

# The Relation of Computers and Work

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*“Twenty five years ago this rapid development and its dramatic changes were partially foreseen by activists starting to discuss the questions of the interference between computers, humans and work ... A quarter of a century later it is now time to ask whether the problems they discussed are settled and/or obsolete, or whether they still exist and have become even more urgent, perhaps through the addition of new ones.”*

**Key words:** Computers and work, participatory design, computers and society, quality of working life.

## THE WORKING GROUP (WG) “COMPUTERS AND WORK” - AIMS AND PURPOSES

The IFIP Technical Committee 9 Working Group “Computers and Work” was founded upon the recognition that computerisation poses significant opportunities and threats for those who work with information and communications technologies. It was in 1977. Since its inception the WG seeks to understand and advance the interests of workers throughout the design and use of computer systems. This was due to the work of Harry Braverman [1974] who stated that computerisation could establish a new relation of power within organisations. In this perspective the computerisation of work was seen as a threat for the workers. The introduction of IT could lead to dislocation, de-skilling and less influence on their own work. It aims at the exploitation of living human labour. In consequence new concepts of human work and qualification have to be

developed and the democratic rights of co-determination have to be strengthened.

Neutrality of technology was considered to be a management myth: computers are not artefacts, neutral machines, but a medium which establishes a new relationship between users and the work place, and this relationship is due to design. Therefore the WG focuses on the design of new work practices: the roles designers, managers and workers play during design and the different ways to design: including the different perspectives of those who are affected by design or excluding voices.

In pursuit of these aims, the Working Group is not attempting to establish itself as a separate field of study. Rather, it aims to serve as an international, interdisciplinary communications and organising forum at the intersection of other larger and more established communities of interest - most notably and in no particular order:

- computer supported co-operative work (CSCW);
- information systems research;
- feminist research;
- computer human interaction (CHI);
- social issues in computing;
- participatory design (PD);
- sociology of work and others.

The Working Group needs to draw upon the ideas and initiatives in these other areas and at the same time bring work-oriented perspectives to them.

## **A short statement about the current status of our domain**

An important aspect of early Working Group activities was cooperation between researchers and unions, especially on design issues. This is seen in the first WG 9.1 conference, Systems Design For, With, and By the Users, which represented an important event in the development of Participatory Design. Since then the focus of WG 9.1 has widened. Today, computer use is a common activity in everyday life. Yet, for the most part, those who design computer system hardware and software remain puzzled by, and often ignorant of the conditions of use by those on the non-technical side of the digital divide. The Participatory Design Conferences, held biannually since 1990, are committed to bringing together researchers and practitioners from the humanities, social sciences, and applied sciences to report on ideas and explore new ways of applying these ideas together. The conferences and their written record in proceedings, journal articles, books and special journal issues, have been rooted in the idea that understanding the use of technology is essential for informing design. In particular the conferences have argued that people who use technology should actively participate in the design and development of the products and services they use.

## **The main issues in our domain**

- Developing approaches, methods and tools for inclusive system design;
- Fostering the mutual understanding between designers and users;
- Establishing a platform for the exchange of ideas and best practices of different cultural ways of system development;
- Privacy - Especially the permanent threat of privacy through networked ICT is a lasting concern and topic of discussion, particularly since the twin necessities of collaborative remote work transparency and control are increasingly seen as a Janus head;
- Monitoring the activities to promote ICT in our societies, e.g. the European Policy Framework for eWork. There needs to be an ongoing discussion if the goals of the Lisbon strategy of the EC for the next decade are to be implemented in work practice: “to become the most competitive and dynamic knowledge-based economy capable of sustained economic growth with more and better jobs and greater social cohesion.” <http://www.eto.org.uk>.

The Working Group will continue to organise conferences, which aim at discussing and exploring solutions for better work practices in a knowledge economy. The dissemination of experiences is the core of group activities.

