COMPUTERIZATION MOVEMENTS AND TECHNOLOGY DIFFUSION

FROM MAINFRAMES TO UBIQUITOUS COMPUTING

Edited by Margaret S. Elliott
and Kenneth L. Kraemer

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Published on behalf of the
American Society for Information Science and Technology by

Information Today, Inc.
Medford, New Jersey

First printing, 2008

Computerization Movements and Technology Diffusion: From Mainframes to Ubiquitous Computing

Library of Congress Cataloging-in-Publication Data

Computerization movements and technology diffusion : from mainframes to ubiquitous computing / Edited by Margaret S. Elliott and Kenneth L. Kraemer.
p. cm. -- (ASIS&T monograph series)
Includes bibliographical references.
ISBN 978-1-57387-311-6
1. Technological innovations. 2. Electronic data processing. 3. Technology transfer--United States. I. Elliott, Margaret S., 1948- II. Kraemer, Kenneth L. III. Title. IV. Series.
T173.8.C67 2008
338.973'06--dc22

200705003

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Dedication

To Margaret's daughters—Allie, Bridget, and Mimi—
and to her husband, Michael.

To Ken's wife, Norine Kraemer.

Acknowledgments

We wish to thank the authors for their outstanding contributions to this book. With their help, we have completed an excellent compendium of research papers that further the work of the late professor Rob Kling on computerization movements. We also wish to thank Samantha Hastings, the ASIST Monograph Series editor, who reviewed the initial and final draft of the book, for her helpful suggestions. We are grateful to John Bryans and Amy Reeve from Information Today, Inc. for their help in managing the publication of this book. And finally, last but not least, we give special thanks to Kathy Honda for her help in making the conference arrangements, communicating with participants, editing the papers, checking the page proofs, and keeping us on track throughout the preparations for the conference and for this book.

Foreword

Dr. Suzanne Iacono
Acting Division Director of the Computer and Network Systems
Division of the Computer and Information Sciences and Engineering
Directorate of the National Science Foundation

The views expressed in the foreword do not necessarily represent the views of the National Science Foundation or the United States.

This book is a significant contribution to scholarly study in Social Informatics and a tribute to a distinguished scholar, Rob Kling, who was professor at the University of California, Irvine from 1973 to 1996 and at Indiana University from August 1996 until his death in 2003. One of Rob Kling's major intellectual concerns, which I also shared, was articulating the notion of computerization movements (CMs), i.e., understanding how new computing technologies evolve and why they are adopted (or not) by organizations.

Dr. Peter Freeman[1] and I were both working in the Directorate for Computer and Information Science and Engineering (CISE) at the National Science Foundation at the time of Rob's death. One of the divisions in CISE—Information and Intelligent Systems—had supported Rob's work since the 1980s. That division funded a workshop that recognized the contributions of this noted scholar and brought together distinguished scholars and researchers to advance the study of CMs. Margaret Elliott and Ken Kraemer, editors of this book, organized the workshop and commissioned distinguished researchers in Social Informatics to write papers that focused on new contributions to the study of CMs.

A major issue in the study of CMs is, "How do new technologies evolve and why do organizations invest in them despite frequent failures to achieve stated objectives like increased productivity, enhanced collaboration, or fully effective virtual organizations?" A key proposition from this point of view is that adoption and diffusion of new technologies do not just depend on simple economic logic or managerial requirements, but on the broader social environment. Much of the research on diffusion of technological innovations has concentrated on adoption within single organizations and emphasized features of technology and organization that shape diffusion in response to economic needs. The macro-social

and cultural environments surrounding the adoption of new technologies by organizations are largely ignored. Most studies also do not look at why or how organizations that implement the same information technology at the same time achieve different levels of success.

Rob and I long argued that the emergence of new technologies and their diffusion take place in a broader context of interacting organizations and institutions, which shape utopian visions of what technology can do and how it should be used. We called these broad environmental dynamics "computerization movements." A CM focuses on a type of computer-based system that advocates claim will be integral and instrumental in bringing about a new social order, e.g., a more collaborative or productive organization or even a new organizational form.

It is useful to reflect on the origin of these ideas. During the 1980s, Rob and I conducted a number of field studies in organizations that had invested heavily in Material Requirements Planning (MRP) systems. During the course of this research, we conducted in-depth interviews with MRP users, and discovered that most users believed the "hype" about MRP systems, i.e., what they could do for their organization in terms of reducing inventory, work in progress, and costs, despite the lack of any empirical evidence that those goals had actually been achieved. After we heard the hype in our interviews with Vice Presidents, Central Information Officers, Materials Managers, etc., we would ask them to provide proof of the benefits achieved from their investments in MRP systems, but none of them could. Rob and I talked about this anomaly continuously. We came to the conclusion that a reality gap existed between the ideology surrounding a new technology like MRP, which management bought into when they made their investments, and the actual practices that later ensued in an organization when they were using the new technologies. We began looking for further evidence of this gap with other technologies.

