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3.8.0 Introduction: Shaping Work and Technology

Peter Brödner and Paul Oehlke

3.8.0.1 New challenges for production and work

Taylor's principles of ↑*scientific management*, later materialised in car production by Ford, leading to pre-determined standard operating procedures for highly specialised work aimed at management control of *obstinate* work processes (TAYLOR 1911, FORD 1922). They rooted in the rationalistic assumption that the world is fully comprehensible in objective terms and, hence, work can be entirely modelled, controlled and removed. This ambition of ultimately replacing humans by machines culminated in the conception of *CIM* (*Computer Integrated Manufacturing*) and flourishing illusions on expert systems (BRÖDNER 1990). Under the historic circumstances of volume production in growing markets for rather simple mass products, this approach could be exploited to its full potential. With increasingly saturated markets and varied consumer demands, however, the pressure for generating complex and rapidly changing products required more manufacturing flexibility and corresponding production strategies. In the long run, this shift of paradigm stimulated new design solutions of work and technology giving a boost to human resource development and vocational education and training (VET).

Crisis of mass production and early redesign approaches

On micro-economic level, strong horizontal and vertical divisions of labour hindered the development and use of human skills and competences needed for more flexible reactions to market demands and at the same impaired the workers comfort and motivation displayed by growing absenteeism, fluctuation and recruitment problems for industrial work. Early responses to these challenges were documented by the publication of 500 company projects of organisational renewal by the *Swedish Employers' Association* (SAF 1975) and the worldwide promotion of new work structures by the car manufacturers Volvo and Saab (NORSTEDT/AGUREN 1973; AGUREN et al. 1976). Hence, the conceptions of ↑*Quality of Working Life* (*QWL*) and ↑*Socio-Technical Design* (*STD*) were on the agenda of European work and technology research. Radical redesign approaches, creating complex tasks in simple organisations rather than simple jobs in complex organisations (DE SITTER et al. 1990), were found appropriate for the demands of a more *diversified quality production* relying on functional flexibility and competence development (PIORE /SABEL 1984; KERN/ SCHUMANN 1984). The *new production schemes* stimulated a practice- and process-oriented shift of VET research and of their ↑subject- and domain-related research methodologies (→5.1.1; →5.1.4).

Scientific criticism and quality of working life research

From the very beginning, quality of working life research has taken up scientific criticism based on a broad range of social and psychological findings (FRIEDMAN 1946; ULICH 1998). The comparative studies of the London *Tavistock Institute for Human Relations* in British coalmines revealed that the collective self-regulation of semi-autonomous work groups was much more productive than systems based on high division of labour (TRIST/MURRAY 1958; EMERY/TRIST 1960). However, there was a long way from the initial investigations via larger-scale experiments in Norway (EMERY/THORSRUD 1964) to modern variants in Sweden (ENGELSTAD/GUSTAVSEN 1993) and the Netherlands (DE SITTER et al. 1990), even in Australia and North America (DAVIS/CHERNS 1976; EMERY 1989, PASMORE 1988; TAYLOR/FELTEN 1993; TRIST 1981). In the course of working life research, the emerging *STD* approach created a comprehensive conception of integral organisational renewal based on ↑democratic dialogue procedures (EIJNATTEN 1993). Particularly in Germany, ↑participatory design processes opened up new perspectives of individual competence development, experience-based knowledge acquisition and the work and technology design approach in VET (→3.8.1).

New demands for applied and interdisciplinary research

Publicly funded research and transfer activities helped to develop and test innovative, skill enhancing and competitive model solutions. Moreover, these challenges demanded from the strictly compartmentalised science systems with sharp demarcation lines between subject areas to cross their epistemological and methodological borders and to overcome their traditional fragmentation by cooperating with practitioners and other disciplines (HERTOG/SCHRÖDER 1989; CORBETT et al. 1991). Analysing existing work and management practices as well as developing new real-life solutions for coping with new demands called for a combination of analytical and applied research in interdisciplinary projects designs balancing the different needs of scientific autonomy and social change. Manifold problems were still breaking up, however, when in concrete research and change processes controversial objectives had to be brought in an always fragile equilibrium within and between scientific disciplines, social partners and governmental policies (GUSTAVSEN 1993; OEHLKE 1994), particularly in VET planning and ↑occupational research on educational profiles (→3.4.1).