## **COMPUTERS AND WORK – A RAPIDLY EVOLVING RESEARCH AND DEVELOPMENT AREA**

On May 16, 2003 the author searched the Internet for hits for “computers AND work” using the search engine Google. After less than a second the search engine found 6.650.000 hits. This impressive result shows how broad this field of interest is. The field has exploded in the last 40 years and nobody can overlook all the facets of this topic. In the Green Paper “Living and Working in the Information Society: People First” [COM-96-389] the European Commission (EC) states that we are living through a historic period of technological change. The societal changes brought about by the development and widening applications of information and communications technologies (ICT) are dramatic, especially in the last decade. This technical revolution enhances efforts in restructuring the economy and the organization of work as well as other aspects of life. It is expected that this process will be both different from and faster than anything we have seen before. Using the potentials of raising flexibility and mobility, it is a huge threat to the existing situation and a huge potential for wealth creation, higher standards of living, working, and better services. But there will be winners and losers and new stratifications between supra-national organizations, national states, and regions and within all those entities.

This development is accompanied by a process of globalization, which increases the level of interdependence and intensifies global networking. As we all experience, ICTs are an integral part of our daily life, providing us with tools and services in our homes, at our workplaces in schools and especially in our leisure time. The Information Society, as a guiding vision for future development of ICT and their application [Computerization Committee, 1972], is nowadays not a society far away in the future, but a reality in daily life. It is adding a new dimension of growing importance to society: the production of goods as well as services is becoming more and more knowledge based. Comparable to the changes to working life, work organizations and productivity caused by the division of labour it is assumed that the division of knowledge will fuel societal innovation and change for the coming decades. The European Commission is aware of the challenges caused by this development. The speed of introduction and adoption of ICTs varies between countries, regions, sectors, industries and enterprises. The benefits, in the form of prosperity, and the costs, in the form of the burden of change, are unevenly distributed between different parts of the European Union and between citizens. This is not only specific for Europe but also, and even more threatening, for less developed countries as well. People are worried and demand answers to questions about the impact of ICTs. Their concerns can be summarized [COM-96-389, 3] in two main questions:

- The first concerns employment: Will these technologies not destroy more jobs than they create? Will people be able to adapt to the changes?
- The second question has to do with democracy and equality: Will the complexity and the cost of the new technologies not widen the gaps between the industrialized and less developed areas, between the young and the old, between those who have the knowledge and those who have not?

The 1996 Green Paper aimed at stimulating the debate on the Information Society to focus on the key issues of the organization of work, employment and social cohesion. This leads from statistical questions about the number of new jobs / losses to questions of organizing new workplaces and the quality of work. Current activities try to summarize the implementations and shifts towards “eWork”. This includes continued development of telework, with its opportunities of raising flexibility in time and place. And it includes a greater concern for the “quality of work” and anticipates the changes in work for most people as new wireless and display technology change office equipment and design, and as the nature of work itself changes in a knowledge economy where creativity and innovation became more important than simple productivity in routine tasks [eWork, 2001].

## **THE HISTORIC DIMENSION – DISCUSSIONS ABOUT COMPUTER AND WORK IN THE 1980's – A LOOK BACK**

Twenty-five years ago this rapid development and its dramatic changes were partially foreseen by activists starting to discuss the questions of the interference between computers, humans and work. They were mostly from academia and some were working for or with trade unions. The discussions they had and topics they raised are still of great interest today. A quarter of a century later it is now time to ask:

- Are the problems they discussed settled?
- Are the problems obsolete now?
- Do they still exist?
- Are they more urgent than before?
- Which new problems have arisen?

In 1979, at the second Conference on Human Choice and Computers Heinz Zemanek mentioned the state of art dealing with the human-computer relation within IFIP: “We still have, however, to convince a couple of IFIP pessimists of the usefulness of the committee and its working groups, pessimists, who would prefer IFIP to remain restricted to purely technical work” [Zemanek, 1980]. This reluctance to integrate societal questions into the design of hardware and software remained within IFIP, as in other professional organizations at a national level. In most of the national or international science communities of computer professionals the discussion of possible negative or unknown societal impacts of computing either did not take place or played a minimal role. Negative impacts were ignored. Despite that, the political system reacted by funding research and development in Technology Assessment and Technology Forecasting e.g. in the USA, The Netherlands, Denmark, Germany etc. These are some of the countries where institutions were established to scientifically answer questions related to the societal consequences of the introduction of the new technology. In Germany, for example, these conferences on Human Choice and Computers were very well perceived and had impact on those politicians and officers who were responsible for the funding of research and development on national level. As a result research programs were established to influence the ongoing process of enculturation of ICT into society [Alemann & Schatz, 1986].

