TOWARDS A DEFINITION OF THE ROLE OF ENTERPRISE MODELING IN THE CONTEXT OF BUSINESS AND IT ALIGNMENT

JULIA KAIDALOVA
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To Nelya Strelchenko who taught me to always be curious.
ABSTRACT

In order to solve a problem of Business and IT Alignment (BITA) it is important to consider various dimensions of it: strategic, structural, social and cultural. In the context of dealing with BITA, Enterprise Modeling (EM) is an acknowledged and widely used practice. On one hand, EM facilitates the creation of integrated models that capture and represent different focal areas of an enterprise, therefore it allowing to obtain a multidimensional view on an enterprise and to integrate these multiple dimensions into a coherent structure. These capabilities make EM a powerful tool for dealing with the strategic and structural dimensions of BITA. On the other hand, solving a BITA problem requires dealing with the numerous points of view of the stakeholders and creating a shared understanding between them, which refers to the social and cultural dimensions of BITA. In this regard EM is also able to provide support to the development of an understanding about the current multidimensional praxis and future vision and strategies. Thus, EM has a high potential for dealing with the strategic, structural, social and cultural dimensions of BITA. This licentiate thesis investigates the applicability of EM in the light of BITA and proposes a framework that allocates intentions of EM application within the frame of the Strategic Alignment Model. The framework positions EM conceptually in the context of BITA and identifies a number of EM challenges and recommendations to suggest how EM can be used to facilitate BITA.
SAMMANFATTNING

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PUBLICATIONS

PUBLICATIONS WITH HIGH RELEVANCE

   Contribution: generation of the idea; data collection and analysis; most of the writing.

   Contribution: generation of idea in collaboration; data collection and analysis; writing.

   Contribution: generation of idea; data collection and analysis; writing.

   Contribution: refinement of the idea in collaboration based on the comments from conference; data collection and analysis; most of the writing.

PUBLICATIONS WITH LOWER RELEVANCE

   Contribution: participation in collaborative data collection and analysis.
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CHAPTER 1
INTRODUCTION

This chapter describes the motivation for this licentiate study, the research questions that it aims to answer, the overview of the chosen research methods, the generated knowledge contributions, and finally it presents the thesis outline.

1.1 RESEARCH MOTIVATION

Today’s dynamic business environment – entwined as it is with rapidly advancing IT capability – presents enterprises that wish to stay competitive with a great challenge. This is further complicated by the special role that IT now plays in most organizations, i.e. as a communication backbone for realizing visions and goals. Indeed, IT can be used to change the way companies organize their business processes, how they communicate with their customers and the means by which they deliver their services (Silvius, 2009). However while it is undeniable that suitable IT solutions are required in order to achieve organizational goals, the effective support of business operations with appropriate IT is complicated due to the dynamic nature of these two (Luftman, 2003). In order to conceptualize this problem – how to mesh business and IT – practitioners and researchers have coined a variety of terms such as "harmony," "linkage," "fusion," "fit," "match," “integration”, but in the long run the term “alignment” has gained widespread acceptance. In early studies Business and IT Alignment (BITA) implied linking the business plan and the IT plan, or alternatively the business strategy and the IT strategy. Later, considerations of BITA started to require consideration of the fit between business needs and information system priorities. These expanded over time and current research recognizes many dimensions of alignment between business and IT (Schlosser, Wagner, & Coltman, 2012).

In general, it is possible to differentiate between the strategic, structural, social and cultural dimensions of BITA (Chan & Reich, 2007a). The strategic dimension refers to the degree to which the business strategy and plans, and the IT strategy and plans, complement each other. The structural dimension refers to the degree of structural fit between IT and the business that is influenced by the location of IT
decision-making rights, reporting relationships, decentralization of IT, and the deployment of IT personnel. The social dimension refers to how much business and IT executives within an organizational unit understand and are committed to the business and IT mission, objectives, and plans. The cultural dimension refers to the need of IT planning to be aligned with cultural elements such as the business planning style and the top management communication style. Of these, the strategic/intellectual dimension currently receives significantly more attention (ibid). However, both strategic alignment and structural alignment influence organization performance. In addition, BITA is closely linked to many of the social and cultural aspects of an organization. Improving alignment within these four dimensions permits the increase of IS effectiveness and efficiency, the enhancement of business and IT flexibility, the improvement of business performance and other positive effects (Vargas, 2011; Schlosser et al., 2012). Given that these significant benefits are matched by a number of unresolved issues, it is no surprise that attention to BITA continues to grow (Silvius, 2009).

BITA is often tightly linked to enterprise transformation, i.e. the action of taking an enterprise from one state to an improved state (Seigerroth, 2011). In order to achieve BITA many enterprises need to transform rapidly and perform changes in their operations reactively, while others have the possibility to be more proactive in the planning, design and implementation of changes. Regardless of the type of change (reactive or proactive), the importance of two issues becomes apparent: (1) agreeing on the future state of an enterprise (TO-BE state), including vision and strategy, and (2) making sure that the stakeholders share a common understanding about the current praxis in the enterprise (AS-IS state). Therefore, if BITA is to be achieved, there needs to be a clear and up-to-date representation of the AS-IS and TO-BE states that accurately reflects – for the different stakeholders within the enterprise – the various aspects that these states imply.

The various aspects of an enterprise can include organizational structure, business processes, information systems, and infrastructure, which together form an Enterprise Architecture. Jonkers, Lankhorst, van Buuren, Hoppenbrouwers, Bonsangue, and van der Torre (2004) define Enterprise Architecture (EA) as a coherent set of principles, methods and models that are used in the design and realisation of these various aspects of an enterprise. Coherent description of various components of EA is able to provide insights, enable communication among stakeholders and guide complicated transformation processes (Jonkers et al. 2004). The unambiguous description of EA components and their relationships requires a coherent modelling language (ibid.).

In this context, Enterprise Modeling (EM) is an acknowledged and widely used practice. EM facilitates the creation a number of integrated models which capture and represent different aspects (focal areas) of an enterprise, for example business processes, business rules, concepts, information, data, vision, goals and actors. (Stirna & Persson, 2009). The essential ability of enterprise models to represent an enterprise from different perspectives allows EM to be used to provide a multidimensional view on an enterprise and to integrate these multiple dimensions into a coherent structure. These capabilities of enterprise models provide a powerful
mechanism for dealing with the strategic/intellectual and structural dimensions of BITA.

On the other hand, solving a BITA problem requires dealing with the numerous points of view of the stakeholders and creating a shared understanding between them, which refers to the social and cultural dimensions of BITA (Jonkers et al., 2004; Kearns & Lederer, 2003; Reich & Benbasat, 2000). In this regard EM is also able to provide solid support, as it is often used to develop a common understanding of the current multidimensional praxis and an agreement on future vision and strategies (Stirna & Persson, 2009). EM can be used for a broad range of purposes that require consensus-driven collaboration between stakeholders and decision makers; for example, development of business vision and strategies, redesign of business practice, development of supporting information systems, knowledge sharing about business practice or decision-making (ibid.).

According to McGinnis (2007), despite the contribution that EM can offer in support of these kinds of purposes, the creation of shared understanding between business and IT people receives scant attention in studies considering the role of EM in BITA. The existing discussion of the role of EM in this context is mainly limited to EA modeling, i.e. the representation of various components of EA in the form of tangible models (Fischer, Aier, & Winter, 2007; Löhe & Legner, 2014; Wegmann, Regev, Rychkova, Le, de la Cruz, & Julia, 2007). Together with IT Governance (Grant, 2003; Luftman, Ben-Zvi, Dwivedi, & Rigoni, 2010; De Haes & Van Grembergen, 2009), EA is one of the acknowledged practices that have a positive impact on BITA (Buckl, Ernst, Matthes, Ramacher, & Schweda, 2009; Fischer et al., 2007; Tamm, Seddon, Shanks, & Reynolds, 2011).

This reasoning leads to the following understanding: EM shows a high potential for dealing with the strategic, structural, social and cultural dimensions of BITA. Several scholars acknowledge the usefulness of EM to achieve BITA (e.g., Chan & Reich, 2007a; Gregor, Hart, & Martin, 2007; Wegmann et al., 2007; Seigerrooth, 2011; Christiner, Lantow, Sandkuhl, & Wissotzki, 2012). EM can facilitate BITA by providing a means of capturing, visualizing and redesigning different perspectives of an enterprise, including processes, organization structures, products, systems, and business objectives (Christiner et al., 2012). Karlsen and Opdahl (2012) argue that EM supports strategic alignment, since it serves as a key tool in understanding business processes and as a prerequisite for business improvements. Furthermore, it can be used as a tool in communication and understanding in business change programs. By representing numerous aspects ranging from higher level considerations in the operational domain of the business down to the implementation of IT system, EM can elucidate gaps between the business context and its supporting technology – thus enhancing BITA (Wegmann et al., 2007). Despite the fact that literature recognizes various benefits of using EM to achieve BITA, there are no studies that illustrate in a holistic way the role of EM in solving the problems achieving BITA. Investigation of this question would position EM conceptually in the context of BITA and could suggest how EM can be used to facilitate BITA.
1.2 RESEARCH QUESTIONS AND RESEARCH METHODS

The research question that this licentiate thesis is going to address is the following:

1. How can EM contribute to BITA?

In order to answer this research question the following three sub-questions are considered and explored:

1.1. How can EM be positioned in the context of BITA?
1.2. What challenges are associated with EM in the context of BITA?
1.3. What could be suitable recommendations to deal with these challenges?

To answer these research questions, a research process has been constructed. This research process includes three parallel parts: theoretical work, empirical work and conceptualization work. Each part employs a different research method in a sequence of interlocking steps, which together produce an integrated set of knowledge contributions. In the theoretical work, literature review will be applied as a research method. The empirical work will employ interviews in order to collect and then analyze data. The conceptualization work will include an iterative refinement of the results by restructuring them, by adding new constructs, and by packaging the results for their subsequent use.

