

## Preface

Databases and database technologies have thoroughly permeated the business and consumer world, and represent the most common and accepted means of data storage and processing in use today. In such an environment development and enhancement of database technologies provide vital support for businesses in their drive to achieve higher performance, efficiency, and customer satisfaction goals. Creating reusable code modules and moving legacy systems to a web environment represent two ongoing trends that are very relevant to database developers and administrators. This volume, *Advanced Principles for Improving Database Design, Systems Modeling, and Software Development* presents nineteen chapters that represent top research in the areas of database theory, systems building, data analysis techniques, web/mobile commerce and middleware, and organization and structures.

Maintaining the high quality of previous volumes in the Advances in Database Research Series the editors have selected research from acknowledged experts in the area of database and systems development and compiled them into this volume. The following sections present a brief synopsis of each chapter.

Chapter I, “*Semantics of the MibML Conceptual Modeling Grammar: An Ontological Analysis Using the Bunge-Wang-Weber Framework*” conducts an ontological analysis of the MibML conceptual modeling grammar. The authors propose that their approach represents a starting point for continuing ontological development.

Chapter II, “*A Measurement Ontology Generalizable for Emerging Domain Applications on the Semantic Web*” provides an ontology for measuring Semantic web application programs. The authors provide details on the creation of the ontology, how it can be used in analysis and how the ontology was validated.

Chapter III, “*Semantic Integration and Knowledge Discovery for Environmental Research*” provides an approach to obtain semantic information from environmental data. The approach details a metadata semantic integration approach to help users integrate, move around in, and query multiple data sources, and the benefits of the approach are indicated in the experimental results.

Chapter IV, “*Towards Code Reuse and Refactoring as a Practice within Extreme Programming*” proposes a framework that incorporates the practice of code reuse into the Extreme Programming methodology. As an Agile development technique Extreme Programming is a methodology that emphasizes an accelerated programming process. The chapter proposes that incorporating code reuse into extreme programming will increase the efficiency of systems development.

Chapter V, “*Requirements Elicitation Technique Selection: A Theory-Based Contingency Model*” develops one of the first theory-based models to assist with selecting the appropriate requirements elicitation technique. The authors argue that their biggest contribution lies in providing a theory to help the understanding of why some elicitation techniques work better than others in specific implementation instances.

Chapter VI, “*IT Value of Software Development: A Multi-Theoretic Perspective*” demonstrates a research model that combines social capital, organizational learning and knowledge based views of organizations. The idea they develop is to use the resultant model to assess the IT value of systems created by systems development teams using different systems development methodologies.

Chapter VII, “*UB2SQL: A Tool for Building Database Applications Using UML and B Formal Method*” describes development of a tool that was created to aid in design and development of database applications. The tool defines rules and tactics, along with a means of proofing the correctness of the specification and process, and has been integrated into a plug-in for the Rational Rose software development application.

Chapter VIII, “*Using Decision Trees to Predict Crime Reporting*” develops an approach to identify the variables and predict crime reporting rates using decision trees. The approach contrasts sharply with the traditional practice of using only descriptive statistics to determine the crime reporting rates.

Chapter IX, “*A Model for Estimating the Savings from Dimensional Versus Keyword Search*,” develops a model that can be used to approximate the cost to a business for using keywords searches as its primary means of searching. The authors go on to illustrate how the model shows that a dimensional search approach can reduce costs for almost all businesses.

Chapter X, “*Integrity Constraint Checking for Multiple XML Databases*” develops a new technique that allows semantic integrity constraints to be checked for XML-based databases. The authors’ *XConstraint Checker* includes an efficient algorithm optimized for semantic integrity constraints and is installed on a prototype system to demonstrate its utility.

Chapter XI, “*Accelerating Multi Dimensional Queries in Data Warehouses*” details the creation of a data compression method that allows quicker query returns in a data warehouse. In laboratory and real-world conditions, the method outperformed other leading schemes in both decoding time and error rates.

Chapter XII, “*View Materialization in a Data Cube: Optimization Models and Heuristics*” provides a materialization scheme for determining the correct number of views to create for a data warehousing application. Their design provides a number of heuristics that the authors examine for accuracy and timeliness in a performance guarantee scenario.

Chapter XIII, “*WebFINDIT: Providing Data and Service-Centric Access through a Scalable Middleware*” presents a middleware solution that provides a means of designing and structuring a dynamic architecture for web-based database applications. The resulting system called WEBFINDIT represents a scalable infrastructure for heterogeneous data sources, making it especially relevant to web databases and web commerce applications.

Chapter XIV, “*Retrieval Optimization for Server-Based Repositories in Location-Based Mobile Commerce*” provides an evaluation and extension of the author’s location-aware method of resolving location-referent transaction-related queries. The determination methods developed resulted in a “useful linkcell size determination heuristic” for optimizing queries in this environment.

Chapter XV, “*Migrating Legacy Information Systems to Web Services Architecture*” describes a means to convert a legacy system architecture into a Service-oriented Architecture. The authors propose that their solution differs from similar approaches in that their solution includes specific object-oriented and functional-oriented features.

Chapter XVI, “*A Socio-Technical Interpretation of IT Convergence Services: Applying a Perspective from Actor Network Theory and Complex Adaptive Systems*” uses an interpretive case study to explore and provide possible explanations of the effect of convergence of digital services. Complexity Adaptive Systems Theory and Actor Network Theory represent the theoretical basis for the research, and the resulting new framework proposes a means to connect the two theories and finally presenting possible ways to explain the underlying behaviors.

Chapter XVII, “*Understanding Organizational Transformation From IT Implementations: A Look at Structuration Theory*” uses Adaptive Structuration Theory (AST) to examine variables in a data warehouse environment that imply how organizations are changed or transformed by the implementation effort. The authors propose that through use of AST, three key aspects of organizations, technology structure, other sources of technology, and group internal system, can be identified and that likely have an impact on how organizational transformations happen.

Chapter XVIII, “*Social Network Structures in Open Source Software Development Teams*” takes the perspective of an open source software (OSS) team in examining how the dynamics of social network structures affect team performance. Results show that at the beginning of an OSS-based project, there is generally a single hub social structure that moves toward a core/periphery model at later stages of such projects.

Chapter XIX, “*Design of a Data Model for Social Network Applications*” proposes that an object-relational graph data model can be used to represent a social network. The authors indicate that this model can be used to represent the node-based properties common to social network theory-based structures.