

Information Technology and Changes in Organizational Work: Images and Reflections

Wanda J. Orlikowski
Massachusetts Institute of Technology

Geoff Walsham
Department of Management Science
The Management School
Lancaster University

Matthew Jones
Management Studies Group
Department of Engineering
University of Cambridge

The papers appearing in this volume are the collection of articles and panels presented at the 1995 IFIP 8.2 Working Conference on *Information Technology and Changes in Organizational Work*. It is widely accepted that work and work-life in the industrialized societies of the late Twentieth Century are undergoing a profound transformation in terms of aspects such as the nature of work and job security at the personal level, changes in practice and instability of structures at the organizational level, and increasing interconnection and globalization at the national and international levels. Information technologies are deeply implicated in these transformations, and the papers in this volume explore some of the relationships between these information technologies and the ongoing and possible future changes in organizational work.

The papers present a more complex picture of the relationship(s) between information technology and new forms of organizational work than has typically been the case. This comes from critical, empirically-based analyses of practice, and the innovative application of a range of theoretical approaches (both new and more established), enabling us to move beyond traditional

technocentric narratives to reveal other stories. These stories are not univocal but present multiple perspectives which are sometimes complementary, sometimes contradictory. Further, many of the papers seek to locate changes in organizational work within a broader context of social transformation and social discourses. These papers illustrate historical precedents for current changes, but also offer a picture of possible new forms of working and organizing.

Taken as a whole, the papers do not offer, either singly or collectively, any definitive conclusion about the relationships between IT and organizational work. Instead, they offer an array of accounts, concepts, and critiques which more than anything reveal the particular intellectual and pragmatic sensibilities underlying our current discourse on these relationships. This discourse is animated both empirically and conceptually, and we can read in it both images and reflections on the nature of organizational work as approached from the analytic and practical lens of information technology. The *images* offered by these papers focus on organizational practices around information technology including both technological development and the creation of new kinds of organizational work and processes. These images provide critical, empirically-grounded analyses of the role of information technology in a range of contemporary and situated work practices. The *reflections* embedded in these papers concern the theoretical concepts and approaches we, as researchers, use to make sense of and investigate organizational practice around information technology. They reflect on us as scholars and the particular ways we see, understand, and act toward our phenomena of interest.

1. IMAGES OF PRACTICE

One major set of papers in this volume focuses our attention on the practices of designing and using information technology in organizations, and on the assumptions, ideologies, motivations, methodologies, omissions, and implications of such practice. Three broad categories of practice emerged from the set of papers accepted for the conference. The first category comprises the production of new forms of work, and whether, how, and with what implications information technology plays a role in facilitating this creation. The second category concerns the practice of business process reengineering, the most recent in a line of managerial approaches intended to reform organizational work and to create innovation and flexibility through the deployment of information technology. The papers raise a number of important questions about this practice, questions involving its conceptual contradictions and its mixed results in implementation. The third category involves systems development, the process responsible for the design, construction and deployment of information technology in organizations. Reviews of the practices employed by systems analysts and designers, as well as their expertise, methodologies, and techniques reveal a range of unarticulated and questionable assumptions about the nature of work and the process of organizational change. They also point to some significant omissions in the conception and conduct of systems development, most notably the exclusion of nonhuman stakeholders and human bodies.

1.1 New Forms of Work

Zuboff argues that despite the many calls for new organizations and new forms of work, the possibilities for transforming organizations remain severely limited by assumptions and imaginations locked in a prior discourse of industrialization, control, and hierarchy. She argues that current

attempts at “changing” organizations have focused on reengineering, downsizing, and obtaining operational efficiencies, rather than on fundamentally challenging and reinventing the nature of work and organization. She points to a contemporary absence of “moral leadership” in organizations, and suggests that notions of an information economy and informed organizations will remain illusory if traditional assumptions about work and control are simply repackaged in new ways.

Zuboff’s critique of contemporary managerial practice is continued by a number of authors who critically examine the role of information technology in the workplace and the ideological nature of knowledge work, business process reengineering, and information technology itself.

Fuller, Hartman, and Raman deconstruct the nature of “knowledge work” and reveal how it embodies a set of assumptions, ideologies, and illusions about professional labor, intellectual skills, and expertise which are contradicted in practice. In the various empirical cases they consider, a range of possibilities are seen to characterize the application of information technology to knowledge work — displacement, visibility, reskilling, deskilling, control, accountability, and outsourcing.