3.8.0.2 From national working life programmes to innovation strategies

While the history of national labour research activities started in the late 1960ies with efforts for industrial democracy and humanisation of working life, the perspective shifted to shaping work and technology according to human needs and flexibility requirements in the 1980ies (OECD 1988). With the wider diffusion of IT and the debate on insufficient productivity growth, emphasis of programme makers further turned to organisational innovation strategies and national innovation systems (DOSI et al. 1988, LUNDVALL 1992). In contrast to Nordic countries, however, these efforts lost momentum during the 1990ies in big European economies like in France and Germany, which focused on cost competition policies rather than labour process developments.

Emergence of work-life activities in Europe

Embedded in mutual negotiation practices and work-related legislation, diverse national activities and programmes for industrial democracy and work-life reform prospered and spread from Scandinavia to Germany and France in the 1970ies, to Belgium and the Netherlands in the 1980ies, a decade later to Ireland and finally, with a vigorous incarnation, to Finland rising to a *small giant* of innovative workplace development at the turn of the century (ARNKIL et al. 2003). All these activities generally aimed at improving poor working conditions as well as ↑productivity growth. With the spreading of IT in the 1980ies, new demands for design of work and technology came on the agenda, in particular, to cope with the unsolved flexibility problems of *CIM* that still incorporated traditional organisational patterns (→3.8.5). Thus, the widely discussed *IT productivity paradox* facilitated the dissemination of *lean production* schemes of Japanese origin (WOMACK et al. 1990), which revived the debate on modern forms of work organisation. During a decade of confusion, a great number of allegedly new management doctrines like *business process reengineering* (HAMMER/CHAMPY 1993), *total quality management* or *agile manufacturing* appeared that mostly presented well-known organisational principles under new labels. However, sound analysis of real organisational practices led to the basic distinction between two adverse strategies: While low road strategies are solely directed towards numerical flexibility and overall cost cutting by downsizing and outsourcing, the high road primarily aims at expanding value creation by developing human and innovative potentials in respective organisational patterns (BRÖDNER et al. 1998; WORK AND TECHNOOLOGY CONSORTIUM 1998) dealt with in particular in some sections of the chapter on Occupational Work and Competence Development (→3.5).

Developing and shrinking work and technology programmes

Norway played a pioneering role in putting socio-technical design principles into a succession of programme developments since the late 1960ies starting with the *Industrial Democracy* programme followed by the *HABUT* programme involving hundreds of SMEs in strategic search conferences and dialogue teams (ENGELSTAD 1991) while the *SBA* democratization programme aimed at local networks in a multi-level change strategy (QVALE 1989). Likewise the Swedish *LOM* programme on leadership, organisation and participation (1985-1990) practised such a democratic approach of industrial and local renewal in diagonal communication processes of managers, staff members and foremen (GUSTAVSEN 1992). On the other hand, the more design-oriented *MDA* (People, Computers, Work) and *MTO* (Man, Technology, Organisation) programmes called for close cooperation of different actors in *STD* like researchers of different disciplines, user groups, and component suppliers. Moreover, the Swedish government promoted, from the 1970ies onwards, multifaceted development activities for occupational health, competence formation, and organisational and technological design, which culminated in the *Swedish Work Life Fund* (1990-1995) allocating around 30 billion SEK (more than 3 billion EUR) to 25,000 development projects all over the country (GUSTAVSEN et al. 1996; RIEGLER 1998). Although never spending such *critical masses* for change, a holistic view of industrial renewal emerged likewise in the course of mainly experimental German programme developments (→3.8.1). However, with shrinking funds for transfer projects of the social partners and SME-focused branch projects in the 1990ies, the social impact of work-oriented innovation strategies declined (OEHLKE 2001; FRICKE 2003). A similar fate also occurred to corresponding Dutch, French and Belgian activities set up in the 1980ies (HERTOG/SCHRÖDER 1989). In the Netherlands, the *TAO* (Technology, Work, Organisation) programme (1988-1993) like in France the programmes on *Men, Work and Technology* and *Technology, Work, Employment and Forms of Life* (*PIRRTEM*) were abandoned whereas the *National Agency for the Improvement of Working Conditions* (*ANACT*) established in 1973 plays still an important role by consulting unions and companies. Likewise the *Flemish Foundation for Technology Assessment* (*STV*) has survived carrying out social research on new organisational structures and working methods on behalf of the social partners.