1.3 KNOWLEDGE CONTRIBUTIONS

The overall knowledge contributions of this research, answering research question 1, have the following characteristics. On one hand it will contribute to the domain of BITA by providing an understanding about one of its supportive practices – EM. On the other hand it will contribute to the domain of EM by describing EM usage for the purpose of BITA.

On a more detailed level, this licentiate thesis offers three knowledge contributions, each connected to the original research questions. The answer to research question (1.1) will conceptually position EM in the context of BITA. Thus, the first knowledge contribution is the following:

Knowledge contribution 1.1: Position of EM in the context of BITA.

The answer to research question (1.2) will identify challenging factors that come into play when EM is used for BITA. Consequently, the second knowledge contribution of this thesis is:

Knowledge contribution 1.2: EM challenges in the context of BITA.

The answer to research question (1.3) will represent ways to overcome these challenging factors, which will result in the third knowledge contribution:

Knowledge contribution 1.3: EM recommendations in the context of BITA.
Together, these three knowledge contributions are synthesized and presented in the Final EM Framework, which constitutes the main knowledge contribution of the thesis. The final EM framework integrates the specific EM challenges and recommendations and positions them in relation to BITA.

Table 1 presents the relationship between knowledge contributions and the associated research questions. Table 1 also shows the related publications in which corresponding knowledge contributions have been first presented, either partially or in full.

<table>
<thead>
<tr>
<th>Research questions</th>
<th>Knowledge contributions</th>
<th>Related publications</th>
</tr>
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<tr>
<td>1. How can EM contribute to BITA?</td>
<td>The final EM framework</td>
<td>Synthesized and presented in licentiate thesis</td>
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<tr>
<td>1.1 How can EM be positioned in the context of BITA?</td>
<td>Knowledge contribution 1.1: Position of EM in the context of BITA</td>
<td>Kaidalova and Seigerroth (2012)</td>
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<td></td>
<td></td>
<td>Kaidalova (2014)</td>
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<tr>
<td>1.2 What challenges are associated with EM in the context of BITA?</td>
<td>Knowledge contribution 1.2: EM challenges in the context of BITA.</td>
<td>Kaidalova et al. (2012)</td>
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<td></td>
<td></td>
<td>Kaidalova et al. (2014)</td>
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<tr>
<td>1.3 What could be suitable recommendations to deal with these challenges?</td>
<td>Knowledge contribution 1.3: EM recommendations in the context of BITA.</td>
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1.4 THESIS OUTLINE

The remainder of this thesis is structured as follows: the research process of this study together with the particular research methods are presented in Chapter 2, the theoretical foundation for the study is presented in Chapter 3, the results of the study are presented in Chapter 4 and discussed in Chapter 5. The relationship between the chapters of the thesis are the following:

- In Chapter 1 research motivation and research questions are introduced. Together these influence Chapter 2, which describes the choice of research methods.
- Chapter 2 serves as a support for Chapter 4, as the chosen research methods direct result generation.
- Chapter 1 also refers to the terms and research areas that are further explained in Chapter 3 as components of the theoretical foundation of the study.
- Chapter 2 supports Chapter 3 by anticipating how the related theories will be used.
- Chapter 3 then provides an important foundation for Chapter 4, as it introduces the various theories that are used to generate the results of the study.
- Chapter 4 provides the basis for the discussion presented in Chapter 5.
In addition to reflecting the applicability of the generated results, Chapter 5 pulls together material from the rest of the thesis: how well the knowledge contributions have answered the research questions from Chapter 1; the suitability of the research methods proposed in Chapter 2; how thoroughly the results have expanded upon the existing theories detailed in theoretical foundation provided by Chapter 3.
CHAPTER 2
RESEARCH APPROACH

This chapter describes the approach that will be used to answer the research questions. Particularly, it presents the overview of the research process that this study follows, discusses the grounding of knowledge that it uses, and motivates the choice of the research methods that have been applied in the various steps of the research process.

To approach the research questions of this study a research process has been designed and then executed (section 2.1). Altogether, the different parts of the research process enabled generation and validation of specific knowledge contributions taking into account specific groundings of knowledge (section 2.2). Each part of the research process employed a defined research method (section 2.3).

2.1 RESEARCH PROCESS

From the research motivation and research questions that have been presented in order it follows that the main aim of this licentiate thesis is to investigate EM practice in terms of challenges and recommendations that are relevant for facilitating BITA. Together, the EM challenges and recommendations form an EM framework. This EM framework plays a central role in the study. The research includes three iterations that are aimed to refine the EM framework. There are three versions of the framework: the preliminary EM framework, the intermediate EM framework and the final EM framework. Both theoretical and empirical foundations have been used to generate and validate the results iteratively, so that the aim of this study could be achieved (see Figure 1). The theoretical foundation includes relevant theories from EM, BITA and other related domains. Empirical foundation includes empirical material on the practice of EM. These foundations help to generate and validate the EM framework in each of the iterations of the research process.
The research process of this study is shown in detail in Figure 2 below. The figure schematically represents three parallel parts of the research process: theoretical work, conceptualization work, and empirical work. Elements with white filling represent steps of the research, whereas elements with grey filling represent results (knowledge contributions). Connectors between the elements show what is the result of a research step, or alternatively - application of a result as a basis to generate another result.

The theoretical work applies research methods that allow collecting and analyzing theoretical material relevant for the study. In the theoretical work of this thesis several types of literature review have been applied (steps 1, 2a, 3a, 4 in Figure 2). The detailed descriptions of performed literature reviews are available in section 2.3.1. Empirical work implies handling empirical material required to answer the research questions. Interviews enabled the collection of empirical material (steps 2b, 3b). The details of the performed interviews are presented in section 2.3.2. Conceptualization work is neither strictly theoretical nor strictly empirical, as it implies continuous analysis and synthesis of various research results, their integration and refinement.
As Figure 2 shows, this research started with a systematic literature review of the BITA domain (step 1). This activity allowed the generation of a typology of BITA literature, which represented the main interest areas and identified existing gaps in the domain. In addition, this typology provided an initial idea about the role of EM in relation to BITA, which in turn allowed the investigation of EM practice in the frame of the BITA domain. After that, on the basis of the typology of BITA literature, preliminary EM framework has been generated with the help of a focused literature review on EM challenges (step 2a) in combination with the first round of interviews (step 2b). The intention behind these two steps was to investigate EM practice in terms of challenges that EM practitioners face.

After that, using the preliminary EM framework as a foundation, a focused literature review on EM challenges and recommendations (step 3a) and the second round of interviews (step 3b) enabled generation of the intermediate EM framework. Here the intention was to investigate EM practice with particular attention to EM challenges and corresponding recommendations. Conceptualization of the findings from both interview rounds (step 2b and 3b) complemented with the findings from the focused literature review about the role of EM in relation to BITA (step 4) and typology of BITA literature supported positioning of EM in the context of BITA. The intention behind it was to investigate the role of EM in the context of BITA. Conceptual integration of the intermediate EM framework with positioning of EM in the context of BITA allowed to generate the final EM framework specialized for BITA.
2.2 GROUNDING OF KNOWLEDGE

Every step of the research process generated one or several knowledge contributions. It is thus important to describe the underlying perspectives regarding knowledge generation and use. Knowledge is used by people to govern their actions (Goldkuhl, 1999). Knowledge can be framed by various theories, strategies and methods and it plays a decisive role in driving people’s action in social practices. It is thus very important to justify such knowledge, i.e. ground action knowledge.

Talking about grounding of knowledge, Goldkuhl (1999) suggests differentiating between empirical, external theoretical, and internal grounding. Empirical grounding is related to the effective application of knowledge. External theoretical grounding links action knowledge to other knowledge of theoretical character. It partly includes the grounding of action knowledge in general explanatory theories. Internal grounding has to do with an investigation of internal warrants (values and categories) and internal consistency and coherence of the knowledge. These three items are decisive to justify knowledge and subsequently ensure the validity of knowledge. The types of knowledge grounding are characterized in Table 2 for both generation and validation of knowledge.

<table>
<thead>
<tr>
<th>The level of action knowledge as such</th>
<th>Generation</th>
<th>Validation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inside development:</td>
<td>Continuous refinement or idea based design introducing new constructs</td>
<td>Internal grounding: Reconstruction of action knowledge and its background knowledge; conceptual and value grounding; evaluation of knowledge coherence</td>
</tr>
<tr>
<td>The level of other knowledge</td>
<td>Deduction: Derivation from outside theory including values, categories and explanations</td>
<td>External theoretical grounding: Grounding in values, categories/definitions and explanations</td>
</tr>
<tr>
<td>Empirical level</td>
<td>Tacit induction: Emergence of tacit action rules based on experiences</td>
<td>Empirical grounding: Based on application of action rules and observation of actions and effects</td>
</tr>
<tr>
<td></td>
<td>Articulate induction: Reconstruction of action rules from practice</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Explicit modification: Changes made based on application and observation</td>
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In this thesis project all three types of grounding have been applied for generation and validation of the knowledge contributions (see Table 3). The first one, i.e. action knowledge as such, is used within conceptualization work upon all parts of results that evolved in this research (Figure 2). This has been manifested through continuous analysis, reconsideration and synthesis in order to improve all parts of results and introduce new constructs to them. For instance, conceptualization was crucial when dealing with all three versions of the EM framework – preliminary EM framework, intermediate EM framework and final EM...
framework. On one hand, inside development is required here, since refinement of results implies continuous articulation, reconstruction and introduction of new constructs to it. Inside development in this sense allows the generation of new results. On the other hand, internal grounding is also used for validation of the results. Continuous reconstruction of knowledge allows the evaluation and validation of results and the verification of their coherence. Thus, internal grounding is also used for validation of the results.

