Chapter 1
Introduction

Many systems and organizations seem complex and difficult to understand—until you show their elements and structures and reveal relations and dependencies. Enterprises are such complex systems with their different organizational units and people working in the enterprise, with workflows and production processes, products and services offered to different customer groups, supplies and business partners, IT systems and production resources, etc. This book is about Enterprise Modeling, a technique that helps to capture the different elements and structures of an enterprise as well as to visualize the inter-dependencies between the elements. Enterprise Modeling can be used for a multitude of different purposes, like visualizing the current situation, analyzing the reasons for shortcomings or problems, developing strategies for business or IT, optimizing processes, or setting up new cooperations with other enterprises.

Enterprise Modeling offers a practical and flexible set of work procedures, tools, and practices, which can be adapted to the situation at hand and to the purpose in focus. One of the main purposes of this book is to provide a "guide for action," i.e., practical advice for how to address challenges in enterprises which can be solved or supported with Enterprise Modeling. The methods, tools, and practices provided by the book are rooted in experience from many industrial modeling projects, but they also have a solid theoretical foundation from research in the field.

Enterprise Modeling is a structured way of working which captures various perspectives, such as goals, processes, and actors, of an organization or a problem situation in an integrated way. It supports management of the organization by supporting change management, decision making, and planning processes both within the different business functions and for the IT support.

Enterprise Modeling has a strong connection to the discipline of Enterprise Engineering, which aims at providing methods and techniques for an aligned development of all parts of an enterprise, e.g., the business, functional, organizational, and technical aspects. Such an aligned development is far from trivial, since the business environment and the IT in an enterprise continuously change, but the pace of change and the time frames needed to implement changes are different.

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Enterprise Engineering combines concepts from management and organization science, information systems science, and computer science to achieve this goal. The core ideas of enterprise engineering, from the perspective of the CIAO! network (http://ciaonetwork.org/), are defined in the Enterprise Engineering Manifesto (Dietz 2011). The manifesto includes seven postulates aiming at achieving practical relevance and theoretical rigor in enterprise engineering.

In some areas of economics, the term "enterprise" is used for the private sector enterprises only. However, this book's interpretation of Enterprise Modeling is not limited to any specific kind of enterprise. It is applicable to public organizations, industrial enterprise of any domain, privately run businesses, as well as any kind of nonprofit association. The term could as well be "organization modeling" but Enterprise Modeling is more established.

Furthermore, Enterprise Modeling does not always have to consider the complete enterprise, it may focus on those parts of the enterprise or organization that are subject to investigation. The scope of a modeling project is usually defined in the early phases of modeling.

Enterprise Modeling is related to a number of other modeling disciplines, like business modeling, business process modeling, or information modeling. Business process modeling and Enterprise Modeling are similar in that both capture and visualize the relevant business processes with the actors involved and resources needed. However, in Enterprise Modeling business processes are only *one* view of the enterprise and not the predominant one like in business process modeling. Enterprise Modeling can support different modeling purposes, which leads to a greater flexibility of the methods; some application areas of Enterprise Modeling do not require detailed process modeling.

Similarly, information modeling and Enterprise Modeling have some overlap. Information modeling aims at identifying information objects with their attributes, which often is a part of enterprise models as well. Information models are used in information systems or software development and have to be very detailed whereas enterprise models include information objects to capture relationships and dependencies, which usually do not require the same level of detail.

Enterprise Modeling and business modeling are often used as synonyms. Business modeling is in principle a broader term consisting of a wide range of approaches originating in operations research, economics, management studies, and information systems.

In summary, Enterprise Modeling as described in this book has two main characteristics: (1) it focuses on addressing multiple perspectives of an enterprise in an integrated way and (2) it offers a set of practical guidelines for knowledge acquisition, modeling, and analysis. In addition, the stance taken in this book concerning the modeling process is that the quality of models and the effect of modeling are greatly enhanced if a participatory approach to stakeholder involvement is adopted.