Not the professional elite as a whole but only a few scientists, societal groups and politicians were concerned about these new technologies, well aware that new or improved technology does not mean simultaneously societal or individual progress. It was the time of disillusionment with technological progress and awareness of its societal risks: nuclear risks (accidents in power plants and problems of storage of radioactive wastes),

“limits to growth”, resource shortages, energy crisis and environmental pollution. In particular, the anti-nuclear movements in Denmark, Sweden, or Germany at this time showed that a narrow disciplinary focus on technology was overrun by much wider perspectives aiming at the usefulness of a technology for society as a whole.

At the same conference Fred Margulies argued, that the computer, in his opinion, constitutes the most important, most powerful, most human-oriented and most revolutionary tool ever created by mankind. “It is bringing about more changes in our lives that we are usually aware of. It tends to attack taboos and to extend activities beyond the border lines.” [Margulies, 1980]. He pointed out clearly the main concerns against the introduction of computing. He saw a twofold menace for the labour force through computerization, namely, it threatens to take their jobs away and leave them unemployed or it may downgrade their present qualifications, leaving them with jobs even more boring and less satisfying. He concluded that there are human choices to computerization but they should not be taken by scientists or politicians but by the people themselves: “not for the people but with the people”. One should realize “that in looking for alternative work organizations we must not try to design systems for other human beings to fit in. If we want to improve the quality of working life, if we want to humanize work, our main target should be to give the people concerned the maximum amount of freedom and self-determination” [Margulies, 1989].

And by his speech he formulated the credo for the Working Group 9.1 “Computers and Work” and lots of similar activities known as Participatory Design or Scandinavian Approach still going on in this century: “My understanding is that the social consequences of technological and economic development, to a very high degree, are being decided on plant level, or sociologically speaking, at the basis. It is essentially the question of how far the workers and employees are given the possibilities to influence those decisions, to participate in all decisions concerning work organization, investments, technologies etc. Industrial democracy by that description seems to constitute one of the main prerequisites for human choice. It can only be brought about if all those really interested in technological progress and in well-functioning man-machine systems, if engineers, social scientists, workers and trade unions all in their own well-founded interest will work together. Industrial democracy and human choice, to my mind, essentially means finding new solutions not for the people but with the people” [Margulies 1980, p. 16].

## COMPUTERS AND THE TRANSFORMATION OF WORK(ING LIFE)

A series of conferences, at the international and national levels, discussed in detail questions of “the human side of information processing” [Björn-Andersen, 1980]. From the beginning, the use of ICT was discussed per organizational and system level: how can this technology help to design better organizations and jobs, how can organizational change be introduced? And since the beginning there was careful discussion on the role of the system designers as agents of change and as those who decide what the remaining jobs would look like [Mambrey & Schmidt-Belz, 1983]. There is until now an ongoing discussion on the role of the designer in system design. Should the designer act as a neutral facilitator or as a missionary pursuing specific goals? Hedberg [1978] advises that designers should adjust their roles; they should be reluctant to provide organizations with goals and to assist them in problem solving because the amount of rationality within organizations is often overestimated. Most organizations invent their goals after the fact in order to explain what they have been doing [Weick, 1969]. “Designers who want organizations to behave more rationally – as they do in the textbooks – can cause serious problems by providing problem-solving systems for action-taking organizations, and by overstating the directive role of organizational goals” [Hedberg, 1980]. The politically and ethically based position of Margulies who sees designers developing human-centred systems which assist industrial democracy as a common goal, is augmented by Hedberg who argues functionally. He sees a lack of rationality (Lindberg’s “muddling through”) and the need for self-organization for an organization to survive and succeed in a changing environment. This assumption, following biological metaphors of an organization (living, surviving, learning, developing, shrinking) totally contradicts the assumptions on the role of designers as change agents for organizations in Business Process Reengineering approaches developed later by Hammer and Champy [2001]. They follow mechanical metaphors of an organization and see organizations as mechanical rational systems that can be decomposed and recomposed and thereby rationally constructed.

