

Preface

I found this book very interesting. It covers many important aspects that I did not yet consider in the context of behavioral modeling.

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The world around us is full of business systems that combine nature, technology, and people. These systems not only involve people but are also created, managed, maintained, and changed by people. Therefore, people need to understand business systems to participate in them effectively and to keep the intellectual control over them.

Business systems are highly changeable, and, therefore, cannot be understood only by their observation. The understanding needs filtering the stable elements and structuring the information about business systems in form of different models.

This book presents a set of related modeling techniques combined into an approach to business system modeling. The techniques have been selected on the basis of coverage of different stages of system understanding from the zero knowledge to the detailed knowledge enabling the simulation of system behavior. The main idea for the selection was to find techniques with comparable semantics, so that the modeling would be applicable on different stages and demand fewer semantic transformations. The highest priority was given to the techniques that provide support for model changes and interaction with modelers and users.

By experimenting with modeling in different research projects, by organizing industrial experiments together with students, by communicating with the developers of different techniques, a combination of related modeling techniques was found, such that it satisfied business modelers with the time spent on modeling and with the level of details that could be modeled and simulated.

The selected modeling techniques are presented in this book. The proposed combination of methods is explained as an approach to system analysis and design. The approach is illustrated with business case studies showing not only the

functional aspects of the business, but also the performance management, motivation, and communication aspects.

The distinctive feature of the presented approach is interactivity. The major support for interaction comes from the specific form of behavior composition built into the presented approach. This composition provides the means to model and simulate chunks of a system at different abstraction levels and then to compose these chunks in a flexible crosscutting manner preserving the behavior of separate chunks.

Organization and Context

The book is organized into three parts.

- **Part I.** An introduction to two semantic foundations chosen for the presented approach called Interactive Modeling and Simulation in Business System Design (Chaps. 1–3).
- **Part II.** A thorough explanation of the proposed approach with examples (Chaps. 4 and 5).
- **Part III.** A handling of three important aspects of business systems, namely, performance management, motivation modeling, and communication modeling within the proposed approach (Chaps. 6–8).

Part I introduces the foundations of Interactive Modeling and Simulation in business system design.

Chapter 1 defines business systems, classifies users of business system models, identifies the two levels of interactivity needed for modeling and the type of simulation required for interactive modeling.

Chapter 2 explains the choice of the Protocol Modeling as the behavior modeling semantics for Interactive Modeling and Simulation.

Chapter 3 presents the goal modeling semantics having comparable semantic elements with the Protocol Modeling. The comparable semantic elements make it possible to support the interaction between the system stakeholders of different roles on the basis of the models.

Part II is designed to help in mastering the Interactive Modeling and Simulation.

Chapter 4 presents the approach using a real insurance application demonstrating its scalability.

Chapter 5 treats four modeling cases of different complexity.

Part III shows the advantages of the proposed approach in modeling of such specific aspects of business systems as performance, motivation, and communication.

Chapter 6 handles the interactive design of performance indicators.

Chapter 7 presents motivation modeling.

Chapter 8 shows the specifics of interactive design of a choreography of communicating services.

Categories of Readers

This book is primarily designed as a course book for the university students studying information systems engineering and business applications.

Professional engineers, business analysts, system analysts, and project leaders may find this book useful for analyzing system requirements at different level of abstraction and for understanding businesses and business rules.

How to Use the Book

The book material can be used sequentially. Chapters 1–4 present the foundations and the modeling approach and should be understood well, especially the semantic of Protocol Modeling presented in Chap. 2. Therefore, Chaps. 1–4 may be used for lectures and seminars. Further, these chapters can be used by the students as a guide or a reference material.

The cases of Chap. 5 show examples of the course assignments.

Chapters 6–8 may inspire the final course assignments and possible research projects for graduate students.

What Kind of Simulation is Described in this Book?

This book presents an approach called Interactive Modeling and Simulation (IMS).

In order to avoid confusion, we need to recall that there are different types of simulation.

- *The classical computer simulation* demands a model of a real or hypothetical system together with its environment. Classical modeling and simulation (M&S) study usually separates conceptual models, simulation models, and simulation code. After the simulation code has been evaluated as credible, the simulation can be started. The input data are generated using generators with given distribution. The classical simulation is not interactive. The variables presenting the environment or elements within the system are fixed before each simulation run. The behavior of the model during the simulation run is recorded. After the simulation run, one may analyze the database of the model on the goal resolution^{1,2} and make predictions about the system behavior on the basis of the behavior of the model.

¹L.G. Birta, G. Arbez, Modelling and Simulation. Exploring Dynamic System Behaviour. (Springer, 2007)

²W.D. Kelton, R.P. Sadowski, D.T. Sturrock, Simulation with Arena. (McGraw-Hill, High Education, 2003)

- *The system requirements simulation* demands a model of a system separated from its environment. The system designers and stakeholders represent the environment, interact with the model, and choose among the behavior allowed by the model. The simulation of requirements allows system designers and stakeholders to use a model while the system does not yet exist. The system is under design or in the process of changes. The simulation of requirements is interactive as system designers and stakeholders play with the model and analyze the steps of model execution. The simulation of requirements serves for identification of tacit requirements and needed changes.
- *The training simulation* demands a system model separated from input of the trainees. This type of simulation is interactive as trainees play with the running model. The training simulation is often used when the system exists but it is dangerous or expensive to use it for training.

The approach presented throughout this book does not support classical computer simulation. The book describes an approach to the system requirements simulation. The interactive models produced by the system requirements modeling and simulation can be used for the training simulation of different business roles.

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Much of the research described in this book was carried out while I was at the Open University of the Netherlands and the Munich University of Applied Science. I want to thank the students who followed my course on modeling. These students helped me with their love of learning and curiosity.

Thanks to my beloved husband Serguei. Not everyone is so lucky as I am to have a researcher and critical listener at home.

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