Table 3 Grounding of knowledge at different research steps

<table>
<thead>
<tr>
<th>The level of action knowledge as such</th>
<th>Generation</th>
<th>Validation</th>
</tr>
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<tbody>
<tr>
<td>Conceptualization work</td>
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<table>
<thead>
<tr>
<th>The level of other knowledge</th>
<th></th>
<th>3a. Focused literature review of EM challenges and recommendations to validate the preliminary EM framework against new, broader search across existing theory</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Systematic literature review in BITA domain to generate <strong>typology of BITA literature</strong></td>
<td>2a. Focused literature review on EM challenges to get a theoretical basis for <strong>preliminary EM framework</strong></td>
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<tr>
<td>2a. Focused literature review on EM challenges to get a theoretical basis for <strong>preliminary EM framework</strong></td>
<td>3a. Focused literature review of EM challenges and recommendations to get a theoretical basis for <strong>intermediate EM framework</strong></td>
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<tr>
<td>3a. Focused literature review of EM challenges and recommendations to get a theoretical basis for <strong>intermediate EM framework</strong></td>
<td>4. Focused literature review about the role of EM in the context of BITA to get a theoretical basis on the position of EM in the context of BITA</td>
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<tr>
<td>4. Focused literature review about the role of EM in the context of BITA to get a theoretical basis on the position of EM in the context of BITA</td>
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<thead>
<tr>
<th>Empirical level</th>
<th>2b. Interview (round 1) to generate <strong>preliminary EM framework</strong></th>
<th>2b. Interview (round 1) to validate results of 2a (on the way to <strong>preliminary EM framework</strong>)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2b. Interview (round 1) to generate <strong>preliminary EM framework</strong></td>
<td>3b. Interview (round 2) to generate <strong>intermediate EM framework</strong></td>
<td>3b. Interview (round 2) to validate results of 3a (on the way to <strong>intermediate EM framework</strong>)</td>
</tr>
<tr>
<td>3b. Interview (round 2) to generate <strong>intermediate EM framework</strong></td>
<td>2b and 3b to generate a position of EM in the context of BITA</td>
<td>2b and 3b to validate the theory-based positioning of EM in the context of BITA (on the way to <strong>position of EM in the context of BITA</strong>)</td>
</tr>
<tr>
<td>2b and 3b to generate a position of EM in the context of BITA</td>
<td></td>
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</tr>
</tbody>
</table>

The level of other knowledge in this research is used to ground knowledge during the theoretical work (the top part in Figure 2). Applied external theoretical grounding contains existing theories from the literature that are relevant to the focus of the study. External theoretical grounding is used for both generation and validation of new knowledge. The first research step (the systematic literature review in the BITA domain) uses external theories to generate a result – the aim of this step is to carry out a search across a large number of existing publications in the BITA domain and come up with a typology of the domain. Steps 2a, 3a and 4 use external theories to generate new knowledge, as during these steps focused literature reviews are performed with a specific focus. A search through existing publications
that deal with specified concepts allows to put together a theoretical basis for further generation of results. For example, at step 4 external theories are used to generate an understanding about the position of EM in the context of BITA. On the other hand, the external theories are used for validation of knowledge at step 3a when there is a need to validate the preliminary EM framework. This is done with the help of the focused literature review.

The empirical level of knowledge grounding corresponds to the empirical work conducted in the course of this study (the bottom part in Figure 2). The empirical grounding of this research implies collection of empirical data via a number of interviews. Empirical data is collected during two research steps – 2b and 3b, and it is used to generate and validate several parts of the results. Empirical material collected during steps 2b and 3b is used to generate two versions of the EM framework and introduce new constructs to it. On the other hand, empirical material collected during these two steps is also used for validation of results that have been created based on external theories. Also, empirical material collected during these two steps is used to both generate and validate the positioning of EM in the context of BITA – a theoretical basis from the focused literature review has been refined with the help of the empirical material.

The way empirical, external (theoretical) and internal grounding are able to justify knowledge is also related to inductive and deductive knowledge generation. An inductive process implies knowledge generation from empirical observations, whereas a deductive process implies generation of knowledge from external theories. It is important to mention that deduction from external theories is not just a process of logical derivation, but also general theories can be used as sources for inspiration in rather creative ways (Saunders, Lewis, & Thornhill, 2006). This line of reasoning leads to the need to define general ways of knowledge generation, i.e. reasoning styles. There are several reasoning styles that are generally used in research (ibid). Deductive reasoning puts an emphasis on using literature for building theories and ideas, i.e. conceptual (theoretical) frameworks. The argument moves from general principles to particular instances (Williamson, 2002). In this reasoning style application of quantitate research methods is typical. Another reasoning approach is inductive, which implies exploring data to develop theories and subsequently relate these theories to literature. In other words, inductive reasoning starts with particular instances and concludes with general statements (Williamson, 2002). A typical example of research design that uses inductive reasoning is to collect and analyze data in order to develop concepts and understanding from the patterns in the data itself.

2.3 RESEARCH METHODS FOR THEORETICAL, EMPIRICAL AND CONCEPTUALIZATION WORK

The focus of this study lies in the domains of EM and BITA, which have specific research traditions. This does not, however, necessarily imply that research methods employed should correspond to the research tradition in these domains. The crucial point is the suitability of research methods for fulfilling the purposes of the
study and answering the formulated research questions. Still, it is important to be aware of existing research traditions in the domains in focus. Before describing these research traditions, it is important to mention that both the BITA and EM domains are relatively young as opposed to more mature fields with rather established research traditions, as for instance, Information System Engineering or Computer Science. This explains the quite diverse characters of research in the BITA and EM fields. Singh and Woo (2009) who explore the benefits of BITA state that both qualitative and quantitative evidence is used in this field. Chan and Reich (2007b) investigate influential articles in the BITA domain with respect to a number of characteristics, pay particular attention to the research methods applied in the investigated articles. The most commonly used research methods are literature review (in conceptual papers), case study and survey. In general both empirical and non-empirical methods are used. Chan and Reich (2007a) point out the desirability of applying research methods and approaches that have not been used yet when examining BITA, as it might provide entirely new insights. The research tradition in the EM domain is quite diverse, and also relies on both qualitative and quantitative research methods. Among research methods that are used in EM domain are case study research (Stirna, Persson, & Sandkuhl, 2007; Karlsen, 2011; Horkoff, Yu, & Ghose, 2010), design science (Persson & Stirna, 2010), action research (Fareedi & Tarasov, 2011), interview and survey (Persson, 2001; Karlsen, 2011; Lucke & Lechner, 2011; Horkoff et al., 2010) and other empirically-based research methods. This study has employed several research methods and data collection techniques during the research process in order to produce relevant and rigorous knowledge contributions. For the purpose of examining the existing literature in the BITA domain in terms of the main interest areas and gaps, a systematic literature review has been chosen as a suitable method (theoretical work). In order to investigate EM practice in terms of challenges and recommendations, literature reviews have been performed to build a theoretical basis (theoretical work), and then interviews with EM practitioners have been carried out (empirical work). To investigate the role of EM in the context of BITA, interviews have been used in combination with literature review, which allowed connecting the empirical findings to the framed theoretical findings (theoretical work and empirical work). In addition to theoretical and empirical work, conceptualization work has been carried out. It included conceptual refinement of the research results and adding new constructs to them. The details regarding theoretical, empirical and conceptualization work and the corresponding research methods are presented below in sections 2.3.1, 2.3.2 and 2.3.3.

2.3.1 LITERATURE REVIEW – THEORETICAL WORK

A review of prior literature is an essential feature of any research project (Webster & Watson, 2002). It enables discovering existing studies regarding the issue in focus and gives the researcher an understanding of the state of the art in the studied domain. In literature, special attention is usually given to a systematic literature review, as it enables identification and investigation of relevant literature in a rigorous and structured manner. This method helps to find, evaluate and summarize a number of research articles, which in its turn helps to show how the phenomenon has been studies and identify knowledge gaps for further research. A systematic
literature review, in comparison to other less structured types of investigations, follows a highly structured approach when finding and analyzing the available literature. A systematic literature review allows decreasing selection bias, i.e. the situation when a researcher only considers papers that have the same point of view. On the other hand, carrying out a systematic literature review requires quite significant resources (including effort and time) from a researcher, which may complicate its application (Kitchenham, 2004).

Kitchenham (2004) presents guidelines for performing systematic reviews in software engineering and propose to carry it out via three high-level phases: planning the review, conducting the review and reporting the review. The planning phase includes identification of a need for a systematic literature review; and development of a review protocol that specifies research questions, the search terms and resources to be searched (including databases, specific journals, and conference proceedings), study selection criteria, data extraction and synthesis strategy. Conducting the review implies implementation of the procedures described in the review protocol. Particularly, it involves identification of research including document retrieval, selection of studies, study quality assessment, data extraction and monitoring, and data synthesis that includes generation of results. Reporting the review implies communicating the results of the review in an efficient manner, for instance, in a technical report, in a section of a PhD thesis or in a journal or conference paper.

As it has been mentioned earlier, a systematic literature review requires significant resources from a researcher, which complicates its application at some stages of the research process. In this respect it is important to take into consideration the purpose that a researcher would like to fulfil by reviewing the literature. Depending on the intentions of the study, it is often possible and sufficient to perform a well-planned and transparently described, but more light-weight literature review that would still fulfil its purpose and take less effort. To differentiate between these two types of literature review in the text of this thesis they will be addressed as systematic literature review and focused literature review. The purpose of using focused literature review differs from the purpose of using a systematic literature review and the former has broader scope than the latter. In addition, focused literature review is especially applicable for theory generation prior to investigation of a certain research question, where some theoretical models are developed from the review (Webster & Watson, 2002). Webster and Watson (2002) present a number of suggestions regarding performing a literature review for both types of review. They suggest to clearly motivate the topic of a review, to provide a working definition of the key terms, and to clearly articulate the contributions of a review. Identification of the relevant literature is an important part of a literature review. To identify relevant literature it is important to consider papers from leading journals and highly-ranked conferences, and also pay attention to the references in these papers and citations to them. It is also recommended to perform concept-centric review as opposed to author-centric one, as the later one might fail to synthesize the literature. It is important to perform a literature review that identifies critical knowledge gaps and thus shows areas requiring investigation. Crucial point in using literature review for theory generation is the possibility of evaluating generated theory, where
commenting on a study by a researcher’s colleagues has not the least importance. Systematic and focused literature reviews are suitable to fulfil different purposes within this study, therefore they are applied within the theoretical work of this study (top part of Figure 2). Performed systematic and focused literature reviews are described in the sections below.