Expanding innovative workplace activities

In contrast to these rather small or selective activities, the Finnish Programmes on Productivity, Ageing Workers and Wellbeing at Work merged 2004 into the enlarged and enriched *Finnish Workplace Development Programme* (*Tykes*) giving evidence of a meanwhile broad belief in Finnish society that organisational innovations may improve both business performance and quality of working life, supplemented by high investments on learning and research (ALASONI et al. 2005). The programme development is embedded in an institutional setting formed by the ↑*triple helix model* of generating innovative solutions through the cooperation of companies, universities and policy-makers

(VINNOVA 2002). Such a grown interaction of the main social actors, in particular the social partners, forms the root of the hitherto extremely successful transition from a raw material-based industrial to an innovative, knowledge-intensive economy while maintaining a socially responsible welfare infrastructure (CASTELLS/HIMANEN 2002). In order to cope progresssively with similar challenges, Ireland has launched a revised *National Workplace Strategy* in autumn 2005 to stimulate the shift to creative and innovative, more value-added and high-skilled activities (NATIONAL CENTRE FOR PARTNERSHIP AND PERFORMANCE 2005). It is based on the experience from the *New Work Organisation Programme* (1995-1998) aimed at managing flexibility demands for change through productive workplace partnership models of high mutual commitment and trust (BUSINESS DECISIONS LIMITED 2000).

3.8.0.3 European activities for quality of working life and organisational innovation

The development of national *QWL* programmes has been reflected in European strategies from the very beginning. There is a broad range of research and information activities by European institutions. Regional and national programmes on working life issues, industrial and employment conditions were funded by the *European Commission* (*EC*) especially under the umbrella of the *European Social Fund* (*ESF*) thereby stimulating the *Social Dialogue* between trade unions and employers' associations. However, the rare attempts to set up institutional links to the influential *Research Framework Programmes* (*RFP*) failed so far; but since 2004, the funding of networking national QWL programmes may pave the way for an integral European innovation approach on work, technology and organisation.

Hardly linked European information activities

As early as 1975, the European Council set up the *European Foundation for the Improvement of Living and Working Conditions* (*EF*). In the same year *CEDEFOP* (Centre européen pour le developpement de la formation professionelle) was founded, followed by the *European Agency for Safety and Health* more than two decades later. All three institutions are organised on a tripartite basis comprising representatives of all EU governments and social partners, but without noticeable cooperation with each other. Their staff members are drawn from the member states and distinguish themselves by professional experience. Moreover, they rely on a network of national experts throughout Europe who prepare case studies and conduct surveys on a broad range of topics. In particular, the *EF* maintains a number of key monitoring tools dealing with industrial relations, working conditions, quality of life and social change thus supporting the formulation of *EU* labour market and employment policies.

