Preface

Database and database technologies are at the heart of many business information systems. New techniques and tools are continuously being introduced. This volume, “Cross-Disciplinary Models and Applications of Database Management: Advancing Approaches,” presents eighteen excellent chapters of exemplary research in the areas of database theory, systems design, systems building, virtual environments, ontologies, and others. Many disciplines are converging, and many disciplines can benefit from theories, models, and research results from other disciplines. Cross fertilization of ideas from different disciplines will help to produce innovative research and create new disciplines. This book consists of many examples of convergence of ideas from various disciplines.

The following presents a brief synopsis of each chapter.

Chapter 1, “Using Ontology Languages for Conceptual Modeling,” discusses the benefits of using ontology languages for conceptual modeling. Conceptual models are used to facilitate communication about application domains in Information Systems development. Conceptual models are created using modeling grammars to represent domain concepts and their relationships. Ontology languages have features that enable the representation of semantic relationships among domain concepts and of domain rules.

Chapter 2, “Modeling Design Patterns for Semi-Automatic Reuse in System Design,” discusses reusable solutions for recurring design problems. It presents an approach to modeling different aspects of design patterns, and semi-automatically utilizing these models to improve software design.

Chapter 3, “Energy and Latency Efficient Access of Wireless XML Stream,” addresses the problem of delayed query processing raised by tree-based index structures in wireless broadcast environments, which increases the access time of mobile clients. It proposes a novel distributed index structure and a clustering strategy for streaming XML data that enables energy and latency-efficient broadcasting of XML data.

Chapter 4, “Toward a Unified Model of Information Systems Development Success,” presents a model that depicts the factors contributing to Information Systems development (ISD) success. Information Systems development (ISD) is a complex process with interconnected resources, stakeholders, and outcomes. The chapter synthesizes past research on the topic and proposes a unified model on ISD success through a systematic and comprehensive literature review. The unified model highlights that ISD is a complex and interactive process involving individual, team, and organization factors.

Chapter 5, “Representing Classes of Things and Properties in General in Conceptual Modeling: An Empirical Evaluation,” argues that how classes of things and properties in general should be represented in conceptual models is a fundamental issue. In this chapter, the authors use ontological theory and cognition theory to provide guidelines on how classification should be represented in conceptual models.
and describes a cognitive processing study that examined whether a clear distinction between classes of things and properties in general impacts the cognitive behaviors of users.

Chapter 6, “Information Search Patterns in E-Commerce Product Comparison Services,” studies the effect of the presentation of product information to facilitate product selection and purchase decisions in e-commerce. This chapter further discusses how disposition styles influence users’ search patterns in product comparison services of e-commerce Web sites. Gensch’s two-stage choice model suggests that people use attribute processing to derive a consideration set before people apply alternative processing to arrive at a final choice in product comparison services. The results of this study are consistent with the Gensch’s two-stage choice model.

Chapter 7, “Antecedents of the Closeness of Human-Avatar Relationships in a Virtual World,” presents an interesting study in the area of Virtual World. The idea of Virtual Worlds where users interact and form relationship with other users’ virtual identities represented by avatars, is increasingly important in today’s businesses and society. This chapter investigates the antecedents of the closeness of such relationships and also conceptualizes the closeness of human-avatar relationship as composed of interaction frequency, activity diversity, and relational influence.

Chapter 8, “Antecedents of Online Game Dependency: The Implications of Multimedia Realism and Uses and Gratifications Theory,” proposes and empirically tests three predictive models of Massively Multiple Online Game (MMOG) dependency by surveying online gaming participants. This chapter focuses on multimedia realism for social interaction that serves as an original antecedent factor affecting other mediating factors to cause MMOG dependency.

Chapter 9, “Assigning Ontological Meaning to Workflow Nets,” presents a Workflow-net (WF-net), which is an application of Petri Nets (with additional rules), that models business process behavior. The chapter proposes a set of rules for mapping the domain in which a process operates into a WF-net, derived by attaching ontological semantics to WF-nets. These rules guide the construction of WF-nets, which are meaningful because their nodes and transitions are directly related to the modeled (business) domains.

Chapter 10, “Maintaining Mappings between Conceptual Models and Relational Schemas,” describes a round-trip engineering approach for incrementally maintaining mappings between conceptual models and relational schemas. It examines the mapping specifying “consistent” relationships between models by defining the consistency of a conceptual-relational mapping, analyzing the knowledge encoded in the standard database design process, and developing round-trip algorithms for incrementally maintaining the consistency of conceptual-relational mappings under evolution.

Chapter 11, “Impact of Flow and Brand Equity in 3D Virtual Worlds,” draws on flow theory as its main theoretical foundation to understand and empirically assess the impact of flow on brand equity and behavioral intention in 3D virtual worlds. It suggests that the balance of skills and challenges in 3D virtual worlds influences users’ flow experience, which in turn influences brand equity. This chapter further highlights the importance of balancing the challenges posed by 3D virtual world branding sites with the users’ skills to maximize their flow experience and brand equity to increase their behavioral intention associated with the brand.

Chapter 12, “Cost and Service Capability Considerations on the Intention to Adopt Application Service Provision Services,” introduces the Application Service Provision (ASP) model that offers a new form of IS/IT resource management option for which the vendor remotely provides the usage of applications over a network. The authors used survey data collected from a national sample of IS/IT executives to investigate empirically the intention to adopt an ASP service from the customers’ perspective.
Chapter 13, “Co-Creation and Collaboration in a Virtual World:  A 3D Visualization Design Project in Second Life,” discusses the use of virtual worlds in education and describes an innovative 3D visualization design project using one of the most popular virtual worlds, Second Life. The chapter also discusses observations and reflections on the 3D visualization design project and concludes with a discussion of future research directions in applying virtual worlds in education.

Chapter 14, “Transforming Activity-Centric Business Process Models into Information-Centric Models for SOA Solutions,” formalizes the information-centric approach and derives the relationships between the two approaches. This chapter further defines the notion of a business entity, provides an algorithm to transform an activity-centric model into an information-centric process model, and demonstrates the equivalence between these two models.

Chapter 15, “An Integrated Query Relaxation Approach Adopting Data Abstraction and Fuzzy Relation,” proposes a cooperative query approach that relaxes query conditions to provide approximate answers by utilizing similarity relationships between data values. It introduces the fuzzy abstraction hierarchy (FAH) that represents a similarity relationship based on the integrated notion of data abstraction and fuzzy relations. FAH supports more effective information retrieval by processing various kinds of cooperative queries and reduces maintenance cost by decreasing the number of similarity relationships.

Chapter 16, “Accelerating Web Service Workflow Execution via Intelligent Allocation of Services to Servers,” studies the Web service operations at the service provider site with the assumption that a service provider has several servers over which Web service operations can be deployed. The authors explore different topologies for the workflow structure and the server connectivity, and propose a suite of greedy algorithms for each combination.

Chapter 17, “Matching Attributes Across Overlapping Heterogeneous Data Sources Using Mutual Information,” proposes a method for matching the most frequently encountered types of attributes across overlapping heterogeneous data sources. Mutual information is used as a unified measure of dependence on various types of attributes.

Chapter 18, “Disclosure Control of Confidential Data by Applying PAC Learning Theory,” examines privacy protection in a statistical database from the perspective of an intruder using learning theory to discover private information. The chapter discusses how to prevent disclosing the identity of unique records in a statistical database and shows how much protection is necessary to prevent an adversary from discovering confidential data with high probability at small error.