She therefore suggests extending the approach to the question of how people actually use

technological artefacts and how artefacts are involved in the creation of social structures and relationships (Wyatt 1998: 23).

The concept of 'technological practices' is of particular interest as it draws attention not only to the relationships between the 'social' and the 'technical' but also includes a cultural dimension. Relying on Pacey´s definition, technological practices are seen as having three dimensions: technological, organisational and cultural (1983). The three dimensions are very much intertwined: changes in one dimension also affect the two others, which means that all three dimensions have to be developed at the same time. According to Wagner (1994:15), ICTs intensify the explicit discussion of norms and rules; support the emergence of an integrated view of the organisation; create new levels of perception; and render interpretations and social practices more homogenous.

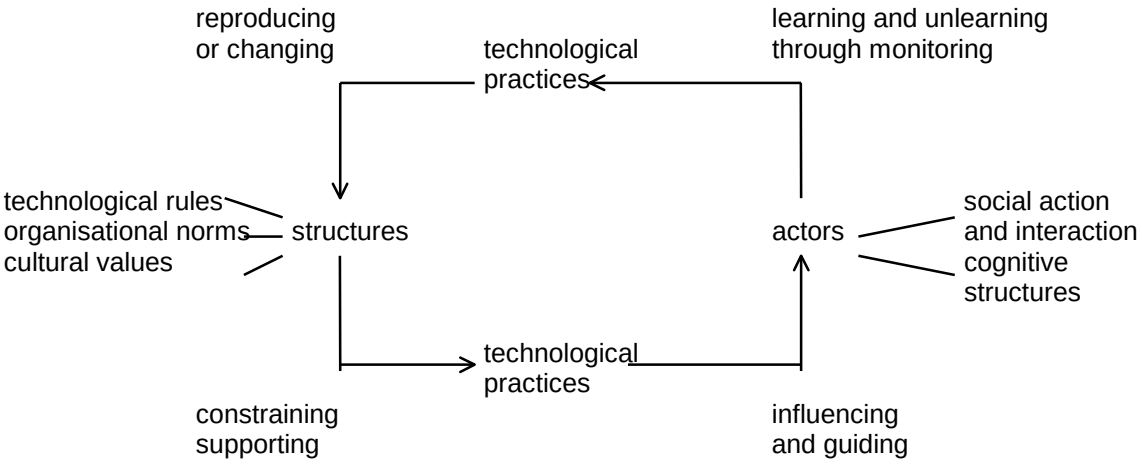


Figure 3. Concept of Technological Practices

ICTs as multidimensional configurations are created by the interaction of groups and individuals but at the same time they also structure future interaction. As suggested by Giddens, we can separate the structural and action aspect of technological practices into three dimensions, as can be demonstrated by Management Information Systems. They provide interpretative schemes which managers can use to analyse and interpret data, take actions and make plans. Furthermore, they are facilities which

managers of different levels and departments can use to co-ordinate and control other organisation members and they communicate a set of norms or values which indicate what is appropriate and what is not.

The concept of 'technological practice' also entails processes of ‘learning by doing’ and of ‘incremental innovations’, as it assumes that social actors continuously monitor the results of their activities and change their way of acting if the results do not match their anticipation. Continuous reproduction of new technological practices then leads to the institutionalisation of new technological, organisational and cultural structures. It is the concept of a 'feedback loop' that establishes a connection between technological practices, on the one hand, and learning by doing and incremental innovation on the other.

Referring to a distinction made by Harris (1980: 65f), we can differentiate between primary and secondary technological practices. Primary practices develop within production processes, while secondary practices aim at integrating and co-ordinating primary practices; we can also talk of management practices, which can be distinguished from production practices (Schienstock 1993).

Production practices develop in single functional units or sub-processes, as, for example, in work groups. As such, technological practices develop more or less independently of each other. There is always the risk that frictions and conflicts will occur between different practice fields and that the whole production process will fall apart. This is why management practices have to develop; they have to ensure the smooth functioning of the total production process. Management practices can be characterised as interventions in the mechanisms of producing and reproducing production practices, aiming at guaranteeing a minimum of normative coherence, social cohesion and continuity over time. Management practices develop to make the various production processes compatible and to control the centrifugal tendencies in production processes. We must, however, take into account that the relationship between production and management practices is not one-sided; changes in the production process can also cause management practices to change and adapt.

The concept of technological practices causes major problems when it comes to research strategies. It is difficult to analyse the interaction of the technical, the social and the cultural dimension of technological practices as well as to reconcile structure and agency. To do research on technological practices it is useful to apply the concept of 'co-evolution'. Instead of looking at processes of reciprocal influence, one can analyse how technical, organisational and cultural structures, but also personal and collective characteristics of actors develop within time.

4.7 Conclusion

Above we have presented alternative functions of modern ICTs. Of course the different functions presented here often overlap to a great extent. Such functions can also be interpreted as dimensions of so-called ‘Leitbilder’ of applying ICTs. Here we will differentiate between two more general images of developing ICT-based systems: ‘technological control of production’ on the one hand and ‘meaning-based co-ordination of actions’ on the other hand (Boes 1996). In the case of the first ‘Leitbild’, the aim is to eliminate or at least to control human labour by transforming tacit knowledge into codified knowledge. This makes it possible to reduce alternatives of acting dramatically; the workers have to follow fixed and standardised sequences of acting, controlled by the pace of the technical system. ICTs as automation technology and as control devices are the two functions which fit very well with this ‘Leitbild’.

In the case of the second ‘Leitbild’, control is not an aim for applying modern ICTs. Instead, the information system represents objects of reality and options for their processing. Work, in this case, can be characterised as interpreting the meaning of symbols. Tacit knowledge is seen as a valuable resource as it is crucially important for continuous innovation. ICTs, in this case, become media, which open up the opportunity for permanent communicative connectivity. They are not used to eliminate tacit knowledge by transforming it into codified knowledge, but to support its rapid and

continuous exchange among workers. This allows for a collective interpretation of information and the development of joint ways of acting.

According to Sampler (1996), due to rapid changes, the characterisation of ICTs has shifted. In this respect, we can mention the price-performance improvements in semi-conductor technologies, new types of technologies such as multimedia, the improved usability and power of software. “Together, these changes have shifted the fundamental emphasis away from computation towards communication and co-ordination of activities” (Sampler 1996: 19). This shift in the emphasis of ICTs also has an impact on the structuring of the work organisation. Together with the shift of emphasis of ICTs, a new organisation logic is developing. Before we analyse this new organisation logic in more detail, we will first discuss the changing nature of work related to the use of modern ICTs.

5. The Changing Nature of Work[3]

When we talk about the changing nature of work in the information society, two aspects are of particular importance here: the growing importance of information work and the increasing reflexivity of work. For the first aspect the fact that a new info-sphere is emerging alongside the techno-sphere is important (Toffler 1980: 165). Concerning reflexivity, both 'self-reflexivity' as well as ‘structural reflexivity' have to be mentioned (Lash 1994).

5.1 The Increased Importance of Information Work

There is widespread agreement that the structure of labour is increasingly determined by activities like information acquisition, information processing, and information-based decision-making. The more efficiently the production processes can be regulated on the informational level, the more information work will gain in importance at the cost of work on the material-energetic level of the production process (Baukrowitz/Boes 1996). Information workers of

[3] This section draws extensively on the German report.

various types whose work is confined to objects and 'material' which exist only on the level of information will replace those working on the material level.

'Interface workers', who influence the material level of the production process by way of the informational level and 'guarantee workers', who as 'guardians' and 'controllers' keep the production process running smoothly will become particularly important. Both groups concentrate their work – in contrast to information work in the strict sense – on the material level of the production process. This is the actual object and quality criterion of their work. But they manipulate their 'work object' indirectly, via the informational level or within the technical-mechanical system, and therefore they have to regulate and control their operations on the basis of the effects which the informational level produces on the material level.

The result of this process is that labour in 'information society' – due to the continued spread of ICTs based systems - is equipped with a new level of intervention, which inserts itself between human labour and the material and energetic level in production. Labour manipulates the material-energetic components in the process of production increasingly by means of this intermediate informational level, and changes its status within production as well as its own nature. It becomes – in essence – information work, or information-mediated interface work.

In the course of this process of informatisation, the level of abstraction applied in handling the objects of the work rises continuously. Manipulation and perception become ever further removed from the material-energetic level of production – to be precise, in varying degrees, whether as information or as interface work. The connection between the informational and the material-energetic levels is becoming more fragile, due to the increasing 'universalisation' of the informational sphere.

A consequence of this 'abstractification' of work could be described as 'de-materialisation' or 'de-sensorisation'. In contrast to manufacturing operations, information work has still another characteristic feature: in manufacturing, the product has a material existence with material properties. Therefore the quality of such an object can be determined 'objectively'. In the case of

information work, the quality of the product can be judged only within the context of a certain interpretation, which results from an – assumed – model of reality, itself a socially-constructed fact. The product of work in this case is a symbol in the network of social relationships, the object of analogous social interpretation, without being unequivocally determined.

The difference seems to be twofold: On the one hand, the objects with which information work is occupied are artificially created, they are artefacts whose existence is determined primarily by certain model assumptions about reality. On the other hand, the product of these operations is not objectively defined; the evaluation of its success is the result of a social process of interpretation. The work-process itself becomes part of a formalised information process which orients itself on the production targets. As a result – it is feared – working capacity will become negotiable and accessible to increasing control and to further phases of rationalisation.

5.2 The Reflexivity of Work

A further argument here is that under increasing systemic integration labour becomes self-reflective; in some way labour creates its own object of study. This development increases the importance of subjective participation in work operations on the part of the employees. Quality control and, within certain limits, the control of productivity as well, are shifted into work-operations. Therefore, in addition to the turnout of goods, labour has to check, improve and regulate itself to guarantee quality and efficiency. The borders between the process of routine work and that of innovation have become blurred: an increasing share of work consists of self-innovation. Furthermore, in systematically organised co-operation, labour must consistently and comprehensively monitor the behaviour of others, but also of itself, to be able to fit its own operations into the intended total operating performance of a work group and, if needed, to correct its own performance.

Lash also stresses the importance of 'self-reflexivity' but he also mentions 'structural reflexivity' as a new characteristic of work. Work, according to Lash, “entails self-reflexivity in that heteronomous monitoring of workers by rules is

displaced by self-monitoring. It involves (and entails) ‘structural reflexivity’ in that the rules and resources (the latter including the means of production) of the shop floor, no longer controlling workers, become the object of reflection of agency. That is, agents can reformulate and use such rules and resources in a variety of combinations in order chronically to innovate” (1994: 119).

Schimank takes up the aspect of 'structural reflexivity' by stressing the increasing subjectivity of work (1986). Contradicting Braverman’s traditional thesis, according to which the introduction of a technical system leads to an increase in control of the production process and to marginalisation of subjectivity, he argues that "subjectivity is just as necessary in the production facilities at present and in the future as it ever was in the past. – possibly even more so." (ibid.: 72). The reason for this basic need for subjectivity is formulated as follows: "The – in principle insurmountable – inability of mechanised systems to insure the environmental conditions of its own operability is the source of the need for subjectivity in mechanised production facilities. Mechanical systems have to be linked with personnel systems. The vision of the fully automated factory is a technocratic illusion. Only subjectivity can re-integrate, when necessary, the horizons of reference which had been banned by techniques, to determine which environmental conditions were not anticipated by the assessment of mechanical operations and to convert them into conditions which can be mastered by the machinery." (ibid.: 82).

Wersig and Tacke add to this argument. While well-ordered relationships of co-operation are typical for Tayloristic work-contexts with correspondingly standardised communication, organised in the manner of an interface between employees, in systemically organised contexts, the relationships of the systemic integrated work to its surroundings and to other subsystems are, in principle, not capable of standardisation. Co-operation and communication are, therefore, neither sequential nor organisable as regular interface-relationships, but only reciprocal, with permanent and irregular communicative relationships (Wehrsig/Tacke 1992). They demand permanent self-reflection from the employees, which is only realisable by means of the subject-relationship on the part of the individual workers in regard to the conditions of

their operations. The fundamental contingence of this situation in principle precludes acting strictly according to rules (ibid.).

5.3 Work as a Problem-Solving Process

Furthermore, customers no longer accept highly standardised mass products, instead they ask for more individual solutions. This process has been commonly understood in terms of ‘diversified quality production’ (Streeck 1989) in which increasingly specialised consumption entails more flexible ways of production (Piore and Sabel 1984). According to Kern and Schumann, the system regulator is becoming the key figure in manufacturing, who - instead of performing standardised tasks - is more engaged in 'problem-solving processes' (1984).

The same trend has been identified in the service sector, where the concept of a ‘service out of one hand’ also transforms work into 'problem-solving'. From this we can conclude that not only because of the integration of indirect and management work, but also because of the changing nature of the core process, direct production work has become more knowledge intensive. It is not only that the production of goods and services has become infused with symbols insofar as knowledge-intensive services have become central to many production processes, but at the same time the core production process itself has become more information-intensive.

5.4 Routinised Work Will Survive

It is important to mention that there are also some opposite trends, however. We should definitely not conflate the transmission of data between people with the acquisition of knowledge. Ernst and Lundvall distinguish between tacit knowledge, which cannot be codified or transmitted by ICTs, and information that can (1997: 35). When we differentiate between the notion of information and the need of knowledge, it becomes quite obvious that the concept of 'information society' and that of 'knowledge society' can have very different meanings. Processing and transmitting data are less demanding and less knowledge-based.

A number of recent studies on call-centres in particular casts serious doubt on the argument that there is a general trend towards knowledge-intensive work. On the contrary, they suggest that these new forms of work exhibit an extreme case of repetitive, tightly controlled, machine-paced, and less knowledge-intensive Taylorised work (Fernie and Metcalfe 1987, Reardon, 1996; Incomes Data, 1997; and McLoughlin, 1997).

We also have to look at the concept of innovation more closely. Very often diversification and innovation are based on the standardisation of parts of the whole product. It is obvious that there is no general trend towards knowledge-based information work. Instead, we can expect some kind of polarisation with increasingly knowledge-based jobs on the one hand and more repetitive and less information and knowledge-intensive work on the other.

6. Structural Changes in Work: The Increasing Importance of Knowledge-intensive Business Services.

Globalisation has contributed greatly to the stiffening of competition as national monopolies or oligopolies have collapsed. However, the fact that globalisation at the same time results in the establishment of new competition criteria is even more important. Today companies in all parts of the world, to be able to participate in global competition, must be capable of selling high quality products and services for a reasonable price and of delivering them within a short period of time. Price, quality and time can be seen as entrance barriers to the global market; success, however, depends upon the capability of companies to be first on the market with new products which meet their customers demands. Under the conditions of global competition, innovativeness and customisation are becoming the key criteria for economic success, particularly as the dynamic technological progress accelerates and as the life cycle of products shrinks across a broad spectrum of industries. This change in the dominant competition criteria has caused major structural changes in work.

In companies we can roughly differentiate among three processes: transforming inputs (material, energy, information) into outputs (products, services); securing the continuous execution of the transformation process; and co-ordinating and regulating the other two processes (Schienstock 1993: 9). The first type of process can be characterised as direct production work or core activities; manufacturing, for example, has the processing of material to produce goods as its core activity and for people-centred services the core activity can be described as care-taking or education. The second type of processes consists of indirect or peripheral activities, the function of which is to support direct production processes by providing resources (finance, knowledge) or marketing and distributing products and services. The third type of processes can be characterised as management work, entailing activities such as planning, organising, co-ordinating, and controlling.