1.1 Goal of the Book: Practical Advice

The main goal of this book is to provide practical advice on Enterprise Modeling (EM). The theoretical background to EM also is part of the book, but it is limited to the most relevant concepts. EM is a powerful technique for many application purposes if used in the right way with the right aids and resources. The approach in this book to providing practical advice is to start from common challenges in enterprises and offer a flexible EM method suitable for tackling the challenges.

The practical challenges are common situations that occur in enterprises and have the potential for cost savings or efficiency improvement if managed correctly and are beyond the normal day-to-day activities of running the enterprise. Such challenges are often connected to midterm or long-term enterprise development, e.g., organizational structure development, quality and process improvements, strategic development, as well as innovation processes.

This book offers an EM approach for tackling these challenges. It is flexible in the following ways:

- It does not have a rigid problem solving process. Instead, the way of working (the modeling process) can be adjusted to the situation at hand depending on the enterprise's preferences and on the preferences of the problem solver.
- The modeling language suggested consists of various components for modeling the different perspectives (e.g., goals, business processes, concepts), which—like in a toolbox—can be combined and applied in many different ways.
- All parts of the approach are freely available and not locked behind consultancy secrets.

The practical challenges are discussed in Chap. 2, the modeling language in Chap. 8 and the modeling process in Chap. 9. In addition to giving advice on how to use EM for tackling business challenges, the book also includes advice on areas related to EM, e.g., elicitation techniques, reference models for enterprise architectures, how to do quality validation of models, and how to run EM as a project.

Much of the work presented in the book originates from research projects and has been validated with scientific methods. It has also been successfully applied in a large number of development and/or change management projects in industry and in the public sector. The experiences from these projects provide a solid basis for this book.

When using EM for tackling business challenges, method knowledge alone is not enough. EM activities also require a solid project organization in order to achieve the desired results, i.e., resources need to be secured, roles assigned, and decision structures prepared. We provide recommendations for setting up an adequate project organization in Chap. 9.

1.2 Structure and Content

The aim of this book is to provide practical advice on how to successfully carry out EM, particularly by using the 4EM method for Enterprise Modeling. This aim is also reflected in the structure of the book:

Chapter 2: This chapter will show how EM can help tackling typical business challenges that practitioners face in their daily work. The common characteristics of the challenges and how 4EM should be used to address them are described. The challenges are the need to understand organizational dependencies, find the need for change, improve business processes, align organizational strategy and IT, as well as develop the IT strategy.

Chapter 3 introduces important terms and concepts used throughout this book—models and their purpose, modeling language and modeling process, as well as basic components of an Enterprise Modeling method used in this book.

Chapter 4: One of the central elements in EM is analyzing the actual situation and existing challenges in the enterprise in close cooperation with domain experts, decision makers, and other stakeholders in the enterprise. In this context, elicitation approaches including interviews, observation, document analysis, and participatory modeling sessions are important skills for the modeler. This chapter introduces the most frequently used elicitation approaches.

Chapter 5 focuses on EM tools. Relevant tools do not only include IT-based applications, but also traditional aids, like flip charts and the "plastic wall." Even though IT-based tools are subject to continuous development and improvement, a number of core features can be identified which many modeling tools offer. This chapter will introduce different tool categories including an example for each category.

Chapter 6: An example case used for explaining the 4EM concepts is introduced in this chapter. The case study is about an imaginary company from the retail sector with several subsidiaries and substantial e-Commerce activities.

Chapter 7 introduces the 4EM method by giving an overview to three main parts of the method—a defined work procedure and notation, the participative approach to stakeholder involvement, and the organization of EM activities as projects.

Chapter 8: The 4EM method includes six integrated sub-models addressing different perspectives of the organization. For each sub-model, the purpose of the model, notation, components, an example from the case study, development process for the sub-model is presented.