Blocked European initiatives and programmes

In the employment and social affaires arena, a wide range of funding activities (e.g. *ADAPT*, *EQUAL*) for multinational projects and national or regional projects has been launched for skill formation, modernising work organisation and creating employment without discrimination. Particularly in the framework of the *European Employment Strategy*, the *ESF* was authorized to promote skilled and trained workforces, to foster innovation and adaptability in work organisation, to develop entrepreneurship, to facilitate job creation and to boost human potential in research, science and technology. Moreover, the Green Paper on *Partnership for a new organization of work* (EUROPEAN COMMISSION 1997, 1998) should stimulate a broad debate on economic reasons, policy challenges and social opportunities for a more flexible and productive, participative and learning-friendly organisation of work. However, some national governments and influential employers' associations were reluctant to accept the Commission's offer to co-finance national programmes by expressing their resistance to new regulations that might limit the prerogatives of management (EIROBSERVER 1999). Accordingly, the Europe-wide *EPOC*-survey (*Employee direct Participation in Organisational Change*) covering more than 6000 firms in EU member states discovered only small progress in advanced forms of participatory, flexible and innovative forms of work organisation except for Northern Europe (EPOC RESEARCH TEAM 1998; ITPS 2001). Even networks of expert teams temporarily established by the European Commission (*European Work and Technology Consortium* 1995-1998; *European Work Organisation Network* (EWON) 1999-2002) to identify *high roads* of skill-based organisational innovation ran out for lack of further support contrasting to the manifold efforts of establishing a European VET research in the perspective of an integrated labour market (→2.6).

European work-related innovation strategies at the crossroads

In spite of a series of analytical studies on anthropocentric production systems and work-oriented design of technologies (LEHNER 1992, RAUNER/RUTH 1991) by the *FAST* (*Forecasting and Assessment in Science and Technology*) programme only very few attempts to include human-centred shaping approaches could be realised in the large European production and information technology programmes. A prominent example was the *ESPRIT* project 1217 on *Human-Centred CIM Systems* with research groups from UK, Denmark and Germany (CORBETT et al. 1991). For lack of coordination between the relevant policy arenas, knowledge on innovative work organisation and work-oriented technology design has been lost. Significantly, a recent *Communication on innovation policy* (EUROPEAN COMMISSION 2003) appeared without any reference to the Green Papers on *Innovation* and on *Work Organisation* (EUROPEAN COMMISSION 1995; 1997), thus re-discovering innovation again as a complex change process, demanding for joint technological and

organisational efforts that "involve all employees in order to make work organisations a collective resource for innovation".

3.8.0.4 Qualitative results and impacts of programmes' development

The activities of the EC and national programmes supporting industry-oriented research and development for improving quality of working life, human-centred design of work and technology and organisational innovations produced, despite all downfalls and differences in details, a number of common shifts in perspective, of procedures and of socio-political arrangements. These basic qualitative results of a *human-centred shift in paradigm* may be summarised as follows.

From reactive safety protection to preventive health promotion

Throughout industrial development, occupational safety and health (*OSH*) issues have become ubiquitous as various machines transforming energy or matter and a growing variety of new or synthetic materials broadly penetrated work processes. They altogether still hold manifold safety and health risks for the workers involved, ranging from accidental risks through noise to hazardous materials (PAOLI/MERLLIÉ 2001). The originally prevailing attitude towards *OSH* issues has been to protect the individual worker against risks of technical accidents or hazardous and poisonous substances after these risks have been identified. Thus, on European level, an *OSH* Framework Directive of 1989 supplemented by individual directives, e.g. on machinery and VDUs, covers a broad range of working environment issues (BIENECK 1992). In the course of development, it has been realised, however, that it would be more effective and less costly to consider safety and health issues beforehand. According to this shift of perspective, work processes and technologies to be used should be designed in such a way that health and safety risks and hazards are *a priori* avoided or minimised already at the source (EUROPEAN AGENCY FOR SAFETY AND HEALTH AT WORK 2005). New types of cooperative intervention connected the design knowledge of engineers and of industrial *OSH* experts with the practical know-how of employees, works councils and management in *health circles* generating *health reports* (KUHN 1992; SCHRÖER/SOCHERT 2000; AUST/DUCKI 2004). Accordingly, the *European Network on Workplace Health Promotion* (*ENWHP*) has been established in 1996 to improve work organisation and working environment, to promote active participation of employees in health activities, and to encourage personal development.