Pettigrew [1980] promoted his understanding of organizations as political systems being influenced by interest groups, which form within organizations around a variety of axes and for a variety of reasons. These interest groups all have different preferences and objectives; there is not “the” organizational goal identifiable and implementable into socio-technical systems. As a key requirement for system designers, Pettigrew sees their capacity to understand and influence the political processes surrounding their attempts to create change. Here the designers act mainly as communicators – as medium making goals and perspectives explicit and

open for a joint bargaining process amongst the participants. In accordance with this thought, Hedberg argues that system designers should only rarely design information systems, because the design should be turned over to the people who use and need information systems. “Computer specialists can act as translators and facilitators, and information analysts can help people in organizations to structure and grasp their information flow. But systems design should evolve from within organizations” [Hedberg 1980, 28].

This position takes the organizational level as the arena for design and redesign, where different interest groups interfere in the shaping, enculturation and further development of a technical application within an organization. Briefs [1980] stresses the more general perspective on a macroeconomic level. For him, computerization is intimately linked to the conditions of economic stagnation and crisis. It is a management strategy to react to unfavourable conditions in the environment of organizations. “In a social system which is based on the exploitation of living human labour this strategy produces overwhelming negative consequences for the working class. Trade unions will have to defend the interests of the working class by an enlargement of collective bargaining and by a policy to promote full employment. Furthermore they will have to develop new concepts of human work and qualification. A further prerequisite is a thorough democratization of production and control in the economy” [Briefs, 1980, 53]. This position insists that designers work within a societal framework, which determines, to a remarkable degree, their work and restricts their autonomy or freedom to act. The first twenty years of research on the relation of computers and work were dominated by research in specific areas (figure 1).

Figure 1: Constant research areas in the field of computer and work

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|---------------------------------------------------|
| Automation, unemployment and job creation         |
| Codetermination rights                            |
| Computers and the quality of working life         |
| Health hazards                                    |
| Job satisfaction; job enlargement, job enrichment |
| Industrial democracy                              |
| Privacy and autonomy                              |
| Surveillance                                      |
| Access                                            |
| Equity: distribution of wealth and resources      |
| Individual responsibility and ethical judgment    |

Often research was biased in visions of future work as an Utopia or a Dystopia (options and risks; opportunities and threats etc.). The main questions were and still are:

- Who or what regime determines the way that work is organised, with what material outcome?
- Who or what regime determines work practice, with what material outcome?
- Who or what regime determines the way people communicate, with what material outcome?
- Who or what regime coordinates people, with what material outcome?
- Who or what regime determines the skill level, with what material outcome?
- Who or what regime determines the time and location of work, with what material outcome?
- How can designers help users to shape technology and work practice according to their needs?

Actors and regimes framed the space for applications of computers and work: actors who acted within a given arena and regimes that determined and framed but did not prescribe the freedom of action for individuals and groups. A lot research activity was undertaken to answer these questions [Greenbaum & Kyng, 1991]. Especially ethnographic field methods as analytical tools for design [Suchman, 1987] and participatory approaches as action research strategies [Briefs, Ciborra, & Schneider, 1983] became new paradigms in socio-technical system design [Schuler, Namioka, 1993]. The ambivalence of technological development for employees and working life was the main concern during this time [Doherty et al., 1987].

## **FROM TELEWORK TO NETWORKED WORK**

The visions of computer use, its problems or societal impact during the early period of discussions about computers and work, were based on the use of computers for office work, clerical work, located at a well defined place and to a fixed time. The cooperative aspect of networking people was low, the dyadic relation dominated, and one can see it in the headlines for this topic: humans and computers, computers and work, computers and society. Computers stood alone at the workplace and were visible “big as behemoths filling a room”.

