

Preface

A database is an indispensable component of any information system. As database systems become increasingly widespread and important to businesses, database management thus becomes crucial to business success, particularly with the current emphasis on data, information, and knowledge as essential resources of any organization. Different database management products continue to emerge, as well as various extensions and complementary offerings to existing products. While commercial vendors have sought to accommodate new user requirements in the past few years, extensive academic research has also helped to enhance the functionality of current database systems, improve information storage, refine existing database models, meet the needs of Internet and e-commerce applications, and develop advanced applications such as data warehousing and data mining. This book presents the latest research ideas and topics in the field of database management.

This book is designed to provide readers with the latest research articles in database and database management. Emphasis is placed on improving theoretical understanding of database systems. It is expected that researchers in universities and research institutions will find such discussions particularly insightful and helpful to their current and future research. In addition, this book is also designed to serve technical professionals, since it is related to practical issues in database applications and aimed to enhance professional understanding of the capabilities and features of new technologies and methodologies.

This book is organized into four major sections: Enhancement of Current Database Models, Refinement of the Contemporary Database Model and Technique, Integration with the Internet Technology, and Applications of Unified Modeling Language.

Enhancement of Current Database Models

This section includes six chapters related to the ER models and the object-oriented approach, two of the most popular models in database literature. In “Enforcing Cardinality Constraints in the ER Model with Integrity Methods,” Balaban and Shoval suggest extending the Enhanced ER (EER) data model with integrity methods that can enforce cardinality constraints. In “Ternary Relationships: Semantic Requirements and Logically Correct Alternatives,” Jones and Song provide a basis for manipulating ternary relationships and offer key insights into methodologies and mechanisms for dealing with them. In “Object-Oriented Database Benchmarks,” Darmont and Schneider give an overview of the benchmarks aimed at evaluating the

performance of Object-Oriented Databases, with particular emphasis on Object-Clustering Benchmarks. Whereas Shoval and Kabeli propose a functional and object-oriented methodology (FOOM) in system analysis and design in “FOOM—Functional and Object-Oriented Methodology for Analysis and Design of Information Systems,” Dori suggests an object-process methodology (OPM), which addresses problems with the object-oriented methods, and presents an application of OPM that models the basic electronic commerce process of credit card transactions in “Object-Process Methodology Applied to Modeling Credit Card Transactions.” The last chapter in this section is “The Psychology of Information Modeling.” In this chapter, Siau reviews cognitive psychology, discusses its application to information modeling and method engineering, and proposes the use of cognitive psychology as a reference discipline for information modeling and method engineering.

Refinement of Contemporary Database Model and Technique

The five chapters included in this section propose applications of theoretical models and techniques to address issues in current database systems design and architecture. For example, in “A Case Study of the Use of the Viable System Model in the Organization of Software Development,” Kawalek and Wastell employ the Viable System Model to deal with business adaptation in a case of a software development enterprise. “Modeling of Business Rules for Active Database Application Specification” by Amghar, Meziane and Flory, develops new techniques to model business rules (e.g., active rules, integrity constraints, etc.). Chin presents the Partial REALLOCATE and Full REALLOCATE heuristics for efficient data reallocation in distributed database systems in “Algorithm Development, Simulation Analysis, and Parametric Studies for Data Allocation in Distributed Database Systems.” In “Using Weakly Structured Documents at the User-Interface Level to Fill in a Classical Database,” Laforest and Flory attempt to provide a system that associates document capture freedom with database storage structure. In “Cooperative Query Processing via Knowledge Abstraction and Query Relaxation,” Huh, Moon, and Ahn propose an abstraction hierarchy as a framework to facilitate approximate query answering.

Integration With the Internet Technology

The three chapters in this section focus on the Internet’s impact on database management systems. In “CMU-WEB: A Conceptual Model with Metrics for Testing and Designing Usability in Web Applications,” Bajaj and Krishnan propose a 3-dimensional classification space for WWW applications, attempting to provide a conceptual model that measures quantifiable metrics. In “Managing Organizational Hypermedia Documents: A Meta-information System,” Suh and Lee refine metadata roles, suggest a metadata classification and the corresponding metadata schema for organizational hypermedia documents (OHDs), and propose a Hyperdocument Meta-Information System. In “Changing the Face of War through Telemedicine and Mobile E-commerce,” Rodger, Pendharkar and Khosrowpour illustrate how Web-base capabilities can enhance medical management of battle spaces.

Applications of Unified Modeling Language

The five chapters in this section elaborate on application of Unified Modeling Language (UML) to information systems analysis and design. “How Complex Is the Unified Modeling Language?” by Siau and Cao provides a reliable and accurate quantitative measure of UML complexity. In “Information Analysis in UML and ORM: A Comparison,” Halpin examines the relative strengths and weaknesses of Unified Modeling Language (UML) and Object-Role Modeling (ORM) for conceptual data modeling, and indicates how models using one notation can be translated into the other. In “Formal Approaches to Systems Analysis Using UML: An Overview,” Whittle surveys recent attempts to provide a more precise description of UML, as well as techniques for formally analyzing UML models. In “Extending UML for Space- and Time-Dependent Applications,” Price, Tryfona and Jensen describe a UML extension, Extended Spatiotemporal UML (XSTUML) and introduce a technique for modeling composite data. In “The Role of Use Cases in the UML: A Review and Research Agenda,” Dobing and Parsons trace the development of use cases and outline a framework for future empirical research to resolve problems with use case applications and theoretical underpinnings.

Keng Siau
University of Nebraska–Lincoln, USA
October 2001