From specialised qualifications to comprehensive competences

New working tasks and procedures as well as the use of new technical devices require adaptations of workers' qualifications. In a *Tayloristic* environment, where design of work processes and technical equipment is up to specialists in planning departments, qualification procedures used to be limited to adapting and training narrow and specialised skills for running the processes. As overcoming the disadvantages of strong horizontal and vertical division of labour is one of the programmes' basic attempts, working tasks are being enlarged and enriched in semi-autonomous work groups so that they provide greater scope of action and more incentives for learning at work (FISCHER/RAUNER 2002). Rather than limited training of specialised qualifications, the new approach emphases the development of broad competences in organisational settings that enable workers to perform a variety of tasks, to become cooperative and proactive members of working teams and to participate in processes of joint work design and continuous improvement (→3.8.3). The workers' ↑*tacit knowledge* (POLANYI 1966) based on practical experience has, combined with explicit knowledge, regained new importance in ↑context-dependent design processes (SATO 1997). This particularly applies to software development and use in computer-supported work processes that require collaborative and discursive efforts of making sense of the artifacts (ENGESTRÖM/MIDDLETON 1996). Accordingly high emphasis needs to be given to the formation of ↑work process knowledge and competences as well as to methodological and communicative skills in VET (→3.8.2).

From techno-centric to human-oriented design of technology

During industrial development, technology has for a long time been seen as an exogenous, autonomously developing factor strongly determining the way work should be organised as well as the qualifications needed for effective use. This ↑*technological determinism* turned out to be a myth, however. Research on the social shaping of technology revealed that technical artefacts themselves are a result of social interests and interactions in scientific research, technological development and design (NOBLE 1984; SALZMAN/ROSENTHAL 1994; BIJKER 1995). In this perspective, technical artifacts are seen as part of an organisation's social structure that they partially embody as *coagulated experience* through design and that, in turn, may effectively stimulate working and learning if designed as tools rather than means of automating routine operations (→3.8.1; →3.8.5). To this end, the artifacts' functions and human-machine interaction need to be designed in a human-centred way supporting rather than replacing human action in work (BRÖDNER 1990, ADLER/WINOGRAD 1992, GILL 1996). In particular, they must allow for and make use of the workers' practical experience, their work capacity, motivation and commitment as main sources of productivity (BÖHLE 1994; Martin 1995). This not only increases quality of work but economic performance as well, as a number of projects – e.g. on work-oriented NC programming, CAD, or production planning and control – could demonstrate (BRÖDNER 1994). More generally, several work and technology design projects revealed that usability and economic efficiency of computer artifacts highly depend on participatory approaches and procedures of software development (MUMFORD

1983, BJERKNES ET AL. 1987, EHN 1988) as carried out in projects of shaping ↑*Computer-Supported Cooperative Work* (→3.8.4).

From division of work to collective self-regulation

Since the 1970ies, increasingly significant indications can be observed for a radical change from industrial to knowledge-based production, in the course of which value-adding processes rely deeply on the creation, sharing and use of knowledge (HELMSTÄDTER 2003). They have become a methodological area of ↑occupational education research which still differentiates between various mixtures of implicit, practical and scientific knowledge in occupational domains and profiles (→5.1.1). Since dealing with knowledge creates more knowledge, innovation, surprise and uncertainty will continue to exist. The new market-driven knowledge dynamics form the background against which cooperative and competence-based forms of work organisation such as semi-autonomous group work, cellular manufacturing or problem solving multi-functional team work (project-type work) have been implemented, not least to make more effective use of technology (BRÖDNER 1990, EIJNATTEN 1993, ANDREASEN ET AL. 1995, NUTEK 1999). They have often been embedded in complementary organisational development projects to establish decentralised and flexible, customer-focused value-adding processes, mostly subsumed under the label of the *learning organisation* (SENGE 1990). Comprehensive organisational and process innovations deeply challenge well-established routines of functional specialisation that emerged during industrial development and that now form a strong social inertia hard to overcome. Changing such grown interaction routines of exerting power and sanctions is a demanding effort of ↑*organisational learning* (ARGYRIS/SCHÖN 1996).