The information society, it is often argued, will be a service society. Structural changes in work are characterised by a growing share of services. However, a closer look at this trend reveals that in the emerging information society the so-called 'secondary services' in particular are gaining importance (Parmentier 1993). These do not service the immediate demand of end users, but they are defined as those services which improve the production through increased support and use of human capital. They are important for guaranteeing the needed investment and organising and optimising business processes (Enquete Kommission 1998: 113). 'Secondary services' are generally characterised as 'knowledge-intensive business services'; they not only include indirect work processes but also management processes. The trend towards knowledge-intensive services contributes to the 'informatisation' of work.

When further analysing knowledge intensive business services we first have to take into account the fact that value added is mainly generated by product and process innovations. “Quicker innovation”, as Lash argues, “entails that a lot more work must proportionally go into the designing of new products. It entails that a far greater proportion of the production process than heretofore must be accounted for by a knowledge-intensive ‘design process’, and a smaller proportion by the ‘material process’" (Lash 1994). But innovation also

depends upon the research potential of the company. Although the results of basic research conducted in universities and state research institutes are publicly available, it takes constant investment effort in theoretical research for companies to be able to interpret and use abstract scientific knowledge (Cohendet et al. 1997). Companies can hardly make use of the public good ‘new theoretical knowledge’ if they do not conduct research themselves.

To a certain extent, we can see similar trends in the service sector. Often services are characterised as those activities in which output is essentially consumed when produced (Quinn 1986). Due to modern ICTs, however, for many services this direct relationship between production and consumption can be broken up. As Soete puts it: “Information and communication technologies, almost by definition, allow for the increased tradability of service activities, particularly those which have been most constrained by the geographical or time proximity of production and consumption. By bringing in a space or time/storage dimension, information technology will make possible the separation of production from consumption of such activities, hence increasing the possibility of such activities” (1996: 48).

If services are tradable, their attraction for customers very much depends on their contents. It is the contents which will become the main value of service activities. Therefore, the design of such services becomes increasingly important. Moreover, when services are no longer immediately consumed, to do research to improve existing services or developing new services can become worthwhile.

The fact that an increasing amount of work is going into design and research processes is only one aspect of the changes in the structure of work caused by the globalisation process. As customisation becomes increasingly important, more work will also go into marketing. First of all, it is becoming important to know more about customers’ needs to be able to provide products or services that can be sold. Furthermore, as customers no longer accept standardised solutions for their problems, instead of expecting specialised solutions for problems they are sometimes not even able to clearly define, it becomes necessary to develop new products or services in close co-operation with them. In addition, an increasing number of customers

does not buy products or services only; they demand complex solutions, which often include long-term after-sales services.

The globalisation process also places high demands on management. Planning is becoming more difficult under conditions of increasing uncertainty. The same is true for the organisation function, since the design of production and service processes is becoming a process of learning and continuous improvement. We can conclude that more work will not only go into indirect work, but also into management work.

There is, we can conclude, an increasing demand for knowledge-intensive business services, including both indirect work and management work, while direct production or service work may decrease. In addition to what we have said so far, we also have to mention the increasing demand for further training. Continuous incremental improvement as well as permanent organisational adaptation and renewal can only be realised if workers get the chance to improve their knowledge continuously through lifelong learning.

The transformation of work seems to indicate that more and more employees will be working in peripheral and management functions and fewer in core activities. However, this is obviously not the case: companies seem to follow a strategy of strengthening the role of direct work and empowering direct workers on the shop floor. This takes place through integrating both indirect work as well as management functions into core activities, while those parts of the direct work with codifiable knowledge become increasingly automated. A general trend can be identified towards reducing both the share of functional specialists performing peripheral work and the share of middle management, while at the same time the share of direct workers also performing indirect and management work will increase. This trend of the transformation of work can be observed in manufacturing as well as in services.

7. The Restructuring of a Business Organisation

In the following, we will first discuss the relationship between information technology and organisation forms, as this technology is often seen as the dominant driver of change. Here we will take a different view arguing that modern ICTs open up ‘occasions for change’, but they do not determine organisation forms. Both ICTs and organisation forms are open to other drivers of change. And it is the globalisation of markets that becomes the main driving force behind the development of a new organisation logic which will evolve in information economy.

7. 1 The Relationship between Information Technology and Organisation

The debate on the impact modern ICTs may have on organisation structures is some forty years old (Leavitt and Whisler 1958). Since that time this relationship has become more complex, partly because of the environment in which it is developing, which has become more like a turbulent field, partly because the nature of modern ICTs has changed rapidly and new functions of ICTs have developed. While ICTs have increasingly interpenetrated work processes and have therefore become more important as organisation strategies at the same time the toolbox of organisation devices has also broadened: new models such as self-contained work groups, cross functional design teams or supplier networks have been introduced.

Thus the relationship between ICTs and organisation forms is not a simple one; concerning this relationship no clear picture has so far developed. A variety of perspectives exists, which, according to Sampler (1996: 6), can be summarised around five principle positions: “(1) IT leads to centralisation of organisational control; (2) IT leads to decentralisation of organisational control; (3) IT has no uniform impact on organisational control but instead this relationship is determined by other factors; (4) organisations and IT interact in an unpredictable manner; and (5) IT enables new organisation arrangements, such as networked or virtual organisations.” In the following we will briefly characterise these approaches, using the main arguments evinced by Sampler (see 1996:5-11).

The first two concepts can be characterised as variations of an approach referred to as technology determinism. It is assumed that ICTs strongly constrain the options for organising production processes. ICTs are seen as an independent variable which in turn effects organisation structures as the dependent variable. Researchers arguing that ICTs will lead to the centralisation of control and decision-making point to the fact that this technology allows an easy and accurate transfer of information to senior management.

The decentralisation variant of the deterministic approach is based on two arguments:

- as IT will take over routine decision-making, individuals will have more time to deal with more complex problems

- through ICTs huge amounts of information can be made available not only to top management but also across the lower level of the organisation. Having more information at their disposal, workers can become involved in more complex decision-making processes.

What the two concepts have in common is that they actually talk about the potential of modern ICTs, which means that whether their potential for controlling on the one hand or decentralising control and decision-making on the other hand is used depends upon other factors. Contrary to the deterministic approach, however, modern ICTs can be seen as fairly open technologies concerning organisation forms. As Naschold puts it: “Information technologies due to their structure of a hardware and software component are depending on the development of a separate social model of production. The regulation of social relationships is an endogenous and functionally necessary part of the development of the technological system…” (1986: 232).

Another school of thought analyses the organisational requirements set by the environment in which the company operates. Organisational characteristics such as information processing needs determine whether and how ICTs will be used. Companies operating in a very uncertain environment, for example, have greater information processing needs than companies working in a stable environment. These different needs influence the way in

which ICTs are applied, as they represent one strategy to fulfil the information requirement. An alternative strategy to reflect information needs is the choice of the organisation form, which can support but also inhibit and control information exchange. Besides environmental uncertainty, organisation size, task variety and knowledge about the task as well as the degree of task connectivity are also mentioned as contingent factors affecting ICT applications and organisational design.

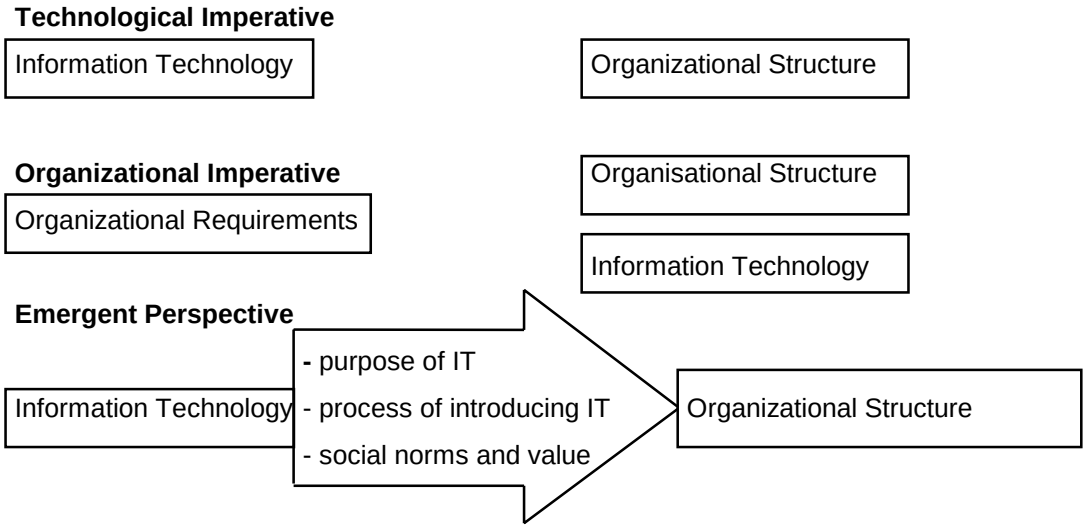
Another approach argues that the use and consequences of the introduction of modern ICTs is unpredictable as they emerge from complex interaction processes. On the one hand, ICTs possess an objective set of rules and resources that changes the roles of workers and the social fabric of the company. The way in which ICTs are implemented and used, on the other hand, depends on the meaning attributed to them, which itself is socially constructed. To be able to make any prediction about the relationship between ICTs and organisation forms, knowledge is needed about the way ICTs are used and for what purpose; but also about the organisational processes evolving around the implementation and use of modern ICTs.

The last approach argues that technology and organisation are truly homologous forms; information technology creates new organisation forms and new organisation forms, in turn, provide new opportunities for technology design (Berger 1993). Neither technology nor organisation is fixed, but both are changing in relation to each other; therefore, the design of information technology and the design of organisation forms are largely becoming the same task (Lucas and Barondi 1994: 9). Communication technologies offer opportunities to manipulate according to specific aims both the communication technologies themselves as well as the organisation contexts in which they are embedded. They provide, as Fulk and deSantis argue, more than traditional technologies, ‘occasions’ for structuring the production process according to other drivers of change such as innovativeness, cost-saving, control, or quality (1995: 337).

This approach continues to argue that due to the fact that shifts in the environment and customer demand occur, companies have to fundamentally restructure their organisation more frequently. One particular argument is that

the pressure for continuous innovation caused by global competition forces companies to adopt more flexible organisational arrangements. In this respect, one can talk of a new organisation logic. The development of this logic, although not caused by the broad diffusion of modern ICTs, is nevertheless supported by them.

The following picture shows the various perspectives of the relation between organisation structure and modern ICTs.



Perspectives of the relation between organizational structure and information technology (adapted from Markus and Robey 1988)

Figure 4. IT and organisational structure. Source: Earl, M. (1996, p. 9)

7. 2 The New Organisation Logic[4]

There is widespread agreement that the newly emerging information society will bring with it new ways of organising production. This is often called 'post-Fordism' (Amin 1993), characterised by 'flexible specialisation' (Murray, 1987, 1988), 'just-in-time production' (Hay, 1988; Ling and Goddard, 1988) and a high degree of outsourcing (Cole, 1981). Studies arguing in this way proclaim the end of both Taylorism and Fordism, but draw their examples almost

exclusively from the car industry and the textiles and clothing sector (Zeitlin, 1991).

On a more practical level, such ideas underpinned a series of prescriptive models for restructuring which were promoted to employers under such slogans as 'lean management' (Lamming, 1993; Womack et al., 1990), 'downsizing' (Tomasko, 1990), 'rightsizing' (Hendricks, 1992) and 'business process re-engineering' (Bartram, 1992, Coulson-Thomas, 1994). The ideas promoted in this literature include reducing staff numbers, delayering management and, in some cases, disaggregating large organisations into smaller profit centres or cost centres. Later, this approach developed further into concerns about supply-chain management and knowledge management. These models, however, seldom discussed the role of modern ICTs in the transformation process.

In the following, we will not deal with single aspects of organisational restructuring but will try to develop an understanding of a new organisation logic which will emerge in information society. ICTs, as has been argued earlier, will have an important role to play in the development of new organisation forms, but they are not seen as a determining factor. They open up 'occasions' for organising production processes, but as to technology applications and organisation forms, both are open to other drivers of change, particularly to the pressures of customisation and innovation competition.

In the literature attempts to describe the new organisation logic mainly list a great number of items without really uncovering the logic which is behind the development of new organisation forms. In the following, we will try to characterise this new logic. But first we will describe the logic which the traditional Taylorist/Fordist organisation model is based on.

[4] This section is based on the British, the Austrian, the Belgian, the Finnish, the Italian and the Irish reports.

7.2.1 The Logic of the Fordist Production Model

The basic assumption of the traditional Fordist model is that there exists a more or less unlimited demand for highly standardised consumer goods. At the same time, due to national monopolies or oligopolies, companies were not confronted with competitors from abroad. Their own internationalisation strategies were mainly based on exports, they themselves hardly invested abroad. We can characterise the environmental situation as complacent, secure and simple. As it was possible to anticipate the market trends for a longer period of time, the production process could be organised in a highly standardised, fragmented and formalised way. To avoid internal turbulence, a bureaucratic control structure was established which became a hindrance to extensive information exchange.

The Fordist production model is based on two important principles: functional specialisation and hierarchical integration. Functional specialisation is seen as contributing to productivity as workers specialising in narrow tasks can develop specific skills which will help them to work more effectively. The logic of hierarchical integration is explained by transaction cost theory. The argument here is that hierarchical integration will reduce companies' control expenses.

The Fordist production model is linked with a specific form of information flow; it contains channels in which only a vertical flow of information is possible and through which the acting of hierarchically arranged units is controlled. Actually, this model includes built-in mechanisms to block information flows; due to its bureaucratic structure and far-reaching division of labour, the model produces too many interfaces both hierarchically and vertically, which become a hindrance to communication and information exchange. There is a risk that within the Fordist production model too much information gets lost, particularly as in the bureaucratic control system the broad middle management is mainly dealing with the routine filtering of information.

In a globalising economy, where innovation competition dominates and customers no longer accept standardised mass products or services, but ask for individual solutions, markets become unstable, insecure and complex.

Companies have to develop organisational structures and channels of information flow that can cope with uncertainty. Production can no longer be organised according to Fordist principles; instead, more flexible organisation forms are needed which allow for extensive information and knowledge exchange to improve and speed up innovation processes. We can actually argue that the new organisation logic is turning the traditional Fordist production model upside down: vertical de-integration and functional or process integration which can also transcend companies' boundaries are becoming the key elements of a new organisation logic.

7.2.2 Vertical De-integration and Process Integration as Key Aspects of the New Organisation Logic

The strategy of vertical de-integration is mainly associated with downsizing and outsourcing. Big companies reduce their size and become leaner to get the same entrepreneurial dynamism, innovativeness and informalism as small companies often have, to be able to react as quickly and flexibly as those do. Downsizing often takes place together with outsourcing. Nowadays, as companies reflect about their core activities and concentrate on these, an increasing number of functions is becoming the subject of 'make or buy' decisions. If units cannot compete with offers from outside suppliers, they are at risk of being outsourced. All functions and processes that do not belong to the core of the business can be subcontracted to other companies specialising in these activities. But not only peripheral functions are outsorced, sometimes even functions that can be considered as core business processes, such as design, become legally independent through outsourcing.

This results in smaller organisations with a more simple structure, which are supplied more frequently in smaller batches and therefore become more dependent on other companies. However, formal organisational relationships do not automatically turn into market relationships; instead, many outsourced parts are still linked very closely with, and are economically controlled by, the core company, based on long-term exchange agreements. In the end, a

company may develop that subcontracts all production and is only concerned with product design, marketing and the management of all activities in the chain conducted by other companies. Electronic networks make such partnerships possible, since they reduce the costs of co-ordination and transaction.

