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# DataBase Special Issue - Information Systems: Current Issues and Future Changes

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## Information Technology at the Turn of the Millennium: Past, Present, and Future Trends

The International Federation for Information Processing (IFIP) has a long history in facilitating interaction among researchers and practitioners. Directions for future investigations are stimulated and set through working group activities and working conferences. Two working groups (WG) that have been active over the last few years are WG 8.2, which has as its scope the development and use of information technologies in organizational contexts and WG 8.6, which is specifically concerned with the diffusion, transfer, and implementation of information technology.

In 1996, WG8.2 held a conference on *Information Technology and Changes in Organizational Work*; in 1997, a second working conference addressed issues of *Information Systems and Qualitative Research*. The sister WG8.6 group sponsored conferences in 1995 on the *Diffusion and Adoption of Information Technology* and in 1997 on *Facilitating Technology Transfer through Partnership*. During this period, many of us realized that a joint working conference focusing on the multi-faceted challenges of IT related change would be relevant, timely, and of significant interest to all.

The joint working conference between WG8.2 and WG8.6, held in Helsinki, December 1998, on *Information Systems: Current Issues and Future Changes*, created a rich forum for addressing key themes and concerns of interest to both groups. Keynote papers were invited from Peter Cochrane, Robert W. Zmud, and Peter B. Checkland. Thirty-three contributions were accepted.<sup>1</sup> An electronic version of the proceedings is freely available at <http://www.bi.no/dep2/infomgt/wg82-86/>

### **The Face of Change**

In discussing the conference and proceedings, as well as the introduction to this special issue, we (the conference program co-chairs and guest edi-

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<sup>1</sup>The call for papers brought a total of sixty-five contributions. The double-blind review involved three referees per contribution. The program committee and the program co-chairs selected 33 papers, position statements, panels, and tutorials. Contributions were revised by authors, in light of reviewers' and program co-chairs' comments, for inclusion in the conference proceedings.

tors for this special issue) found ourselves engaged, quite predictably, in lively conversations about "the times" in which we are living. We talked about information technology and its role in the knowledge economy; the pace of change; and the extent to which we were, or weren't, living in unusual or accelerated times. We speculated that each era most likely saw itself as unique and important — where the contributions, struggles, and experiences of its people were unlike that of any other. Indeed, each is unique; *but* the nature, import, and legacy of those times remain for us to debate.

What, then, is special about our time? Could it be the very sensitivity that we, as a global community, have internalized about time itself: what change means, and what access and information-flow enable, especially as we approach the year 2000, that most daunting marker? Perpetually, we live and work on "fast forward" in an environment where the only constant seems to be change. In his keynote address, Peter Cochrane (1999) told us: "We are living at a time of unprecedented change with technology advancing faster and producing more new opportunities and problems than ever before. Computers and telecommunication (IT) have not only created the means to generate even more information and do more in a shorter time, but they have also created the means of storing, accessing, and transporting information on a scale that was inconceivable just 10 years ago." And he warned us of the irony: if we "are to keep up with a world of technology, that is increasingly changing faster than we can now accommodate, we have only one course of action. We have to embrace technology to cope with the changes introduced and provided by technology."

These are important issues to debate. Past events, as represented to us in history books and through news media, document ecological catastrophes and cleanups, population movements of great magnitude, long-standing wars, systematic suppression and repression, economic upheaval, and, indeed, dramatic changes in technology. People who have lived through epochal shifts and transformations might claim that the changes we are experiencing are relatively benign in nature and limited in scope; minor reorientation within larger patterns of global change. When considered against the political and environmental problems we face today, we might liken IT change to the rip-

ples and rings that form after we have tossed a pebble into calm waters. Meanwhile, a tidal surge three hundred feet high may be close by.

In keeping with the principle of "bounded rationality" (Simon, 1955; 1956; 1991), perhaps we, as "inner members" of the IT clan, have become a little obsessed with IT change and with change for change's sake. Is our objectivity compromised? Is the development and use of IT so anchored in the industrialized Western societies' culture, norms and economies, that we privilege the IT-related changes that claim to make our lives so special?

The true pace of change may not be as rapid as we think; and we may have a significant wait before IT performs as intelligently as humans do — if ever (Stork, 1997). In computing studies, it has long been thought that IT would prompt radical shifts in organizational structure and in how work is performed. Here, also, social transformation has not occurred as swiftly as predicted. In 1958, Leavitt and Whisler (1958) anticipated that in the 1980s the use of mathematical programming, operations research, and simulation of higher-order thinking through computer programs would become part of the manager's daily routine. Use of the computer would alter managerial work and shrink the middle management layer. For decades, these changes eluded us (Hunt & Newell, 1971).

More recent developments confirm some of Leavitt and Whisler's predictions (Applegate, Cash, & Mills, 1988). Today, the middle management population is reduced. Newly introduced management control systems, executive information systems, telecommunication networks, e-mail, topic-specific global databases, office automation, standard packages, data warehouses, and the multi-media web are just some of the IT services, which have facilitated these changes. Leavitt and Whisler speculated that modern computer use would lead to centralization. Today, however, we see centralization, decentralization, and outsourcing occurring simultaneously. And as the role of middle managers shifts from control (over the execution of planned activities) to feeding organizational innovation processes, the need for managers may climb again (Dutton & Ashford, 1993).