Chapter 9: For an EM project to succeed, knowledge of the basic elicitation approaches and EM perspectives is necessary, but not sufficient. Establishing an EM project in the organization and carrying out the EM process are equally important aspects. This chapter describes how such a modeling project should be structured and established. This includes the roles within the project team, organizational frame conditions, and typical project phases.

Chapter 10: The success of EM projects also depends on having personnel with the right competences in the project team. This chapter discusses issues of competence supply.

Chapter 11: Organizations usually begin using EM in a project form where an outside vendor and/or consultant provide the method and tool usage competence. If they use EM sufficiently frequently a need to use EM without external support often arises. This chapter discusses the process of how to acquire an EM approach and a tool in order to use it without the support of outsiders. More specifically, this chapter discusses the acquisition and adoption processes as well as organizational structure needed to support EM activities.

Chapter 12: EM projects and the cooperation process between different stakeholder groups sometimes result in organizational change measures which can be implemented without initiating bigger change projects or the introduction of IT support. In such cases, the different models developed might only be used for documentation purposes. However, in the majority of the EM projects, the sub-models will be continuously refined, improved, and transformed; they need to have a high-quality level. This chapter discusses the overall principles of enterprise model quality as well as suggests a number of best practices for improving model quality.

Chapter 13 addresses the two aspects of reuse in EM—developing reusable model fragments (design for reuse) and reusing existing reusable components in building new models (resign with reuse). The main focus of the chapter is on the concept of patterns as the main medium for supporting reuse.

Chapter 14 introduces a selection of EM and business process modeling methods that show similarities to the 4EM method. The purpose of this chapter is neither to provide an exhaustive list of approaches nor is it to include all details and usability aspects of these approaches. The intention is rather to show that 4EM in many aspects is a typical or exemplary modeling language, i.e., it is easy to switch from 4EM to another method, since most concepts and perspectives used in 4EM also are to some extent available in other methods.

Chapter 15: Within the field of EM, substantial work has been spent on defining frameworks and architectures. In comparison to EM methods, frameworks and architectures do not focus on procedures for the actual modeling process, notations, and modeling languages, but they address the modeling domain or the results of the modeling process. Most frameworks were developed within a specific application domain or for an enterprise function and structure this domain and function. This chapter introduces frequently used reference models and discusses their relevance and application potential for enterprise modeling.

Chapter 16 discusses the current research trends and directions for further studies. This includes the connection between EM and information system development, and in particular the field of Requirements Engineering, the area of enterprise architecture management, linking EM and Model Driven Development, and support for mobile and cooperative modeling. The main objective of the chapter is to give advice to the reader on which additional subject area and material could be of interest.

1.3 Reading Recommendations

This book is written for everybody who wants to learn more about EM with specific focus on how to do it in practice and how to teach it. Although the book does not require any prior knowledge about EM, background knowledge in how an enterprise functions and the basics of modeling in general is recommended.

Basic modeling knowledge, like how to develop an information model, is recommendable since abstracting the most important aspects from reality in order to capture these aspects in a model is also at the heart of EM.

General knowledge about structures and processes in organizations helps to understand the method description in this book and applying the method constructs to reality.

More specifically, the book is written for four main target groups:

- Instructors in the field of Enterprise Modeling,
- Students in the areas of information systems, computer science, and business administration,
- Newcomers in the field of Enterprise Modeling, and
- Practitioners looking to extend their competence and to get practical advice for tackling their business problems.

