



Introduction to the course

PREFACE

Before you start this course, we advise you to read the Introduction chapter of this workbook. In doing so, you will read about this course's purpose, the main objectives, the structure of the course, and the literature. This introduction to the course also informs you of how to study Enterprise Modeling and how your work within this course will eventually be graded. In sum, this workbook provides you with valuable insights as well as practical and technical information, guides you through the course, and helps you study successfully.

1 BACKGROUND

1.1 The need for Enterprise Modeling

In response to an ever-increasing competitive environment, modern enterprises are under pressure to become more agile and lean in their operations, accelerate their innovation processes and capabilities, and deliver products with more efficiency and effectiveness than ever before (Mikalef & Pateli, 2017). It is within this complex process that enterprises apply innovative strategies as well as information systems and information technology (IS/IT), and develop strong IT capabilities in order to deal with a multitude of interrelated and multifaceted challenges (Lu & Ramamurthy, 2011; Sambamurthy, Bharadwaj, & Grover, 2003). In addition, enterprises need to leverage intangible internal IS/IT resources to build strong competences under high environmental uncertainty as a crucial determinant of survival in a competitive and rapidly changing environment (Teece, Pisano, & Shuen, 1997). Next to the above developments, there is also the need for a clear understanding of all internal IT-enabled business operations and procedures (Kaidalova, Seigerroth, Kaczmarek, & Shilov, 2012). It is argued that Enterprise Modeling (EM) is an appropriate method that meets all of the above internal and external business challenges (Fox & Gruninger, 1998; Stirna & Persson, 2009). EM is in essence a technique that supports the process of capturing different elements and structures of an enterprise (e.g., processes, actors, systems) and of visualizing the interdependencies between those elements (Sandkuhl, Stirna, Persson, & Wißotzki, 2014). As a technique, it still offers much room for improvement before reaching its maximum potential (Sandkuhl et al., 2016). As a result, EM is a powerful tool – with practical and flexible working procedures and tools – that helps enterprise by creating multi-perspective models which represent various aspects and angles of business operations, including ambitions, primary needs, business goals, and IS/IT strategies and architectures in different organizational contexts (Frank, 2014; Kaidalova et al., 2012; Sandkuhl et al., 2014; Stirna, Persson, & Sandkuhl, 2007). As such, the EM practice focuses on specific parts of the enterprise that are subject to investigation or on specific business problems (Sandkuhl et al., 2014) and is usually applied in a participative and collaborative setting that includes various stakeholders with different views and perspectives that need to be critically understood, considered, and consolidated (Sandkuhl et al., 2014; Stirna et al., 2007).

EM comes with many definitions. Chen, Kazman, and Garg (2005) define EM as “visual structures, which represent the key components of the business that needs to be understood.” A similar definition is provided by Vernadat (2002): “EM is the art of externalizing enterprise knowledge which adds value to the enterprise or needs to be shared. It consists of making models of the structure, behavior, and organization of the enterprise.” As EMs endow organizations with a multidimensional understanding of an enterprise, this capability is useful to a broad range of purposes including strategy development, business process redesign, IS/IT architecting, and Business/IT alignment (BITA). The latter is especially important due to the accelerating changes of both business and IS/IT (Chen et al., 2005).

BITA has been a major concern for executives and IT practitioners for decades and refers to applying IS/IT in an appropriate and timely way, in harmony with business strategies, goals, and needs (Gerow, Grover, & Thatcher,

2016; Van de Wetering, Mikalef, & Pateli, 2017). Scholars and practitioners have argued that investments in IS/IT, along with structured adoption and use, can in fact lead to multifactorial advantages and a competitive potential for organizations in various industries. These financial and non-financial gains and advantages include more efficient processes, reduction of costs, better deals with business partners, fewer human errors, and much more (Devaraj & Kohli, 2003). However, despite heavy investments in IT, organizations quite often fail to achieve improvements in their organizational performance due to their inability to align IT with organizational needs. Moreover, achieving alignment and pursuing intended goals within organizations seems to be an intricate and poorly examined process (Van de Wetering, 2016). The facilitating role of EM and architectures in the context of BITA and the coevolution of IS/IT with business capabilities in constantly changing business environments has been recognized in recent studies (Chen et al., 2005; Kaidalova, Siegerroth, Bukowska, & Shilov, 2014; Van de Wetering & Bos, 2016; Vessey & Ward, 2013). There are currently many tools, frameworks, and IS/IT solutions available to facilitate this process in practice, such as modeling suites, integrated business process management, and architecting tools.

