

Introduction

In this era of the Internet and distributed multimedia computing, new and emerging classes of information technologies have swept into the lives of office workers and everyday people. As technologies and applications become more overwhelming, pressing, and diverse, several well-known information technology problems have become even more urgent. *Information overload*, a result of the ease of information creation and rendering via Internet and WWW, has become more evident in people's lives [1,3]. Significant variations of database formats and structures, the richness of information media (text, audio, and video), and an abundance of multilingual information content also have created various information interoperability problems — *structural interoperability*, *media interoperability*, and *multilingual interoperability* [9,12].

Knowledge networking and knowledge management: the field and its significance

Several new federal and business initiatives have emerged in an attempt to transform our information-glut society into a knowledge-rich society. In the National Science Foundation (NSF) Knowledge Networking (KN) initiative, scalable techniques to improve semantic bandwidth and knowledge bandwidth are considered among the priority research areas, as described in the KN report: “The Knowledge Networking initiative focuses on the integration of knowledge from different sources and domains across space and time . . . KN research aims to move beyond connectivity to achieve new levels of interactivity, increasing the semantic bandwidth, knowledge bandwidth, activity bandwidth, and cultural bandwidth among people, organizations, and communities” [2,4].

“Knowledge networking,” or a more general term, “knowledge management” (KM), has attracted significant attention from academic researchers and even executives in Fortune 500 companies. O’Leary [11] provides the following definition: “Enterprise knowledge management entails formally managing knowledge resources in order to facilitate access and reuse of knowledge, typically by using advanced technology. KM is formal in that knowledge is classified and categorized according to a pre-specified — but evolving — ontology into structured and semi-structured data and knowledge bases.” Knowledge management systems (KMS) may employ various computational techniques including: linguistics analysis, data mining, machine learning, agents, information retrieval, and human–computer interaction.

The information technology think tank Gartner Group [7] defines KM as: “a discipline that promotes an integrated approach to identifying, capturing, retrieving, sharing and evaluating an enterprise’s information assets. These information assets may include databases, documents, policies and procedures as well as the uncaptured tacit expertise and experience resident in individual workers.” Gartner Group predicts that KM may become the third wave of the Net, making significant impacts on business practices and US economy in the next century. Many Fortune 500 and IT companies have considered knowledge sharing as their most critical strategic area [5,6].

Although it has been variously defined, it is evident that KM exists at the enterprise level [6] and is quite distinct from mere information [6,10,15]. Also apparent in this area is the challenges that KM poses to an organization. In addition to being difficult to manage, knowledge traditionally has been stored on

paper or in the minds of people [5,11]. The KM problems facing many firms stem from barriers to access and utilization resulting from the content and format of information [8,13]. These problems make KM creation and utilization a complex and daunting process.

The just-released PITAC (President's Information Technology Advisory Committee) report concluded that "the current Federal program is inadequate to start necessary new centers and research programs... The end result is that critical problems are going unsolved and we are endangering the flow of ideas that have fueled the information economy." Among the priorities for research, the PITAC report suggests that the federal program should "support fundamental research in capturing, managing, analyzing, and explaining information and in making it available for its myriad of users" [14].

In spite of increased federal and industrial interest in KM, research efforts in KM are fragmented and confusing. There is a division between the technology-centered computer and information scientists and the process-oriented social scientists and practitioners. Many re-label old information technologies with the new KM label without justification. There has been no systematic attempt to study the technical, social, and managerial foundation, theory, and methodology of KM that can be adopted in various social and industrial contexts.

About the Special Issue

The purpose of this special issue is to present research in this emerging field. In particular, we aim to report research attempting to achieve the following two goals: (1) Develop KMS technologies and methodology that are appropriate for capturing, analyzing, visualizing, sharing, and explaining information in social and organizational contexts. (2) Study the organizational, social, cultural and methodological impacts and changes that organizations need to make to maximize and leverage an institution's investments in KM.

This special issue consists of 12 papers. The first paper, "Experimentation with an Information Filtering System That Combines Cognitive and Sociological Filtering Integrated with User Stereotypes," by Shapira, Shoval, and Hanani, presents a dual-method

