

Foreword

I am honored to be invited by the editor, Dr. Raj Bali, to write the foreword for this book. In today's information technology world, we are facing daunting challenges in realizing an all aspiring and an all-encompassing paradigm of "data-information-knowledge-intelligence-wisdom". In the early nineties, under the aegis of the United States National Information Infrastructure, the Internet facilitated the creation of an "information-for-all" environment. Despite the unstructured nature of its existence, the Internet has seen an unprecedented global growth in its role as a promoter of information solutions to the citizens of the world. In contrast to the developments we witnessed in the past decade, the features of the next generation Internet have shifted emphasis from the "information-for-all" environment to a "knowledge-for all" paradigm. Some have even called it the Internet 3. Healthcare is undoubtedly one of the major areas in which we are beginning to see revolutionary changes that are attributable to the emergence of the knowledge engineering concepts. Bali and his eminent authors have done great justice to the book's contents, by pooling together many different dimensions of knowledge management into this book.

"Knowledge" is the key phraseology that has become the guiding mantra of future systems. As aptly stated by the National Library of Medicine's report on the next generation of their program on the Integrated Advanced Information Management Systems (IAIMS), "if the challenges of the 20th century IAIMS was tying together all of the heterogeneous systems that an organization owned, the principle challenge of the next generation of IAIMS efforts is effective integration of information, data, and knowledge residing in systems owned and operated by other organizations." There is no doubt that, in recent times, we are beginning to see that knowledge revolution. Advances in the field of medical informatics are a clear testimony of newer technology developments facilitating the storage, retrieval, sharing, and optimal use of biomedical information, data, and knowledge for problem solving. These are reflected in the design and implementation of comprehensive knowledge-based networks of interoperable health record systems. They provide information and knowledge for making sound decisions about health, when and where needed.

This book delves into the technologies of knowledge management beginning from the concepts of knowledge creation and extending to the abstraction and discovery tools, as well as integration, knowledge sharing and structural influences that need to be considered for successful decision making and global coordination.

There are three major and somewhat overlapping areas of knowledge engineering applications, which have dominated the healthcare sector: education, patient care, and research. Knowledge stimulates creation of new knowledge and the management and dissemination of such new knowledge is the key to the building of modern educational infrastructure in medicine and healthcare. Whether it is the utility of the electronic cadaver in anatomy education, or the capturing of evidence-based medical content, or the design of a rule-based expert system in disease diagnosis, technology developments have stayed focused on creating the knowledge discovery tools, with insights mainly borrowed from the Artificial Intelligence methodologies. These include machine learning, case-based reasoning, genetic algorithms, neural nets, intelligent agents, and stochastic models of natural language understanding, as well as the emerging computation and artificial life. The central dogma in healthcare research is to ensure the patient to be the principle focus, from diagnosis and early intervention to treatment and care. Especially with the advent of the Internet, clinical knowledge management is a topic of paramount importance. As Bali et al. have pointed out in the opening chapter of this book, “future healthcare institutions will face the challenge of transforming large amounts of medical data into clinically-relevant information for diagnosis, to make recognition of it by deriving knowledge and to effectively transfer the knowledge acquired to the caregiver as and when required.”

Creation of new knowledge from existing knowledge is what makes the field grow. Bali and his authors present in the book a number of discussions of the available technologies to stimulate the future expansion. Knowledge repositories are increasingly getting larger in size and complex in structure, as seen for example, in the hospital information systems. Such massive data explosions require efficient knowledge management strategies, including the critical need to develop knowledge retrieval and data mining tools. The latter mostly consist of appropriate software-based techniques to find difficult-to-see patterns in large groups of data. The effective analysis and interpretation of such large amounts of data collected are being enhanced by applying machine vision techniques while at the same time we are looking at machine learning mechanisms to provide self-learning instructions between processes. These are all some of the modern day innovations that are providing the capabilities to extract new knowledge from the existing knowledge. Healthcare is benefitting immensely from these applications, making it possible for healthcare professionals to access medical expert knowledge where and when needed.

Medical knowledge stems from scores of multiple sources. The design principles for the management of knowledge sharing and its global impact are a complex mix of issues characterized by varying cultural, legal, regulatory, and sociological determinants. What is especially important is to improve the overall health of the population by improving the quality of healthcare services, as well as by controlling the cost-effectiveness of medical examinations and treatment (Golemati et al.). Technology’s answer to this lies in the vast emergence of clinical decision support systems in which knowledge management strategies are vital to the overall design. I am very pleased that the authors have done an excellent job by taking a succinct view of what the issues are and the

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priorities of what needs to be addressed in this ‘fast lane’ knowledge world at large and the literature resource in particular. My congratulations to Editor Bali and his entire team.

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