**Performed systematic literature review**

This licentiate thesis employs **systematic literature review** in order to investigate literature in the BITA domain (step 1 in Figure 2). The main aim of this systematic literature review is to discover the main interest areas in BITA research, the gaps and main trends in the domain and to build an initial understanding of the position of EM in this domain. It involves number of steps that correspond to the three phases for performing systematic literature review by Kitchenham (2004): planning, conducting, and reporting (see Figure 3). Each phase included one or several steps.

**Planning**

1. **Scope and selection**
   - Selection by source to search in (workshops proceedings and databases)
   - Selection by relevance of content
   - Selection by the year of release

2. **Extraction of the papers for consideration**
   - Papers from databases (key words search)
   - Papers from workshops
   - Removal of duplicates and not relevant papers

**Conducting**

3. **Data analysis**
   - Categorization of papers from selected set into several categories

4. **Results generation**
   - Proposed categorization
   - Number of papers according to the year of publication
   - Number of papers according to the source type (workshop or database)

**Reporting**

5. **Reporting the results**
   - Workshop paper (Kaidalova and Seigerroth, 2012)
   - Licentiate thesis, section 3.1.2

**Figure 3 Performed systematic literature review**

**The planning** phase included the definition of criteria for selection of literature. Papers for further consideration have been selected according to three aspects.

- **Sources to extract papers from.** This item is related to sources that have been used to retrieve papers for consideration. It was decided to browse two types of sources: scientific databases (SpringerLink, ACM Digital Library and Emerald) and conference/workshop proceedings (BITA and BUSITAL). The reason to work through these scientific databases is that all three of them involve solid collection of scientific papers from Computing and Information Technologies research areas and allow using search interfaces that simplify the identification process. BITA and BUSITAL are thematic events in the BITA field, which means that studies presented there are most likely relevant.

- **Relevant content.** Taking into consideration increasing number of works related to BITA that are available via scientific databases, it was quite reasonable to limit the search using keywords. Pondering over the most suitable keyword compositions, it was noticed that the literature shows slightly different ways to name alignment between business and IT: business-IT alignment (for example, Luftman & Brier, 1999), business/IT alignment
(for example, De Haes & Van Grembergen, 2009), IT/business alignment (for example, Saat, Winter, Franke, Lagerstroem, & Ekstedt, 2011), business and IT alignment (for example, Wegmann, Balabko, Le, Regev, & Rychkova, 2005). Thus, it was decided to search in the aforementioned databases for papers that have “Business IT alignment” in titles. Works that have been presented on BITA and BUSITAL workshops have been taken for granted in terms of relevance, thus they did not need any sorting by keywords.

- **Time of publication.** According to Luftman and Brier (1999) the importance of BITA has been well known since the late 70s, whereas Schlosser et al. (2012) assert that the beginning of intensive development of BITA research falls on the early 90s. It is also well known that researchers have used different terms to talk about alignment of business and IT - integration, fit, strategic alignment, harmony and other terms (Mendoza, 2009). It was reasonable to consider papers that have been published after the BITA terminology has been established. Maes, Rijsenbrij, Truijens, and Goedvolk. (2000) criticized BITA research of the day because of its ambiguous nature: “In general, alignment is defined in an indefinite and vague way, if at all!” (Maes et al., 2000, p.7). Therefore the author of this thesis believes that this point of time (year 2000) can be considered as a reference point when the BITA domain started to move towards crystallizing dominating research directions and using more unified terminology. Thus, papers that have been published within time frame of years 2000-2012 have been considered in the systematic literature review for this study.

**The conducting** phase included extraction of the papers according to the defined selection parameters and analysis of the collected data in order to generate results. The search for the “Business IT alignment” phrase within titles of papers from three databases has been performed (publication years from 2000 to 2012). Papers that have been presented in the BITA and BUSITAL workshops have been included into the preliminary set of papers for further categorization without any filtering, since it was assumed that they are a priori relevant to the BITA research field. One abridgement of the preliminary set of papers has been done by removing false positives – works that do not deal with BITA, but that for one or another reason has been included into preliminary set. After the set of relevant papers has been outlined and obtained, it was possible to do the analysis of the collected data. This was done simultaneously with the progress of reading papers. The process of creating categorization was continuous – papers have been studied one by one, adding logical tags to each of them. Afterwards it was possible to gather papers of corresponding sort into one category, distinguishing differentiation between categories. The elaborated content of this categorization is presented in Theoretical Foundation, section 3.2.1. After categorization has been done, the results have been analyzed from two points of view: number of papers per category according to the year of publication and number of paper per category according to the source type (database or workshop).

The final stage was **reporting.** Systematic literature reviews can be reported as a technical report, section of a PhD thesis or a paper. The results of the literature
review performed for this study were presented in a workshop paper (Kaidalova and Seigerroth, 2012), and in section 3.1.2 of this licentiate thesis.

**Performed focused literature reviews**

In addition to systematic literature review this licentiate thesis also employs *focused literature review* at several steps of the research process (steps 2a, 3a and 4 in Figure 2). Particularly, steps 2a and 3a (Figure 2) imply the need for a focused literature review for investigating EM practice in terms of challenges and recommendations with the further intention to generate the preliminary EM framework and the intermediate versions of the EM framework. At step 4 a focused literature review has also been applied when investigating the role of EM in the context of BITA. The main aim to use focused literature review at these steps of the research process was to build an understanding of the subject matter from the existing studies, which then was validated and refined. The suggestions of Webster and Watson (2002) have been applied to perform focused literature reviews at these steps of the research process. The search for relevant literature has been performed with the help of the search interface of the SpringerLink database. Specific keywords relevant to the described steps of a research process have been applied during the search. In addition, searches have been performed across the basket of journals in the IS field. In this thesis the AIS (Association for Information Systems, n.d.) recommended journals have been considered: European Journal of Information Systems; Information Systems Journal; Information Systems Research; Journal of AIS; Journal of Information Technology; Journal of MIS; Journal of Strategic Information Systems and MIS Quarterly. The search across these journals has been done with the help of ProQuest platform that enables convenient search by keywords and keywords combinations across specified resources. The search has been performed at different moments in time for the three focused literature reviews that the research process includes. The main characteristics of the search are presented in the Table 4.

<table>
<thead>
<tr>
<th>Step of the research process</th>
<th>Keywords</th>
<th>Year of the review</th>
</tr>
</thead>
<tbody>
<tr>
<td>2a. Focused literature review on EM challenges</td>
<td>enterprise modeling challenges OR enterprise modeling issues</td>
<td>2012</td>
</tr>
<tr>
<td>3a. Focused literature review on EM challenges and recommendations</td>
<td>enterprise modeling challenges</td>
<td>2013</td>
</tr>
<tr>
<td></td>
<td>enterprise modeling recommendations OR enterprise modeling guidelines</td>
<td></td>
</tr>
<tr>
<td>4. Focused literature review about the role of EM in the context of BITA</td>
<td>enterprise modeling AND business IT alignment</td>
<td>2014</td>
</tr>
<tr>
<td></td>
<td>enterprise modeling AND alignment</td>
<td></td>
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</tbody>
</table>

Searching for the relevant literature by keywords allowed to follow a concept-centric approach of literature review, as compared to an author-centric one (Webster & Watson, 2002). It is also important to mention that other relevant papers have
been found by browsing related conference and workshop proceedings, and considering the papers suggested by the author’s research network. These focused literature reviews provided a theoretical basis for generation of preliminary and intermediate EM frameworks (described in sections 3.2.3 and 3.2.4) and a position of EM in the context of BITA (described in section 3.3).

2.3.2 INTERVIEWS – EMPIRICAL WORK

In order to provide the study with an empirical base, interviews have been used as a data collection technique. In most cases interviews are considered to be effective for collecting qualitative data, and can be used in combination with other techniques and methods. Interviewing aims at understanding people from their own point of view (Williamson, 2002). This specific quality of the interview makes it suitable for this study, particularly for those parts that concentrate on EM practitioners’ experiences.

Williamson (2002) describes three types of interviews: structured, unstructured and semi-structured. A structured interview implies asking respondents exactly the same questions in a fixed sequence. An unstructured interview, on the other hand, implies having a dialogue with respondents without a predefined structure of questions, but generating questions based on the answers given. Semi-structured interviews imply using a predefined list of questions, but allow the interviewer to follow up on leads provided by participants for each question. Semi-structured interviews have a more in-depth character and allow capturing the respondents’ perspective on a situation or event under study. This study applied semi-structured interviews to investigate EM practice and to provide in-depth insights into it and, even more importantly, to run interviews in a more agile manner in order to receive rich and detailed feedback. Interviews have been conducted in English.

Interviews that have been carried out in this study implied careful and thoughtful choice of respondents. The main criterion was relevant experience in EM, including both managing modeling sessions and using created models for various purposes. Some information regarding chosen respondents for both rounds of interviews is presented in Table 5.