1.2 A related concept: Enterprise Architecture

As a practice, EM is closely related to Enterprise Architecture (EA). Since its conception in the late eighties (Zachman, 1987), the EA domain has received substantial interest from theorists, government EA initiatives, consultants, and IT practitioners. John F. Zachman was one of the first to develop an EA framework, the Zachman Framework for Enterprise Architecture, which is nowadays still widely used in both private and public organizations around the globe. EA's models and frameworks generally guide design decisions across the enterprise, specify how information technology is related to the overall business processes and outcomes of an organization, and ensure that the relationships and dependencies among architectural components are managed (Janssen, 2009). EAs are commonly represented in different layers to describe a set of cohesive or related elements in order to create structure within a chaotic environment (Janssen, 2009; Winter & Fischer, 2006). In comparison with the EM practice, EA frameworks and architectures do not specifically focus on procedures for the actual modeling process, notations, or modeling languages. Instead, they address the modeling domain or the results of the modeling process (Sandkuhl et al., 2014).

To conclude, these background sections briefly elaborate on the concept of Enterprise Modeling, what it is and where it can be used in practice. EM allows organizations to collaboratively model a specific part of reality, taking relevant real-world properties into account. It embraces a specific way of thinking with directions and rules structured in a systematic way, thereby documenting the outcome of the modeling process using procedures, notations, and concepts to be analyzed. EM is a powerful tool that can be used for a broad range of purposes and is a proven instrument to address various business challenges.

2 LEARNING OBJECTIVES

After studying this course, you should be able to:

- design enterprise models for specific business challenges and problems, both in terms of the current state and the future state of affairs, using various models and sub-models associated with the 4EM methodology. In doing so,
 - o you are able to argue why enterprise modeling is a useful method for analyzing issues and challenges in organization, process development and information system design;
 - o you are able to recognize different elements, concepts, and levels of abstraction of an enterprise model and define them;
 - o you have the knowledge to name basic quality criteria and are able to assess those model criteria in practice;
 - o you are able to use elicitation approaches and supporting tools for enterprise modeling in order to correctly and fully obtain/elicit relevant knowledge from different stakeholders within the enterprise;
 - o you are able to argue how enterprise modeling (situational) can contribute to improving and enhancing organizational performance and alignment between business and IT;



- define what is required to set up 4EM projects in practice, including the roles and competences involved in the project team as well as the organizational prerequisites in enterprises;
- argue “how” and “why” EM contributes to continuous organizational improvements and how this procedure can be achieved in practice;
- apply all acquired knowledge and EM skills to a specific case study and deliver a report which documents the process of applying the 4EM method to a specific business problem or challenge;
- compare the 4EM methodology (in terms of content and approach) with other modeling approaches and techniques. It is through this process that you should be able to identify the added value of the 4EM methodology.

3 PLACE OF THE COURSE WITHIN THE CURRICULUM

The Enterprise Modeling course is part of the propaedeutic year of the bachelor’s Information Sciences of the Faculty of Management, Science & Technology. Enterprise Modeling is part of the learning pathway Modeling and system development. Other courses within this particular learning pathway are (1) Object-Oriented Analysis and Design, (2) Information Systems Requirements, (3) Software Engineering, and (4) Information Science Practical.

For young IS/IT developers and business professionals, this course offers a good way to understand, in a structured way, what EM involves and how to apply EM in real-world practice. Using a carefully selected textbook, this course provides you with a “guide to action” as well as practical advice on how to tackle persistent business challenges.

4 PREREQUISITE KNOWLEDGE

In this course, you will be working on an EM project (see Section 5.2) and write a report on the process and the most important outcomes. As a result, you need to have the basic skills to work in teams and have a basic understanding of what is needed to manage and control a specific modeling project (i.e., planning, developing, testing, deploying, and documenting an information system). Therefore, we presume that you are familiar with (1) the main concepts in information sciences (i.e., the introductory course on Information Sciences) and (2) analytical techniques and modeling approaches (i.e., the courses on Model Driven Development and Object-Oriented Analysis and Design).