The use of computer-based information systems has been seen as an essential feature of the organizational changes introduced in the UK National Health Service since 1990. *Louw* argues, however, that much of the resulting investment in healthcare computerization has been ineffective. Invoking a distinction between proceduralized (structured) and interpretative (semi-structured and unstructured) information, she argues that computerization is unsuitable for systems that use information primarily of the latter type. Drawing parallels with recent developments in cellular manufacturing, *Louw* suggests that it may be better to reduce information processing needs, by, for example, creating self-contained organizational units. She uses a case study of the planning of a patient-focused care system in a British hospital to illustrate the advantages of this approach.

1.2 Business Process Reengineering

Business process reengineering — both in practice and theory — is subject to critical examination by four of the papers in this volume, and found wanting. Conceptual critiques reveal its utopianism, its contradictions, and its lack of novelty. Assessments of business process reengineering initiatives indicate that organizational members report conflicting interpretations and experiences, as well as decreased organizational commitment and job satisfaction after the initiative has ended.

Grint, Case and Willcocks analyze the practice of reengineering using the results of a survey of UK companies claiming to be engaged in reengineering initiatives. The results suggest that these companies were less radical in their approach than reengineering’s proponents advocate, and that they achieved less dramatic outcomes. Given these results, *Grint, Case and Willcocks* question reengineering’s popularity, and why companies seek to ally themselves with its prescriptions even if their practice is different. The authors identify an important dimension of reengineering’s attraction to be its politics. Reengineering, they argue, both denies politics and advocates a form of organizational utopianism, but also proposes a directly political, top-down model of organizational change. They identify information technology as one of the “actors” in this political process, and suggest that part of the effectiveness of reengineering rhetoric lies in its encourage-

ment of a selective amnesia about previous failures of IT-led organizational change. In the light of this assessment, the chances that reengineering will learn from previous experience, as Hamilton and Atchison propose, would seem to be low.

Willmott and Wray-Bliss seek to locate reengineering within a broader discourse of enterprise and to consider the implications for the employees of companies that adopt its prescriptions. They also critically examine the rhetoric of reengineering through an analysis of its claims to establish an “empowered” form of accountability. They argue that the characteristics of reengineering bear little resemblance to those of socializing systems of accountability, and that reengineering remains essentially hierarchical in its approach to organizational control. This exemplifies tensions and contradictions within the concept of reengineering which are likely to give rise to difficulties in its implementation. Such contradictions, however, may also provide opportunities for resistance to the discourse of which it is seen to be a part.

Hamilton and Atchison argue that reengineering has many similarities to earlier IT-led change initiatives, and illustrate this with a case study of a large-scale IT project in Telecom Australia in the 1960s and 1970s, the COMIS plan. They see reengineering as sharing two key assumptions with this earlier initiative: that IT has reached a stage of development such that it fundamentally alters the logic of business process design; and secondly, that existing processes are so inefficient as to require radical restructuring. In the absence of reliable empirical evidence of the long-term implications of reengineering, Hamilton and Atchison propose that the experience of these earlier initiatives may provide insights into the limitations and dangers of such a model of organizational change.

Gallivan describes a case study of a large telecommunications utility company in the USA which had initiated a major reengineering and reskilling program. He examines the perceptions and attitudes of three stakeholder groups, namely the change management specialists, IS managers and employees, and outsiders to the reskilling initiative. Results from the study demonstrate strong differences of view among the stakeholder groups, and Gallivan explains these in terms of the different cognitive frames they hold with respect to the anticipated technological changes, as well as to their assumptions about organizational changes that must accompany technological change to achieve the desired outcomes. Gallivan argues that, where possible, organizations should seek to reorient members’ frames to more congruent positions, although he recognizes the problematic nature of such an endeavor.

Guimaraes examines how the job perceptions of organizational members change following the implementation of a business process reengineering initiative in one manufacturing company. Applying the Job Characteristics Model to this question, Guimaraes assessed a range of attitudinal variables before and after the BPR initiative. He found that while the BPR initiative created a richer overall work environment, as measured by variables such as task identity, skill variety, and job autonomy, employees reported lower job satisfaction and organizational commitment after the business processes were reengineered. Guimaraes suggests that more effort by both researchers and practitioners should be devoted to exploring the negative perceptions employees have of initiatives such as business process reengineering.

1.3 Systems Development

The contributions on systems development raise a variety of critical issues about the efficacy and appropriateness of the processes, methodologies, concepts, and expertise prevailing in the practice of information systems development. Some call for greater integration of approaches from other disciplines into systems development, others argue that the very notion of systems development needs to be problematized, and some urge the reconstruction of systems development approaches in the light of organizational shifts toward new forms of work and organizing.

