Preface

Within the information systems field, conceptual modeling is a promising instrument to develop information systems. However, the modeling process is often resource-consuming and faulty. As a way to overcome these failures and to improve and accelerate the development of enterprise-specific models, the concept of reference modeling has been introduced.

Research on reference modeling has become quite popular in the 1990s. Interest in reference modeling, both in industry and in academia, has grown rapidly over the past decade, and continues to grow. The output of the various research streams is documented in the literature. However, non-experts cannot easily access most of this work because it is spread around in different conference proceedings, scholar journals, project reports, and so forth. The objective of this book is to consolidate the already-available knowledge in this area and to point to open problems. The book will provide insights and support for:

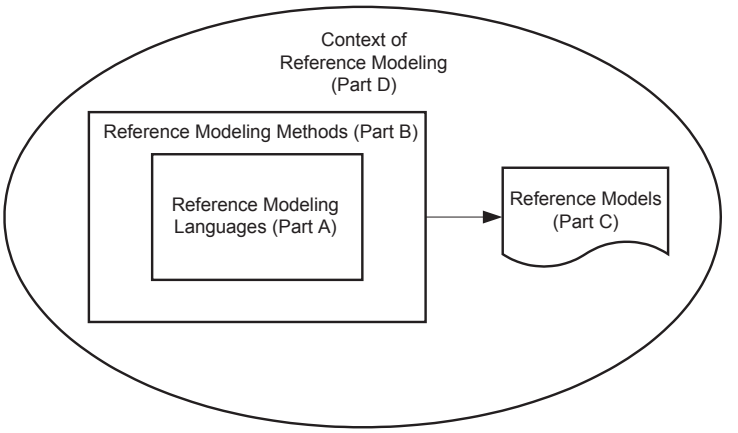
- Professionals and researchers working in the field of conceptual modeling in general and reference modeling in particular
- Practitioners and managers concerned with business systems analysis

We want to stimulate further research and provide one building block for an international community on reference modeling with the help of this book.

At the beginning of 2005, we published a call for chapters and invited several experts in the reference modeling field to provide us with proposal chapters for this book. The response to our book was indeed overwhelming. We received 27 full chapters, which forced us to spend a considerable amount of time on the selection process. All chapters received have been reviewed by at least two experts in the field of conceptual modeling or reference modeling respectively. Finally, we selected 16 chapters for inclusion in our book.

Chapter I by Fettke and Loos motivates research on reference modeling and introduces the chapters of this book on using reference models for business systems analysis. Their discussion is based on a framework for research on reference modeling that consists of four

Figure 1. Reference modeling framework used in the book



elements: reference modeling languages, reference modeling methods, reference models and reference modeling context (cf. Figure 1). Each element of the framework is discussed with respect to prior research, the contributions of chapters in this book and future research opportunities.

Section I of the book consists of Chapters II and III. In **Chapter II**, Recker, Rosemann, van der Aalst, Jansen-Vullers and Dreiling reflect on the area of configurable reference modeling languages. Their chapter discusses typical requirements for and the development of a reference modeling language. The proposed approach is discussed against the background of ERP systems and exemplified by so-called configurable event-driven process chains (C-EPCs), an extension of a well-known process modeling language in the area of business process management. The usefulness of their approach is demonstrated by applications in the area of SAP enterprise system configuration, process mining and integration of configurable data and process models.

Chapter III by vom Brocke provides an excellent summary of well-known design principles for reference models. In his chapter, he proposes a framework for reuse relations between conceptual models. The framework presented does not only stress the need for configuration concepts to reuse conceptual models, but also elaborates other design principles such as instantiation, aggregation, specialization and analogy. As a special feature, a precise meta model defines each design principle. Furthermore, vom Brocke discusses the trade-off between the costs of designing reference models *for* reuse and the costs of designing reference models *with* reuse. Some guidelines for applying the design principles complete this chapter.

Section II of the book consists of Chapters IV to VII. In **Chapter IV**, Ahlemann and Gastl introduce a process model for the construction of reference models. The proposal describes how to base the model construction process on empirical data. To achieve this objective, typical empirical data gathering methods such as interviews, systems analysis, and so forth, are used. The construction process of reference models consists of four phases: (1) planning the reference model project, (2) model construction, (3) practical testing and (4) documen-

tation. Each phase is described in detail. Furthermore, the authors present many concrete examples illustrating how the proposed process model can be applied in reality.

In **Chapter V,** Duarte, Fernandes, and Machado investigate methods for business modeling in process-oriented organizations from a software development perspective. The authors propose a generic framework for process-oriented software houses. The framework can be understood as a particular reference model and describes important software development processes such as management, support and add-value processes. The instantiation of this framework is demonstrated with the well-known rational unified process (RUP). Additionally, it is explained how the framework can be used with other kinds of processes. The chapter concludes with the results from a case study investigating a real software development project.

It can be assumed that the effectiveness and efficiency of the application of a reference model is strongly determined by the quality of the model. To evaluate the quality of reference models, Frank develops a multi-perspective framework in **Chapter VI**. This framework consists of four perspectives: (1) costs and benefits of reference model use are assessed from an economic perspective; (2) the deployment perspective describes criteria for the ability and willingness of users to deal with a reference model; (3) from an engineering perspective, a reference model is viewed as a design artifact that has to fulfill particular requirements; and (4) finally, reference models can be assessed from an epistemological point of view. Additionally, the chapter explains a generic process model for performing a reference model evaluation.