A criterion to distinguish between different types of networks is the degree to which one partner in the network influences others. In a traditional EDI application concerned with data exchange, partners have more chances to react to the other network actors, since they have faster access to more reliable information, but the different organisations continue to operate autonomously. Different levels can be distinguished until finally the reciprocal influence by the actors of the network is so intensive that the separate organisational context fades and the network itself emerges as the new organisation. Then one is not far away from the theoretical concept of the ‘virtual organisation’, which is no longer bound to time or distance.

The establishment of 'cost and profit centres' is another strategy to reduce vertical integration. More autonomy is given to the firm's divisions, while at the same time they become fully responsible for costs and profit. The tasks and responsibilities of the headquarters, on the other hand, are reduced quite significantly. According to Hedlund and Rolander, in so-called ‘heterarchically’ organised companies responsibility for product groups, functions and specific territories can be decentralised in such a way that many parts have a say in the company's decision-making process (1990). Loose coupling and direct negotiation among sub-units, particularly concerning transfer prices, is typical for a 'profit centre organisation'.

The restructuring of service functions within companies is also part of the organisational renewal process. Again, the principle of process integration is applied. Finance, purchasing, personnel, accounting, long-term planning controlling and logistics are integrated in service or advice centres, which are to deliver the necessary services within the company and to external agencies, to take responsibility for corporate development, and to ensure the organisation's goals are attained. These centres are also responsible for costs, time and the quality of their services.

A consequence of the introduction of cost and profit centres is the flattening of hierarchies as organisation levels between headquarters and the centres become obsolete. But the reduction of organisational levels of bureaucracy continues further down the hierarchical ladder as companies become more aware of the disadvantages of such a large bureaucracy: slow information exchange and even loss of information, lengthy decision-making processes and particularly a non-innovative business culture. All these consequences of large bureaucracies will become serious problems in an economy where business success depends greatly on companies' innovativeness.

Internally, companies need to organise their production process around customer-oriented processes rather than functions. The implementation of ICTs is aimed at eliminating steps in the hierarchy and create flat organisations, instead of centralised organisations where computer systems are established around mainframes. The most important aspect of an organisational strategy of process integration is the introduction of group work. Traditionally work is divided into many different tasks and workers are specialised and located in separate departments. In a process-oriented structure, teams perform activities which are traditionally spread all over the organisation. This implies that many unproductive activities such as control and waiting for decisions taken higher up the ladder are made redundant.

Work groups become responsible for self-contained production processes without any fixed division of work among their members. If teams are assigned to perform a whole process, they also need to be given the responsibility for it. Work groups have to organise themselves; they are expected to continuously optimise the way in which they organise their work. But at the same time, by monitoring each other, work groups should also continuously improve their co-operation and information exchange. Learning by doing and by interacting are important aspects of group work.

Work situations will be described less by restrictive job descriptions. Each individual is no longer responsible only for his own task, but also for the end result. The barriers between different qualifications in small groups become blurred. Everyone becomes better acquainted with different steps of the production process. In this way the delimited responsibility which goes hand

in hand with a specified job that fits nicely within the ladder of hierarchy will fade. Smaller teams of workers can process increasingly complex data flows in and between organisations. The new communication technology enables these small groups to get easy and fast access to the necessary information.

Such re-allocation of tasks affects the position of middle management. Their position was based on filtering and spreading the information coming from above in the organisation. If there are less hierarchical organisations where workers have to solve problems directly they themselves need to have the necessary information at their immediate disposal. The increased opportunity to directly control work processes through ICTs further erodes the position of middle management. Their responsibilities should be rather coaching and motivating the teams instead of controlling and directing them.

Similarly, within companies, ICTs allow for a faster transfer of data between departments. Through the implementation of ICTs, companies can get the work done faster in the organisation. The treatment of a file through many different steps done in several departments or locations can be accelerated. A material file no longer needs to be transported physically and some intermediate steps are rendered redundant.

The group or team approach is also applied to organise the development and the design processes. A new style of innovation management reintegrates research and development with engineering, design, procurement, production and even marketing. The development of new products, quality control, market assessment and price calculation - all these activities are performed within a cross-functional team consisting of members from various departments. The idea of such teams is that all products are designed with manufacturing in mind but also to speed up marketing.

As has been said earlier, process integration can also take place across company boundaries. Large companies completely restructure their supplier chain by reducing the number of suppliers drastically. At the same time, a new division of tasks takes place; suppliers have to produce complete systems which can be assembled directly without any contribution from the core company. Furthermore, supplier firms have to take over additional tasks,

particularly research and development; the innovation process becomes more like a joint undertaking of networked firms. In addition, customer firms can take part in the co-construction of new products, to avoid marketing problems.

In view of these assertions, it is all the more surprising that empirical research (Huys et al. 1995) on organisational restructuring sometimes tells a different story. Several sector-wide studies (chemical, automobile, machine tool and clothing industry) have investigated the transformation from a traditional Tayloristic division of labour to a new socio-technical division of labour. Although in some respects changes in the organisational structure do take place, the effects on the work content of production workers remain limited, with a continuing domination of merely implementational and small jobs. The researchers attribute this slow transformation to the larger than expected adaptability of the Tayloristic production concept to meet the demands of the changing environment and to the rigidity of the employment relationship which influences the dominant production concept. This would suggest that – at least in these traditional industrial sectors – the potential of ICTs is not fully exploited. The (few) empirical results available do not support the recommendations of the OECD (1995) that “the diffusion of ICTs should be accompanied by a restructuration of production and work organisation“.

7.3 Changes at the Boundary of the Firm - Spatial Flexibility[5]

Another aspect of the reorganisation of work, the spatial relocation of activities, which is made possible by the use of ICTs, is taken up in the literature under the heading of teleworking. In the following we will discuss briefly the main forms of ICT-supported spatial relocation of information-processing work.

The first of these concerns home-based working, which falls into three broad types: work which is partially based at home and partially in the workplace (generally carried out by employees in medium or high-skilled technical, professional or managerial occupations); fully home-based work for a single

[5] This section draws extensively on the British report.

employer (generally carried out by low-skilled workers, often paid by results and without secure employment contracts) and freelance homeworking.

There is considerable evidence that teleworking works best where hierarchies are flat, bureaucratic rules are minimised, job descriptions are flexible and workers are encouraged to work towards targets which they have negotiated with their managers or team-mates. This form of teleworking tends to prosper best with a managerial style which is nurturing and enabling, rather than autocratic or dictatorial - a 'maternal' rather than a 'paternal' model - in which trust plays a crucial role. There is also evidence that flexible teleworking is easier to introduce into organisations which already have a well-developed electronic communications culture - in which the staff is already used to using voice-mail, e-mail and other forms of communication which make location irrelevant and which facilitate asynchronicity (in other words, which make it easier to shift messages in time as well as space). The introduction of intranets is currently spreading such communications culture rapidly. Having an intranet makes it immediately visible who is just sitting on information and who is doing something productive. And it encourages people to go straight to the source for the information they need, instead of going via line managers. It seems likely that the spread of intranets may also contribute to a reduction in numbers of middle managers.

The second form of home-based teleworking - fully home-based working - has more often been included in studies of 'traditional' forms of homeworking (Phizacklea and Wolkowitz, 1995, Huws, 1994). Researchers have tended to find social isolation, precariousness and ignorance of legal and social security rights amongst in this group. However, a simple 'exploitation' model does not fit the evidence comfortably. Many of these workers express considerable ambivalence about their position. If they were not working from home they would probably not be working at all and they tend to view it as a freely chosen option which represents the lesser of two evils. The interaction between structure and agency is complex and multi-faced here.

Freelance teleworkers usually have lower earnings than would prevail in equivalent office-based work, and suffer from extreme unevenness in the flow of work, with periods with too much alternating with those when there is none

at all. The latter cannot be enjoyed as leisure because of the fear that new work might never arrive. Huws et al. found a paradoxical situation whereby most freelance teleworkers claimed to have actively chosen this way of working because it offered autonomy, control and the freedom to 'be your own boss'. Yet in reality, because of the unpredictability of their situation and their relatively low earnings, they had less control over the disposition of their own time than equivalent office-based workers. They were, for instance, unable to plan holidays because they never knew whether an urgent job might appear on that date (Huws et al. 1996).

A second category of teleworking is mobile or nomadic working. Although there is some evidence that a large and growing number of workers falls into this category, it has been insufficiently researched. There is, however, some evidence that the typical mobile worker (compared with a home-based teleworker) was likely to be younger, and more likely to be a man, and working exceptionally long hours (Huws, 1990).

A third category of teleworking involves organising workers into 'virtual teams' or ‘virtual organisations’ regardless of location. These consist of individuals working out of physically dispersed workspaces, or even individuals working from mobile devices and not tied to any particular workspace. They often form temporary small groups to solve specific problems. As soon as a solution to the problem has been found, the group dissolves and its members start to work in another group, often with different partners. In general, people work in several groups at the same time. Through this we can see the development of a network of overlapping group structures.

The lifeline to the network and major source of integration is the communication link among collaborative workers. No established organisational structures exist; instead, job responsibility and lines of authority shift regularly in virtual organisations. These new forms can therefore be characterised as ‘co-ordination intensive structures'. Many patterns and relationships between the members of the virtual organisation exist, but to function this organisation form needs extensive information and knowledge exchange via electronic network technologies. If vertical de-integration and

outsourcing continue we may see new network forms evolving, consisting of a multitude of very small organisations and single persons.

Finally, we come to the relocation of whole functions to back offices or call centres, either in-house or outsourced. These generally involve a relocation of work to other regions or, indeed, another country.

7.4 Conclusion

Based on what has been said so far, we can characterise the new organisation logic as mainly relying on the governance mechanism of networking, which integrates both the flexibility advantage of the market and the stability advantage of bureaucracy. Three levels of network structures can be identified:

- an intra-organisational network structure which develops between sub-units, replacing the bureaucratic governance regime; this increasingly includes global production networks as companies break down their value chain and locate discrete functions in different regions all over the world

-an inter-organisational network structure which develops between companies, replacing the market as the traditional mode of co-ordinating exchange

- a network of teleworkers associated with companies in different ways.

8. Governance Aspects

8.1 Changing Co-ordination and Control Strategies

Decentralisation and responsible autonomy always carry the risk that co-operation will turn into competition. Therefore, although top management and other superiors can no longer rely on traditional command and control mechanisms, they still have to co-ordinate business processes. Here we can identify a change from bureaucratic control to contractual relationships. Agreements are signed in which output, the quality of the product, the time of

delivery as well as costs or profits are fixed. This happens on various levels of the hierarchy down to shop floor level. Furthermore, management has to rely on ‘softer’ measures of co-ordination and control such as creating a joint vision, developing a company culture; organising platforms to exchange information and to develop long term strategic plans. Here we can speak of discursive co-ordination (Schienstock 1997a) as a new way of governing business processes. This can also be applied in the relationships between core companies and their suppliers or customers.

Frenkel et al. argue in a similar way. When management can no longer rely on bureaucratic control measures and has to cede more control over the work process to employees, it does not mean that management is giving up control, instead we can identify a change in control forms. In this respect Frenkel et al. use the term ‘info-normative control’ (1993: 786ff). The new control form has two elements: a technical and a normative one. The basic element is a performance agreement between management and single work groups and/or departments. This may include output norms, quality aspects and time of delivery. The rationale behind this is that when workers are involved in the fixing of performance standards they themselves are also committed to them and they become responsible for achieving the agreed performance norms. Thus we can speak of a normative integration of workers in contrast to an alienated or calculated involvement characteristic of the bureaucratic control system.

IT-based management information systems and the application of user-centred and performance-centred design in computer applications have also become an important part of the new control form. “Technology becomes less a means of dictating control (by machine pacing) than a means by which management is able to set and encourage worker commitment to achieve performance standards. This is made possible by automatic generation of performance data … and analysis" (Frenkel et al. 1993: 787). One example would be the number and duration of service transactions, another the number of customers served or the turnover within a department store: sometimes customer-based matrices are obtained from surveys.

Performance data are often not used to control the outcome in the first place but to stimulate competition among work groups. Within companies they become the basis for an intra-organisational benchmarking between work groups (Schienstock 1997a: 177) Objective data then become the basis for future performance agreements; they are better accepted by workers than abstract performance norms prescribed by the management. “Communicating performance to employees in the form of graphs and summary data, for example by presentation on workplace bulletin boards or through electronic mail, tends to legitimise performance standards” (Frenkel et al. 1993: 787).

In an information economy, we can conclude, companies may develop into flat and lean micro-firms. No fixed departments exist but new autonomous project groups or teams will be formed at any time according to demand. The boundaries between the inside (employees) and outside (customers and suppliers) will become more permeable and will change continuously. Co-ordination will take place through continuous discourses. Companies will adapt in a flexible way towards environmental changes in co-operation with others.

8.2 The Network Culture

The new network structures require, as Schienstock (1997b) argues, a new mentality and a new organisation culture. The traditional Fordist model was based on distrust, therefore a hierarchical control structure was established. A rigid corporate culture developed which is now the most important obstacle to establishing more flexible organisation forms. The use of modern ICTs as a control device aggravated the problem of bureaucratisation and rigidity.

A network structure of enterprises cannot function on the basis of distrust and bureaucratic rigidity. In a network where each company is specialising, companies become dependent upon each other. Networks therefore need a cultural dimension; they are not purely instrumental, accidental alliances. Long-term co-operation can only develop on the basis of trust relations.

Castells (1996: 199, see also Schienstock 1993: 38f) argues that, when analysing network structures, we have to abandon the traditional concept of

organisation culture. In general, culture is understood as a network of interlocking rituals, norms, assumptions and values which have developed out of continuous interactions among the members of an organisation and which is accepted as a general device to guide the behaviour of people as, from the views of the members, it has proved itself as successful in solving problems of adaptating to a changing environment and of mediating internal conflicts (Schein 1986). Such a definition, however, fails to appreciate the fact that organisation culture consists of different and often contradicting elements.

Castells rejects such a concept of a unifying network culture. It is certainly not a new culture in the traditional sense of a system of values which, as Castells argues, glues the organisation networks together. A network consists of a multiplicity of actors and networks are very different, which contradicts the idea of a unifying 'network culture'. There is, as Castells continues, indeed a common cultural code in the diverse workings of the network enterprise. But "it is made of many cultures, many values, many projects that cross through the minds and inform the strategies of the various participants in the networks, changing at the same pace as the network's members, and following the organisational and cultural transformation of the units of the networks." We can speak of a multifaceted, virtual culture. Although it is virtual, it is still powerful in enforcing organisational decisions and co-operation in the network. But, as Castells argues, it does not stay; the 'spirit of informationalism' is the culture of creative destruction (1996: 199).

Taking Castells arguments into account it seems to be more appropriate to understand culture as a 'toolbox', out of which actors can take cultural elements to underline their arguments and to legitimize their behaviour (Swidler 1986: 277). We can then speak of a 'bargained culture'; as soon as restructuring processes take place within the network a new bargaining process starts. This means that it becomes impossible to crystallise the position in the network as a cultural code in a particular time and space.

9. Regulation of Work

When analysing the developing information economy, we also have to look at the regulation of work. Here we can expect that in future two principles will dominate: deregulation and flexibilisation. When we talk about deregulation, we are referring to procedural rules. Deregulation means that the regulation mechanism of collective agreements will be replaced by individual or group bargaining. Work groups, for example, often have the right to decide about working time on their own. They may also become responsible for dividing a group bonus among all members.

