

## Preface

The field of database technology has become vitally important to information and technical science as the world turns more and more frequently to technology for the storage and interpretation of intangible media. As the information age booms, so does the need for cutting edge research and technology with the purpose of understanding, maintaining, and improving database management. Database architecture, data mining, and data warehousing are each vitally important areas in which practitioners, researchers, scholars, and academics have continued to work to develop the most elegant and efficient database technologies.

During this period of time, numerous researchers and academicians have developed a variety of techniques, methodologies, and measurement tools that have allowed them to develop, deliver and at the same time evaluate the effectiveness of several areas of database technology. The critical importance of these technologies and methodologies continues to inspire an abundance of new, state-of-art literature related to all aspects of this discipline, allowing researchers and practicing educators to learn about the latest advances in the field of database technologies.

Due to the constant search for improved methods and technologies, it is a challenge for researchers and experts in this discipline to take in the volume of information available on these innovations, and to develop and deliver more novel methodologies and techniques utilizing new technological invention. This collection endeavors to provide the most comprehensive, in-depth, and recent coverage of all issues related to this important field, as well as to offer a single reference source on all conceptual, methodological, technical and managerial issues, opportunities, future challenges and emerging trends related to database technologies. *Information Science Reference* is pleased to offer a four-volume reference collection on this foundational discipline, in order to empower students, researchers, academicians, and practitioners with a comprehensive understanding of the most critical areas within this field of study.

This collection entitled, “**Database Technologies: Concepts, Methodologies, Tools, and Applications**” is organized in eight (8) distinct sections, providing the most wide-ranging coverage of topics such as: (1) Fundamental Concepts and Theories; (2) Development and Design Methodologies; (3) Tools and Technologies; (4) Utilization and Application; (5) Organizational and Social Implications; (6) Managerial Impact; (7) Critical Issues; and (8) Emerging Trends. The following provides a summary of what is covered in each section of this multi-volume reference collection:

Section I, ***Fundamental Concepts and Theories***, serves as a foundation for this extensive reference tool by addressing crucial theories essential to the understanding of database technologies. Chapters such as, “A Generalized Comparison of Open Source and Commercial Database Management Systems” by Theodoros Evdoridis and Theodoros Tzouramanis as well as “Highly Available Database Management Systems” by Wenbing Zhao provide an excellent framework in which to understand the fundamental concepts of database technologies. “Conceptual Modeling Solutions for the Data Warehouse” by Stefano Rizzi offers illuminating insight into the conceptual framework of data warehouse design, while chapters

such as “Approaches to Semantics in Knowledge Management” by Cristiano Fuggazza, David Stefano, Anna Montesanto, and Cesare Rocchi address the various approaches to semantics and the challenges of creating a system with its own unique semantics. With over 25 chapters comprising this foundational section, the reader can choose from a compendium of expert research on the elemental theories underscoring the use of database technologies.

Section II, ***Development and Design Methodologies***, presents in-depth coverage of conceptual architecture frameworks to provide the reader with a comprehensive understanding of the emerging technological developments within the field of database technologies. “Design of a Data Model for Social Network Applications” by Susanta Mitra, Aditya Bagchi, and A. K. Bandyopadhyay offers a data model for storage and retrieval of social network information while “Database Design based on B” by Elviar Locuratolo provides a detailed look at the integration of the ASSO feature in B. From broad examinations to specific discussions on database technologies such as Efreem Mallach’s, “A Database Project in a Small Company (or How the Real World Doesn’t Always Follow the Book)” the research found within this section spans the discipline while also offering detailed, specific discussions. From basic designs to abstract development, chapters such as “Web Data Warehousing Convergence: From Schematic to Systematic” by D. Xuan Li, J. Wenny Rahayu, and David Taniar and “Designing Information Systems Capabilities to Create Business Value: A Theoretical Conceptualization of the Role of Flexibility and Integration” by Christoph Schlueter Langdon serve to expand the reaches of development and design technologies within the database technology community. This section includes over 20 contributions from researchers throughout the world on the topic of database technologies within the information science and technology field.

Section III, ***Tools and Technologies***, presents an extensive coverage of various tools and technologies available in the field of database technology that practitioners and academicians alike can utilize to develop different techniques. Chapters such as Emmanuel Udoh’s, “Open Source Database Technologies,” offer a look at the open source database technology available and discusses its use in comparison with the popular closed source databases. A specific data mining algorithm is looked at in chapters like “MILPRIT\*: A Constraint-Based Algorithm for Mining Temporal Relational Patterns” by Sandra de Amo, Waldecir P. Junior and Arnaud Giacometti. It is through these rigorously researched chapters that the reader is provided with countless examples of the up-and-coming tools and technologies emerging from database technology. With more than 20 chapters, this section offers a broad treatment of some of the many tools and technologies within the database technology community.

Section IV, ***Utilization and Application***, discusses a variety of applications and opportunities available that can be considered by practitioners in developing viable and effective database management systems. This section includes more than 25 chapters such as “Enhancing UML Models: A Domain Analysis Approach” by Iris Reinhartz-Berger and Arnon Strom which addresses the problems of completeness and correctness within the UML modeling language by advocating the use of application-based domain modeling. Additional chapters such as Christopher B. Mayer and K. Selçuk Candan’s, “Large-Scale ASP Replication of Database-Driven Portals” discuss the ultimate necessity for logic and database replication in web portals to keep up with increasing user demand. Also considered in this section are the architecture and characteristics of mobile transactions from the database perspective within Z Abdul-Mehdi, A Mamat, H Ibrahim, and M Dirs’ chapter, “Transaction Management in Mobile Databases.” Contributions included in this section provide excellent coverage of the use of database technologies and how they can be applied to the various types of database use.