5 COURSE STRUCTURE

5.1 Course overview and study load

The course on Enterprise Modeling consists of four *blocks*, eight *learning units*, including various weekly individual exercises, a larger enterprise modeling project at an organization, and a presentation of your collective work during the exam week. Each block takes about two to three weeks to complete. Within each block, every learning unit focuses on *assigned readings* from the textbook and a limited number of relevant scientific articles on enterprise modeling.

For the first five weeks, there are various individual *practical assignments* (see Appendix A for a complete overview). During these first five weeks, you learn the basics of enterprise modeling, enabling you to apply this acquired knowledge in practice. In addition, we provide you with clear project instructions, tips, and tricks (i.e., “*Enterprise modeling project parts*”) as part of the larger course project that guides you through the research project; see next section and Appendix B for a complete overview. You submit the weekly assignments through yOUnlearn *individually!* When you have submitted them, you get automatic feedback.

Individually submit weekly assignments!

To pass this course, you have to submit *all* of the five individual assignments through yOULearn by the end of the course. The originality of the work will be checked.

At the end of this course, you also have to write and hand in an individual reflection on the course. A standard template will be made available on yOULearn.

This course has a total workload of *126 hours*. Each learning unit indicates what the approximate study load associated is; see also Table 2 for a complete overview per block and learning unit. For a complete overview of the workload per activity (type), see Appendix C.

You study the course material and apply acquired knowledge and insights to various assignments and a comprehensive course project during the span of the course, i.e., eleven weeks.

TABLE 2. Enterprise Modeling study load

<i>Course part</i>	<i>Study load (hours)</i>
Course orientation	8
Block I: Basic concepts	13 (total) in two weeks
Introduction	3
Learning unit 1: Business challenges and Enterprise Modeling terms	5
Learning unit 2: Elicitation approaches and tooling in practice	5
Block II: Enterprise Modeling	34 (total) in three weeks
Learning unit 3A: Overview of the 4EM method	10
Learning unit 3B: Goals, rules, and concepts	12
Learning unit 3C: Process, actors and resources, and technical components	12
Block III: Project organization and adoption	21 (total) in two weeks
Learning unit 4: Project organization and competences	9
Learning unit 5: Continuous organizational improvement and adoption	12
Block IV: Quality aspects and frameworks	38 (total) in three weeks
Learning unit 6: Quality and reuse of enterprise models	12
Learning unit 7: Enterprise modeling approaches and architecture frameworks (divided over two weeks: weeks nine and ten)	26
Learning unit 8: Presentation meeting	12



5.2 Enterprise modeling project

Important learning objectives of this course are designing enterprise models to address specific business challenges and problems, and being able to reflect on this particular case study. Therefore, in the second part of this course, we shift attention from theory toward practice and apply acquired enterprise modeling knowledge and competences. This process is integrally achieved through a modeling project. Pairs of students (see yOULearn for further instructions) select a specific business problem within an existing organization and subsequently analyze, evaluate, and design a proper solution using the 4EM method and associated suitable sub-models. Models can be developed using Microsoft Visio or any other modeling tool that supports the 4EM notation.

The selected case organization can be your own organization or, for instance, that of a current or past client if available. During this process, you will be interviewing key stakeholders – as described in the book – and collaboratively designing enterprise models. In order to achieve this goal, it might even be necessary to organize a small-scale workshop/brown paper session within this organization. Taking the considerable and timely preparation into account, student couples should be able to execute this project within the timeframe of the course.

Each duo writes a concise report. This report determines 75% of your passing grade (the other 25% comes from the presentation; see next section). The report is written in Dutch; it may also be written in English if you prefer. The report should approximately be 10 pages long (single-spaced). The 10 pages must include all text, tables, and figures. Appendices are excluded from the 10 pages. The report may contain scientific references (e.g., articles that we read throughout this course); this aspect is not obligatory. A basic format and additional guidelines for structuring the report will be made available on yOULearn at the beginning of the course. Also, minimum requirements (and grading conditions through a rubric) will then be specified and explained in more detail. All reports should be original. This requirement means that no content may have been previously written and published in any outlet. We will check for plagiarism using automated software. All reports must be submitted as a “.docx” file.

