Methodical and well-planned analysis and design is a key factor in the successful development, implementation, and efficient use of any system. With explosive growth of computer-based systems in diverse application areas, appropriate and additional application-specific methods of analysis and design are emerging. New approaches are being developed and new ways of utilizing older and new techniques are being constantly reviewed. In such an ever-evolving environment the practitioners, educators, researchers, and professionals of a discipline need access to the most current information about the methodologies, concepts, issues, trends, tools, and techniques in systems analysis and design. The Handbook of Research on Modern Systems Analysis and Design Technologies and Applications will be a useful source for comprehensive coverage and definitions of related topics, providing evolution of systems analysis and design methodologies and practices with insight into the comparative study of general and application-specific analysis and design approaches.

This book has 35 chapters divided into eight broader areas:

- System development methodologies
- Modeling processes
- Agile software development
- System design and considerations
- Object oriented development
- Design applications
- Medical applications
- Educational applications

The following paragraphs are intended to put together the abstracts from the chapters in this book that will provide an overview of the topics covered.

**System Development Methodologies:** The ever-growing business needs in large organizations demand for complex, but flexible, scalable, extensible, and forward-thinking technical solutions. To effectively manage the architecture assets and design top-quality IT solutions in a diverse environment the highly structured methodologies are of critical importance to achieve an array of goals, such as separate concerns, divide responsibilities, encapsulate the complexity, utilize patterns, leverage best practices, control quality, ensure compliance, and establish execution processes. Chapter I discusses the solutions architecting method (SAM), which is defined as a methodical approach to dealing with the architecture complexity of enterprise information systems in IT solution designs. It consists of eight interconnected modules: framework for e-business architecture and technology, prescriptive artineering procedure, technology architecture planning, architecture stack and perspectives, rapid architecting process, architecture readiness maturity, generic application platform, and tao of IT development and engineering. Best practice and lessons learned as well as future trends are discussed in the context. Chapter II presents a new high level methodology for the analysis and design of information systems, specifically to support routine action at the operational level of organizations. A brief case study illustrates how using the methodology can sensitiz the analyst to opportunities to increase human efficiency and effectiveness through lighter weight information systems. Chapter III introduces an assembly-based method engineering approach for constructing situational analysis and design methods. It is supported by a metamodelling technique, based on UML activity and class diagrams. Chapter IV focuses on the analysis
and design issues and techniques for the location-based service (LBS). It also presents the architecture and database design issues in LBS systems and studies the performance of an LBS system and evaluates its properties. Chapter V aims to identify important research questions in PM-SDLC formulated for software-intensive systems. Chapter VI is an effort to synthesize accumulated knowledge through developing a review of the types of requirements, processes, activities, and techniques used in software systems development. Analysis and synthesis of such findings permit to posit a generic requirements engineering process. Chapter VII is an attempt to theoretically analyze the antecedents of individual attitude toward improvisation by looking at the information systems development domain, while Chapter VIII discusses design and analysis methods, techniques, and issues related to decision support systems (DSS). Chapter IX takes a closer look at project management, highlighting the major existing risk factors and some measures facing project management practices. It also evaluates the unique issues in delivering projects brought about by globalization. Chapter X focuses on decision-making rules for investing in reuse frameworks and attempts to determine the parameters that should be taken into account in decisions relating to degrees of reusability. Two new models, a restricted model and a nonrestricted model, used for decisions-making relating to reusability are presented, analyzed, and discussed. Chapter XI presents three alternatives for structuring static tables and provides algorithms for construction. It also provides simple guidelines for choosing among the strategies. Chapter XII argues that the evolution, analysis, and design of the application software representing higher level concepts cannot be deduced from the underlying concepts, which are valid on a lower level of abstractions.

**Modeling Processes:** Model driven architecture (MDA), rapid application development (RAD), adaptive development, extreme programming (XP), and others have resulted in a shift from the traditional waterfall model. Unified modeling language (UML) was created by the convergence of several well-known modeling methodologies. Chapter XIII reviews the UML evolution (UML2, xUML), and outlines criteria and requirements to evaluate UML and xUML. It discusses the potentials and limitations that impose restrictions on it to completely fulfill the vision of software development through a continuous exactable modeling process. Chapter XIV discusses the dynamic essential modelling of organization (DEMO), which is a typical language for modelling business processes and the UML, which is a predominant language for information systems modelling. It also challenges the assumption of their incompatibility by providing a framework for the integration of these languages. Chapter XV provides an overview of business process management and business process modeling in a comprehensive way such that academics and practitioners can use it as a reference for identifying more specialized works.