From socio-technical innovation to cultural change

Traditional ways of looking at change emphasised technology as driver and determinant and saw a more or less linear development process from scientific research via technological development and diffusion of technology to organisational consequences. The work and technology design approaches outlined here revised this technology-centred view and replaced it by a more comprehensive understanding of socio-cultural change. Innovation in this perspective includes all kinds of renewal, in particular new forms of organisation, new businesses and new organisational settings in connection with the design and implementation of new technologies (EUROPEAN COMMISSION 1995). The dynamics of knowledge creation, sharing and use compel firms increasingly to cooperate for problem solving, often in the form of temporary cooperation in *networks of innovators* (FREEMAN 1992, 93-120) as an intermediate governance structure between market and hierarchy (SYDOW 1996). As processes of innovation are embedded in a socio-cultural context, from which they draw necessary resources, they require a great number of preconditions: Actors involved need to agree on direction and objectives of the renewal, on the ways of organising collective learning, and on the material, social and institutional resources they need. In accordance with the principles of ↑*evolutionary economics* they, thus, are part of a system of innovation that may provide them with rather conducive or impairing features and conditions (NELSON/WINTER 1982, LUNDVALL 1995). In a wider European frame, there is the task to balance the outstanding challenges of innovative flexibility and social security in a distinct *European Model* built on cooperative work in teams, between companies and social partners (NEUMAN ET AL. 1995; ROUILLEAULT, ROCHEFORT 2005).

3.8.0.5 New challenges of knowledge-based societies

In his Lisbon strategy of 2000, the EU Council announced to make Europe the most competitive and dynamic knowledge-based economy producing sustained growth, full employment and social cohesion. Real development, after half a decade however, indicates an almost complete launch failure except for the Nordic countries. This is due to a confused and inconsistent macroeconomic and social policy, to a managerial crisis and neglect of work organisation issues and to under-utilised and wasted human resources. As the nature of the emerging knowledge-based economy is characterised by unprecedented high dynamics and complexity, surprise and uncertainty are normal and inevitable phenomena, in particular under the conditions of deregulated markets and high competitive pressures. Coping with dynamics and uncertainty requires broad and continuous development of individual competences and collective capacities as well as new forms of support structures and of social security.

Competence-based high road strategies

Since knowledge creation, sharing and use are essential parts of value adding processes, building an effective knowledge infrastructure comprising high-capacity education and training systems as well as cooperative research and science systems is among the most important preconditions for dynamic growth and employment (LENEY 2004). Competence-based *high road* strategies strongly depend on this infrastructure that provides innovation competences on a broad scale. With respect to the dynamics of knowledge and learning requirements, ↑competence formation must be organised in the form of ↑lifelong learning schemes combined with skill-enhancing work processes, organisational settings and ↑industrial cultures (RUTH 1995; RASMUSSEN/RAUNER 1996); they become particularly relevant for ageing workforces in most European countries. Coping with the dynamics and uncertainty of innovation, knowledge creation and use puts extremely high demands on the action competence of individual knowledge workers. Since most of them are working in more or less traditional organisational structures, where they suffer from great discrepancies between

high demands and available resources, they are increasingly exposed to enormous stress. This also applies to new forms of autonomous work that are more directly exposed to market and time pressures combined with regularly controlled performance objectives. These new forms of strain hold unprecedented mental health risks as indicated by rapidly growing numbers of mental diseases (PAOLI/MERLLIÉ 2001). This is another new challenge calling for revived forms of *corporate social responsibility* (*CSR*) and the development and exploration of ↑*sustainable work systems*, in which individual and social resources for healthy work are being maintained rather than consumed (DOCHERTY ET AL. 2002).