Newcomers to Enterprise Modeling. Newcomers need to understand what EM is for and where its limits are and that an enterprise should be viewed from different but integrated perspectives in order to fully understand dependencies, how to start an EM activity, and the actual way of modeling relevant facts and using the model for the purpose at hand. The reading recommendation in this case is:

- Start with Chap. 2, which will provide a number of typical examples where EM is useful. There is no need to study all of the content of Sect. 2.1 in detail, but reading at least some Sects. of 2.1 (practical challenges) plus 2.2 and 2.3 is recommended.
- Chapter 3 introduces important terms in EM. You can either go through it at the beginning or use it as reference section for checking the meaning of terms.
- Chapter 4 contains valuable information about how to elicit knowledge from the problem domain by various approaches such as interviewing, observing stakeholders, studying documents, and performing participatory modeling sessions. The content of this section is very important for practical modeling, but it does not strictly originate from Enterprise Modeling, i.e., you might have learned it elsewhere.
- Chapter 6 introduces the case study used for illustrating the modeling techniques. Read at least Sect. 7.1 to get an idea of the case and revisit other parts of Chap. 7 when using the examples in Chap. 8.
- Chapter 7 is important because it shows how the modeling method (Chap. 8), the project organization (Chap. 9), and the participative way of working (Sect. 9.6) complement each other.

- Chapter 8 should be studied in great detail. Here, you will learn the different views of an enterprise, how to capture them, and what questions to ask. For each perspective, you should take some time to inspect the examples.
- Chapter 9 complements the knowledge of "how to model" with knowledge about "how to start" in an enterprise and how to set up modeling projects.

In order to have most use of it, newcomers to the subject should study the remaining sections of the book only after gathering some practical modeling experience first.

Practitioners Practitioners will probably use the book in different ways, depending on the situation of use. On the one hand, the book can be used as reference manual for reading up on subjects of interest to the practitioner. Elicitation approaches, EM methods and perspectives, reference frameworks, or quality assurance are among the subjects covered in chapters that can be studied independently of the other book chapters—if the background knowledge is sufficient.

On the other hand, the book provides instructions on how to approach problem solving for business challenges (some of them outlined in Sect. 2.1). The challenges all include information about the EM perspectives important for tackling the challenges and the tools or subject matter experts needed. With this information, the reader can proceed to Chap. 7, which explains the different elements of a successful EM activity. Afterwards, Chap. 8 is important, where each modeling perspective and its use is presented in a cookbook style, including which questions to ask and what information to look for. Chapter 9 provides information on how to set up an EM project and Chap. 5 provides advice regarding tools available while Chap. 12 discusses aspects of model quality.

Instructors Instructors will find the material in this book suitable for different levels of courses and different study programs. The book serves as a basis for education on Bachelor-, Master-, and PhD-course level. In the following, a proposal for both Bachelor and Master level courses is presented. Additional information, lecture slides, and other teaching material are available on the book's companion website (See http://www.4em-method.com).

For a course on Bachelor level a lecture track in parallel to a lab track with exercises in EM is recommended. The lecture track could consist of the following parts:

- An introductory session about EM and typical application cases based on Chap. 2 and examples from the case study in Chap. 7
- One or two lectures about knowledge elicitation techniques presented in Chap. 4. To what extent this subject has to be addressed depends on whether it is covered elsewhere in the study program.
- One lecture about the basic terminology in EM based on Chap. 3
- 2–3 lectures about the different EM perspectives, how to approach them, and what notation to use. This part should be based on Chaps. 7 and 8

- One lecture about the case study used in the book, or alternatively, the case study used for the lab work. Alternatively the students can be allowed to choose their own case.
- One lecture about the quality characteristics and validation of enterprise models based on Chap. 11
- One lecture about setting up and organizing Enterprise Modeling projects based on Chaps. 9 and 10
- One lecture about how to use the enterprise models produced for process improvement and information system development.

The lab part should primarily consist of performing EM for a given purpose in a sample case using all perspectives. Such a course should be scheduled after fundamentals of business administration and basics of information or process modeling.

On the Master level, method knowledge, knowledge about tools, reference architectures, and quality aspects can be in focus. Chapters 5 and 11–15 can serve as a basis for lectures introducing these subjects and as study material for the students. Most chapters contain recommendations for future readings, which provide starting points for assignments to students.

Students If you intend to study by yourself, you should study the content of the book according to the sequence of its chapters. If the book is used as part of a course or study program, the instructor will provide advice on how to proceed.

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