model and system for filtering and ranking relevance of information presented. The second paper, "Discovering Near-optimal Pricing Strategies for the Deregulated Electric Power Marketplace Using Genetic Algorithms," by Wu, describes a new genetic algorithm approach to the first-best pricing problems for the electric power sector. The third paper, "Knowledge-based Knowledge Management in the Reengineering Domain," by Nissen, presents KOPeR, a KMS that automates and supports KM in the reengineering domain. The fourth paper, "Document Clustering for Electronic Meetings: An Experimental Comparison of Two Techniques," by Roussinov and Chen, reports the implementation and comparison of two text clustering techniques (Ward's clustering and Kohonen's self-organizing maps) for electronic meeting applications. The fifth paper, "Improving Browsing in Digital Libraries with Keyphrase Indexes," by Gutwin, Paynter, Witten, Nevill-Manning, and Frank, reports a new search engine, Keyphind, that allows users to interact with a collection at the level of topic and subject rather than at that of word and document. The sixth paper, "WOODSS — A Spatial Decision Support System based on Workflows," by Steffino, Medeiros, Rocha, and Yi, presents a software used in conjunction with a GIS to provide spatial decision support involving environmental data. The seventh paper, "Evaluation of User Interface Designs for Information Retrieval Systems: A Computer-based Experiment," by Hu, Ma, and Chau, describes a computer-based experiment to evaluate and compare the effectiveness of six different interface designs, graphical or list-based, in supporting communication of an object's "relevance" to its users. The eighth paper, "Managing Process Knowledge for Decision Support," by Balasubramanian, Nochur, Henderson, and Kwan, describes a goal-oriented modeling schema and its associated tool that capture and organize knowledge during the decision-making process. The ninth paper, "Multidimensional Scaling for Group Memory Visualization," by McQuaid, Ong, Chen, and Nuna-maker, presents a system that aims to alleviate information overload through information visualization. The tenth paper, "Mining Relational Patterns from Multiple Relational Tables," by Tsechansky, Pliskin, Rabinowitz, and Porath, presents the concept of relational patterns and an approach to extracting them

from multiple relational tables. The eleventh paper, “Do Smart Systems Make for Smarter Organizations,” by Hendricks, reports an empirical investigation of 24 knowledge-intensive, commercial organizations and shows that knowledge-based systems usually have a positive impact on organizational competencies. The last paper, “Supporting Collaborative Process Knowledge Management in New Product Development Teams,” by Ramesh and Tiwana, reports a case study that identifies problems associated with KM in the context of new product development and suggests a prototype system that meets specific KMS requirements.

We hope this collection of research papers will help advance our knowledge and understanding of this new and fascinating field of KM.

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Dr. Hsinchun Chen is a McClelland Endowed Professor of MIS at The University of Arizona and Andersen Consulting Professor of the Year. He received the PhD degree in Information Systems from New York University in 1989. Author of more than 70 articles covering semantic retrieval, search algorithms, knowledge discovery, and collaborative computing in leading information technology publications, he serves on the editorial board of *Journal of the American*

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Dr. Chen founded the University of Arizona Artificial Intelligence Lab in 1990. The group is distinguished for its adaptation and development of scalable and practical artificial intelligence, neural networks, genetic algorithms, statistical analysis, automatic indexing, and natural language processing techniques. Since 1990, Dr. Chen has received over US\$5 M in research funding from various government agencies and major corporations including the National Science Foundation (NSF), Defense Advanced Research Projects Agency (DARPA), National Aeronautics and Space Administration (NASA), National Institutes of Health (NIH), National Institute of Justice (NIJ), National Library of Medicine (NLM), National Center for Supercomputing Applications (NCSA), SAP, 3COM, and AT&T.

Dr. Chen received the NSF Research Initiation Award in 1992 and the HICSS Conference Best Paper Award in 1994. Dr. Chen's work also has been recognized by major US corporations and been awarded numerous industry awards for his contribution to IT education and research. In 1995 and 1996, he received the AT&T Foundation Award in Science and Engineering. In 1998 he received the SAP Award in Research/Applications and became the Karl Eller Center Honored Entrepreneurial Fellow. In 1999, Dr.

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Dr. Chen has been heavily involved in fostering digital library research in the US and internationally. He was a PI of the NSF-funded Digital Library Initiative-1 project (1994–1998) and recently received another major NSF award (1999–2003) from the new Digital Library Initiative-2 program. Dr. Chen was the guest editor of digital library special issues in *IEEE Computer* (May 1996 and February 1999) and *Journal of the American Society for Information Sciences* (1999, forthcoming). He also helped organize the Asia digital library research community and chaired the *First Asia Digital Library Workshop*, held in Hong Kong in August 1998. He is the conference chair of *the Second Asia*

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Dr. Chen has frequently served as a panel member and/or workshop organizer for major NSF and DARPA research programs. He has helped set directions for several major US initiatives including: the Digital Library Initiative (DLI), the Knowledge and Distributed Intelligence Initiative (KDI), and the Integrated Graduate Education and Research Training (IGERT) program, for a total of more than US\$150 M in federal information technology research spending.

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