

Preface

Influencing every facet of business, society, and life worldwide, with speed beyond imagination, the field of information science and technology has without doubt brought upon a revolution in the way the human population interacts, does business, and governs. As one takes into account the leaps and bounds experienced in information sharing and communication exchange over the last few decades, a truly admirable phenomenon presents itself and clearly shows that the results of this pivotal rising will monumentally impact the way the world thinks, subsists, and evolves.

With a long history of expeditious evolution, the growth and expansion of information technology began during the early 1950s with the main purpose of initiating scientific computing, expanding research, and utilizing the power of computers as a means to support a mass volume of computational tasks in scientific applications and discoveries. Later, during the 1960s and '70s, the use of computer technology was also extended to business applications mostly in accounting and financial areas that involved processing numbers and collecting data in a quantitative sense. As a result, the use of this technology was limited to those who had an expansive knowledge of these systems and had access to computer programming languages. With the evolution of computers and telecommunications in the 1980s, a new information technology was born with a strong focus on the management and dissemination of information by both information providers and users across the globe.

In the early 1990s, the most noticeable advancement in the information technology revolution was the creation of the Internet. During the past two decades, Internet technologies have become the driving force in allowing people worldwide to communicate and exchange information, creating a new dimension that is virtual, interactive, and provides a digital forum for global social connection. In recent years, through the use of Web-enabled technologies, organizations of all types and sizes around the world have managed to utilize these technologies to disseminate and process information with prospective customers, suppliers, students, and governments. Today, the ability to communicate and connect from many locations through personal computers has influenced different people in many different societies. These technologies allow everyone, regardless of their geographic location, to bring the information age to its full realization.

In recent years, the science of understanding the nature of information processing and management along with the computers and technologies that decipher, disseminate, and manage information has become known as information science and technology. Technology has profoundly impacted science, business, and society, thus constructing an entity that improves access to the rapidly expanding body of knowledge in almost every discipline. Society fuels this knowledge creation, as it receives, manages, educates, and collects information. The volume and intensity of research in information science and technology have exceeded many other fields of science, and research discoveries have become the impetus behind many emerging tools and applications seen at every organizational level.

In addressing this need for the representation of evolving information science and technology disciplines in academic literature, the First Edition of the Encyclopedia of Information Science and Technology, released in early 2005, positioned itself as the first of its kind in reference publications, offering an invaluable source of 554 articles highlighting major breakthroughs, discoveries, and authoritative research results in technological advancements. In providing this compendium of references, definitions and key words within this field of pivotal social and organizational movement, the Five-Volume Encyclopedia of Information Science and Technology, First Edition, supplied researchers with a definitive one-stop reference source.

With the endeavor of progressing from this precedence, and in effort to exhibit the latest research innovations, the Second Edition of the Encyclopedia of Information Science and Technology collects and uncovers the most current research findings related to technological, organizational and managerial issues, challenges, trends, and applications of information

technologies in modern organizations. The coverage of this Encyclopedia seeks to bridge existing gaps in available references on technology and methodologies with its contribution as a valuable resource of encompassing paradigms shaping the ever changing research, theory and discovery of information science and technology.

Including a thorough coverage of innovative topics and terms embodying the disciplines that construct this field, the Second Edition of the Encyclopedia of Information Science and Technology offers the most comprehensive list of research references to further support these developments. New articles focusing on emerging topics, as well as enhanced and updated articles featured in the First Edition, allow for the Encyclopedia of Information Science and Technology, Second Edition to construct an up-to-date exhibition of must know developments.

The articles were carefully selected for this publication for their presentation of the most comprehensive, innovative, and in-depth coverage of information science and technology. The topics covered in this all-encompassing publication, include the most influential areas of this field.

Articles fully cover the area of Artificial Intelligence in their examination of current applications applied within organizational spheres that are impacted by such technologies as Machine Learning, Computational Intelligence, Digital Ecosystems and Adaptive Systems. By providing these chapters, the Encyclopedia is able to supply audiences with reputable sources for identifying future trends in breakthrough computing and technologies that will direct everyday aspects of life, such as intelligent transportation, smart homes, and intelligent diagnostics.

Through introducing the changing state of business information systems, the Encyclopedia analyzes the driving force of globalization and the concept's effect on international trade, economics, and capital. Because business information systems are so far reaching, from the intranet to export tracking and manufacturing intelligence, the research results comprise a breadth of review and discussion of methodologies behind these systems and how they are implemented in the field of business.

As a growing discipline of theory, concept and science, cognitive informatics is discussed in several articles that delve into the philosophy behind knowledge, how behavior is determined through this analysis, and what impacts are made through this careful evaluation. With such areas as cybernetics and systems theory being implemented into social and organizational practice, the references provided through this research offer invaluable sources of further evaluation.