The principle of flexibilisation on the other hand is related to the regulation of the substance of work; we therefore speak of substantive rules. When we talk about flexibilisation, we often differentiate between a quantitative and a qualitative aspect. Qualitative flexibility refers to the use of labour: the intention here is to use labour for a wider variety of different tasks. The principle of qualitative flexibility is often applied especially in work groups , as it is expected that members are capable of performing almost all tasks in the group's production process.

Quantitative flexibility refers to the regulation of working time and wages. The principle of wage flexibility, for example, is realised by including an individual or group component. The individual wage component is based on an evaluation procedure, which includes criteria such as the mastery of tasks and functions performed within the work process, participation in further training, or the contribution to the group work. Sometimes wage differentials are also based on an evaluation of group performance; here criteria such as the use of machine capacity, the idle time of machines, the number of customers served, suggested process innovations and others are included. Of course, criteria used in such evaluation procedures are adapted to the specific character of the work process. Another aspect of wage flexibility is the payment of a bonus, which depends on the results which a group, a department, or even the whole company achieves.

Referring to flexibilisation of working hours, we can assume that the traditional work contract of indefinite duration will, at least for a great number of workers, be replaced by more flexible forms of organising working time. Furthermore, the 'normal working day' will no longer be valid for a great number of people. When we talk about flexibility of working hours, we can either refer to the duration of work or its position during a period of time. Concerning the duration of work, a typical form of flexibilisation is part-time work or a fixed-term contract for the duration of a project. Flexibilisation in this respect is often seen as indicating a precarious work situation, but we can expect that more and more specialists will be hired on a project basis.

Flexibilisation of a position is nowadays very common; people can decide within limits when they will start and finish their workday. We often find agreements that workers will have longer working hours during periods of high demand and reduced working hours during less stressful times. But nowadays, agreement on the working hours per year is becoming more widespread, as it includes both flexibilisation of duration and position.

10. Skills Needs in the Information Society[6]

It is highly disputed which skills the emerging information society will require. Early discussion saw the information society as essentially the further application of Taylorism (see also Robins and Webster 1997). The main argument is that the widespread application of the computer and other forms of electronic data processing contributes to the process of Taylorising services processes and therefore reinforces the general 'de-skilling' tendencies in capitalist production. Some researchers argue that the application of new technologies, particularly in the office, is leading to re-skilling of lower level occupations accompanied by redundancy of routine workers, while the professionals and middle management are the main

[6] This chapter is based on the British, the Finnish, the Portuguese and the Austrian reports.

victims of de-skilling (Baran 1989: 697). It is now agreed, however, that the de-skilling thesis is an oversimplification.

Contrary to what has been stated so far in other publications, a tendency of re-skilling is assumed. The development of human resources, it is argued, is inextricably linked with the economic success of the company. Without investing in human capital, companies will neither be able to manage the fundamental restructuring of their production processes and business organisation necessary for them to stay competitive in global markets nor will they be capable of deriving the maximum benefit from the new organisation forms that have been established. The lack of human resources often becomes a limiting factor in relation to innovation and economic success (Stahl et al. 1993: 26). Human capital thus constitutes an intangible asset with the capability to enhance or support productivity, innovation and learning (OECD 1998: 9). The Enquete Komission argues in a similar way. "Generally we can anticipate that together with the wider diffusion of modern ICTs as well as information and knowledge work the average level of qualification demand will increase" (1998: 115). Kumar argues in the same way, new technologies, according to him, add rather than subtract from the skills of workers (1997: 23).

Another important aspect related to the broad diffusion of ICTs is a growing demand for specialist skills, enabling ICT systems to be effectively implemented and exploited in different companies. These specialists require a range of skills. Technical skills are obviously very important. However, ICT does not operate in a vacuum. It can only be effective if introduced in a form which meets particular business needs. IT specialists, therefore, require a wide range of other skills. In particular, they need to be able to understand and analyse business needs, translate these into IT solutions, communicate effectively with other specialists and non-specialists (Dench, 1998; West London TEC, 1993). These specialists also play an important role in identifying new developments in ICTs which are relevant to a business, driving an organisation forward and generally in ‘bringing technology to the business’.

It is also agreed, however, that despite the high-tech world of new ICTs, there remain jobs for poorly qualified workers, especially in direct contacts with the customer. For telesellers in call centres, for example, only secondary level education is required. For the home delivery of products ordered by phone, fax or computer there is also a potential for poorly qualified people. However, this is another kind of low qualification than the routine jobs in industry. The low qualified ICT jobs require more communicative skills to confront the customer, the ability to handle ICT and to respond promptly to different questions from the customer.

One can question that the traditional dispute on whether the broad diffusion of information technology will lead to de- or re-skilling focuses on the main problems. In criticism it could be argued that:

(1) tendencies of skilling cannot be derived from technological development, they very much depend on organisational strategies

(2) the changing structure of the workforce has a major impact on skill needs; here we have to mention increasing need for knowledge-intensive services

(3) qualification is a multidimensional concept; we therefore have to go beyond the argument that there is a general trend towards re- or higher qualification. Instead, we have to specify which new qualifications are needed in the information society.

10.1 Conceptual Aspects

When we talk about the need to invest in human capital, we have to go beyond the argument of a general trend towards higher qualification or re-skilling (Kern/Schumann 1984, Piore/Sabel 1984). Instead, we have to point to particular forms of knowledge, skills, competencies as well as work orientations, attitudes and work virtues that have to be promoted to develop and fully exploit the productivity, innovation and learning potential of new organisation forms. As company restructuring cannot be interpreted as a single act adapting the enterprise to a changing environment, it must be understood as a continuous process of organisational learning, strategies to

engage workers in a process of lifelong learning are justified and necessary (European Commission s.a.).

No generally accepted definition of human capital and skills exists. In the OECD Report on 'Human Capital Investment' the following meaning of human capital is adopted: it comprises “the knowledge, skills, competencies and other attributes, embodied in individuals which are relevant to economic activities” (1998: 9). This definition indicates that human capital is a multidimensional concept. Skills are also classified in different ways (see,e.g., Anderson and Marshall, 1996; Dench, 1998; Industry in Education, 1996; Rajan and van Eupen, 1998; Quaestor, 1996). These take a very broad definition, really encompassing the whole host of attributes and abilities employers are looking for. The main emphasis of all these classifications is their avoidance of a narrow focus on technical and job specific skills. It is argued that a whole range of personal and inter-personal characteristics or skills is essential in a wide range of jobs.

We will mainly follow the definition of human capital proposed by the OECD, differentiating between knowledge, skills or competence. But instead of talking about other attributes, we will speak more concretely about work orientations, attitudes and work values (see also Hillage and Pollard, 1998). Although knowledge is a contested concept, some important categories have been established. In this respect, we can differentiate between theoretical, or abstract, knowledge, content knowledge, technical knowledge and practical, or tacit, knowledge. Within the second aspect of qualification we can differentiate between social, management, international and professional skills. The concept of skills, however, is gradually shifting towards the broader concept of competence, which stresses particularly the ability to handle complex and unclear situations. In the orientation or disposition aspect, quality consciousness and reliability on the one hand, and creativity, innovativeness and entrepreneurial spirit on the other hand, are seen as important qualifications, which have to be cultivated to really gain the advantage of new organisation forms.

10.2 Trends in Skill Development

When it comes to the knowledge aspect, we can identify a trend towards more theoretical, or abstract, as opposed to content knowledge. Theoretical knowledge can be defined as a body of codified principles applied to a particular field of endeavour (Frenkel et al. 1993). It becomes important as employees no longer perform highly standardised tasks and routinized jobs; instead, work becomes increasingly a problem-solving process. The needs to innovate more rapidly and to take the needs of customers into account more carefully are two of the driving forces behind the transformation of work into a process of problem-solving.

Due to the transformation of work into problem-solving, workers are increasingly confronted with new and unfamiliar tasks for which no solutions are as yet available. In such situations, the workers can draw only to a limited extent on their content knowledge: instead, they need more theoretical or abstract knowledge. To find solutions to new problems, the workers must have the ability to ask the right questions, to find the information needed, and to select the most suitable aids and tools. They must be able to conceptualise new problems in such a way that they can search for solutions by proceeding in the appropriate systemic and methodological way (European Union CCAM Contract #76246). To be able to continuously find solutions to new problems, employees must have a profound theoretical knowledge of their field.

The advance of modern ICTs is fundamentally influencing the demand for new qualifications. Here it is important to mention the aspect of connectivity. As has been stressed earlier, modern ICTs make the exchange of information and knowledge between different actors much easier, as they bridge both time and space (Fulk and DeSantis 1995). It is expected that due to the easy access to technological databases, vastly expanded connectivity and a sharp rise in communication bandwidth, modern ICTs will speed up innovation processes within firms significantly. Those advantages, however, can only be realised if all employees know how to use the modern ICTs in a creative way. Technical knowledge, therefore, is becoming a key qualification. One can also speak about digital knowledge.

Some critics argue that although the popular view is that nearly every job involves some contact with ICTs, this is not always the case. Indeed, many companies, particularly small companies, operate with little technology. This is no doubt changing, but it is not clear to what extent. There may continue for a long time to be a group of companies using traditional methods and little, if any ICTs. In many jobs it seems that the actual level of IT skills needed is fairly low (Dench, Perryman and Giles 1998). It is an acceptance of using computer technology and possibly keyboard skills which are sought. The systems used every day in many sectors, for example, in retailing and banking, can be set up so that there is limited scope for initiative. Staff members have to follow a set of steps and know how to deal with any basic mistakes they make.

As regards the knowledge aspect, we can identify another trend in particular. In order to be able to handle complex technical systems, not only technical, but also practical knowledge is crucially important. The increased use of technology and a trend towards organisational integration of single functions and activities are both causing the role of human work to change. Production no longer consists of materials processing and direct interference in the production process; instead, the principal responsibilities of workers include monitoring, controlling and regulating technical processes and systems. The use of modern technology leads to uncertainties and problems which are difficult to predict. In concrete situations, these uncertainties cannot be solved on the strength of theoretical knowledge and a systematic way of thinking alone; a kind of knowledge is needed which enables people to react immediately to new and uncertain situations.

Problems may be caused by an inconsistent quality in raw material or by differences in the parts delivered by suppliers. Other sources for problems are old machines and malfunctions in monitoring and control systems. The increased flexibility requirements of small batch production may lead to modes of operation within the production process that are neither foreseeable nor calculable. Furthermore, the increased complexity and integration of technical systems may lead to breakdowns developing in a chaotic and totally unexpected way.

Practical knowledge can be characterised in many different ways: Someone has a right feeling for a material, an ability to detect pitch changes in the sound of technical systems or the ability to make decisions without reflection, to use their intuition and improvise. Such practical knowledge can be seen as the particular contribution of human labour to the production process. It is important, for example, that workers are able to detect early signs of problems and in this way prevent process shutdown. In the event of an accident, workers must be able to minimise the damage without time-consuming analyses of all the relevant data, and to make the right decisions.

We often refer to practical knowledge as 'tacit knowledge' as this knowledge cannot be codified; instead, it must be accumulated by processes of 'learning by doing' or 'learning by using'. Personal factors, such as feeling, the capacity for anticipating and intuition, are becoming important, as people need to be able to function in uncertain and unstable situations.

Having practical knowledge also means that the workers should be able to use their competence to deal with problems in unknown situations. It does not, however, here refer to the ability of people to transfer technical knowledge they have acquired in the past directly to new situations. Instead, practical knowledge means that people have learned how to deal with the unexpected, to cope with critical situations on the basis of fragmentary information only, to make decisions immediately. In a way, they must have learnt how to learn. Learning how to learn is the usual expression for the quality enabling individuals to transcend their current capabilities and to solve unknown problems (European Union CCAM Contract #76246).

When it comes to the aspect of skills, we first have to discuss new trends concerning professional skills. Here we can identify the need for multiple or interlocking skills as a major trend; multi-skilling will be defined as the possession of skills which exceed the boundaries of a specific profession. As long as principles such as the division of labour and specialisation dominated organisational restructuring strategies, workers could get along with skills related to a single profession only. But new forms of organisation are characterised by the erosion of the traditional division of labour; they are based on principles opposite to the traditional Fordist ones: re-integration of

divided jobs and de-specialisation deserve special mention here. Because of this new trend of restructuring, a broader spectrum of skills in the sense of multi-skilling is becoming increasingly important. Workers need to have skills from different professions, for example mechanics and electronics, to perform their jobs in the new forms of organisation. Yet there is not always the need to have skills as profound as those which are acquired for a specific profession.

If one wishes to participate in the dynamic process of developing group work, it is not enough to have skills in only one specific profession. The extensive group process integrates various manufacturing functions with indirect functions, such as quality control, repair work or programming, to mention a few, and also with some disposition functions. When work is primarily structured around a small number of business processes or work flows linking the activities of the employees with the needs and capabilities of the customers, the canon of professional skills the workers must have, expands.

With vocational activities constantly broadening and undergoing a process of permanent change, some social scientists already predict a paradigm shift by the year 2000. Problem-induced 'just-in-time' learning or learning 'on demand' will become increasingly important as the tasks and responsibilities of work groups continue to expand. Does it still make sense to have a training system based on the idea of a profession? Why not training on the job or workplace rotating training, as in Japan? Or training according to a module design? This is a type of training in which, according to demand, specific modules are taught and where one obtains a specific certificate for each training unit.

There is little or no doubt that the concept of a single, lifelong profession is no longer relevant today. However, it is important not to underestimate the advantages of being trained in a specific profession. As well as serving to strengthen self-confidence, specialised professional knowledge may also pave the way to lifelong learning. It is important that what can be termed 'just-in-time' training has a solid foundation.

The process of organising a business globally will call for a range of new skills, which can be classified as international skills (Dertouzos et al. 1994). By this we do not only mean the ability to speak foreign languages. Today this

does not only involve the large companies: even for medium and sometimes even small “high-tech” firms, dealing with foreign clients or suppliers is just normal business as the globalisation of markets and international integration accelerate. In these international relationships, co-operation is much easier if one knows about the culture, tastes, customs, legal systems and institutions of the partner's country. Japan is a good example of this. The difficulties of European and American companies to get a foothold in the Japanese market can partly be explained by the fact that they were not familiar with the Japanese way of doing business.

It is argued that social skills or competencies are becoming as important as theoretical knowledge. Given the mutual dependence of workers within a work process, they will be increasingly required to co-operate and communicate with each other. Due to the trend towards decentralisation, workers also have to keep direct contact with members of other work groups. Social competence, therefore, is often related to the ability to take part in teamwork processes in such a way that all participants are satisfied and that the outcome of the group work will be seen as a collective achievement. Another reason why social competence or skills will become important is that, together with higher levels of autonomy and the decentralisation of decision-making, workers will more and more often be speaking directly to suppliers and customers.

Social skills include the following characteristics: flexibility in attitudes towards new tasks, autonomy in decision-making and willingness to shoulder responsibility, self-confidence in defending one´s own ideas within the working group, ability to express one´s own views and thoughts, tolerance of the argumentation of others, and willingness to co-operate and to support the others if necessary, as well as a willingness to search jointly for a compromise in conflict situations.