Westrup calls for an examination of developers' practices to reveal the ways in which these actively constitute the organizations for which they build information systems. That is, analysts construct representations of organizations that require the use of information technologies. In addition, their practices constitute developers as competent and authoritative, and configure users as passive participants. *Westrup* argues that without an investigation of how developers' practices abstract, simplify, and rationalize organizational work, calls for greater social analysis skills by analysts are misguided.

Kuutti further critiques the assumptions embedded in the work of systems designers, pointing to their implicit notions of routinization and automation, and hence their inadequacy in the context of new work practices and structures. However, in contrast to *Westrup*, he proposes that the integration of approaches from information systems and computer-supported cooperative work can inform and elaborate the practices of systems designers. Such connections can help designers integrate the post-Fordist and collaborative work notions characterizing the new forms of organizational work emerging today.

Scarborough examines the influence of IS specialist expertise on the social construction of IT systems as strategic or non-strategic, which has consequent implications in shaping information technology and organizational work. He describes the results from an empirical research study of six IT projects in Scottish-based financial institutions, and shows, using paired comparisons, that the strategic classification of particular projects did not depend primarily on the technology deployed, but rather on the way that the IS function enlisted both the immediate contingencies of the project at hand, and the wider institutional context, in advancing its classificatory claims. *Scarborough* cautions that resultant classifications will, however, remain tentative and uncertain, since they do not represent timeless and universal representations of IS activities.

Gasson and Holland report on a survey of senior information technology managers which found that the majority of tools and techniques applied to information technology-based organizational change projects were oriented toward technical/functional, rather than business, issues. In examining user participation, these authors found that such involvement was heavily skewed toward the implementation stage where most of the requirements had already been "frozen" so that user involvement had little impact. In addition, they found a significant lack of user participation in third party systems development. These findings point to the continued difficulty of changing systems development practices and approaches so as to integrate both a business orientation and user contributions throughout the systems development life cycle.

Baskerville, Fitzgerald, Fitzgerald, and Russo challenge the widespread belief that methodologies can improve the practice of systems development. They question this assumption by contrasting the experiences of developers with the prescriptions of their methodologies, and expose some critical inconsistencies. They argue for the importance of moving to a new systems development paradigm which better accommodates the new organizing assumptions and practices emerging today.

Baskerville raises the issue of security in information systems and shows how mechanisms aimed at reducing direct threats against systems such as software unreliability or physical abuse (first order security issues) have unintended consequences for the organization (second order security issues). In particular, *Baskerville* argues that the first order safeguards embedded in information technologies reduce the capacity for organizations to be adaptable and flexible. He recommends that systems developers include a consideration of second order security issues when developing new systems, and proposes some mechanisms and safeguards for implementing adaptive security.

Finally, the work of *Vidgen and McMaster* and that of *Mingers* force us to reconsider the very objects we choose to incorporate in our systems design practices and methodologies. *Vidgen and McMaster* argue that our tendency to separate nature and society creates problems in systems development, in particular, the elision of nonhuman stakeholders from the analysis. They propose a view of information technology as quasi-object, a representation that captures organizational context *and* technology without privileging either. They illustrate their ideas using a case study of an innovative car parking system which was both an information system and an access control system. They carry out a stakeholder analysis of both human and non-human interests, and describe how the attempted translation of these interests into the black box of a hard(ened) fact was not achieved in this case due to weaknesses in the network of associations between stakeholders.

Mingers argues that most contemporary work in artificial intelligence and information systems perpetuates the Cartesian dualism of mind and body. He draws on a range of theoretical writers to emphasize the embodied nature of human communication and action. He concludes that traditional disembodied artificial intelligence will shed little light on embodied human intelligence, and he calls for the development of AI systems with embodied characteristics. With respect to information systems, *Mingers* argues for the development of technologies that make more use of people's bodies, and for the need to consider seriously the impacts on human society of disembodied technologies such as the Internet.

2. REFLECTIONS OF RESEARCH

As researchers studying information technology and organizational work we have shared in and contributed to the modernist narrative that technology is a powerful agent of change in human history. Yet, as the papers in this volume reveal, there is disquiet about the implicit determinism underlying accounts of technology as a dominant force in organizational life. The assumptions, approaches, and analyses proffered by the papers in this volume, while acknowledging a central role for technology in human history, focus more intently on human doings and institutional influences. By explaining the influence of technology in organizations through the power of social action, whether intended or unintended, these papers reveal their authors' belief in human agency, as expressed in learning and participation, as well as in institutionalization, as evident in the

inscriptions, classifications, and narratives, of, for example, reified accounting methods, standards, and medical ideologies.