Continuously utilized for the evolution of technical applications, the areas of data mining and databases are comprehensively discussed in a significant level of articles in the Encyclopedia as a channel for introduction and advancement. In taking into account the growing incorporation of data mining into Web development and databases into engineering progress, these resources supply audiences with authoritative results and a foundation for additional research.

With a considerable effect on the global economy, electronic business applications are discussed in the Encyclopedia and offer readers a credible source of knowledge for understanding the current realms of mobile applications for business functions, technologies for marketing, and virtual enterprises. Seeing the importance of these technology-based management systems, modern electronic business is analyzed as a growing phenomenon of capitalism.

As today's form of trade, shopping and purchasing, electronic commerce is fully presented in the Encyclopedia as a phenomenon of progressive change. With significant growth since the dot com explosion of the past two decades, e-commerce is exposed as a discipline with global reach and international application for the way currency is exchanged and services are dealt.

With undeniable influence on policy making and delivery, aspects of electronic government are examined in the Encyclopedia, including electronic voting, public service delivery, and citizen management. Considering the social change developing as a result of e-government implementation, articles offer researchers and policy makers a wealth of perspective on the challenges and opportunities in directing government via information communication technologies.

Given the worldwide focus on the environment, the Encyclopedia provides audiences with emerging findings in the area of environmental informatics. As a growing area of attention, this discipline is supported by prominent international researchers studying the future of maintaining environmental functions and safeguarding the planet.

Global information technology has emerged as an area of study with growing importance as digital communications spread internationally. The Encyclopedia supplies articles that delve into the importance of the digital divide, as well as case studies exhibiting regional adaptation, resistance, and adoption of technologies.

As technological demands extend and users multiply, high-performance computing seeks to maintain the flow of communication between servers, knowledge workers, and organizations. With much recent advancement in Grid computing, and technologies to handle large amounts of data, the Encyclopedia offers readers a close look at these breaking areas of study and applications of growing necessity.

Considering the human element in making technology the paradigm it is today, the Encyclopedia provides readers with a comprehensive view of human aspects of technology. With an analysis of end-user behavior, gender differences and ubiquity of computing, readers will find an extensive amount of research results and analysis to assist in building literature in the important area of study; human computer interaction.

Following the advancements of the industrial revolution, industrial informatics is described in the Encyclopedia as a bridge between technological progress and the application of manufacturing, transportation, and construction. With growing utilization in enhancing and expediting good production, building and usage, research results examine the future trends of such technologies and how these applications will incorporate into the daily life of individuals.

As a contemporary social motivator, IT Education is comprehensively examined in the Encyclopedia. This is an area of research with philosophical and constructivist reach into all levels of learning. In discussing blended learning, distance education, tools for online learning, advanced pedagogy and computational support for teaching, IT education demands further attention in developing reliable research. As a popular area of examination, the Encyclopedia lends support to emerging trends in the discipline while supplying a venue for further discussion of terms, themes, and additional implication.

Taking into account the massive growth in technological utilization for sensitive data, government, personal and organizational functions, IT security and ethics as an area of study continues to involve expanding securitization and streamlining for the best protection of digital information. In examining such areas as digital forensics, authentication, cryptography, cyber warfare, and trustworthy computing, analysis of IT security and ethics take precedence as a point of key discussion in the Encyclopedia, with the endeavor to enrich the field.

As a result of the current structures of both public and private sector administration, the field of knowledge management has been positioned as a concept of both utility and application. Considering the need for quality sources indicating best practices in the management of knowledge workers, IT governance and information sharing, the Encyclopedia supplies readers and researchers with a considerable selection of current themes, terms and topics relating to the state of knowledge management.

With many library systems implementing digital filing and cataloguing systems, the study of bibliometrics has flourished in the scientific world. With cutting edge technologies in archiving and classification, preservation and reformatting, library science has developed into an intricate branch of information science and the Encyclopedia illustrates explanations of the vast spectrum of this study. As issues such as open access, security, and Internet property rights take center stage, legal aspects of the digitization of information are explored.

Mobile devices, wireless systems, sensors, and wearable computing applications are technologies that are shaping communication and public administration. Keeping in mind the spread of the need for reliable means of information transfer, mobile and Wireless computing is explored in the Encyclopedia as a field of widening pervasiveness. With uses ranging from machine correspondence to business interrelationships, important research findings are effectively exposed and discussed by top researchers in the field.

Whether utilized for entertainment, learning, or public policy, multimedia technology as a form of study involves behavioral and practical analysis. The Encyclopedia offers audiences with many aspects of analysis on topics such as gaming, simulation and hypermedia to best understand how the world is displaying its information for consumers and administrators.