Due to the flattening of hierarchies, the power to make decisions has been increasingly decentralised and more responsibility has been handed down to various levels of personnel, down to the operational level. Workers must be able to plan, organise and also control their work autonomously or together with their colleagues. They have to establish, sustain and renegotiate

exchange relationships with co-operation partners both within the firm and from the outside. Furthermore, workers are becoming responsible for the quality of their work, for achieving the agreed cost limits and delivering their products at the agreed time. Group autonomy can also include the right to select new members. All these are tasks earlier performed by the management - planning, organising, negotiating, control and decision-making are seen as typical management functions, which means that the new forms of organisation can only function if the workers acquire the necessary managerial or executive competencies. To this we can add the need for being able to manage information flows.

The more such aspects as quality and time gain importance as criteria in global competition, the more the success of a company depends on specific work orientations and virtues such as quality consciousness, precision and reliability. New skills required and partly lacking were not primarily ICT-related know-how but mainly extra-functional skills such as accuracy, quickness, mental flexibility, etc. (Blumberger 1990). Another factor is immediacy — for example, e-mail and faxes mean that documents arrive almost immediately, and people expect immediate replies. This not only creates new pressures on workers but also diminishes the time available to consult with colleagues or supervisors about the right way to respond; the knowledge must be immediately at hand.

However, companies can only survive in today's global competition if they are capable of innovating rapidly. Therefore, more than these virtues, creativity and entrepreneurial spirit are becoming crucially important qualifications. The transformation of such abstract concepts as continuous improvement or a constantly learning organisation into a reality inside a company very much depends on a creative work force. To be creative means inferring a course of action from a synthesis of diverse pieces of information (Frenkel et al. 1993). Entrepreneurship can be characterised as the willingness to try new things and to take the risk of failure as long as high gains may be anticipated.

Sometimes it is argued that a 'new way of thinking' for all members of the company is needed in order to develop an innovative and constantly learning organisation. Commitment and trust are seen as the most important aspects

of such a new way of thinking. It must be based on an understanding that only a joint effort of management and workers to improve innovativeness can lead to success in global competition.

Changing work orientations and virtues is not a one-way street. Management also has to change its orientation towards its employees. This, in the first place, means that workers must be seen as the main resource of increasing productivity and innovativeness, and must therefore be dealt with very carefully. This demands leadership from managers, but there is also a need for skills in planning and disposition, co-ordination and organisation, problem solving and bargaining, presentation and moderation. Managers can no longer rely on giving orders to enforce their ideas and will; they have to convince their subordinates about the usefulness of their ideas and solutions. In Japan, for example, quality has become the most important element of business culture, which not only has had consequences for competitive outcomes, but also for the democratisation of working life. Workers are seen as the main resource for continuous improvement of quality.

From Japan we can learn that the change in the orientations and virtues demanded of workers by management must be supported by the introduction of an “industrial citizenship”, which, in exchange for their commitment, gives workers increased rights in their companies. A study conducted in the USA at the beginning of the 1990’s aimed at improving the global competitiveness of the country has defined industrial citizenship in the following way: “All members of the company have the right to be trained continually and comprehensively; they should become masters of their technology and should be able to control their work environment, and they should be involved in shaping their company´s objectives” (Dertouzos et al. 1994). In the following table, the arguments concerning future qualification needs are drawn together.

Table 3. Techno-organisational restructuring and new qualification needs

qualifications	**restructuring aspect**
knowledge	
theoretical knowledge	work as a process of problem-solving
technical (digital) knowledge	introduction of modern ICTs
practical, tacit knowledge	increased uncertainty, risk situations caused by technical integration
skills	
professional skills (multi-skilling)	integration of tasks, de-specialisation, group work
international skills	globalisation of markets and production
social skills	direct interaction within and between work groups, customisation, direct interaction with suppliers
management skills (information management)	flat hierarchies, decentralisation, increased information exchange
work orientations and work virtues	
quality consciousness, reliability	quality and time as key aspects of global competition
creativity, entrepreneurship	innovativeness as key element of global competition
leadership	co-ordination of autonomous work groups
new work virtues	commitment, trust, industrial citizenship

10.3 Training Aspects

It is quite obvious that a great number of qualifications mentioned above cannot be acquired in an education process which is separated from the production process. Instead, they have to be developed continuously in learning processes taking place within day-to-day business. By performing their tasks, workers will gain specific knowledge and skills and take on new work virtues. Social skills and competencies, tacit knowledge, quality consciousness and entrepreneurship are some examples of those qualifications that workers would acquire mainly while going about their day-to-day business and co-operating with other people. Certain other qualifications, such as theoretical or abstract knowledge, technical knowledge or international skills can, at least partly, be taught in specific organisations.

ICT also impacts on the delivery of training. Many employers utilise IT to deliver training, through the provision, for example, of open learning centres/resources centres, computer packages which personnel can work through in their own free time. There has also been a growth in distance learning and experimentation with the delivery of learning to people who are unable to attend classes regularly, or who want to learn in their own free time.

11 The Impact of ICTs on Business Performance[7]

Attempts to analyse the economic success resulting from the introduction of modern ICTS have mainly failed. Despite research done for over two decades, DeLone and McLean (1992) argue, no satisfactory solution could be found to measure the success of information systems or the effectiveness of management information systems. Without a systematic way of measuring the benefits of modern ICTs, much research, the two authors conclude, will be purely speculative.

[7] This chapter is based on the Finnish report.

For a long time the value of computers and IT was undisputed. However, in 1990, Strassman demonstrated (CITE) that there is no relationship between expenses for computers and business profitability. The amount of money invested in computers, according to Strassman, influences none of the ordinary finance performance indicators: neither return on investment, nor return on net assets nor return on equity. Other studies also confirm that the hope of managers to increase profitability dramatically by investing in modern ICTs did not materialise (Lillrank 1996).

One can, of course, criticise such attempts to measure the benefits of modern ICTs. Economic advantages that can be achieved by the innovative use of modern ICTs can only last for a very short time as all companies have to keep up with the leader to stay competitive, fierce competition will soon wipe out the excess profit earned by the use of modern ICTs.

In general, companies have two main reasons to invest in modern ICTs: to reduce costs by automating manual procedures on and to create higher value to customers through better design, faster delivery, or entirely new or more individualised products and services (Lillrank 1996: 13). The cost assessment, which looks at the automation of direct labour, is relatively simple and precise (Francalanci and Maggiolini 1994). However, a greater share of ICT investment is obviously made to increase the value of the customers. Here the benefits are more intangible: for example, modern ICT can increase direct communication, organisational flexibility or it can contribute to the optimisation of production flows. To assess the value of these benefits is rather difficult, therefore decisions on ICTs applications cannot be based on traditional investment models.

When discussing the benefits of ICT applications, we also have to take into account that they exist as hardware and software. The benefits of modern ICTs depend on the design of the software in the first place and to a much lesser extent on the hardware. Furthermore, we have to take into account that no significant benefits will be achieved from the introduction of modern ICTs as long as computers are used on top of traditional business processes and corporate structures. All these arguments illustrate clearly that the

mechanisms for linking modern ICTs and performance indicators are not well understood.

12 Territorial Aspects[8]

As has been mentioned earlier it is often argued that ICTs are becoming the basis of a new techno-economic paradigm (Freeman 1992). Castells, for example, speaks about the 'informational mode of production'. The argument of a paradigm shift in production puts the territorial aspect to the forefront, as it stresses the moment of organisational and institutional embeddedness of production processes. Here we will first discuss the national production and innovation system approach, as it is the strength of this concept to point to the aspect of embeddedness. We will then take up problems related to a paradigm shift in production. Also related to the territorial aspect is the fact that regions are beginning to play a major role in the economic transformation process.

12.1 Companies in Their Environment

We have argued earlier that to be able to stand on their own in global innovation competition companies have to totally restructure their work and business organisation. The feasibility and profitability of organisational restructuring processes depend on factors that transcend the scope and 'direct' efficiency of the restructuring efforts of individual enterprises. Even the efforts affected by the experiences and knowledge received from other firms may not guarantee a successful organisational transformation process. They will depend on 'higher-level organisations' and institutions that can provide additional input for the restructuring process (Teubal 1998: 9). Because of the fact that companies depend on the support of other economic actors to renew their business structures successfully, we can talk about a production and innovation system (Lundvall 1992, Nelson 1993, Edquist 1997, OECD 1997).

[8] This chapter is based on the Irish, Belgian and German reports.

The concept of 'embeddedness' (Granovetter 1985) is directly related to the effective functioning of national production and innovation systems. Teubal defines the embeddedness of a business enterprise sector within the national system of which it is a part as follows: we can speak of embeddedness, “whenever the institutions and links with other agents/organisations of the system, and their capabilities, provide business enterprises with flexibility and the possibility of speedy and continued adaptation in response to changes in the environment” (Teubal 1998: 16). The capability of enterprises to adjust requires, as Teubal continues to argue, “a set of distributed capabilities located in other agents/organisations which enterprises have access to” (ibid.). Of course, benefiting from such access institutions and links among the two sets of agents must be appropriate; otherwise such access is useless for companies. In addition it must be stressed that embeddedness provides the capability of adjusting for only a limited set of minor changes. We will argue later that in the case of changes that radically alter the prevailing techno-economic or production paradigm, embeddedness may even become dysfunctional.

In the literature focusing on technical innovations the term national innovation system is often used. Narrowly defined this exists in the R&D departments of firms, universities, private and public research institutes, technology transfer institutes and government agents involved in technology and innovation policy. However, such a narrow definition does not take into account the fact that innovativeness very much depends on adequate organisational structures, the intelligent use of modern ICTs and on educated workers. Innovations often occur directly in the production process through 'learning by doing' or 'learning by interacting'. Therefore, the term 'national production and innovation system' is used, which also includes schools and training organisations, investment banks, economic associations and other government agents responsible, for example, for labour market policy or training and education policy. The idea of a system takes into account that due to the intensive exchange of knowledge, information and other resources, it often makes no sense to regard firms as isolated individual decision-

makers. Instead, it becomes useful to analyse firms embedded in a network of other actors.

Companies not only interact with other organisations, but are also embedded in an institutional environment together with them (Edquist 1997). The function of an institution is to "regulate the relationships between people and groups of people within as well as between and outside the organisations" (Edquist and Johnson 1997:51). It is useful to differentiate between the following of the functions of institutions:

- to reduce uncertainty by providing information

- to manage conflicts and co-operation

- to provide incentives (ibid.).

Among the institutions that reduce uncertainty by providing information, technical service systems as well as patent laws and other intellectual property rights have to be mentioned in the first place. Concerning institutions that have the function to manage conflicts and co-operation, we can mention practices of job security within companies and other kinds of institutions that regulate conflicts provoked by innovation processes such as security arrangements, education and retraining rights or labour market arrangements. Among the institutions that provide incentives to companies to engage in learning and innovation activities we can differentiate between the pecuniary and non-pecuniary ones. The first category includes tax allowances, income taxes and property rights to knowledge and ideas while the second one covers a variety of very different institutions such as, for example, cultural elements, mechanisms of distributing status and prestige, or the normative regulation of co-operation and participation (Edquist and Johnson 1997: 52-54).

The national production and innovation approach argues that in each country there are specific organisations and institutions that provide security for the production and innovation activities of companies. Dosi (1982) took up the idea; he differentiates between a technological paradigm and specific national trajectories. According to Dosi, a technological paradigm embodies strong prescriptions on the directions of technical change to pursue and those to

neglect (ibid.: 15). Freeman defines a techno-economic paradigm as a set of dominant common-sense guidelines for technology and investment decisions.

A technological paradigm can take various national paths of development, each formed by a specific organisational and institutional setting. National trajectories emerge from a technological paradigm; they represent the way of problem-solving which is typical of a national economy. Once a national trajectory is established in an economy, it becomes a 'technological regime' which will dominate the thinking and acting of engineers, managers and designers for some decades (Nelson and Winter 1982). Dosi's differentiation underlines the argument that there is no single logic in technological development, since it can be shaped by the national socio-economic environment.

The concepts of technological trajectories and paradigms offer some understanding of how technological development proceeds. However, they identify technology as a driving force behind socio-economic change. Although social shaping is accepted, it is still too much technology-centred. A different view gives preference to the socio-economic development; new technologies become effective if they fit with and support socio-economic change. It then makes sense to consider - parallel to the notion of technological trajectories - “the development of different organisational trajectories namely specific arrangements of systems of means oriented towards increasing productivity and competitiveness in the new technological paradigm and in the global economy” (Castells 1996: 153).

Schienstock (1997a) argues in a very similar way suggesting a distinction between a paradigm or 'Leitbild' of production, which opens up a new field of ideas as to how to resolve problems of production and trajectories of production that can be described as the dynamic aspect of a production paradigm. He also stresses the fact that a production paradigm can unfold itself in different development paths. A given production trajectory will undergo successive improvements which will make it perform better and will by this very fact be selected for future renewal strategies. In each country there are only limited options for transforming a production paradigm into

concrete organisational practices, as the existing institutional setting and cultural patterns restrict the number of alternatives for organisational renewal.

The concept of path dependency somehow assumes a stable institutional and cultural environment. Organisational renewal takes place through adaptive learning, which means that companies undertake organisational changes to be able to fully exploit the productivity potential of the existing trajectory. The situation, however, is quite different when a new production paradigm is about to replace the old. In such a situation there is no development path which channels the process of organisational renewal; on the contrary, the traditional trajectory, still in existence, may become a hindrance for the unfolding of the new production paradigm. Past experiences show that path dependency can also lead to so-called ‘lock-ins’ (Grabher 1993, Johnson 1992). A ‘lock-in’ exists if a specific development path in an economy exhausts itself, which is indicated by a loss of competitiveness, retarding economic growth and increasing unemployment

In the following a distinction is made between a ‘structural’, a ‘political’ and a ‘cognitive’ lock-in. One can refer to a ‘structural lock-in’ when most of the resources of an economy are bound to one or only very few industries, leaving no space for industrial diversification, and when the organisational and institutional setting is mainly tied to this economic structure. A ‘political lock-in’ exists when a power structure between some economic actors has been firmly established and when this dominant coalition is able to hinder any new development that is not in its interests. Finally, we can speak of a ‘cognitive lock-in’ if economic actors, because of earlier successes, continue to adhere to the dominant governance structure even if it can no longer ensure global competitiveness.

What we have discussed so far on a theoretical basis has taken place during the last decade in several industrial countries as companies have learned to increasingly exploit the productivity potential of the Fordist model by adapting their production structures more and more to the rationale of this model. However, this has become a hindrance to them in undertaking fundamental organisational changes exploiting ideas of the new paradigm of a ‘production

paradigm', whether we call it 'informational mode of production' or 'network economy'.

Therefore, the term 'system' might be misleading in some way. It makes one believe that only if strong ties between economic actors are developed, can 'production and innovation systems' function effectively. By strong ties we mean both intensive and particularly exclusive relationships between economic actors. But these are also a major cause for a restrictive transmission of knowledge and for small-scale innovation activities only. The traditional institutional setting and the dominant cultural patterns have kept companies from undertaking radical organisational innovations.

The unfolding of a new production paradigm, we can conclude, can only take place together with fundamental institutional and cultural changes (Perez 1987). The process of transforming a new organisational logic into a national trajectory must become an inter-organisational exercise (Lindberg et al. 1991). While reorganising their internal structure, economic actors - companies and supportive organisations - have to continuously monitor each other and to exchange information in dialogues and multilogues to stabilise the new production trajectory (Sabel 1994).

While embeddedness can become dysfunctional for a radical economic transformation process, characterised by the breakaway from a specific development path, it is crucially important for the stabilisation of the transformation process. If, for example, pioneer companies, having started a far-reaching and highly uncertain restructuring and innovation process, cannot find support from the infrastructure and the organisations housing it, they may give up.