Section V, ***Organizational and Social Implications***, includes a wide range of research pertaining to the social and organizational impact of database technologies. In this section, you will find chapters such as Roberta A Bartsch’s, “Misuse of Online Databases for Literature Searches.” This study describes the

use and misuse of online library databases and attempts to help lecturers structure their assignments in such a way as to avoid misuses by increasing students' level of information literacy. In "Fine-Grained Data Security in Virtual Organizations" by Harith Indraratne and Gábor Hosszú, the concept of controlling the information available to a user down to the row of data provided by using fine-grained access control is thoroughly discussed. The increased importance of privacy protection combined with the demand for accessibility of information is discussed in George T. Duncan and Stephen F. Roerhig's chapter "Reconciling Information Privacy and Information Access in a Globalized Technology Society."

Section VI, **Managerial Impact**, presents contemporary coverage of database technologies, which is more specifically related to the corporate and managerial utilization of database management systems, and how these technologies can be facilitated within organizations. Chapters include important comparisons between business technologies, such as Emmanuel Udoh's "Database Integration in the Grid Infrastructure" which discusses Oracle 10g and argues that businesses will embrace enterprise database grids for their various beneficial attributes. The availability of databases for online database searches by their users is discussed in "Database High Availability: An Extended Survey" by Moh'd A. Radaidah and Hayder Al-Ameed. Equally as crucial are chapters such as "Empirical Assessment of Factors Influencing Success of Enterprise Resource Planning Implementations" by Fiona Fui-Hoon Nah, Zahidul Islam and Mathew Tan, which discusses key factors which influence the success or failure of ERPs.

Section VII, **Critical Issues**, contains 25 chapters addressing issues such as improving storage for semantic models, improving the accuracy of queries to databases with integrity constraints, and the security of databases containing sensitive information. Within the chapters, the reader is presented with an in-depth analysis of many of the current and relevant issues within this fundamental field of study. The section includes Russel Pears and Bryan Houlistan's "Optimization of Multidimensional Aggregates in Data Warehouses" which discusses the use of the prime factor scheme to compress data within a warehouse and compares it with the Haar wavelet. The particular idiosyncrasies involved in a multimedia database and a proposed data model to answer those unique functionalities is discussed in "Managing Uncertainties in Image Databases" by Antonio Picariello and Maria Luisa Sapino. These and the other chapters in this section combine to provide a wealth of debate on a variety of theoretical topics as they relate to database technologies.

The concluding section of this authoritative reference tool, **Emerging Trends**, highlights research potential within the field of database technology, while exploring new areas of study for the advancement of the discipline. Introducing this section is a chapter entitled "From Databases to Ontologies" by Guntis Barzdins, Janis Barzdins, and Karlis Cerans, which presents the UML profile for OWL as a bridge between legacy relational databases and OWL ontologies. Providing a view of a generalized measurement ontology meant to interact with the semantic web is "A Measurement Ontology Generalizable for Emerging Domain Applications on the Semantic Web" by Henry M. Kim, Arijit Sengupta, Mark S. Fox, and Mehmet Dalkilic. This chapter argues that these generalized ontologies are needed as a first step toward creating more detailed domain-specific ontologies. Concluding this section is an article by David A Gadish called "Introducing Elasticity for Spatial Knowledge Management." This chapter discusses the property of elasticity as it relates to spatial databases and the management of inconsistencies between related spatial data. Several areas of emerging trends and suggestions for future research within this constantly evolving discipline are found in these 16 chapters concluding this exhaustive multi-volume set.

Although the primary organization of the contents in this multi-volume is based on its eight sections, offering a progression of coverage of the important concepts, methodologies, technologies, applications, social issues, and emerging trends, the reader can also identify specific contents by utilizing the extensive indexing system listed at the end of each volume. Furthermore to ensure that the scholar, researcher

and educator have access to the entire contents of this multi volume set as well as additional coverage that could not be included in the print version of this publication, the publisher will provide unlimited multi-user electronic access to the online aggregated database of this collection for the life of the edition, free of charge when a library purchases a print copy. This aggregated database provides far more contents than what can be included in the print version in addition to continual updates. This unlimited access, coupled with the continuous updates to the database ensures that the most current research is accessible to knowledge seekers.

Database technology is a discipline that will always be critical to the information technology field as its subject matter is a foundational piece of computing technologies. The use of databases for information storage and analysis will only continue to grow as the demand for greater quantities of knowledge and faster database systems increases. Practitioners in the field combined with researchers and scholars will continue to look for ways to improve retrieval and interpretation of information as well as its format and storage capabilities. As the field continues to grow, develop, and improve an abundance of new and innovative research on database management systems and their various implications and uses will continue to persist.

The diverse and comprehensive coverage of database technologies in this four-volume authoritative publication will contribute to a better understanding of all topics, research, and discoveries in this developing, significant field of study. Furthermore, the contributions included in this multi-volume collection series will be instrumental in the expansion of the body of knowledge in this enormous field, resulting in a greater understanding of the fundamentals while fueling the research initiatives in emerging fields. We at *Information Science Reference*, along with the editor of this collection, hope that this multi-volume collection will become instrumental in the expansion of the discipline and will promote the continued growth of database technologies.