<table>
<thead>
<tr>
<th>Interview round</th>
<th>Respondent</th>
<th>Information about a respondent</th>
</tr>
</thead>
</table>
| Round 1 (May-August 2012)        | Respondent 1-1 | Managing partner at a consultancy firm working with strategic and technical development. Managing partner and consultant with more than 20 years of experience within:  
- Collaborative business development;  
- Knowledge capturing and structuring;  
- Development, maintenance and support of SAP, Portal and CAD solutions. |
|                                  | Respondent 1-2 | Currently employed at a large public sector organization as Test Strategist. Has more than 20 years of consultancy experience within:  
- Project management, test management;  
- System development;  
- Quality assurance during system development and maintenance; |
| Respondent 1-3 | Employed at a consultancy firm working with design, integration and analysis of business processes. Senior Enterprise Designer with more than 10 years of experience in:  
- Clarification and definition of concepts and processes;  
- Strategic business development and change management  
- Business analysis and design  
- EM workshop facilitation.  
- Education for enterprise modeling with Astrakan and Enterprise Architect methods. |
| Respondent 1-4 | Employed at consultancy firm working with design, integration and analysis of business processes. Senior Business Developer with more than 35 years of experience within:  
- Business process design;  
- Value chain analysis;  
- Business needs interpretation and analysis;  
- Concept, information and business process modeling;  
- EM workshop facilitation. |
| Round 2 (May-August 2013) | Respondent 2-1 | Employed at consultancy firm working with business development. Senior Management Consultant with more than 10 years of experience within:  
- Business transformation;  
- Business process design;  
- Project management. |
| Respondent 2-2 | Employed at consultancy firm working with business development, process improvement and education (execution of EM workshops). Consultant with more than 15 years of experience within:  
- Business development;  
- Product development and structuring;  
- Strategic competence analysis and management;  
- EM workshop facilitation;  
- Education for EM workshops facilitation, EM and business process modeling. |
| Respondent 2-3 | Employed at consultancy firm working with business development, process improvement and broad range of EM education. At the moment of interview employed at Jönköping University. Consultant with more than 5 years of experience within:  
- Business development;  
- EM workshop facilitation;  
- Requirement engineering and project management for IT support. |
| Respondent 2-4 | Employed at consultancy firm working with business development, process improvement and broad range of EM education. Consultant with more than 10 years of experience within:  
- Business development;  
- Process improvement;  
- Requirement engineering and project management for IT support;  
- EM workshop facilitation. |
In this study interviews played a key role in empirical work (bottom part in Figure 2). Particularly, the first round of interviews was used when investigating EM challenges to generate the preliminary EM framework (step 2b in Figure 2). Then the second round of interviews was used for further identification of EM challenges and recommendations to generate an intermediate EM framework (step 3b in Figure 2). The reason to carry out the interviews in two rounds was to refine the preliminary version and to validate the identified findings upon the new set of respondents. In addition, data from both rounds of interviews was used to investigate the role of EM in the context of BITA. Interviews allowed collecting empirical material to refine theoretical findings, which has been done during conceptualization work (middle part in Figure 2). The overall process of carrying out interviews in this study is presented in Figure 4.

![Flowchart of research process](image)

Figure 4 Overall process of collecting empirical data via interviews

Before carrying out the interviews the initial theoretical models were formed for both rounds. Interviews have been designed depending on a focus of a particular research process step. When designing interviews it was also important to consider the background of the respondents, as it is very important to use appropriate terminology and drive the interview in a suitable manner. After designing interviews in a thoughtful manner it was possible to conduct them. Finally, after the interviews had been carried out, collected data was analyzed in order to generate results. The details of carrying out the first and the second rounds of interview are described in the sections below.

**Interview round 1**

The first round of interviews provided an empirical basis for the preliminary EM framework and for positioning EM in the context of BITA. The process is presented in Figure 4 above and started with **forming a theoretical model** of EM challenges with the help of the focused literature review (presented in sections 3.2.3). The first round of interviews was intended to validate the theory-based set of EM challenges. EM challenges have been identified considering their potential influence on successful EM execution and on alignment of business and IT, therefore the **interview design** has been done accordingly. The first part of the interviews had the intention to disclose the most significant challenges that respondents face during EM. For this part of the interviews the author has designed a set of direct questions (among others, “When creating enterprise models what challenges you usually face?”). The second group of questions had a particular intention to validate
the initial set of EM challenges. This group included both direct and indirect questions. For example, validation of Degree of Formalism challenge has been done with the help of direct question (“Do you consider degree of formalism as a challenging factor?”) and a number of indirect questions (among others, “Have you faced the situation when chosen formalism degree was not suitable for further improvement or use of model?”). Having these two types of questions allowed looking into the real fact of the matter instead of just checking it superficially. During further analysis of respondents’ answers both direct and indirect answers regarding one or another challenge have been taken into consideration. The final questions of the interviews have been designed with an intention to conclude the discussion and get a filtered and condensed view on EM practical challenges (“What challenges of EM practice would you consider as a top three?”). An intention here was to make respondents reconsider and rank the challenges that they have just mentioned, so as to make it possible to see which of those they consider as the most important. The interview guide that has been used for the first round of interviews is available in Appendix A.

**Conducting interviews** started from a stage during which respondents have been provided with a brief description of an initial theory-based model and corresponding EM challenges. This stage had a goal to start and facilitate further discussion by either admitting or denying theory-based challenges. It also served as a warm-up that opens the main part of the interview. Then other prepared questions were discussed in an open-ended manner. In other words, respondents were able to build their answers and argumentation quite freely and unconstrained. However, prepared interview questions served as a directive frame for the conversation.

After the interviews had been carried out, it was possible to **analyze the data** and **generate the results** in form of the preliminary EM framework. The interviews were recorded, transcribed, and analyzed. In the analysis of interview data the goal was to detect all challenges that have been mentioned by interview respondents, and to logically group detected challenges. Having interview data transcribed in textual form allowed performing careful analysis using such practices for qualitative data analysis as categorization and unitizing (Saunders et al., 2006). Classification implies classifying data into meaningful categories, such as “Group dynamics and human behavior”, “Shared language and terminology”, through adding codes and labels to the data for the purpose of providing emergent structure to it. Names for labels that were used for codifying the data originated both from the names used in theoretical model (degree of detail, degree of formalism, modeling perspective, change and model dependencies) and the terms used in the interviews by the respondents (right information, group dynamics, human behavior, shared language, roles of stakeholders). A set of assigned labels then evolved into the set of categories – EM challenges. After that it was possible to unitize data. Unitizing data implies attaching relevant units of data to the corresponding categories, where units of data are lines or paragraphs of transcribed data (Saunders et al., 2006). Thus, it was possible to generate a set of conceptually structured practical EM challenges. As a bonus, it was possible to introduce another part of results for this step of the research, which are general recommendations to deal with presented chal-
challenges. The results of this round of interviews have been used to generate the preliminary EM framework, which is presented in section 4.1, and partly to position EM in the context of BITA (presented in section 4.3.1).

**Interview round 2**

The second round of interviews provided the empirical basis for intermediate EM framework and position of EM in the context of BITA. Similarly to the first round of interviews, conducting the second round of interviews included a number of general steps presented in Figure 4. To **form a theoretical model** at this step the preliminary EM framework has been complimented with the help of a focused literature review on EM challenges and recommendations (described above in 2.3.1).

This round of interviews has been designed to provide a comprehensive and coherent picture of EM challenges and to propose recommendations of how to cope with these challenges. In addition, the interviews also allowed collecting many-sided practical opinions regarding the applicability of EM in the context of BITA. One part of the questions was aimed at identification of EM challenges that EM practitioners have experienced when using enterprise models for various purposes. For this part a set of direct and indirect questions has been designed, for example “For what purpose do you usually use enterprise models?”, “When using enterprise models for a certain purpose what challenges do you usually face?” Another part of the questions was aimed at validating challenges and recommendations that have previously been identified and described in the preliminary EM framework. The aim was to validate EM challenges and recommendations for the theory-based findings according to the chosen respondents. Therefore, in this part of the interviews existing EM challenges and recommendations were presented to the respondents, so that they could comment and discuss them.

When **conducting the interviews**, to get started the respondents were provided in advance with a brief description of the research purpose and the preliminary EM framework with the identified EM challenges and recommendations. This initial stage had the goal to direct respondents into the desired area and set the scene in terms of that they would acknowledge or object to the presented issues. The interviews were then conducted with each respondent in the form of a semi-structured dialogue after the start-up phase. The prepared interview guide guided all the interviews. The second part of the interview questions was dedicated to validation of the preliminary framework of EM challenges and recommendations. During this part of the interviews the preliminary EM framework with set of EM challenges and corresponding recommendations has been presented to the respondents and explained if needed. Then respondents were asked to go through the presented challenges and recommendations and to identify which of them were valid according to their opinion. Also they were encouraged to add any points that were missing from their point of view. This validation allowed refining and enhancing the framework of EM challenges and recommendations. The full interview guide for the second round of interviews is presented in Appendix B.

**Data analysis and results generation** on this round of interviews has been performed similarly to the first round of interviews, thus, it included recording, transcribing, and analyzing the interviews. It enabled careful analysis of the data
through such practices for qualitative data analysis as categorization and unitizing. The second part of all interviews was dedicated to validation of the preliminary framework of EM challenges and guidelines. This was done by adding the challenges and recommendations to the framework that were described by respondents as missing, and to reconsider those ones that were described as “not valid”. Categories from the preliminary EM framework served as basis for categorization in this part. After analysis of interview data it was possible to come up with results of the study, i.e. the intermediate EM framework and description of the role of EM in the context of BITA.

2.3.3 CONCEPTUALIZATION WORK

Conceptualization work included continuous restructuring of the research results, adding new constructs to them and packaging them (middle part in Figure 2). This part of the research process allowed generating a number of results throughout the study. A fundamental concept that is used throughout the whole research process of this thesis is framework, thus it is important to describe the meaning of this term. A framework in the general sense can be defined as “a basic structure underlying a system, concept, or text” (Framework, n.d.). A framework can have a more narrow meaning, which is connected to the definition of a method – a prescriptive guideline that tells what to do in different situations in order to arrive at certain goals (Goldkuhl, Lind, & Seigerroth, 1998). A framework in this context has the following meaning: a framework is one of the constituents of a method that links all other method components into a structure, i.e. it connects procedure (What questions to ask?), notation (How to express answers?) and concepts (What to talk about?) into a coherent structure. This way of defining a framework has been presented by Goldkuhl et al. (1998) as a part of a method definition. Together with three method components (procedure, notation and concepts) and framework that structures them, a method also includes perspective (What is important?) and cooperation forms (Who asks? Who answers?). Another definition of the term framework is presented by Vargas, Plazaola, & Ekstedt (2008). They use the term similarly to how Zackman (1987) defines framework for information systems architecture: a systematic taxonomy of concepts and their interrelationship.