**Agile Software Development:** Agile development emphasizes the relationship and communality of software developers as opposed to a universally applicable methodology for software and systems development. Chapter XVI hypothesize that an agile method can be created from method fragments, once those fragments have been identified and appropriately documented. It identifies and documents the method fragments that conform to an underpinning metamodel (AS4651) and that support a range of agile methods, including XP, Crystal, Scrum, ASD, SDSM, and FDD. An important part of any such research is the validation phase. This is described in Chapter XVII, where four agile methods are recreated from the fragments in the newly enhanced OPEN process framework (OPF) method base.

**System Design and Considerations:** The design and the maintenance of data management environments are driven primarily by technical and functional requirements. Chapter XVIII suggests that economic considerations, such as the utility gained by the use of data resources and the costs involved in implementing and maintaining them, may significantly affect data management decisions, and accordingly proposes an analytical framework for analyzing utility-cost tradeoffs and optimizing design. Chapter XIX emphasizes identifying security risks and documentation requirements from the very early stage in the development life stage, which is vital for the design, use, and maintenance of data, and the information system that manages it. It argues that practitioners will be able to improve both the security and the overall quality of computerized information systems by paying attention toward improving security with automated tools, performing abuse cases, tracing security requirements, holding regular security reviews, conducting certification and accreditation, and developing security response processes.

Chapter XX focuses on the design aspects of human-computer interface by examining the relationship between the functionality and features of the interface and the cognitive factors associated with the design of such interface. It proposes a framework and guidelines for designing an effective interface. Chapter XXI explores the potential of model-based design for enterprise information systems (EIS) and identifies the basic requirements for model-based EIS design. It discusses the RUP SE, UML4ODP, and EIS design framework based on the above requirements.
The significant advances exhibited in the field of mobile and wireless information systems have resulted into a rapid proliferation of mobile information devices and considerable improvement in their capabilities. Chapter XXII addresses the software engineering dimensions associated with the development of mobile and context-aware multiagent systems, while Chapter XXIII introduces and investigates the applicability of the multiagent paradigm for engineering and developing CSCW systems with the aim of advocating modern design dimensions and software engineering implications.

Object Oriented Development and design patterns: Chapter XXIV describes the use of design patterns as reusable components in program design, while Chapter XXV introduces Hibernate, which is described as a powerful, high performance object/relational persistence and query service.

Design Applications: With the remarkable growth of the Internet and multimedia applications, the production, distribution, and transmission of digital media are gaining importance. With increasing demand of video, its transmission through limited bandwidth media requires efficient video coding techniques. Chapter XVI describes the background, features, recent developments, and future trends of a pattern-based video coding technique that has recently established its potentiality to improve coding compared to the standard H.264 in the range of low bit rates. Chapter XVII discusses the issue of secure distribution of digital contents maintaining the quality of service of the applications and the rights of the content owner as well as enforcing a viable business model among the producer, consumer, and distributor of digital contents. Chapter XVIII deals with the development of an automated support vector machine (SVM) system with state-of-the-art technologies.

Medical Applications: Chapters XXIX to XXXII discuss tools, design, and trends in medical applications development. The first chapter focuses on hybrid data mining algorithms and their use in medical applications. It includes experimental results with existing and new hybrid approaches to demonstrate the superiority of hybrid data mining algorithms over standard algorithms. The next chapter describes the application of machine learning techniques to solve biomedical problems in a variety of clinical domains. Chapter XXXI provides an understanding of the complexity of healthcare as a setting for information systems and how this complexity influences the achievement of successful implementations. It discusses the challenges that must be balanced by the health systems implementer in delivering robust systems that support evidence-based healthcare processes. The next chapter discusses research trends and system design issues of telemedicine and proposes a mobile telemedicine system architecture and design.

Educational Applications: Chapters XXXIII to XXXV introduce design and analysis concepts in educational applications. Chapter XXXIII discusses the “course concept dependency schema” using Web ontology language (OWL) to represent the prerequisite concept dependency. The next chapter argues that an information systems curriculum is an information system, and, as such, design of a university curriculum in the information systems discipline needs to follow many of the same processes that professional systems analysts use. The last chapter reports on the design, development, and implementation of a hybrid introductory systems analysis and design (SAD) course.

As is evident from the above collection of the abstracts, many different audiences can make use of this book. Contributions to this publication have been made by scholars from around the world with notable research portfolios and expertise. Provocative ideas from the methodologies, applications, case studies, and research questions in different chapters from different aspects will make it instrumental in providing researchers, scholars, students, and professionals access to current knowledge related to systems analysis. Even a casual reader may benefit from it by getting broader understanding of the design and analysis terminologies and concepts.

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