We examined technologies that had been developed and diffused during the period from the 1960s to the mid-1980s, and found that similar ideologies had arisen around urban information systems, artificial intelligence, computer-based education, office automation, and personal computing. We identified five mobilizing ideologies that we believed CM advocates in specific organizations employ when seeking to convince management to computerize their own organizations. Since few CM activists assert key ideological themes directly, we derived these ideologies from conversations with practitioners and developers, and from careful reading of books and articles about the benefits of these new technologies. The five mobilizing ideologies are as follows:

1. Computer-based technologies are central for a reformed world.

2. Improved computer-based technologies can further reform society.
3. More computing is better than less, and there are no conceptual limits to the scope of appropriate computerization.
4. No one loses from computerization.
5. Uncooperative people are the main barriers to social reform through computing.

Leigh Star was putting together a special issue of *Social Problems* and encouraged us to further develop these ideas, which resulted in our first paper on CMs (Kling & Iacono, 1988), where we argued that computerization in the United States had been strongly influenced by these mobilizing ideologies. We further noted that these ideologies were often offered by "CM activists" who were not employees of the computer vendors, but who were independent actors such as practitioners, academics, and journalists. We further distinguished between a general computerization movement in society in which activists proclaim "revolutionary" social changes and specific CMs focused on particular technologies and their benefits. We refined this work in two later papers in which we explored the concept of technological utopianism in the CM discourse (Iacono & Kling, 1996) and analyzed the Internetworking CM (Iacono & Kling, 2001).

This book builds on these earlier works in several important ways. First, it brings together 30 distinguished scholars from the U.S., Canada, and Europe, who each apply CM theory and concepts to their current areas of research. Thus, the book is unique in being the largest collection of research papers on CMs to date.

Second, it greatly extends our earlier contribution to CMs. It introduces new uses of the CM construct to characterize adoption decisions occurring in contemporary society. It provides richly textured descriptions of how public discourse within society creates utopian visions about the benefit of computer use. It uses the CM construct to better explain issues of mobilization and recruitment to various CMs. It shows how not only technology vendors, but also journalists, academics, visionaries, professionals, and users can all become "activists" promoting ideal visions of what the new technology is good for and how it should be used. And it shows that CMs greatly influence how people think about computing technologies and therefore help shape the technology adoption decisions of managers and users in organizations, and more broadly within society.

Third, the studies in this book show that the gap between the utopian visions promulgated by CM activists and the ways in which the technologies are actually used is very large indeed. This gap augers for

change in the conduct of CM discourse as well as continuing research into new and emerging CMs.

Fourth, aside from the individual studies, the editors have analyzed the current socio-technical environment and have articulated today's key utopian visions surrounding new technologies. In the Introduction (Chapter 1), they identify five CM outcomes: productivity, democratization, death of distance, freedom and information rights, and ubiquitous computing. They then use examples from selected chapters to illustrate these themes. These themes also form the organizing framework for the body of the book (Chapters 2-19).

Finally, in the Conclusion (Chapter 20), the editors present a historical portrayal of CMs through comparative analysis of CMs during the four eras of computerization: Mainframe, PC, Internet, and Ubiquitous Computing. They generate new knowledge about the implications of ubiquitous computing by looking forward to examples of emerging technologies, and looking backward to earlier technologies for how they might inform this new era of ubiquitous computing. The editors conclude with these seminal points regarding the current and future state of CMs:

- There is a continuing gap between CM visions and the reality of technology use in organizations and society.
- CM rhetoric tends to shift from the utopian to the pragmatic with experience and contending discourse.
- Technologies that require a support infrastructure to be built as part of their implementation take longer to diffuse than those that can use existing infrastructures, resulting in a lower probability that a CM requiring a new infrastructure will lead to successful diffusion.
- The realities of day-to-day use of a CM's promoted technology cannot be predicted precisely in advance, but informed technology assessments can be made by better understanding of similarities and differences of emerging and earlier technologies. Such assessments can improve the success of a CM.
- The social context shapes technology use as much or more than the technology per se. New technology often reinforces existing organizational and social arrangements, rather than disrupting, changing, or transforming them. CMs that leverage the technology-organization linkage will be more successful than those that do not.

Finally, the editors develop a few key implications of their analysis for software designers, managers and professionals, organizational users, and CM scholars.