Embeddedness is even more important for the full transformation process, which includes a fundamental change of the whole business sector. Successful examples of pioneer enterprises may not trigger a cumulative transformation process that also includes early followers and late-comers. Such a pervasive transformation process depends on organisations that can provide new knowledge and inputs related to organisational restructuring and technical innovations. The extension of the transformation process to an

increasing number of companies depends upon the emergence of new, collective organisations which can anticipate and at the same time satisfy the needs of imitator firms. By providing information and knowledge about firms' restructuring strategies, those intermediary organisations, for example technology centres, can promote cumulativeness of the business sector transformation process.

This analysis cannot be reduced to the structures in the national environment that are supportive of the production system only. As the evolving information society may also cause new forms of social inequality and exclusion, as we will discuss later, one can question whether traditional institutions conducting labour market and social policy can handle the newly emerging problems. Therefore the analysis of the current transformation process based on the new production paradigm changes must be extended to the institutional environment dealing with problems of social exclusion and inclusion. It also becomes important to analyse whether cultural changes take place, and in what way they support new policies in order to avoid a segmentation of society.

12.2 The New Economic Role of Regions

Research has shown that companies anticipate more success in regaining global competitiveness if they benefit from the specific advantages of their regional environment. Those companies that have reacted specifically to different environments have been more successful than others who believed in a ‘one best way’ of organising business (Kern 1994). Due to intensive global competition, companies are forced to look for the most supportive environment for specific functions or products world-wide.

As cost leadership has to be combined with high quality, quick delivery and product differentiation, companies break down their value chain into discrete functions and locate them where they can be performed most effectively wherever companies can take advantage of the local environment. (Ernst and Lundvall 1997). Cost-sensitive production is transferred to those regions with cheap labour while knowledge-intensive production and services will be

located in regions with highly qualified labour and a well-developed information infrastructure.

Companies' restructuring is directed by the concepts of 'product or functional specialisation', which means that each production area within a globally organised company concentrates on specific products or even parts of products on the one hand or on specific functions on the other. This is true not only for larger companies but also for medium-sized firms. New transport and information technologies facilitate this kind of global organisation of companies' production and innovation processes. Moreover, as production becomes more knowledge-based, advantages such as a developed research infrastructure, a highly qualified workforce or an innovative culture are becoming more important factors for companies to select the production side than natural resources.

Companies also have to globalise their production because they have to adapt to the specific needs of their customers in different parts of the world. Companies therefore locate discrete functions where they are needed to facilitate the penetration of highly dynamic markets. Ernst and Lundvall stress the importance of systematic globalisation. For them globalisation not only has a quantitative but also a qualitative aspect; this implies “a shift from partial to systemic forms of globalisation. In order to cope with the increasingly demanding requirements of global competition, companies are forced to integrate their erstwhile stand-alone operations in individual host countries into increasingly complex international production networks” (Ernst and Lundvall 1997: 11f).

Outsourcing is an important part of the companies’ global organisation of production. Due to their concentration on core activities, and the subcontracting of others on the one hand, and the easy storage and transport of information on the other hand, delocalisation of data processing activities is increasingly feasible. As distances play no part in the transfer of data, the region where activities are subcontracted and the region where these activities take place, are not necessarily the same (Goorden 1997). Marketing, for example, can take place at the headquarters of a company

while the processing of data which will produce the needed information for decision making can actually take place in a spatially distant department.

From what has been said so far we can conclude that a supportive environment for companies can be deliberately created. To make a location attractive to foreign investment but also to keep local companies in their territory, governments can set up specific organisations and institutions to support their innovation strategies. In this respect, it might be that region-states are more appropriate for designing supportive environments than nation-states. Ohmae (1993), for example, argues that in an increasingly borderless world the nation-state is becoming dysfunctional. Instead, the region-state, according to Ohmae, is the ‘natural’ economic area since it represents genuine communities of economic interest and can take advantage of true linkages and synergies (economies of scale and agglomeration) among economic actors. Regions have to seek competitive advantages by mobilising all their assets including institutional organisational and governmental assets where these exist, or demand them where they do not.

In their pursuit of competitive advantages, regions have to specialise. The more companies follow a strategy of ‘product or functional specialisation’, the more regions have to react to this strategy by developing unique advantages in specific fields of technology. These include universities conducting basic research, an efficiently functioning system for monitoring new technological developments, high standard and internationally connected libraries that allow easy access to all relevant knowledge, a highly skilled and competent workforce with particular knowledge in the field of the regions' technology strength, an experienced management which has specific knowledge of all relevant markets, highly specialised supplier firms able to produce parts of high quality and the latest technical standards. Such a specialised agglomeration economy has several advantages:

– the co-presence of many different kinds of producers offering specialised inputs and services in timely and flexible response to on-demand needs

– the learning effects that are engendered by the constant interaction between producers within trans-national networks

– the emergence of local pools of labour with agglomeration-specific skills and forms of habituation

– the cultural and institutional infrastructure that invariably come into being in and around industrial clusters and that are often crucial to the effective operation of the entire local socio-economic system

– the development of trust relationships between regional economic actors (Scott 1996).

12.3 ICTs as Means for Regional Development[9]

ICTs, it is often argued, offer opportunities for regions to develop internal growth strategies. As the number of contacts between companies as well as with support organisations and their complexity increases, there is a growing need for efficient information and communication. There is a growing market especially for the delivery of information services, which are indispensable for these core activities. The many data related to logistics, sale, management of stocks, personnel policy or product features which are communicated daily between the network partners have to be organised efficiently. Besides this, information directed to individual consumers is also growing.

Together with the emergence of electronically supported organisation networks a regional development is possible that prevents polarisation between ‘endogenous’ and ‘exogenous’ growth. In a Fordistic area the exogenous growth model was common. Regions would attract large companies through low wages and subsidies. But this seems not to be a solid basis for regional development any longer. Rather many regions are switching to mobilise the endogenous potential and their own SMEs.

Networks can synthesise the exogenous and endogenous development of a region. The growing complexity and need for information offers opportunities for small companies to get involved in mutually advantageous co-operation

with large companies. This tendency towards networks of core businesses, mobile companies and local SMEs could allow underdeveloped regions to get involved in activities with higher added value. The qualification potential of the region can be developed without the employees having to move or without companies having to establish a location in that region.

Valenduc & Vendramin (1998), however, oppose the 'myths' of ICTs as a means for regional development. One myth, they argue, is that ICTs reinforce decentralisation and put central and peripheral regions on the same level. This myth tells that local enterprises will have access through ICTs to new markets and new information sources. They will decentralise the activities of information processing away from the urban centres. Moreover, they will contribute to better access to health services, education and entertainment. They will reinforce democratic participation in regions far away from the centre of decision-making. Finally, they will promote cultural diversity and reduce isolation. As such, however, ICTs could as well reinforce the control possibilities of central regions on peripheral ones. They allow for delocalisation of activities to the areas with worst labour conditions. They will impose a uniform culture.

Therefore, ICTs by themselves do not lift the barriers to regional development, such as a lack of enterprising culture, a lack of available qualifications, defensive public policies, etc. The delocalisation that does happen is comparable to the industrial logic in which standardisation and division of labour create simplified tasks that require fewer qualifications. This dequalification in its turn allows these activities to be disentangled from the urban centres where qualifications are traditionally higher. But higher value adding activities remain in central regions. Indeed, data may be easily transferred everywhere, but qualifications are not uniformly spread over all regions.

Another 'myth' concerning ICTs is that they wipe out distances and therefore flatten differences between regions. However, ICTs are not implemented in the first place to bridge distances, but to master complexity. ICTs therefore do

[9] This section draws extensively on the Belgian report.

not automatically bring solutions to problems related to periphery or rurality. Next to distances, many other factors remain important in the choice of location: the environment, the human resources, the dynamic and innovative features of the local economy and community, local partners,…etc. Although ICTs do diminish the weight of unfavourable aspects linked to distances or isolation, in the same time they do enhance the weight of the other criteria. ICTs therefore lead to a re-evaluation of the nature of comparative advantages between regions.

13. Employment Aspects of the Information Society[10]

Employment is one of the key aspects in the information society discourse. The Bangemann Report (High Level Group on the Information Society 1994), for example, expresses great hopes that the emerging information society will contribute significantly to the overcoming of high unemployment. Other publications are much more sceptical; they anticipate that the emerging information society will have only little impact on employment. Hopes and fears exist but it is quite clear that all anticipations are based on a great amount of uncertainty. It is extremely difficult to calculate the impact of the emerging information society on employment. The debate on this question has raged over the last two decades and, although particularly during the 1980s many studies on different countries and industries were made, this is far from generating a clear-cut answer (Castells 1997: 252ff). Kaplinsky (1986: 153) points to the fact that the findings differ according to the level of analysis: "Process and plant level investigations generally seem to point to a significant displacement of labour. On the other hand, national level simulations more often reach the conclusion that there is no significant employment problem on hand."

Difficulties in anticipating employment effects associated with the emerging information society, result from the complexity of the subject. First we have to

[10] This chapter is based on the German, Austrian, Italian and Irish reports. The last part draws extensively on the British report.

agree on how to measure employment effects resulting from the developing information society. Often the share of information workers in the whole work force is used to analyse employment effects; but there are many different ways of defining the information occupations that make up the information sector of an economy (Enquete Kommission 1998: 118f). Therefore, the range of calculated jobs created by the emerging information society is enormous.

Nonetheless, we cannot restrict our calculation of employment effects to the information sector. ICTs, the technological basis of the emerging society, are unique insofar as they affect every function within companies as well as every industry and service. They contribute to the creation of new products and processes but they also automate production processes; this means that they both create and destroy jobs (Bessant 1989: 27-30).

Therefore, it is important to differentiate between direct and indirect employment effects of modern ICTs. The creation of new jobs for producing and delivering new products and new services can be seen as the main direct effect while the indirect effects are seen in other areas. Freeman et al. describe the diverse effects of modern ICTs, which makes it very difficult to compare the balance of job gains and job losses in information society.

> “The computer industry, for instance, provided machines, which displaced earlier types of electro-mechanical office equipment, whilst the microelectronic industry largely displaced the old valve (tube) industry. With the new digital telephone exchanges which require far less labour to manufacture and to maintain than the old electro-mechanical exchanges, the number of people working in the telephone switch industry has fallen in most industrial countries. Competitive restructuring of the old monopolistic networks has also resulted in a reduction in the number of employees, even though the number of firms and the number of lines and calls has increased. At the same time, however, the new telecommunication infrastructure provides the basis for new information-service industries and equipment, such as e-mail, fax, databanks and the multi-media services on the future" (Freeman, Soete and Efendioglu 1995: 589).

It becomes quite obvious that neither a view of ICTs as simply a process of automation and job destruction nor a view of ICTs as a purely positive source of new employment reflect reality. To assess the employment effects of

modern ICTs in a sophisticated way, we have to take into account both job destruction and job creation. We cannot deduce the overall employment effect simply from information on the diffusion of ICTs.

Another problem is how to define ICTs and how to distinguish them from other technologies. The results very much depend on the technologies or industries included in the evaluation studies. Studies concentrating on single technologies such as robots or the Internet may come up with more concrete results than studies focusing on certain industries or the whole economy. However, due to their reduced perspective, they do not inform about the development of employment in the emerging information society. Although it is very difficult to make any exact calculation of the employment effect caused by the broad implementation of modern ICTs in production, it seems to be undisputed that these technologies will lead to significant productivity gains and will therefore fail as job creating mechanisms, at least in the short run.

Furthermore, and even more important than what has been said so far, no direct relationship exists between modern ICTs and employment. The overall equation must take into account several different aspects; the development of the employment in an economy depends upon the permanent change of social and economic structures in which modern ICTs are embedded (Enquete Kommission 1998: 117). Although modern ICTs may be seen as important factors in influencing employment, they are by far not the only ones. On the contrary, according to Castells "institutions and social organisations of work seem to play a greater role than technology in influencing job creation or destruction" (1996: 265).

The demand for modern ICTs is one significant factor that is of relevance here. The demand for specific technologies, however, very much depends on the information infrastructure available. Furthermore, new products of the equipment manufacturers will only reach a rapid mass market if they provide access to attractive information and communication products. We can assume that nowadays the innovativeness of content and software producers is decisive for the development of employment in the information society.

The substitution potential of new ICTs, of course, also has an impact on employment. Computer-based technologies, for example, have replaced traditional electro-mechanic office equipment. Often less labour is needed to manufacture and to maintain new ICTs compared to the substituted technologies.

There are factors that can hinder the diffusion of modern ICTs and therefore reduce the employment growth associated with technological progress as, for example, legal uncertainties with regard to intellectual property rights, a lack of standardisation, or security of data. Furthermore, financial bottlenecks in the state sector, where the potential for ICT applications is great, can prevent their diffusion and therefore also employment growth. The general economic situation, of course, also has an impact on ICT demand.

In a globalised economy the competitiveness of national ICT producers has a decisive impact on employment growth in each country. Low competitiveness means that jobs related to new ICTs will be created elsewhere. Of course, companies´ competitiveness depends very much on the institutional environment in their particular countries. Therefore, it is important that governments create a supportive environment that helps local companies to stay competitive or even attracts strong foreign companies to invest. Furthermore, the speed of diffusion of modern ICTs is decisive. Rapid diffusion of modern ICTs means that in countries with less competitive firms the employment effect will be reduced compared to cases of slow diffusion. Less competitive countries can only participate in the job creation process caused by the diffusion of new ICTs if they are capable of eliminating factors that cause disadvantages.

When discussing the employment effects of modern ICTs we should not focus our attention, as was mentioned earlier, only on the suppliers of ICTs, instead we also have to take a look at the users of ICTs. The general argument that the use of ICTs reduces employment is too simple. Of course, the fact that ICTs contribute to automation and therefore the replacement of employment cannot be denied. But we have to take into account the fact that the increased use of ICTs can increase productivity, reduce costs and improve competitiveness. This may open up new markets and increase

output. Furthermore, the use of modern ICTs may increase information and knowledge exchange and will improve innovativeness and the development of new products. However, it is often argued that the application of modern ICTs will hardly have positive employment effects; only if these are embedded in new decentralised and more flexible organisation forms and supported by training activities to improve the skill level of the employees, may the anticipated positive employment effects occur. Whether the negative employment effects related to improved productivity and automation can be compensated for by the development of new markets and new products is difficult to anticipate. We also have to take into account tha fact that more competitive companies within a country may oust less competitive companies from the market.

Here we have mentioned only the most important factors that influence the employment effect of the application of modern ICTs and related social changes. Given the diverse effects, comparing the balance of gains and losses becomes a difficult undertaking. Castells (1997: 263) summarises his overview of studies on the topic conducted in several industrialised countries in the following way: "...it seems, as a general trend, that there is no systemic structural relationship between the diffusion of information technologies and the evolution of employment levels in the economy as a whole."

Most researchers agree, however, that the emerging information society may create new jobs to an extent which will compensate for job losses. But in the short run, job destruction may dominate while overall job growth may only take place in a longer perspective. Still, there is no alternative to the rapid introduction of modern ICTs as job losses will occur where innovation is slow. The rapid introduction and application of modern ICTs may help to save jobs as companies increase productivity and become more competitive. Furthermore, there is still the question of where the new jobs will be created. So far Europe seems to be less competitive and may be less successful in increasing ICT-based employment.