With the expansion of wireless networks, telecommunications have flourished as users are able to get in touch from just about anywhere with the use of ad-hoc networks, Bluetooth, and RFIDs. Advancements in neural and wireless sensor networks have increased availability of the Internet exponentially. Peer-to-peer networks are discussed in the Encyclopedia, along with optical access and overlay networks.

Social computing describes the intersection of social behaviors and computer systems, intricately examining areas such as social networking sites, augmented realities, and online auctions. Tools such as blogs, Wikis, tags, and podcasts have expanded the user's online researching experience. The Encyclopedia expands on social informatics and explores instant messaging, virtual groups, mailing lists, and forums; just a few of the places that users interact with one another.

Technological engineers focus on algorithms, modeling languages, and kernel applications to design and format the machines that the world uses today. Systems analysis, visualization, and diagnostics all play a role in the design and improvement of the ever changing software being developed. The Encyclopedia takes a look at the vulnerabilities, specifications, and quality of software and its architectures.

As a result of the Internet explosion of the 1990s, Web technology as a field of study has taken the stage as a discipline of ubiquitous importance. With the Web being a single source of infinite information, responding and expanding at exponential rates, the Encyclopedia offers readers a snap shot of disciplines such as portal technologies, semantic computing, Web 2.0, and service-oriented technologies.

The Encyclopedia elaborates on the expansive area of bioinformatics. Subjects such as artificial immune systems, biomedical imaging, and biometric tools such as those used for identifying humans by biological, intrinsic traits are discussed. Topics of importance also include organic computing, proteomics, and computational chemistry.

Electronic patient records, e-health, and cybertherapy are three of the many topics explored through the Encyclopedia's investigation of health information science. With new assistive and rehabilitative technologies, medical data storage, and issues of security and privacy, Health Informatics affects the lives of human beings worldwide. Considering this growth, research results prove valuable for healthcare administrators and academic disciplines, such as nursing and health management.

Advanced medical technologies are incorporated into daily measures to secure and save lives. Medical informatics is exemplified in this second edition Encyclopedia through an intricate look at the updates and improvements in this pivotal field. Medical imaging, biosensors, and new nanotechnology modernizations for surgical procedures are just a few of the exciting and significant advances in medical technologies. Rehabilitation, disease detection, and routine medical care are assisted and revamped with advances in hospital machinery and tools.

The selected topics of this encyclopedia are to provide the best balanced compilation of concepts and issues from researchers around the world. These researchers were asked to submit proposals describing the topic and scope of their articles. All proposals were carefully reviewed for suitability by the editor-in-chief. Upon the receipt of full entry submissions, each contribution was forwarded to at least three expert external reviewers on a double-blind, peer review basis. Only submissions with strong and favorable reviews were chosen as entries for this encyclopedia. In most cases, submissions were sent back for several revisions prior to final acceptance. The goal was to assemble the best minds in the information science and technology field from all over the world to contribute entries to this encyclopedia and to apply the highest level of quality in selecting entries.

As a result, over 650 entries were selected for inclusion in this eight-volume encyclopedia, highlighting current concepts, issues, and emerging technologies. All entries are written by more than 1,512 knowledgeable, distinguished scholars from many prominent research institutions throughout the world. Over 5,000 technical and managerial terms and their definitions have been organized by the authors to enhance the articles, allowing for extensive research into core concepts and ideas. In addition, this eight-volume set offers a thorough reference section with over 14,500 sources of additional information for scholars, students, and researchers in the field of information science and technology.

Multiple detailed Tables of Contents have been organized to better assist readers in navigating and identifying information. Contents are structured through alphabetical, categorical, and contributing author listings for simple reference. The Encyclopedia includes these three comprehensive and detailed tables of contents to greatly assist readers in locating articles on topics within a particular discipline, as well as identify any particular entry per author or title.

Complimentary online access to this encyclopedia for the life of the edition will also be provided to any library with the purchase of the print copy. This complimentary online availability will allow students, faculty, researchers, and corporate managers to access the latest contents of this comprehensive and in-depth encyclopedia regardless of their location. This particular feature will prove to be an extremely valuable resource for distance learning educational programs worldwide.

The field of information science and technology today is a collection of many specific disciplines that researchers have created. No longer is this discipline limited to a few technology-related areas. Today, information science and technology as a paradigm is heavily intertwined in medicine, learning, finance, government, and many other areas. Technology is constantly changing and improving, necessitating the creation and study of innovative literature in many disciplines of information science and technology.

The diverse and comprehensive coverage of multiple disciplines of information science and technology in this eight-volume, authoritative encyclopedia will contribute to a better understanding of all topics, research, and discoveries in this evolving field. Furthermore, the contributions included in this publication will be instrumental in the expansion of knowledge in this field. This publication will inspire its readers to further contribute to the current discoveries in this immense field, creating possibilities for further research and discovery into the future of information science and technology and what lies ahead for the knowledge society.