Sustainability by social regulations and support systems

Since in knowledge-based value adding processes, in contrast to industrial mass production for relatively stable markets, almost all determinants of work – working tasks, tools, processes, co-operations, and knowledge – are uncertain or subject to risky change, workers need at least some stable and reliable conditions ensuring a safe social existence. Otherwise modern knowledge workers, whether they are skilled craftsmen or senior professionals, will not be able to unfold the necessary creativity and motivation for continuous personal growth and lifelong learning to maintain ↑employability and sufficient capacities for value creation. And they urgently need rules protecting them against the health risks of excessive demands, overload and stress connected with new forms of work (GABRIEL/LIIMATAINEN 2000). Moreover, workers are increasingly exposed to the repercussions of the new divide between a core and peripheral workforce subdued to casual and precarious work, restricted employment conditions and periods of unemployment, low wages and discriminating social support systems, growing poverty and exclusion. Personnel policies singling out older, female and immigrant workers have to be counteracted by creating legislative conditions, collective agreements and technical instruments for their integration and development at work (KISTLER/OEHLKE 2003). Maintaining employability on a broad scale is dependent on regulated and certified systems of skill formation and lifelong learning to keep and develop occupational competence (STEVENS/MACKAY 1991). As the whole system of value creation and competitive business development depends on such frame conditions providing *flexicurity*, *sustainability* and ↑*personal development* at work, there is a strong responsibility of governments and social partners to establish societal support systems in research, education and training as well as to push through basic regulations, e.g. on working time, minimum wages and social security.

Coping with social change in Europe

It is no surprise that industrial organisations and institutions have great difficulties to cope with the ongoing fundamental change. While market requirements for flexibility, innovation and learning are universal, some regions persistently perform better than others. In particular, the Nordic countries own more conducive institutional settings for productivity and growth, for innovation and learning while maintaining social security and welfare, on the basis of which they outperform the rest of Europe on the way into the ↑knowledge-based society. There is an uneven distribution of human-centred forms of work, organisation and technology use ensuring functional flexibility of companies for strategic operations which may open up new markets for products and services as an expression of employment-creating *high road strategies* to innovation across Europe with the Nordic countries on top and a distinct slope towards the South (EPOC RESEARCH TEAM 1998, NUTEK 1999, ITPS 2001, BRÖDNER & LATNIAK 2003). In other countries *low road* strategies more or less prevail, backed by long-term deregulation policies and downward adjustments of social systems. They determine the ultimate form of negative integration in Europe: “harmonisation by erosion” (EUROPEAN COMMISSION 1998, 47-49). However, the high ranking of Nordic countries according to criteria of human development as well as of international competitiveness gives evidence that positive forms of integration by sustainable innovation strategies, fostered by public interventions and work-oriented research policies might also have a future in other European countries. Moreover, the *high road* perspective of socio-economic development in the knowledge society demands a thorough shift of paradigm from the era of industrial division of labour in mass production to ever expanding cooperative forms of organising work and value creation built on participative design of work and technology, on intra-firm and inter-firm cooperation, regional and national settings for comprehensive innovation efforts and continuous VET opportunities as well as on corresponding development coalitions between main social stakeholders in a genuine ↑*European Social Model*.

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Authors:

Brödner, Peter, Dr.-Ing., Research Director of Production Systems at the Institute of Work and Technology of the Science Centre North Rhine-Westphalia, Focal Points of Work: Design and Implementation of Computer-Supported Work Systems; Organisational Change

Oehlke, Paul, Dr. phil., DLR Project Management Organisations for the Federal Ministry of Education and Research at Bonn, Focal Points of Work: Public Labour Policies, Social Innovation Strategies and Development of Work and Technology Programmes