IT advancements over the past decade still have tremendous usage potential, as yet unexploited

and unexamined. Some developments may have questionable benefit for a host of reasons, including cumulative effect and social consequence. For example, what may be a sound or reasonable decision for an individual organization may, in sum, have problematic social ramifications. Centralization of knowledge and increased efficiency threaten to jeopardize full employment for all (Rifkin, 1995).

In 1996, the European Commission recognized precisely these issues in its green paper on the challenges raised by the transition to the information society. The paper acknowledged that while the adoption and widespread use of information and communication technologies offer great opportunity for the creation of wealth and increased standards of living, there are many concerns still to be reckoned with about the impact of the information society on the quality of life. Two key questions are framed:

- "Will these technologies not destroy more jobs than they create and will people be able to adapt to the changes in the way they work?"
- Will the complexity and the cost of the new technologies not widen the gaps between industrialized and less developed areas, between the young and the old, between those in the know and those who are not?"

(European Commission, 1996).

Meaningful employment for all is clearly a foundation for developing and securing democratic rule. We suggest that the least problem we are facing is that "perfectly reasonable micro decisions make macro nonsense (Van de Ven, 1986)"; the real challenge is that "perfectly reasonable micro decisions may make macro calamity." With regard to the IT development process, we recognize a tendency to choose oversimple models. For example, many researchers hold to Rogers' (1995) diffusion of innovation theory, even though there is ample evidence that the theory only works under limited conditions (Wolfe, 1994) and that complex innovation processes usually do not evolve along simple paths (Van de Ven & Poole, 1995). The information society promises to bring fundamental changes to how we do our work — changes requiring us to rethink our systems and to build complex, dynamic models and simulations, to discover new balances between flexibility and reliability, generalizability and specificity, and innovation and stability.

We may disagree on the magnitude and meaning of the present rate of change in IT. However, there is general agreement that knowledge management represents a major driving force behind organizational learning and change (Nonaka & Takeuchi, 1995; Argyris & Schon, 1996; Brown & Duguid, 1991; Lundberg, 1991). As part of an ongoing process, every private and public organization must decide how to utilize IT to gain competitive advantage and support core competencies. Change is something that many of us have to deal with and often; it is not reserved for the elite, for top managers, top engineers, R&D, or formal organizational units mandated with innovation. Our ability to manage knowledge and handle change feeds more requirements for flexibility and malleability, in turn, raising expectations for products and solutions tailored for smaller and smaller target segments — to *our* needs. Increasingly, tailoring and customization are becoming core activities. This, then, is our pragmatic platform: IT-related change is a part of our everyday lives; we must address these changes to the best of our ability to increase the probability of utilizing this tool to our benefit.

Many books and articles have been published about positive and negative impacts from IS/IT development and use. Examples of impact areas addressed include business value, organizational effects, (work) group effects, deskilling, and effects on the individual level. Within each of these broader areas, economical benefit or loss, magnitude of change, impacts on the formal and informal social structure, changes in job content, and information satisfaction have been explored. Research and trade publications, in business and public administration, are positioned on all managerial levels: strategic, tactical, and operational.

The subjects we have been discussing here — technological advances that outstrip our understanding of consequences and raise quality-of-life issues, rapid change in dynamic environments, and tendencies to mass customization; the space between being data rich and information poor — are symptomatic of the tensions that many of our conference contributors addressed and critiqued.

The Twenty-First Century economy is taking shape. As ideas turn over with increasing rapidity, knowledge and experience are at a premium. Process engineering is giving way to workflow

management; object technologies are maturing; and knowledge management is the dominant issue for senior managers. We must make the best use of whatever partial knowledge that is available to us. How can we combine highly focused research with the broad lens of experience? How can we make theory practical and practice generalisable?

Since we need to integrate our understanding of the field, as well as envision the challenges ahead, the working conference objective was to present practical and theoretical frameworks that explore the nature of IS/IT-related change. Of special value was the coupling among theoretical thinking, effects exploration, and practical managerial guidelines. As we approach the 21st century, we ask: what do we envision in IS/IT development and use? How might we integrate our understanding of knowledges, processes, and technologies, in the organizations of the future, to better serve learning and work?

Consequently, our theme for this special issue is change and its many faces. We have been in the enviable position of considering articles from a conference proceedings of outstanding quality. We have selected those that we believe best represent excellent documentation and discussion of issues and commonly held beliefs or truths at the IT crossroads. We have looked for authors breaking new ground and forwarding new and original ideas, in subject matter and research methodology. Finally, we have tried to include contributions that reflect the richness of the topics discussed at Helsinki event. There is something to be said for depth — for including articles under a narrow umbrella. However, to do so would be to contradict the spirit of the Helsinki conference and the agreement that we reached there on the multifaceted nature of IT related change. This is our challenge at the turn of the millennium.

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