At the end of the 90s, in different countries, the discussion about telework started. It became very clear that a new period in the relation of computers and work had begun with new options to shape work, organisation and work practice and with new risks in decreasing the number and quality of jobs [Clement, Kolm, & Wagner, 1993].

New metaphors for the technology appeared: disappearing computers, ubiquitous computing, and ambient computing. And new metaphors for work and organisation appeared: virtual work, networked work, telework,

virtual organisation etc. The computer was transformed from a technical artefact to a medium coordinating people and processes. It lost face, place and time – the network dimension of computing began. In their preface to the book about telework, Korte et al. [1988] reported on the new dimensions caused by telework for structure, routine, and the content of office work. The increased implementation of telework for these will imply extensive structural changes in companies and at the work place. By linking office automation with telecommunications, telework will allow considerable decentralisation of office work, with regard to both its location and organisational control. The new perspectives and aspects of telework were discussed in depth: economically, organisationally, legally, socially, psychologically [Korte et al., 1988]. The perspectives with regard to the relationship ‘computer and work’ dramatically evolved:

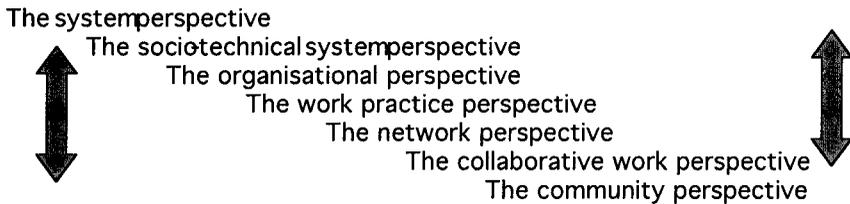


Figure 2: Perspectives of the relation between computers and work

Recently, new methods of work and work organisation are being discussed. Especially within the context of Electronic Commerce, the research and development of new methods of work attracts a considerable amount of research funding of the European Commission. In 2000, the Member States of the European Union adopted a strategy for accelerated development of the knowledge economy with the objective for Europe “to become the most competitive and dynamic knowledge-based economy in the world, capable of sustained economic growth, with more and better jobs, and greater social cohesion” [European Commission, 2001]. Networked computers and networked work give options to:

- New action spaces;
- New knowledge spaces;
- New types of cooperation and coordination of processes and persons.

This raises new questions, in addition to the well known areas of change, and requires new regulations and practices concerning:

- Trans-local forms of working and organisation, virtual organisations;
- Trans-local forms of codetermination and participation;
- Group growth, awareness and alienation;
- Computer based assistance and human functions in organisations;
- The role of coordinating mechanisms in virtual organisations;

- Global working (24 hours and 7 days);
- ...

In recent research, the economic dimension is more often in focus than the social dimension of work. And, furthermore, the focus on networked work, especially on assisting technologies (hardware, software, and protocols) often neglect, that “it is labour that remains the source of productivity, innovation, and competitiveness” [Castells, 2001, 90]. Martin Carnoy [2000] has documented the transformation of labour in the new networked economy: self-employment, part-time work, temporary work, subcontracting, and consulting are expanding in all advanced economies. As a general trend, following Castells, the “organization man” is out and the “flexible woman” is in. He mentions the requirements of work in the economy: labour must be able to reprogram itself into skills, knowledge, and thinking, according to changing tasks in an evolving business environment, as well as constant re-training and re-learning processes that continue throughout adult life. Castells sees a revival of work autonomy [Castells, 2001, 92] the possibility of organizing work beyond Taylor.

Actual tasks and research fields enrich the preliminary questions raised in figure 1.

Figure 3: Actual tasks and research fields (enriching fig. 1)

How can we shape:

- Virtual working environments for collaborative work;
- Knowledge division within virtual organisations;
- Keeping knowledge in an organisation;
- Augmenting glocal (= global and local) work;
- Technology and laws to avoid overall transparency and control;
- Collaborative communities, community building;

Despite these open questions we all use computers, networks and communication facilities for our work. Are we forced to use this technology? Who forces us? Are the concerns not really strong enough? Do we personally see more opportunities than threats from networked work? The main question still remains open: do computers enhance or degrade the quality of working life?

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