I am pleased to see the progress that the many chapters in this book, and the book as a whole, represent. I am grateful to the many scholars who contributed to the workshop, to the special issue of *The Information Society* critiquing Rob Kling's contribution to the field, and to this book on CMs. It was a great honor for me to have worked with Rob for so many years. His influence within the field of Social Informatics was ubiquitous, and remains so.

Endnotes

1. Peter was Assistant Director of the National Science Foundation and head of the Directorate for Computer and Information Science and Engineering (CISE) from 2002 until 2007. Peter and Rob were both Professors of Information and Computer Science at the University of California, Irvine during the early 1980s and were office neighbors for most of that time.

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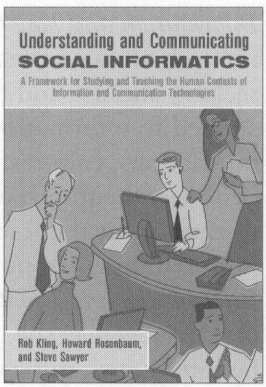

By Rob Kling, Howard Rosenbaum, and Steve Sawyer

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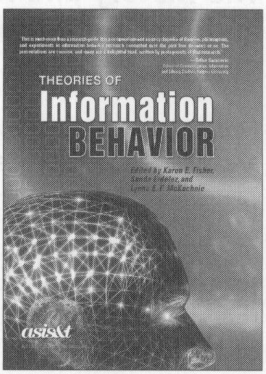

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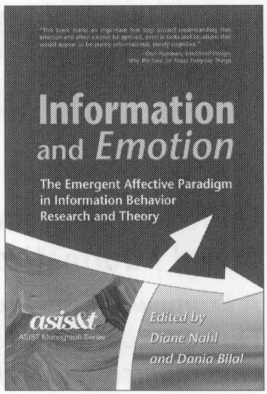

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Information and Emotion introduces the new research areas of affective issues in information seeking and use and the affective paradigm applied to information behavior in a variety of populations, cultures, and contexts. The book's editors and authors are information behavior researchers at the forefront of charting the emotional quality of the information environment. Colletively, their contributions make *Information and Emotion* a unique source of research findings on the user perspective; the user experience; and how emotional aspects can be interpreted, mitigated, or enhanced through design that is informed by use, and by users who directly participate in information design.

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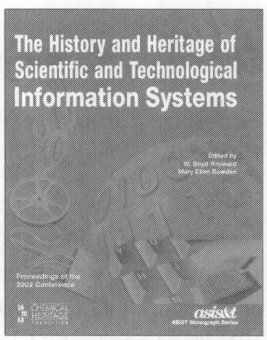

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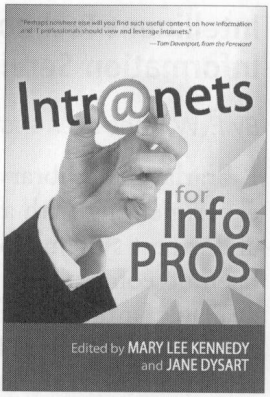

Edited by Mary Lee Kennedy and Jane Dysart
Foreword by Tom Davenport

The intranet is among the primary landscapes in which information-based work occurs, yet many info pros continue to view it with equal parts skepticism and dread. In *Intranets for Info Pros*, editors Mary Lee Kennedy and Jane Dysart and their 10 expert contributors provide support and encouragement to the information professional responsible for implementing or contributing to an intranet. Chapters demonstrate the intranets strategic value, describe important trends and best practices, and equip info pros to make a key contribution to their organization's intranet success.

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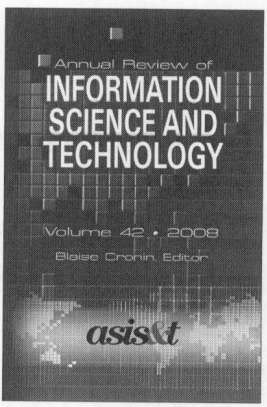

Edited by Blaise Cronin

ARIST, published annually since 1966, is a landmark publication within the information science community. It surveys the landscape of information science and technology, providing an analytical, authoritative, and accessible overview of recent trends and significant developments. The range of topics varies considerably, reflecting the dynamism of the discipline and the diversity of theoretical and applied perspectives. While *ARIST* continues to cover key topics associated with "classical" information science (e.g., bibliometrics, information retrieval), editor Blaise Cronin is selectively expanding its footprint in an effort to connect information science more tightly with cognate academic and professional communities.