In this thesis the term framework is defined according to the following:

A framework is a structure that integrates several components of descriptive and prescriptive nature into a coherent whole across the BITA context. The descriptive and prescriptive items are: EM challenges (what are the problematic factors that EM practitioners need to deal with?) and EM recommendations (how can EM practitioners deal with these problematic factors?).

On the way to generate the main result of this thesis, which is the final EM framework, a number of results have been produced. A typology of BITA literature has been generated as a result of the systematic literature review of the BITA domain (step 1 in Figure 2). It allowed getting an understanding about the main interest areas in the BITA domain and capturing the initial idea about the position of EM in BITA literature. Taking into consideration this position of EM in the context
of BITA, the **preliminary EM framework** has been generated. A focused literature review (step 2a in Figure 2) allowed building a tentative set of EM challenges and recommendations that has been refined based on the findings of the first round of interviews (step 2b in Figure 2). After that it was possible to structure the identified EM challenges and recommendations into the preliminary EM framework, which served as an input for the **intermediate EM framework** later on. The findings from the focused literature review on EM challenges and recommendations (step 3a in Figure 2) have been used to enrich the preliminary EM framework. After that the enriched set of EM challenges and recommendations has been validated through the second round of interviews (step 3b in Figure 2). A new set of respondents provided another point of view on the previously identified EM challenges and recommendations. At the same time, findings from the first and the second rounds of interviews, together with findings from the focused literature review on the role of EM in the context of BITA, allowed describing the **position of EM in the context of BITA**. In order to do this, the initial typology of BITA literature has also been considered, since it allowed using the fundamental theories of the BITA domain as a foundation for positioning. The findings of the interviews provided the empirical base to conceptually place EM within the chosen frame. Finally, EM challenges and recommendations for the preliminary EM framework have been structured according to the position of EM in the BITA context, so that the **final EM framework** specialized for BITA has been generated. The final EM framework limited the set of previously identified EM challenges and recommendations, since the focus of this framework is on the applicability of EM for BITA.

### 2.4 SUMMARY OF THE CHAPTER

This chapter described the research approach that was used in this study to answer the research questions. The research process and motivation for applying certain research methods during the research process of the study were also presented in this chapter. The research process included a number of steps, each producing a result. Together with describing the fundamental steps and their results, the main types of work that this study involved, i.e. theoretical, empirical and conceptualization work, this chapter discussed the knowledge grounding for both generating and validating of results. In addition, particular details of applying chosen research methods (literature review and interview) for answering the research questions were described in this chapter.
CHAPTER 3
THEORETICAL FOUNDATION

This chapter presents theories that this licentiate study relies on and that have be used to generate its knowledge contributions.

In order to carry out this study it was important to find existing theories that are relevant for the subject matter. Thus, existing theories in the areas of BITA, EM, business modeling, business process modeling and concept modeling have been investigated.

3.1 BUSINESS AND IT ALIGNMENT

IT has changed the way companies organize business processes and communicate with customers (Silvius, 2009). As it has been discussed earlier in the introduction, one of the key factors for the success of an enterprise is the alignment between IT support and business strategies and processes. The importance of business and IT alignment is discussed and recognized by both academics and practitioners (Silvius, 2009). The challenge of business and IT alignment is not new though, as it originated together with the rise of information systems use in organizations. The need for alignment of IS/IT with business processes and strategy became apparent in the ‘70s (Silvius, 2007). Different practices emerged as a response to this problem – traditional IT planning and BITA (in the ‘90s). However, after many years of research in the BITA domain some issues are still not addressed. The theoretical foundations of BITA are still relatively young and contain quite diverse definitions and conceptualizations (Silvius, 2007). The terminology is also a matter of an ongoing discussion, as academics address the problem of business and IT alignment with different terms, e.g. Business-IT alignment (Luftman, 2004; Maes et al., 2000; Wegmann et al., 2005; Lee, Kim, Paulson, & Park, 2008), IT/business alignment (Luftman, 2003), IT alignment (Chan & Reich, 2007a; Hussin, King, & Cragg, 2002), business/IT alignment (De Haes & Van Grembergen, 2009), IS/IT alignment (Gregor et al., 2007), business and IT alignment (Silvius, 2007), strategic alignment (Henderson & Venkatraman, 1992; Kearns & Lederer, 2003) and others. In this thesis the term Business and IT Alignment (BITA) is used.
Various definitions of BITA can be found in literature. Henderson and Venkatraman (1992) describe strategic alignment as the degree of fit and integration between business strategy, IT strategy, business infrastructure, and IT infrastructure. Reich and Benbasat (1996) define BITA as the degree to which the mission, objectives, and plans contained in the business strategy are shared and supported by the IT strategy. According to Sauer and Yetton (1997) the basic principle of BITA is that IT should be managed in a way that mirrors management of the business. McKeen and Smith (2003) argue that strategic alignment of IT exists when an organizational goals and activities remain in harmony with the supporting IS. Luftman and Brier (1999) argue that good alignment means that the organization is applying appropriate IT in certain situations in a timely way, and that these activities remain consistent with the business strategy, goals, and needs. There are two conceptual views on BITA – a process, the activities to reach a certain state of alignment, and a state, the amount of alignment. The first view implies that BITA is an ongoing process, which requires specific IT management capabilities, includes specific actions and has distinct patterns over time (Chan & Reich, 2007a). The second view implies that BITA is a state, for which it is possible to identify antecedents, measures, and outcomes. A definition that contains both views is presented by Silvius (2009): “Business & IT Alignment is the degree to which the IT applications, infrastructure and organization, enable and support the business strategy and processes, as well as the process to realize this.”

In the early studies BITA focused on linking the business plan and the IT plan (Chan & Reich, 2007a). Another perspective originated later that had a slightly different focus - ensuring congruence between the business strategy and the IT strategy. Later BITA has evolved into a concept that imply the fit between business needs and information system priorities (ibid.). The conceptualization of BITA has been elaborated over time, revealing many dimensions in BITA. According to Chan and Reich (2007a) there are several dimensions of alignment: strategic/intellectual, structural, social, and cultural. The strategic/intellectual refers to the degree to which the business strategy and plans, and the IT strategy and plans, complement each other. The structural dimension refers to the degree of structural fit between IT and the business that is influenced by the location of IT decision-making rights, reporting relationships, decentralization of IT, and the deployment of IT personnel. The social dimension refers to the state in which business and IT executives within an organizational unit understand and are committed to the business and IT mission, objectives, and plans. The cultural dimension refers to the need of IT planning to be aligned with cultural elements such as the business planning style and top management communication style. Achievement of BITA requires analysis and improvement of all BITA dimensions. On one hand, there is a need for accurate and up-to-date representation of an enterprise from various perspectives, as it enables alignment of the considered perspectives and in this manner deals with the strategic and structural dimensions of BITA. On the other hand, it is required to deal with
numerous points of view of involved stakeholders and create a shared understanding between them, which could allow managing the social and cultural dimensions of BITA.

BITA as a state is often criticized for being a “fuzzy” target, as according to Silvius (2007) practitioners are often faced with an ambiguity: what exactly in the business should be aligned with IT? When focusing on the strategic alignment, the suggestion would be a business strategy. However, in practice business strategy is often an unclear target, since strategy provides a direction, not a final destination. In addition, in reality IT is often supposed to serve several business divisions with different business requirements. Most of the existing frameworks describe a one-to-one relationship between IT and business, whereas in reality most enterprises with several divisions have to deal with a many-to-one relationship. All business divisions then have their own business requirements, which IT should be aligned with, taking into account the need to be cost-effective. This is often a challenging task for practitioners and requires negotiation between divisional information managers and a centralized IT department (Silvius, 2007). Significant attention in the current literature is given to strategic alignment. Strategic alignment refers to the degree to which the business strategy and plans, and the IT strategy and plans, complement each other (Chan & Reich, 2007a). One of the most referential strategic alignment models has been presented by Henderson and Venkatraman (1992) (see section 3.1.1. below).

3.1.1 STRATEGIC ALIGNMENT

One of the most widespread alignment frameworks is the Strategic Alignment Model (Henderson & Venkatraman, 1992; Silvius, 2007). This framework defines alignment as the degree of fit and integration between four elements: business strategy, IT strategy, business infrastructure, and IS infrastructure.

Figure 5 Strategic Alignment Model (Henderson and Venkatraman, 1992)
The SAM framework is used in research and practice, and is generally considered to be a key reference alignment model (Chan and Reich, 2007b; Saat et al., 2011; Schlosser et al., 2012). The four main elements of SAM are (see Figure 5 above):

- **Business strategy** – includes (a) business scope; (b) distinctive competencies, i.e. those attributes of strategy (e.g., pricing, quality, value-added service, distribution channels) that contribute to a comparative advantage; and (c) business governance, i.e. choices of structural mechanisms to organize the business operations (e.g., strategic alliances, joint ventures, and licensing) that recognize the continuum between markets and hierarchy.

- **IT strategy** – includes (a) information technology scope that refers to the types and range of IT systems and capabilities potentially available to the organization; (b) systemic competencies focusing on distinctive attributes of IT competencies (e.g., higher system reliability, interconnectivity, flexibility) that contribute positively to the creation of new business strategies or better support existing business strategy; and (c) IT governance choices of structural mechanisms (e.g., joint ventures, long-term contracts, partnerships) to obtain the required IT capabilities, as well as strategic choices.

- **Business structure (organizational infrastructure and processes)** – includes (a) administrative infrastructure with organizational structure, roles and reporting relationships; (b) processes – the articulation of workflows and the associated information flows for carrying out the key activities; and (c) skills - the capabilities of the individuals and the organization to execute the key tasks that support a business strategy.

- **IT structure (IS infrastructure and processes)** – includes (a) architectures involving choices pertaining to applications, data, and technology configurations; (b) processes concerned with the work processes central to the operations of the IT infrastructure, including processes for systems development, maintenance, as well as monitoring and control systems; (c) skills regarding the knowledge and capabilities required to effectively manage the IT infrastructure.