Noran demonstrates in **Chapter VII** how reference models can be used in the area of enterprise architecture. The complete description of the methodology used is beyond the scope of this chapter. Instead, the author exemplifies the usefulness of his approach with a particular example. This example shows how to assess and organize reference models into a structured repository using a generalized architectural framework. Further, the chapter provides guidance for the selection of an appropriate reference model. The chapter concludes with reflections on improving the quality of reference models and some interesting aspects used to structure and select reference models.

Section III of the book consists of Chapters VIII to XIII. In **Chapter VIII**, Scheer, Jost and Güngöz summarize the results of 20 years of research on developing and applying a reference model for industrial enterprises. The so-called Y-CIM reference model is established and recognized as the standard reference model in the industrial sector and is also being deployed more by other industries. This chapter focuses on the development of CIM and how the Y-CIM reference model can implement it. Some particular features of the Y-CIM reference model are discussed. Additionally, the applicability of the model in the service industry is investigated.

In **Chapter IX**, Becker and Schütte give an overview of a reference model for retail enterprises, the so-called "retail-H model." This reference model provides a structural framework for information systems for the retail sector. The reference model and its graphical representation aim at enhancing the orientation within the numerous conceptual models applied in the retail sector. These conceptual models are pivotal for the management of information systems and business processes. Furthermore, the authors describe some exemplary reference data models in the retail sector.

In **Chapter X**, Mäuser describes the SKO data model, a reference model for the Sparkassenorganisation (the organization of German Saving Banks). The SKO data model was initially developed approximately 15 years ago and is derived from the Financial Services Data Model, which had been provided by IBM. Currently, the model is probably the most extensive reference data model in the banking area with more than 17,000 well-defined modeling objects. Until now, this reference model has been utilized in about 30 projects. The model is organized around five abstraction layers that provide different levels of modeling granularity. A dedicated software tool guarantees the efficient use of the SKO data model.

Faced with changing market conditions and higher pressure on cost and productivity, enterprises have started to concentrate on their core competencies. This results in a paradigm shift in the domain of strategic sourcing from a supplier centric to a supply network scope. In order to support the paradigm shift, Albani, Müssigmann and Zaha have developed a reference model for the domain of strategic supply network development in **Chapter XI**. This reference model extends the traditional frame of reference in strategic sourcing to a supply network perspective. Additionally, the authors describe the development of a prototype that is based on the proposed reference model.

While the Y-CIM and retail-H reference models, as well as the SKO data model, primarily address traditional business areas, numerous reference models have been proposed in the meantime to facilitate the development of electronic business systems and applications. Mišić and Zhao conduct a comparative analysis of existing electronic reference models in **Chapter XII**. Such an analysis is the first step in selecting the right foundation for the system that is being developed. This chapter presents some results of a comparative analysis of four well-known reference models for electronic businesses. Their analysis is primarily conducted from the viewpoint of a reference model's suitability to support the development of flexible and interoperable electronic business applications.

In **Chapter XIII**, Van Belle presents the results of the evaluation of 10 reference models that are well-known in theory and practice. His analysis is based on an evaluation framework that encompasses syntactic, semantic and pragmatic aspects. Most evaluation criteria used allow a quantitative evaluation of reference models. However, not all criteria proposed can be measured using clear or unambiguous metrics. To overcome these limitations, the author suggests some novel, exploratory approaches. The chapter does not only evaluate selected reference models but also provides some insights into the methodological problems of reference model evaluation.

Section IV of the book consists of Chapters XIV to XVII. In **Chapter XIV**, Thomas explores the idea of reference model management. His work is motivated by the fact that today's reference modeling processes are not well supported by software tools. Of course, there are tools that support a particular reference modeling activity. However, there is no integrated approach to computer-supported management of reference models. Such an approach is developed by the author. The proposed system is described with the help of particular data structures and system architectures. Additionally, experiences from a prototypical implementation of a reference model management system are reported.

In **Chapter XV,** Braun, Esswein, Gehlert and Weller investigate the topic of configuration management for reference models. They argue that the modification of reference models should be systematically supported by a model configuration management system, which has to address versioning and referencing. Versioning is needed to trace changes made to reference models over time. The concept of referencing describes the relationship between

a generic reference model and a particular enterprise model. The chapter discusses several requirements of configuration management and shows how these requirements can be supported by an adequate system.

In **Chapter XVI**, Mendling, Neumann, and Nüttgens discuss interchange formats for reference modeling. Interchange formats build on isomorphic mapping between a domain-specific meta model and the scheme of the interchange format. First, the authors explain general aspects of interchange formats, including their pragmatic, economic and conceptual efforts and present general design guidelines for interchange formats. After that, they illustrate interchange formats for EPCs and UML, two frequently used modeling languages for reference modeling. Additionally, the authors illustrate the benefits of interchange formats for three important areas of reference modeling: model interchange, separation of process modeling and execution as well as model transformation.

Finally, in **Chapter XVII**, Höhnel, Krahl, and Schreiber report on several lessons learned in reference modeling. The authors gained their experience from more than 40 reference modeling projects in different industries. The lessons learned described by the authors can be grouped into five critical success factors: open communication, open construction principles and quality criteria, tool support, business justification and "use what you bought." Each success factor is derived from their practical experience and is extensively discussed. Furthermore, the authors especially demonstrate which factors are of particular importance for successful reference modeling during which phases.

We hope that you will enjoy this book as much as we have enjoyed the effort involved in preparing it. May this book and the work reported in it offer guidance for your work and stimulation for your own research.

Peter Fettke & Peter Loos