13.1. Gender and Age as Factor in Employment

It has been criticised that, with the exception of the industrial dimension, research on aspects of job distribution and segmentation in the information society is hardly available (Enquete Kommission 1998: 118). How job gains and job losses are distributed among various social groups is not yet very well known. Research in this field has mainly focused on the gender aspect, while the differentiating impact of information technology on particular ethnic, national, age and disabled groups has been studied less extensively. The question about who will be the winners and the losers in the information society is still waiting to be answered.

One of the earliest studies on the impact of ICTs on the labour process, taking the gender aspect into account, was conducted by Barker and Downing (1980). This focused on female office workers and proposed that information technology was being introduced as a means of control, routinisation and deskilling, albeit in a feminised way which incorporated elements of patriarchal control into the capitalist model. This Bravermanian conclusion was based on the prevailing stereotype of office work according to which there is a rigid hierarchy of organisational positions, with men on the top and an army of women at the botton doing standardized, formalized, simple routine tasks. According to Rantalaiho (1990) and Korvajärvi (1990), this type of approach should be extended (see also Webster 1996). Office work consists of continuous information processing and it is difficult to say where and what is a product and what is a process. The majority of office work, in Finland for example, consists of producing, distributing, conveying, rearranging, applying and interpreting infomation of various kinds. All this is by no means an unambiguous and visible new product. It is a question of maintaining the past and the recurrent order to guarantee continuity in the work community and in the whole work organisation. Thus in case of ICTs and office work the focus should be also on the everyday gendered practices which include women’s work orientations as a resource for running the work organisation. A more developed version of focusing on gendered practices sees gender as activities, as doing gender (Korvajärvi 1998). Gendering technological practices includes then exploring the complexity of gender, culture and orgnisations in concrete situations.

Cockburn (1983 and 1985) has also stressed the cultural and symbolic aspects of gendering processes at work. Cockburn (1983) examined a form of 'masculine' work - that of type-setters in the newspaper industry undergoing radical transformation as a result of computerisation - and concluded that the concept of 'skill' was itself socially constructed, and 'gendered'. Cockburn (1985) also understands both technology and gender as socially defined. From this social constructionist framework, she argues that some tasks traditionally performed by women such as knitting, although involving a high manual dexterity and computation content are excluded from definitions of technology and technical work. The study of the social and historical shaping of gender in information technology shows how strong a strong tie between male identity and information technology expertise constructed the whole field in one country (Vehviläinen 1997).

A series of case studies in Australia by Game and Pringle (1984) produced evidence that the sexual division of labour changes radically from sector to sector but remains a constant, indeed, a defining feature of working life. Technological change may alter the boundaries between 'men's' jobs and 'women's' jobs, but some boundaries persist. The authors quote the example of the banking sector in which the jobs of managers became downgraded and deskilled at precisely the moment that women started to enter them in reasonable numbers. Conversely, in hospitals the moment that men started entering nursing in large numbers coincided with the upskilling and professionalisation of the occupation. In both cases, a technological change coincided with this shift. They suggest that jobs may not be inherently skilled but are only acknowledged as such as a result of organisation and struggle (Game and Pringle, 1984, p. 17).

The developing information technology sector tends to be dominated by men with autonomous positions, high status and wages but, on the other hand, the majority of IT users are women in subordinated, low-paid jobs. According to Finnish studies, the overall segregation of the labour market seems to be persistent despite changes on the labour market, such as a rise in women’s level of education to that of men, even labour force participation, strong attachment to employment and other structural changes in society. However,

changes inside some individual occupations are possible, but at the same time the general structure of labour market segregation remains. Some occupations may develop towards a more even share of men and women, but at the same time some former even-share occupations become male-dominated and some are transformed into female-dominated (Kolehmainen-Lindén 1997, Rantalaiho 1997).

Several case studies in Finland on the change to flexible work organisation in textile and clothing industries analyse the gender aspect of employment as connected to practices in the use of labour. The result of the research is that work practices on the shop-floor are constructed in the interaction of the technological system and the social system. The gendered work cultures of women workers, stressing codes of commitment and responsibility in teams on the one hand, and the dominating organisational traditions in companies in understanding women's work as simple and subordinated regardless of the actual demands of the work on the other hand, are of crucial importance as to how the implementation process of flexible work organisations proceeds in companies. On the basis of these studies, the writers remark that implementation of new technologies or new socio-technical practices, such as team working, need to be followed both by cultural and social innovations with critical insight and by reflexivity as regards to the traditions of the organisation (Lavikka 1997, Heiskanen et al. 1998). The same conclusion can be made in the case of clerical and white-collar work organisations (Korvajärvi 1998).

Henwood (1993) identifies two main approaches within the substantial body of literature examining the relationship between gender (particularly women) and technology. The first she terms the 'women in technology', the second 'women and technology'. The first focuses on women's exclusion from technical work, with change seen as a function of increased access and further equal opportunities policies. For many feminists working within this framework, increasing the proportion of women in IT and computing is seen as the solution to inequality between women and men in IT. Campaigns such as WIT (Women into Technology) are a central feature of their strategy for change (Henwood, 1993). The second approach is rather broader, examining the nature and development of technological work and its articulation with

changing gender relations, it reflects in particular on the ‘gendering of technological skills and knowledge’ (Henwood, 1993).

The third approach is developed by a Finnish researcher on technology and women, Marja Vehviläinen (Vehviläinen 1997), who questions technology itself, women’s own space and women’s expertise from their own interests’ point of view in technology, asking: How do the knowledge and practices of expertise become socially constructed? Women’s interest arise from their claim on subjectivity, autonomy and citizenship. It is her opinion that technology and gender are intertwined; technology is gendered male. She writes that technology is constructed through artefacts, knowledge and social action where gender is embedded.

Retail and financial service organisations have extended their operating hours in the last ten years. Advances in IT have facilitated the shift towards flexible working through the development of systems to monitor fluctuations in trade. In addition, in some finance organisations, computerisation has changed the skill content of jobs, and the new jobs are considered to be more suitable for ‘non-standard’ workers (EOR, 1996).

The impact of teleworking on family life has been addressed more specifically by Haddon and Tucknutt (1991) and Huws and Gunnarsson (1997). The evidence is contradictory. On the one hand, working at home appears to make it easier to combine work with parenting or childcare by making it possible to 'time-shift' work to fit in with family responsibilities; on the other hand, it creates considerable stress and eats into personal time. Because it is not possible to work and look after young children simultaneously, work is often squeezed into hours when they are asleep or being cared for by others. Kivimäki (1999), a Finnish researcher, argues that it is important to understand teleworking from the perspective of the whole life of employees; for an individual life is a totality and not separate domains. In construction of meaning of a good life, it is communities that matter: the work community on the one hand supports us as citizens, and the family community on the other is our primary source of personal care. For employers, teleworking creates better possibilities in the exploitation of women’s work, and for the society it is important that while teleworking, women are able to attent to their roles as

primary caretakers. From the family's point of view, teleworking gives increased flexibility in organising everyday life during the critical years of early childhood, but the results of the study show that the persons who do telework miss badly their former work communities; they suffer from isolation.

It is a view widely expressed in the popular literature that the possibility of reorganisation of work may open up major new opportunities for people with disabilities to enter the labour market (e.g., Oliver 1995). It thus appears, on the face of it, that the impact of the new technologies may well be to lessen inequalities based on differences in ability. However, comparatively few studies have been carried out to support this hypothesis. There is also some evidence that home-based teleworking may actually exacerbate the isolation of the disabled by keeping them imprisoned in their homes instead of improving their access to external workplaces (Huws, Ashok and Hall, 1986).

Although it seems likely that computer skills are much more likely to be found amongst the young and that older people are more at risk of redundancy when new technologies are introduced, we know of no studies which have addressed this issue specifically, although there have been some general studies of age discrimination at work (Walker, 1997).

14. Social Exclusion[11]

Social exclusion has become the key concept in the international debate on social disadvantages. This signals the increasing awareness of social risks related to the current socio-economic transformation process. At the end of this century, as Touraine argues, the point is no longer a matter of being "up or down", but of being "in or out" (1991: 8). In France the concept of social exclusion, based on the tradition of social solidarity, became popular already in the 1960's and has played a vital role in shaping the theoretical discussion, the political discourse and state intervention since then. However, the discourse on social exclusion did not spread across Europe as a whole earlier than the late 1980s or beginning of the1990s (Silver 1994: 535).

[11] This chapter draws extensively on the British, the German and the Italian reports.

In 1989, the Council of Ministries of Social Affairs of the then European Community passed a resolution to combat "social exclusion and to support integration and a Europe of Solidarity." The Observatory on National Policies to Combat Social Exclusion was established in 1990 by the European Commission. And the White Paper "Growth, competitiveness, employment" published by the European Commission in 1994 called for a fight against exclusion and "the poverty, which so degrades men and women and splits society in two." During the 1990s, several European countries, among them Germany, Italy, Portugal and Denmark, have taken action on social exclusion and have also established new institutions. Recently the British government published a report on social exclusion in that country and has proposed concrete measures to fight social exclusion (Social Exclusion Unit 1998).

While in France the debate about social disadvantages has always focused on a wider perspective of people's active integration into the social dialogue with its policy emphasis on social solidarity, in the British tradition the dominant concept to study of social difference has been that of 'poverty'. This has given rise to the notion of the 'poverty line', an arbitrarily defined and relative income threshold below which people are defined as 'poor' and a policy focus on measures to relieve 'poverty traps' (Parker, 1995) or provide income support (Evans, Paugamand Prélis, 1995).

A different, but related concept, much used in Britain but also in other European countries, is that of 'inequality' (which also tends to be used in an empirical and descriptive sense, rather than a theoretical and dynamic one). This concept is used in relation to a number of different variables, including gender, race, disability and age, which affect an individual's chances of entering employment, obtaining access to skills and earning power. Research on social inequality aims at identifying the disadvantages of specific social groups in comparison to others. Obtaining access to skills, for example, is in general easier for men than for women.

14.1 The Concept of Social Exclusion

The list of attempts to define social exclusion is endless. All observers of this phenomenon agree that it is difficult to give an exact definition. The concept is very vague and ambiguous, as it includes various economic, social and political aspects. During the last years ever more types of social disadvantages have been subsumed under the concept of social exclusion and ever more social groups have been characterised as excluded. Due to this ambiguity, it becomes very difficult to delimitate it from other concepts of social disadvantages. Somehow one can argue that the concept can be made to express virtually anything.

The concept is rooted in the concept of 'social dialogue', which in its turn can be traced back to the notion of society as a body in which all individuals should be included as active participants. Therefore, social exclusion is defined as "breaking of the social ties" (Xiberras 1993). This definition assumes some kind of a clear line dividing "inside" and "outside", it understands social exclusion as a monolythic phenomenon. Crossing the borderline would mean that individuals have become excluded. No gradual scale of membership in a social system seems to be possible, but only abrupt, definitive exclusion. To avoid such a strong demarcation the pair of opposing terms: exclusion/inclusion or exclusion/integration has been introduced (Luhmann 1994). The fact that various degrees of integration can be identified makes it possible to speak of exclusion/inclusion as a relative concept (Xiberras 1993: 25).

As there are many ties that link people with society, social exclusion is seen as a multi-dimensional and cumulative phenomenon (Stichweh 1997). Normal life takes place in various social spheres: work, education, health care, leisure activities, housing, and cultural life, for example. Not participating in one of these spheres cannot be seen as exclusion. For example, lack of employment does not in itself necessarily lead to exclusion, but only in the interaction or in a sequence of collapses of various inclusions. Only those people that do not participate in all or at least the majority of the various social spheres can be characterised as excluded.

The processual character of social exclusion is also very often stressed. Paugam (1993) defines exclusion as a process of ‘social disqualification' that

occurs in three consecutive stages: fragility (under/unemployed but retaining links with society), dependence on social aid (discouraged from work but filling other social roles), and then complete breakdown of social bonds. Castels (1992) also characterises exclusion as a dynamic three-stage process running from full integration through precarious, vulnerable employment and fragile relations to disaffiliation or exclusion. The zone of vulnerability is strategically important as it "designates the crumbling of the social tie before it breaks" (Castels 1992: 138). Exclusion is then perceived as the accumulation of various disadvantages, as the last stage in a process of social disqualification (Paugam 1993).

On the basis of what has been said so far, the notion of social exclusion implies a relative and process-linked vision of degradation with respect to a certain status experienced previously, at the end of which the person finds him-/herself cut off from all circles of social exchange. Therefore, in general, the state of social exclusion pinpoints a situation that manifests a certain deterioration with respect to a previous situation. Integrated subjects can become vulnerable because of organisational transformation in the working environment and these vulnerable people can fall over the precipice into social exclusion. The excluded would then occupy the fringes of social life, characterised by the loss of employment and, then, social isolation. In this way, it is possible to analyse the distinctive reasons and intermediary stages of the process of professional de-qualification in their identified stages within specific and differentiated courses. From this point of view notions such as loss (of role, autonomy, tasks), marginalisation, precariousness or vulnerability seem to be decisively more appropriate to describe phenomena of risk ultimately leading to exclusion that can strike workers whose working environment has been qualified by technological innovations and organisational restructuring processes.

In the following we will further clarify the concept of social exclusion by confronting it with the concept of social inequality. The two approaches differ in the following aspects:

Table 4: The concepts of social exclusion and social inequality compared

	social exclusion	social inequality
areas of society covered by the concept	different areas of society	focus on the economic sphere
dimensions	multidimensional	one dimension
perspective of the concept	dynamic concept	static concept
character of the concept	including subjective aspects: vulnerability	objective concept: distribution of economic resources
political aspect	participation in the social dialogue, empowerment	add resources

While many authors recognise the complexity of the phenomenon of exclusion, we will use a more limited concept, focusing on work (see also Nasse 1992). Employment is seen as the core of the social tie as our modern societies have privileged economic exchange and thus remunerated work (de Foucauld 1992: 6). Now the globalisation of markets threatens social cohesion and social transaction.

14.2 Organisational Restructuring and Social Exclusion

One major consequence of the introduction of the new organisation logic, as we have described it earlier is the destabilisation of bureaucratic career structures enjoyed by a large proportion of managerial and professional staff. Fewer of those in such occupations can now be guaranteed lifelong employment and continuous career advancement (Brown 1995). This does not mean that the restructuring strategies of companies will lead to an absolute decline in the number of jobs in management and specialist functions, on the contrary, projections of the future demand for managerial and professional workers suggest a significant increase. Furthermore, knowledge-intensive business services is one of the few sectors with continuous job growth.

Although there seems to be a growing demand for managerial, professional and knowledge workers, at the same time we can identify an increase in the sense of 'risk' among employees in these occupations. With the demise of the bureaucratic business structure these groups of workers have to accept flexible careers (Brown and Scase 1994). An inevitable feature of 'flexible career' patterns, according to Brown, is that they are inherently insecure (Brown 1995: 36).

A consequence of this development is that unemployment is constantly affecting new categories of people. Those workers who had been employed for a long time in 'normal', that is to say non-precarious, conditions are now being made redundant (Yépez del Castillo 1994: 619-620). Of course, low-skilled workers are more threatened with becoming unemployed than qualified workers, but lay-off caused by outsourcing, streamlining and restructuring often affects middle management and specialists in particular. The outsourcing of the R&D department or its transfer to other countries is one example. In this case not individual, less qualified people are selected to become redundant, but whole work groups and departments are closed down.