Two domains of SAM are the business domain and the IT domain. SAM also differentiates three levels at which alignment can be observed: alignment at the strategy level – between business and IT strategies; the operational (or structural) level – between business and IT structures; and cross-domain alignment – between the elements of strategic and operational level. The strategy level is related to the external perspective, which influence the enterprise from outside by many factors, such as product market, outsourcing relationship, etc. The structural level has an internal focus, such as processes, skills, organizational form, etc. The cross-domain level focuses on the connection between business and IT strategy and organizational and IT structure.
The multivariate alignment of SAM’s main elements includes six bivariate alignment perspectives:

1. strategic fit on business side – the alignment of business strategy and business structure,
2. strategic fit on IT side – the alignment of IT strategy and IT structure;
3. strategic integration – the alignment of business and IT strategies;
4. functional integration – the alignment of business and IT structures;
5. automation – cross-domain perspective that implies the alignment of business strategy and IT structure;
6. linkage – cross-domain perspective that implies the alignment of IT strategy and business structure.

The SAM framework is often mentioned as one of the fundamental frameworks in the BITA domain (Chan & Reich, 2007b; Silvius, 2007). However, it has some limitations. For example, depending on how IT-intensive an enterprise or an industry is, the applicability of SAM may vary, as the underlying assumptions of the SAM model may not hold (Burn & Szeto, 2000; Chan and Reich, 2007b). In addition, when aiming at functional integration in SAM, there is a need to understand the business processes and organization (Silvius, 2007). The business requirements are often changing frequently and the information about them is limited, therefore functional integration requires dealing with a moving target. Moreover, the SAM framework considers the environment of an enterprise only partially, whereas there are many external factors that can influence BITA. Despite these limitations, the SAM framework provides a fundamental representation of the four key elements of an enterprise and divides them between the strategic and operational levels, and the areas of business and IT.

### 3.1.2 An Inventory of Business and IT Alignment Literature

In order to get an overview of the BITA domain, including the main interest areas and trends, a systematic literature review across the BITA field has been performed (see description of the procedure in section 2.3.1). The preliminary number of papers for categorization is presented in Table 6.

<table>
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<tr>
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<th>SpringerLink</th>
<th>ACM Digital Library</th>
<th>Emerald</th>
<th>BITA</th>
<th>BUSITAL</th>
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</tr>
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<td>21</td>
<td>10</td>
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<td>176</td>
</tr>
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</table>

After removing duplicates the total number of papers decreased to 162. After removing false positives the number of papers decreased to 138.
In the course of categorization the following interest areas (categories) within the BITA research domain emerged:

1) Papers aiming to **develop BITA instrumental support** (for example, method, framework, strategy, tool or other)

2) Papers aiming to **evaluate existing BITA instrumental support** (for example, method, framework, strategy, tool or other)

3) Papers aiming to **apply existing BITA instrumental support** (for example, method, framework, strategy, tool or other)

4) Papers aiming to **identify factors that can be used to influence or give indication of BITA** (quite often these two types of factors have been discussed within one work)

5) Papers aiming to **study the current state** of the BITA research field

6) Papers that study other dimensions of BITA

Thus, the set of relevant papers has been sorted according to these categories (1-6). Table 7 shows number of papers in each category by publication year. The highest number of papers for each year is marked in bold.

<table>
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<tr>
<th>Year</th>
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<th>3</th>
<th>4</th>
<th>5</th>
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<th>Number of papers per year</th>
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Table 7 Number of papers in each category (1-6) according to the year of publication

It is noticeable that the total number of papers per year has a stable tendency to grow yearly – from year 2003 with 1 paper to year 2011 with 31 papers. For transparency reasons the number of papers per year is represented using three numbers: the number of papers that were retrieved from the selected databases (DB column), the number of papers that were retrieved from workshops proceedings (WS column) and the total number of papers. This is done in order to see both the overall decrease or growth tendency and the same for each source type. Interestingly enough, the number of papers that were retrieved from databases tends to increase yearly with slight deviations, the same as for the total number of paper per year.
irrespective of source type. The distribution of papers into categories is uneven, which illustrates a quite natural research phenomenon of higher interest to one research direction and comparatively lower attention to another.

The performed inventory of the BITA domain shows that a significant part of publications in the domain between 2000 and 2012 present instrumental support to facilitate BITA. This instrumental support includes methods, approaches, strategies, frameworks, models, CASE tools and other artifacts that can provide guidelines for BITA achievement, improvement, maintenance or assessment. This instrumental support is aimed on solving existing BITA problems. Interestingly enough, most of the proposed instrumental support for BITA has a non-procedural nature, whereas the procedural dimension seems rather neglected. Quite little attention in the BITA research domain is paid to evaluation of existing methods, tools and approaches for BITA. Publications that belong to this category mostly deal with discussing strengths and weaknesses of existing BITA methods or frameworks. Comparatively higher research interest is dedicated to the application of existing BITA methods, tools and approaches. This category involves publications that describe applications of BITA methods in practice, but they hardly propose procedural guidelines for their application. Significant attention is dedicated to BITA key performance indicators. The purpose of publications dealing with this issue is to describe factors that can be used as influencing or indicating BITA, for example enablers and inhibitors of BITA, the effects of BITA, as well as BITA antecedents and outcomes.

The second largest category of BITA publications includes publications that discuss miscellaneous issues related to BITA. These publications describe minor or particularistic issues of BITA, which are often problems that have originated from the BITA area, but have eventually separated into separate research fields. In addition, some publications illuminate the applicability of concepts and practices from other research domains of BITA, i.e. introducing means for facilitating or enabling BITA. Among concepts and practices that are mentioned in such publications the following concepts are among the most frequently addressed: business requirements, requirements engineering, IS requirements, business needs, business model, goal model, value model, business process model, business process management, enterprise architecture, enterprise modeling, service modeling. Here, among the means to support BITA, various types of modeling are discussed as practices that are beneficial for BITA. Enterprise Modeling receives minor attention, despite the recognition of its potential for facilitating BITA. The fundamentals of EM relevant for this study are presented in section 3.2, and existing descriptions of the role of EM in BITA are presented in section 3.3.

### 3.2 ENTERPRISE MODELING

As it has been discussed in section 3.1 there is a clear need to capture both organization (business) and technology issues during design and implementation of enterprise Information System (IS) (Gibson, 2003). Moreover, capturing these dimensions in a valid and comprehensive way requires the involvement of a large
number of stakeholders. In this respect EM has served as a widely applied and effective practice. EM (sometimes also called business modeling, c.f. Kirikova, 2000) is a practice for developing, obtaining, and communicating enterprise knowledge, like strategies, goals and requirements to different stakeholders (Kirikova, 2000; Stirna & Kirikova, 2008; Persson, 2001). Sandkuhl, Stirna, Persson, & Wissotzki (2014) define EM as:

**EM is the process of creating an integrated enterprise model which captures the aspects of the enterprise required for the modeling purpose at hand. An enterprise in this context can be a private company, government department, academic institution, other kind of organization, or part thereof. An enterprise model consists of a number of related sub-models, each focusing on a particular aspect of the enterprise, e.g. processes, business rules, concepts/information, vision/goals, and actors. An enterprise model describes the current or future state of an enterprise and contains the commonly shared enterprise knowledge of the stakeholders involved in the modeling process. (Sandkuhl et al., 2014, p.29)**

EM is often used during development or refinement of enterprise IS. Researchers pay significant attention to the applicability of EM for software requirements engineering (de la Vara and Sanchez, 2008; Rolland & Prakash, 2000; Persson, 2001). According to Stirna et al. (2007), EM is an activity where integrated and commonly shared models describing different aspects of an enterprise are created. Enterprise models focus on some aspect of the problem domain, such e.g. processes, business rules, concepts/information/data, vision/goals, or actors. Therefore the core capability of enterprise models is to capture different aspects (focal areas) of the enterprise practice in terms of procedures, operations, management etc. A model plays an important role as a visual mapping of reality in the form of a diagram, thus fostering communication; it is a compact abstraction, thus it allows coping with complexity; it is usually based on shared concepts, thus it facilitates shared understanding; it is a conceptual model, thus it serves as a blueprint for simulation design (Barjis, 2011).

An EM activity usually comprises both intra-organizational and inter-organizational processes (Barjis, 2011). In order to analyze these processes a large number of stakeholders have to be involved in EM, which makes the traditional consultative approach (i.e. fact gathering, analysis, and delivering an expert opinion) hardly applicable when dealing with “wicked” problems (Persson, 2001; Stirna et al., 2007). As a result, participative or collaborative EM, where modeling sessions in groups are led by EM practitioners, has been established as a practical approach to deal with organizational design problems (see 3.2.1).

According to Barjis (2011), collaboration, participation, and interaction among a large group of stakeholders is highly beneficial in the practice of modeling, as it enables more effective and efficient model derivation and it increases the validity of models. The participative approach implies involvement of various stakeholders in modeling and enables more efficient data acquisition and better understanding
of enterprise processes (Front, Rieu, & Santorum, 2014). The problem, which might occur here is that the obtained representations (enterprise models) are often not enough formalized, which complicates their further application. Therefore the role of the EM practitioner who leads this kind of EM effort becomes vital for the success of any modeling initiative (Rosemann, Lind, Hjalmarsson, & Recker, 2011).

The idea of collaboration and interaction has earlier been also described and formalized as non-interactive and interactive modeling where the purpose is to expand the shared knowledge through EM. Lind and Seigerroth (2003) have divided the modeling process into four generic modeling phases, 1) Interactive collection, 2) Interactive modeling, 3) Non interactive modeling, and 4) Interactive validation. Interactive collection is the phase where the modeling experts together with the business people set the scope for the upcoming modeling sessions in order to agree upon what to focus on and what not to focus on. The two next phases are the actual modeling phases where answers interactively are expressed and structured using different model types. Interactive modeling is where answers are expressed and structured together with the respondent(s). Non-interactive modeling is a phase where answers are further structured and refined in models without any involvement of the respondent(s). This phase usually also involve the transformation of models into some IT-based tool. The last phase, Interactive validation includes a mutual agreement about the structured answers that are manifested in models being developed between the respondent(s) and the modeling experts (c.f. Lind & Seigerroth, 2003). This process is one way to conceptualize the transformation of information into enterprise models.