2.1 Inscription

Latour raises our awareness of the multiple and interdependent inscriptions that exist in the various systems with which humans interact in daily life. He further highlights the process of delegation in which non-human actors represent, define, act on behalf of, and delimit human behavior. Latour identifies two earlier broad approaches to understanding information technology in human society: first, the rationalist approach which treated humans as largely irrelevant and, second, the humanist backlash which tried to restrict and circumscribe the role of non-humans. Newer approaches such as actor-network theory recognize the weakness of both these earlier approaches, and treat human and non-human actors as part of a network bound together by a set of heterogeneous associations. In this paper, Latour discusses the limitations of trying to identify all such associations. He proposes instead a supplement to actor-network theory involving examining networks by tracing how an indefinite number of entities grasp one another in a limited number of ways. He illustrates this idea with an amusing example of Anglo-French cooperation.

A number of authors seek to apply Latour's concepts, and consider in some detail how the various inscriptions, classifications, and narratives constructed in everyday practice constitute and control ways of thinking, acting, and developing information technology.

Boland and Schultze examine the role of activity-based costing as an exemplar of the use of information technology for inscribing and representing organizational work. They consider the truth claims of those arguing in favor of activity-based costing as a more faithful representation of work than prior systems of cost accounting, by examining the role of a narrative of factory life and its use as a rhetorical device. Boland and Schultze undermine this approach by constructing an anti-narrative in which additional events are added, a later story is told, and the conclusions on the merits of activity-based costing are reversed. The purpose of their analysis is not to argue for the use of a particular system of accounting. Rather, as a more interesting way to think about the organization, ethics, and aesthetics of work, the authors suggest the need to consider multiple narratives which give voice to and allow the construction of multiple inscriptions and representations of organizational work through information technology.

Monteiro and Hanseth continue the focus on inscription and consider the role of standards, particularly those embedded in infrastructures, in prescribing and proscribing forms of interaction with information technology. They describe two examples in the Norwegian health sector, using actor-network theory as an analytic approach. The first example concerns the definition of an EDI message standard for describing the identifiers of a drug prescription, and illustrates how the standard represented a translation and inscription of the pharmacies' interests. The second is an EDI system for the exchange of test results from laboratories to general medical practitioners, the standard for which was initially developed in line with the interests of a particular laboratory. This created problems for other laboratories, and the development of a broader standard to meet all their needs was a radically more difficult translation task.

Bowker, Timmermans and Star explore the ways in which the apparently simple process of designing a classification scheme contributes to the restructuring of work practices and knowledge production and inscribes a moral order. In particular, they describe how classification schemes involve tradeoffs between three areas: comparability, visibility and control. Focusing on the design of a classification scheme for understanding the nature of nursing work, they illustrate how these areas are addressed in practice and the dilemmas that this gives rise to. *Bowker, Timmermans and Star's* analysis provides an interesting background to that of *Louw*, where the adoption of standardized nursing protocols is seen as a necessary and desirable part of the development of patient-focused care systems.

Bloomfield and McLean examine and disclose the ideologies underlying technological interventions to promote empowerment within the UK National Health Service. In an empirical examination of a psychiatry department, the authors show how empowerment of actors, such as patients and health care workers, is not a consequence of information technology introduction and use, but is implicated in the particular psychiatric and technological practices used to develop and implement the technologies. Through their participation in such practices, patients and health care workers are constituted as empowered subjects, and particular forms of organizing are produced and reinforced.

2.2 Learning

The "Learning Organization" is widely promoted, but what this means in practice is much less frequently discussed. *Ciborra, Patriotta and Erlicher* address this question through an analysis of the operation of Fiat's new Melfi plant, where a semi-autonomous work-team structure has been adopted. They propose a model of the firm as a learning organization which they describe as the "learning ladder." This seeks to integrate different learning processes at the strategic, capability and routine level. The authors pay particular attention to the way in which the organizational context both shapes and is created by the learning process. For example, they highlight the way in which interpretive schemes and organizational routines developed in traditional assembly lines, and instantiated in the design of the information systems, hamper the effectiveness of the work-teams. They propose an audit methodology to evaluate the effectiveness of learning processes and describe its application in the new Fiat factory.

Continuing the focus on learning as a central organizing practice, *Beuschel, Van den Besselaar, Krogh and Gowlland* discuss the challenge and opportunity of tele-learning. The technologies available for tele-learning are developing at a considerable pace, but relatively little attention has been paid to complex social and organizational issues. Management issues include leadership, access, control, coordination and the balancing of the different needs of companies, end-users, and the providers of learning materials and technology. Other issues include the economics of tele-learning, and questions of appropriate modes of interaction related to different theories of learning.