Restructuring strategies caused by global competition have contributed significantly to the massive increase in unemployment. What is striking, however, is not the scale of unemployment but its structuration. It is the increasing long lasting nature of the phenomenon that causes severe problems, since more and more workers become long-term unemployed. Salais mentions the proliferation of unstable forms of employment is an important factor that causes long-term unemployment (1980). In a situation of decreasing labour demand it becomes more and more difficult for the unemployed to find a normal, non-precarious employment. Instead, the newly unemployed are constantly moving from one insecure and unskilled job to another, while young and highly qualified people are the beneficiaries of newly created, more demanding jobs. But even the majority of the newly created jobs are based on precarious work contracts.

For those who are unemployed the risk of becoming long-term unemployed and finally totally excluded from the labour market increases exponentially

with the length of unemployment. "This dual trend – precarious employment and recruitment of over-qualified workers – continuously pushes the back of the queue those among the unemployed who are considered to be the least productive (Yépez del Castillo 1994: 620). Women, unskilled workers and persons over the age of 50 are those groups which are mostly at risk of becoming stigmatised.

Often our future society is described as being highly segmented. We can expect, it is argued, that only a small group of core workers will have a secure work status and contracts of indefinite duration. Core workers are those, whose skills are most essential to the main activities of the firm. They are required to accept ‘functional flexibility’ (Beatson 1995), also known as ‘internal flexibility’ or ‘flexibility on the intensive margin’’ (Hart, 1987) that concerns the employer’s ability to vary the allocation of work within the organisation so that changes in their jobs can easily be made when required. Functional flexibility may be accomplished by the introduction of ICTs but this coincidence does not necessarily imply a causal relationship. However, it is clear that a major technological change can provide a pretext for introducing functional flexibility and all the social innovations included, such as multi-skilling or group work. The technology also provides a means of monitoring and managing complex and variable work patterns.

There is, however, a second form of flexibility, often known as ‘external flexibility’ or ‘flexibility on the extensive margin’, (Hart, 1987). This takes the form of varying the size of the workforce in response to changing requirements, whether these involve seasonal fluctuations or responses to changes in customer demand or market changes. These forms of flexibility may involve the introduction of temporary working, part-time working, home-working, on-call working or casual labour (Atkinson, 1995). Workers in this segment can be called peripheral workers, they conduct those activities which are less critical to the firm's core activities.

Many of these forms of flexible working involve the employment of women (Huws et al. 1989). Because these forms involve the rapid movement in and out of the workforce (and hence, very often, the benefit system) and a blurring of the boundaries between work and non-work, it is this type of flexibility

which appears to have the greatest potential impact on social exclusion. Part-time, temporary, on-call or other flexible workers may well find themselves outside the remit of social protection regulations, precarious, poorly paid and socially marginalised (Huws, 1998). Here too, ICTs have played a crucial enabling role, if not a determining one. Typical large supermarkets, for instance, will have up to 200 different shift patterns in operation in any given store in any given week (Huws, Hurstfield and Holtmaat, 1989). Without a computerised system it would be impossible to manage such a complex system either from the point of view of responding to fluctuation in consumer demand or from the point of view of calculating the payroll.

The third group comprises external workers distanced from the enterprise; generally they are service suppliers, subcontractors or self-employed workers. They do not have conventional career perspectives and employment security. It is likely that their status of employment will change very often. People may be employed on the basis of a short-term conventional labour contract, they may work as independent entrepreneurs on a contract, or they may become unemployed for some time. Their work situation will become much more insecure.

Our traditional understanding of core and peripheral workers, however, does not seem to hold true any longer. We can see new risk groups arising, such as middle management, foremen or some specialist groups, which were for a long time seen as core workers, sheltered by ‘internal labour markets’. Obviously for some groups of employees, formerly perceived as core workers, these internal labour markets are about to disappear.

On the other hand, we can no longer equate peripheral workers (without long-term contracts) with those who have a weak labour market position. Among the peripheral workers we can identify at least two groups: highly qualified self-employed specialists who work on a contract basis for companies on the one hand and low-skilled workers performing routine jobs (data collecting and processing) with very flexible work contracts (part-time, etc.). The first group actually has a very strong labour market position, as they can be seen as ‘networked people’, who due to their many connections can easily mobilise all the knowledge needed to solve complex problems.

No doubt self-employment has some advantages such as independence and taking more responsibility. But not all people concerned have chosen 'self-employment' voluntarily; often they are forced to accept this new employment form as the result of the outsourcing strategies of companies. They can be called 'fictitiously self-employed'. Although they have the status of independent employees, economically they are not independent, instead 'de facto' they work as employees dependent on their principle. The fact that an increasing number of normally employed workers is replaced by fictitious self-employed people may become a major problem as the latter are not covered by the protection mechanisms of the labour and social law (Enquete Kommission 1998: 130). Nowadays an increasing number of school leavers also start their working-life as enforcedly self-employed by the unemployment situation.

14.3 Regional Exclusion

It is argued that the globalisation of markets will lead to economic convergence, as it allows each region to specialise and to develop specific advantages that will attract big trans-national companies to invest and set up businesses. This argument, however, ignores the fact that regional specialisation is always tied to the demands of companies. Companies' strategies to organise their production processes on a global scale, however, do not only create chances for a 'high road development'; 'low road development' perspectives are also produced (Sengenberger and Pyke 1992), since for some of their products or parts cheap labour and less restrictive environmental regulations are seen as advantages particular regions can offer.

Because of the fact that companies, when organising their production processes globally, are looking for both a 'high road' and a 'low road' environment, only a limited number of regions can acquire the position of a knowledge and decision centre in global organisation networks (Amin 1993). Many regions, however, although they are integrated into global production networks, are caught in the trap of a 'low road development'; less value

creation seems to be their fate. Often a less qualified workforce, traditional value patterns, ineffective institutions and traditional regulation practices reinforce this development, which makes the changeover from a low road to a high road very unlikely. Instead, the less developed regions compete against each other; economic development becomes a 'zero-sum game', one region loses what the other gains. In their attempt to catch up with the high road regions, less developed regions start to put each other in the shade through low wages, permissive environmental regulations and open-handed subsidies (Schienstock 1997b: 83). This means that social exclusion is no longer a phenomenon associated with individual courses of life only, but it is a collective fate.

14.4 New Forms of Segmentation in the Information Society

It is often argued that the transformation of the traditional industrial economy into what is called information or knowledge society will lead to new forms of social exclusion. Two trends are mentioned to underline this argument. One aspect is that the changing organisation forms of business processes and the emerging network structure in economy will result in prioritisation of certain types of occupations. Robins and Webster mention the following groups: "those which manage and operate across global networks, those which are capable of offering design intensity, those which can provide high added value to products and services through scientific excellence, imaginative skill, financial acumen, or even effective advertising (1997: 9). All these jobs can be characterised as informational; they are increasingly interpenetrated by information work (Castells 1997).

Individuals are working out of physically dispersed workspaces, or even from mobile devices not tied to any particular workspace. In general they work on a short term and consultancy basis, drawing on their extensive networks and renewed knowledge to ensure effectiveness (Robins and Webster 1997: 9). As soon as a solution to the problem has been found, the group dissolves and its members start to work in another group, often with different partners. Their greatest quality therefore is a high level of flexibility. These people are called

information or knowledge workers or symbolic analysts. It is assumed that they will make up about 30% of the whole work force.

At the same time, we can see a continuous transformation of tacit knowledge into codified knowledge. On the one hand, those people whose knowledge can be codified can be characterised as de-skilled, as their knowledge is no longer an asset which is needed in the production process. Soete speaks of an inherent skill bias of new ICTs, as an increasing number of skills are becoming totally codifiable and their importance is dramatically reduced (1996: 53). Those people with outdated skills and competencies will have difficulties to stay in work.

The growth of a group of highly skilled and very flexible knowledge workers on the one hand, and the increasing codification of knowledge on the other hand may lead to a process of segmentation in society. Authors like Reich (1992) or Castells (1997) assume that the symbolic analysts will not only rise in the upper ranks in companies but they will also take over key positions in society from property owners. However, the authors also fear that the great majority of workers, less qualified and flexible as they are, will form a new underclass which will be more or less irrelevant for informational society or capitalism. The information age, according to these authors, will be one which excludes a great majority of people, not only in less developed parts of the world but also in the metropolitan societies.

Lash (1994) also stresses the risk of social segmentation in future society. He speaks of ‘reflexivity winners’ and ‘reflexivity losers’, pointing to the fact that reflexivity is underpinned by an articulated web of global and local networks of information and communication structures. While in industrial capitalism ‘life chances’ and class inequality depend on an agent´s place in and access to the mode of production, “in reflexive modernisation”, according to Lash, “life chances - the outcome of who are to be the reflexivity winners and who the reflexivity losers - depends instead on the place in the mode of information. Life chances in reflexive modernity are a question of access not to productive capital or production structures but instead of access to and place in the new information and communication structures.” (Lash 1994: 121)

14.5 Policy Implications

To preventing or combat social exclusion different approaches have been developed. They are based, as Foucauld (1992) argues, on a concept of social justice different from the one underlying the postwar social consensus which simply insured the population against predictable risks. We can distinguish between individualistic and collectivistic approaches. Individualistic approaches often define social exclusion in connection with citizenship and social rights. The Observatory on National Policies to Combat Social Exclusion, for example, states that social exclusion "can be analysed in terms of the denial - or non-realization – of social rights (Room et al. 1992: 13-15).

The right to work can be seen as a key social right. The emphasis here lies on employment, not on income compensation through social welfare; the integration into the work process is the aim of strategies to combat social exclusion. Therefore, unemployed and school leavers having difficulties to find a job are the main target groups. The following measures of an active labour market policy can be seen as key strategy elements:

- the readjustment of the unemployed to new labour market demands
- the appropriation of wage subsidies for the creation of new jobs in firms
- the promotion of employment outside the labour market.

Training to readjust the unemployed to new labour market demands cannot be reduced to instructing workers in specialised knowledge only. Instead it becomes more important to strengthen their labour market position, as in future an increasing number of workers has to cope with the perspective of flexible careers. Therefore a variety of different skills and competencies such as social skills, learning how to learn, digital skills and management competencies are becoming increasingly important.

There is always the risk that wage subsidies will not create new jobs or at least no stable employment. On the one hand, it is argued that companies will only employ those workers who they need anyway; on the other hand, it is very likely that companies will only hire temporary workers. It is therefore important to combine employment based on wage subsidies with a

qualification element. The promotion of employment outside the labour market dissociated work from employment; this means that people become socially integrated, although they are not occupationally integrated. Furthermore, such a strategy helps people to manage non-employment" (Yépes del Castillo 1994: 621). The promotion of employment outside the labour market is often combined with the strategy to guarantee employment for those people who have been unemployed for a longer period of time.

It is often stressed that to combat social exclusion one has to start before people become unemployed as unemployment stigmatises them and then it is more difficult to get a job. The realisation of the concept of lifelong learning may be helpful to avoid precarious employment and may even support people in starting a new career in a more promising work environment. For workers in precarious employment so-called adaptive qualification can be seen as a possible measure to avoid unemployment. In the case of skill miss-match employees have to acquire new skills through further training inside or outside the company. This strategy can also become a part of companies' human resources management.

For some risk groups continuous learning becomes a hard burden. Elderly people particularly often have difficulties in acquiring the knowledge needed to participate in learning organisations; their position in the labour market may be gradually weakened and in the end they may become excluded from the labour market (Ernst and Lundvall 1997: 15). It is possible to protect such people from being fired and becoming unemployed through collective agreements or legal regulations. The problem here is that protective regulations for specific groups increase the risk of other groups of becoming unemployed. "Social protection schemes have – in part at least – had a negative impact on employment in that they have, in the main, tended to protect people already in work, making their situation more secure and consolidating certain advantages. They have in effect proved to be an obstacle to the recruitment of job-seekers or of new entrance to the labour market "(European Commission 1993: 124).

The following presents a five-stage model of social exclusion and strategies for prevention are mentioned. The process runs from full integration (stable

employment), through forms of precarious, intermittent or seasonal employment to unemployment and long term unemployment and results in the total exclusion from the labour market, when people become unemployable.

Table 5: The process of social exclusion and options for political intervention

Stage 1: Stable and long-term employment
Intervention options: continues further training
Stage 2: precarious, fragile employment
Intervention options: protection agreements, training to overcome mismatch between skills needed and existing qualifications
Stage 3: unemployment
Intervention options: wage subsidies, adjustment training
Stage 4: long-term unemployment
Intervention options: job guarantees, promotion of employment outside the labour market, further training and wage subsidies for firms to create new jobs
Stage 5: final exclusion from the labour market
Intervention options: training to keep workers employable, social aid

Active labour market policy, including measures such as further training, wage subsidies or the creation of employment outside the labour market, may help individuals to avoid social exclusion, but one may have some doubts that this will solve the problem entirely. On the contrary, these measures are often seen as very limited, particularly in a longer perspective. To tackle the problem of social exclusion fundamentally a new solidaristic approach, or as Lundvall and Borrás argue, a new new deal is needed. This is not meant in the sense of guaranteeing material security but of re-establishing boundaries between excluded people and society.

The sharing of work is seen as the key approach towards re-establishing solidarity. The general reduction of working time is discussed as one option to employ more people. Dividing the existing working time among more people by reducing the general working time is, however, seen as a defensive

strategy; a low demand is taken as given. Whether a general reduction of working time will have a significant impact on employment is still controversial, it is more seen as an instrument to stabilise than to increase employment.

Promoting part-time work is also discussed as a strategy for sharing work among a larger number of people. As part-time work is applied to low-skilled jobs in particular, it may help to reduce the problem caused by the rising need for skills and the increasing skill bias. The establishment of more flexible transitions from employment to other social spheres such as education, leisure, family, community and retirement is also seen as a promising approach to divide existing jobs among more people. The idea of such an approach is that if people have a real choice between different activities, without risking loosing their jobs, the supply of labour will be reduced and more people can be employed.

Valenduc (1998) advocates a new balance between flexibility and security. The development of flexible forms of labour requires reflection on their implication on social security. Companies should be able to acquire more flexibility, while offering their workers an appropriate security. Workers may also wish for a more flexible form of labour, without abandoning a part of their social rights. Work legislation and the organisation of social security is too much based on the typical model of labour (one single employment, for one employer, in one place, full-time salaried and for an undetermined time). To combine security and flexibility, a more balanced agreement should be found in industrial relations between collective and individual arrangements. Collective agreements are needed defining a framework in which individual arrangements of working times are possible. Indeed, in addition to the flexibility demanded by employers, workers themselves should put forward their own flexibility requirements as:

- measures to combine family and professional life more easily such as parental leave, career interruptions, compatible working hours with the educational rhythm of children

- measures that allow for lifelong learning and the development of competencies such as systems of replacement of workers in training, sabbatical leaves, credit hours and training holidays
- measures to annualise working times, so as to compensate for peak-loads with longer holidays adapted to personnel wishes
- new modalities to divide jobs, such as ‘job sharing’, free time in compensation for overtime work, additional jobs for night and weekend work, reduction in working time to prevent dismissals.

To reduce working time is generally identified as a defensive strategy to deal with the problem of social exclusion, as a low demand for labour is taken as given. Increasingly the need for applying an innovation-oriented growth policy which aims at creating new jobs is seen as a promising strategy to tackle the problem of social exclusion. However, traditional innovation policy, aiming at encouraging major technological breakthrough, seems to be less effective in creating new jobs. Instead, a policy is needed which creates the general conditions for continuous improvement, incremental innovations and continuous learning in as many companies as possible.

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