Reports that violate any of the above guidelines (and the requirements specified on yOULearn) will be temporarily eliminated from the feedback process by the lecturers and ultimately from the review process and thus the grading process.

Based on experience with related courses, we advise each couple to start as soon as possible with project preparation. An example project timeline in Appendix B helps you to structure your project and plan all required steps and activities. These activities include planning, dividing tasks and responsibilities among students, contacting potential case organizations, identifying business problems and challenges, requesting documents, planning interviews with IT managers and advisors, etc. Appendix B also provides an overview of the projected workload for each of the different steps in this project. The planning and execution of this project is your responsibility.

It is important to note that the lecturers might use outcomes of the reports and cases (or a subset) anonymously for research in this domain. Therefore, when you contact an organization or start working on the project, we advise you to address this topic, ask for their formal approval, and archive this approval. We elaborate on this topic in one of the instructions of the enterprise modeling project and we will probably also address it during one of the online sessions.

Getting modeling project approval!

Each pair of students needs to get approval from one of the lecturers before carrying out their project. In practice, this process means that you have to email a brief description of the intended modeling project including 1) the business problem/challenge, 2) project goals/objectives and scope, and 3) the next steps that you as a team are preparing.

5.3 Presentation

During the exam week (Week 11), we organize a mini-conference (see yOUlearn for the exact schedule). All couples present the results of their project and participate in interactive discussions. You should be present and actively participate during this mini-conference. The lecturers grade the team presentation during the mini-conference. It will determine 25% of your final grade.

5.4 Course content

In this course, you study all chapters from one textbook:

Sandkuhl, Stirna, Persson, & Wißotzki (2014). *Enterprise Modeling. Tackling Business Challenges with the 4EM Method*. Springer-Verlag Berlin Heidelberg.

In addition, you study various scientific articles and white papers on enterprise modeling and/or related topics.

This course's *workbook* structurally outlines (on a weekly basis) which chapters of the textbook and/or articles you need to read. It also describes weekly assignments and briefly introduces the course project that you will be working on.

6 SUPERVISION AND GUIDANCE

Supervision and guidance for this bachelor's course is done primarily through the course's digital learning platform and website, yOUlearn. This site is the platform that we use to provide you with all the necessary course information, news, web links, assignments, feedback on assignments, reading material, the exact course schedule, etc. You can also participate in and ask relevant course-related questions on the discussion forum. In addition, we use yOUlearn for three planned online sessions. During the first online session, the kick-off, we briefly address some practicalities concerning the course and discuss some basic terms, definitions, and concepts of enterprise modeling. In addition, we outline what we expect you (and your teammate) to do during the modeling project. The second online session (Week three) primarily deals with the practice of process and enterprise modeling and the novel approach of 4EM (the textbook covers this method in detail). The final online session (during Week seven of the course's eleven weeks) tackles various enterprise modeling topics, e.g., quality aspects of enterprise models and architectural frameworks. During this final online session, we also discuss some preliminary project results, potentially encountered problems and obstacles, and tips and tricks. The lecturers give you some general feedback (based on what they have seen so far). Up-to-date information about these meetings can be found on the yOUlearn site.

7 STUDY INSTRUCTIONS

The course is divided into four blocks and eight associated learning units. This workbook effectively guides you through the course and specifically outlines what to read during each week from the textbook and/or articles for each distinctive learning unit. In addition, each block and learning unit contains a brief introduction to the main content. Each learning unit outlines specific learning objectives that indicate what you should be able to understand and do after studying the respective unit. The learning units also present practical assignments (for the first five weeks of the course) and introduce assignments and subassignments of the enterprise modeling project (as of Week 6).

For the online sessions (or virtual classes), we make use of a Collaborate plug-in within yOUlearn. In order to actively participate in these sessions, you need (1) a good internet connection (plug in your UTP cable, as wireless devices sometimes interrupt the connection), (2) a headset, and (3) a webcam, although the latter is not always necessary. We make recordings of each online session so that you can review it once more if needed.