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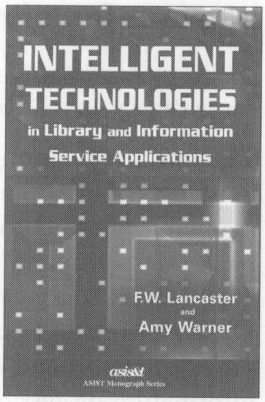

By F. W. Lancaster and Amy Warner

Librarians and library school faculty have been experimenting with artificial intelligence (AI) and expert systems for 30 years, but there has been no comprehensive survey of the results available until now. In this carefully researched monograph, authors Lancaster and Warner report on the applications of AI technologies in library and information services, assessing their effectiveness, reviewing the relevant literature, and offering a clear-eyed forecast of future use and impact. Includes almost 500 bibliographic references.

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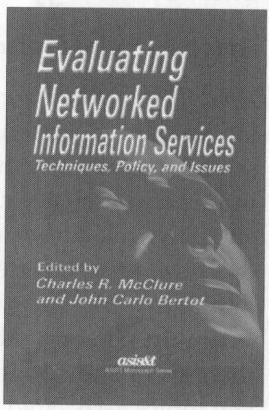

Edited by Charles R. McClure and John Carlo Bertot

As information services and resources are made available in the global networked environment, there is a critical need to evaluate their usefulness, impact, cost, and effectiveness. This monograph brings together an introduction and overview of evaluation techniques and methods, information policy issues and initiatives, and other critical issues related to the evaluation of networked information services.

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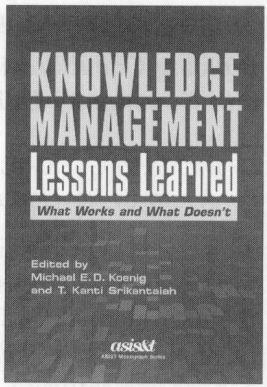

Edited by Michael E. D. Koenig and T. Kanti Srikantaiah

A follow-up to Srikantaiah and Koenig's ground-breaking *Knowledge Management for the Information Professional*, this new book surveys recent applications and innovations in KM. More than 30 experts describe KM in practice, revealing what has been learned, what works, and what doesn't. Includes projects undertaken by organizations at the forefront of KM, and coverage of KM strategy and implementation, cost analysis, education and training, content management, communities of practice, competitive intelligence, and much more.

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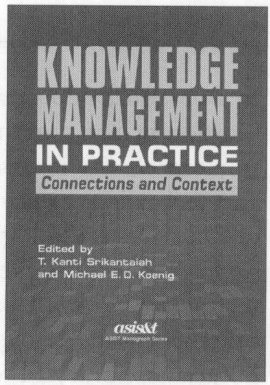

Edited by T. Kanti Srikantaiah and Michael E. D. Koenig

This third entry in the ambitious, highly regarded KM series from editors Srikantaiah and Koenig features 26 chapters contributed by more than 20 experts from around the globe. The book not only looks at how KM is being implemented in organizations today, but is unique in surveying the efforts of KM professionals to extend knowledge beyond their organizations and in providing a framework for understanding user context. *Knowledge Management in Practice* is a must-read for any professional seeking to connect organizational KM systems with increasingly diverse and geographically dispersed user communities.

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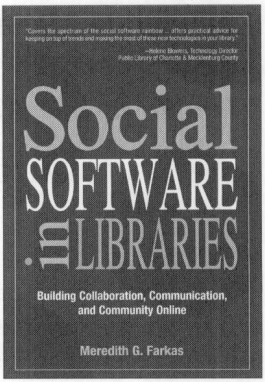
By Meredith G. Farkas
Foreword by Roy Tennant



This guide provides librarians with the information and skills necessary to implement the most popular and effective social software technologies: blogs, RSS, wikis, social networking software, screencasting, photo-sharing, podcasting, instant messaging, gaming, and more. Novice readers will find ample descriptions and advice on using each technology, while veteran users of social software will discover new applications and approaches. Supported by the author's Web page.

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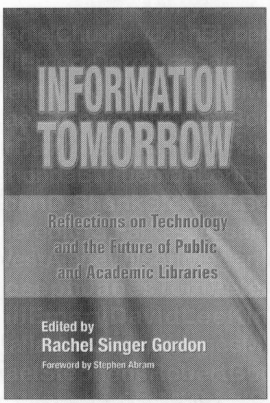
Reflections on Technology and the Future of Public and Academic Libraries

Edited by Rachel Singer Gordon



In *Information Tomorrow,* Rachel Singer Gordon brings together 20 of today's top thinkers on the intersections between libraries and technology. They address various ways in which new technologies are impacting library services and share their ideas for using technology to meet patrons where they are. *Information Tomorrow* offers engaging, provocative, and wide-ranging discussion for systems librarians, library IT workers, library managers and administrators, and anyone working with or interested in technology in libraries.

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