2.3 Participation

Mumford explores the ideas of Mary Parker Follett on freedom, and in this empathetic review, revisits the principle of participation and her own work in that area. Follett emphasized the

importance of organizational integration, and believed that freedom for the individual and the group were mutually supportive and enhancing. She accepted the traditional concepts of power, authority and leadership, but redefined them as power *with, joint* responsibility, and *multiple* leadership. Mumford's own work on participative approaches to systems design draws heavily on Follett's ideas, and her objective has always been to increase the user group's freedom to choose the organizational and technical systems that they prefer. Mumford argues that Follett's ideas remain a relevant vision for designing in the technologically-based worlds of today and tomorrow. Indeed, these ideas may embody some of the "moral leadership" called for by Zuboff.

3. IMAGES AND REFLECTIONS: CONCLUSION

Collectively, the set of papers in this volume represent a significant critique of contemporary practice with and through information technology, and pose a substantial challenge to those who would do otherwise. One challenge which arises from the contributions in this volume is how to replace or modify current management ideologies concerning information technology as a support for hierarchy and control with alternative ideologies concerned with using information technology to enable human agency and augment human capacity. A more specific challenge is to consider the role of business process reengineering, and how it reflects prevailing management approaches of top-down control as a means of bringing about organizational change. The papers also challenge the modes and practices of systems development, reflecting and reinforcing as they do, particular views of management, technology, work, and organizing. A contemporary challenge for design practice is how to account for and facilitate non-traditional views of work and work-organization. These papers also represent some challenges for the practice of research, and the need to look beyond simple technocratic explanations of organizational change, and to develop theoretical approaches that engage the complex interaction of social, technical, institutional, and interpretive influences that shape organizational changes in specific contexts.

The ubiquity of information technology in today's organizations and the central role that it plays in the transformation of work give a particular significance to the images and reflections expressed in these papers. They paint a picture of where we have been and where we may be heading, both at the level of practice and that of theory. This picture connotes some of the ambivalence and ambiguity we share about information technology and its relationship to changes in organizational work. We know there is a relationship, indeed, many relationships, but their contours, the what, why, when, where, and how of those interactions elude easy characterization and categorization. Perhaps that is how it should be. The very nature of information technology shifts and changes, historically and contextually, conceptually and empirically. Organizational work too, is a multi-valenced concept as well as a multi-dimensional practice. It has included and continues to cover much territory: clerical, artistic, managerial, craft, supervisory, production, professional, routine, knowledge, symbolic, emotional, informal, technical, individual, and collaborative. Animating both technology and work is the human capacity to act in the world, to construct and use information technology, to define, control, and modify work. Human agency is routine and innovative, mindless and reflective, planned and improvisational. It has both intended and unintended consequences. Most importantly, the assumptions, interests, concepts, approaches, and theories that we use, shape and refine our views of the world and of ourselves.

As views and mirrors, the papers in this volume inscribe, construct, delegate, inform, constrain, enable, highlight, critique, provoke, and promote particular forms of information technology, particular changes in organizational work, and particular understandings of them. We believe that

this rich collection of images and reflections offers much to think about as we grapple — intellectually and practically — with the ongoing issues of inventing and reinventing work and our concepts of work through the particular lens of information technology.

About the Authors

Wanda Orlikowski is the Gordon Y. Billard Career Development Associate Professor of Information Technologies at the Massachusetts Institute of Technology, Sloan School of Management. She received her Bachelor and Master of Commerce degrees from the University of the Witwatersrand, and her M.Phil. and Ph.D. degrees in Information Systems from New York University. Her primary research interests focus on the organizational change implications of information technology, with particular emphasis on organizational dimensions such as structure, culture, work practices, knowledge, communication, control mechanisms, and social cognition.

Geoff Walsham became Professor of Information Management at Lancaster University in 1994, after nineteen years at Cambridge University. Prior to that, he was a lecturer for four years at the University of Nairobi in Kenya, and he also worked for a similar period as an operational research analyst for BP Chemicals. His work over the last ten years has been concerned with computer-based IS and their implications for organizations and society, and he has published on a wide range of IS topics. His current research interests include IS strategy and implementation, GIS, and IT in developing countries.

Matthew Jones is a University Lecturer in Information Management in the Department of Engineering and Judge Institute of Management Studies at the University of Cambridge, UK. He previously held postdoctoral positions at the Universities of Reading and Cambridge where he was involved in the development of computer-based models for public policy decision-making. His current research interests are concerned with the social and organizational aspects of the design and use of information systems and the relationship between information technology and social and organizational change.