An important issue regarding the EM domain is related to its heterogeneous nature. The benefits of using EM are often dependent on a specific EM method that is used within an EM project. A part of the EM community focus on notational rules that a specific EM method should follow (e.g. Engelsman, Quartel, Jonkers, & van Sinderen, 2011), whereas other parts focus on a procedure that should be followed during an EM project (e.g., Stirna and Persson, 2009). In this thesis the term EM is used to address a participative and collaborative process, where various stakeholders’ points of view are considered and consolidated in order to create multidimensional conceptualizations of an enterprise (Stirna and Kirikova, 2008). Participative EM is consensus-driven in the sense that it is the domain stakeholders who own the models and decide their content (Persson, 2001).

Generally stakeholders who are involved in participative EM can be divided into two parties - participants from the enterprise itself and an EM practitioner (or facilitator) that leads the modeling activities. The first group of stakeholders consists of enterprise employees who have the role to share and exchange their knowledge about enterprise operations (domain knowledge). There are various factors that can hinder the process of sharing knowledge between enterprise employees. For example, as the project progresses the enterprise becomes less interested to allocate their most knowledgeable human resources to modeling sessions, since it can be considered as a waste of time (Barjis, 2009). The second party of EM is an EM practitioner
– a person who facilitates and drives the EM project process (partly or fully) towards effectively achieving its goals (Persson & Stirna, 2010). This role is responsible for making sure that the project resources are used properly in order to achieve the goals of the project and to complete the project on time (ibid, Rosemann et al., 2011). More details about the roles in EM project are available in Stirna and Persson (2012).

Performing EM successfully is a non-trivial task that requires considerable skill and experience, since the EM practitioner needs to manage the intricacies of discovering the domain knowledge, consolidating different stakeholder views, and representing this knowledge in a coherent and comprehensive model (Stirna et al., 2007). Among the core challenges of EM Barjis (2009) highlights the complex sociotechnical nature of an enterprise and conflicting descriptions of the business given by different stakeholders. Thus, EM practitioners need to have considerable experience and a broad range of knowledge regarding EM execution, since various problems and challenges occur both during the execution of EM sessions and during the follow-up stages of EM (Stirna & Persson, 2009).

An overview of theories for framing EM challenges is presented in section 3.2.1., whereas in section 3.2.2 some relevant studies for framing EM guidelines are outlined. Aimed on investigating challenges and guidelines of EM, this study also takes into account existing studies in such areas as business process modeling and business modeling, since they can provide some useful insights regarding modeling practice in a broad sense.

3.2.1 THE ENTERPRISE MODELING PROCESS

It is important to have a conceptual understanding of the processes and activities that EM usually involves. One way to view EM projects in terms of involved activities was presented by Persson and Stirna (2012). According to them, a stereotypical EM process involves the following steps:

1. Define scope and objectives of the project;
2. Plan for project activities and resources;
3. Plan for modeling session;
4. Gather and analyze background information;
5. Interview modeling participants;
6. Prepare modeling session;
7. Conduct modeling session;
8. Write meeting minutes;
9. Analyze and refine models;
10. Present the results to stakeholders.

Lind and Seigerroth (2003) discuss the process of team-based collaborative knowledge reconstruction based on modeling and identify four basic activities: interactive collection, interactive modeling, non-interactive modeling, and interactive validation.
Another more generic view on EM is presented by Kaidalova et al. (2014). According to this model, EM processes include three basic activities that are usually performed in sequential order, but in some cases can roll back (see Figure 6 below).

1. Extracting information about the enterprise
2. Transforming information into enterprise models
3. Using enterprise models (after mutual agreement on models is achieved)

Figure 6 EM activities (Kaidalova et al., 2014)

After having started the EM effort the EM practitioner, often together with the domain experts, needs to analyze what information should be collected in order to reach the goal of the modeling effort. Therefore, the first activity of EM is to collect information about the enterprise in focus. During participative EM, where domain experts play an important role the main source for getting information are modeling sessions or workshops. During such sessions the EM practitioner is supposed to have a leading role and collect opinions about various aspects of the enterprise. The ability of the EM practitioner to facilitate open discussions is crucial in order to extract the necessary information and then to transform this information into enterprise models, i.e. to visualize the obtained information in a structured way in the form of enterprise models (activity 2 in Figure 6). Most often models are created during modeling sessions together with domain experts to make sure that existing viewpoints are considered and consolidated. It is a common practice to iterate between the first and the second activity several times when creating models to make sure that all the needed information has been captured and documented.

However, in some cases the manifestation or actual visualization of models can be done after the modeling sessions. It is important to emphasize that documentation of models is a continuous process, which will continue until a common agreement on the created models is achieved among the involved participants. There are various challenges that are specific for these two activities of EM - extracting enterprise-related information and documenting it into models. Common agreement among the stakeholders on creating enterprise models is crucial in order to use the created enterprise models for any purpose (activity 3). The objectives to achieve consensus and get a shared understanding about different enterprise aspects (focal areas) can play a central role in EM initiative, but often enterprise models serve as a visualization and blueprints for the required change process.

This model is quite generic and provides a high-level overview of EM process. It is possible to find a correspondence between the model of Persson and Stirna (2012) of the EM process with this one. The activity extracting information about the enterprise might include (1) definition of scope and objectives of the project; (2) planning for project activities and resources; (3) planning for modeling session; (4) gathering and analyzing background information; (5) interviewing modeling par-
Participants; (6) preparing modeling session; (7) conducting modeling session. The activity *transforming information into enterprise models* could then contain (8) writing meeting minutes; (9) analysis and refinement of models, whereas the activity *using enterprise models* could include (10) presentation of the results to stakeholders and further implementation of the project result. It is also possible to find the correspondence with the model of Lind and Seigerroth (2003). *Extracting information about the enterprise* corresponds to the combination of (1) interactive collection and (2) interactive modeling. *Transforming information into enterprise models* corresponds to combination of (3) non-interactive modeling and (4) interactive validation. *Using enterprise models* does not have an explicit corresponding activity in Lind and Seigerroth (2003), since their model has a focus on using EM for knowledge sharing. The model of Kaidalova et al. (2014) will be used in this thesis as a generic way to represent the EM process.

### 3.2.2 THE INTENTIONAL PERSPECTIVE ON ENTERPRISE MODELING

Apart from development or refinement of an enterprise IS (e.g. Zikra, Espana, Ruiz, Pastor Lopez, & Stirna, 2012), EM can be used to create shared domain knowledge (e.g. Lind & Seigerroth, 2003; Reich & Benbasat, 2000; Chan, Sabherwal, & Thatcher, 2006). Both of these abilities play an important role in BITA, however the advantages of using EM depend on the purpose behind EM in a particular case. Persson and Stirna (2001) present a hierarchy of EM intentions, which shows possible purposes of using EM. It has been further refined in Bubenko et al. (2010). The main elements of this model are presented in Figure 7. In this thesis this model will be addressed as the hierarchy of EM intentions of Persson and Stirna.

![Figure 7 The main elements of the EM intentions hierarchy (Persson and Stirna, 2001)](image_url)
Persson’s and Stirna’s hierarchy of EM intentions differentiates between three high-level intentions. The first deals with ensuring the quality of the business, primarily focusing on two issues: (1.1) ensuring acceptance of business decisions through committing the stakeholders to the decisions made, (1.2) maintaining and sharing knowledge about the business, its vision, and the way it operates. With respect to knowledge sharing EM plays an important role, since it provides a multifaceted map of the business as a platform for communicating between stakeholders. It facilitates knowledge management by keeping employees informed with regard to how the business is operating. The issue of commitment of stakeholders to carry out business decisions is crucial for achieving high quality business operations. In this respect EM, particularly using a participative approach, is an effective practice, since it stimulates communication between stakeholders.

The second group of EM intentions is developing the business, which can be considered as one of the most common intentions of EM. EM can be used in the early stages of IS development as an effective practice for gathering business needs and high-level requirements. Developing the business might include (2.1) developing business vision and strategies, (2.2) redesigning business operations and (2.3) developing the supporting information systems.

The third top-level intention in the hierarchy is using EM as a problem-solving tool, where EM is only used for supporting the discussion among a group of stakeholders trying to analyze a specific problem. In such cases EM can be helpful for capturing, delimiting, and analyzing the initial problem situation and in order to decide on further actions. The main characteristic of this top-level intention is that enterprise models are not planned to be used for further development work. In many cases such an EM effort continues with one of the abovementioned EM intentions, for example, if the problem turns out to be more complex than expected or the organization realizes the benefit of using EM to solve it.

### 3.2.3 ENTERPRISE MODELING CHALLENGES – RESULTS OF FOCUSED LITERATURE REVIEWS

This section presents theories that have been found in existing literature with the help of focused literature review described in the second part of section 2.3.1. The two focused literature reviews searched through a significant amount of publications using keywords. At research step 2a (Figure 2), enterprise modeling challenges OR enterprise modeling issues have been used as keywords. After that, at research step 3a (Figure 2), enterprise modeling challenges, enterprise modeling recommendations or enterprise modeling guidelines have been used as keywords. Together with publications that include the specified terms it was possible to find a number of publications that use a slightly different terminology, but still are relevant for the study, for example, publications that deal with the competence of EM practitioners or critical success factors of EM. Relevant theories are presented in Table 8 for an overview and are then described in details below.
### Table 8: Studies that help to frame EM challenges

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<th>Concept in focus</th>
<th>Study</th>
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<tr>
<td></td>
<td>Rexhepi (2012)</td>
<td>1. Challenges that can occur before modeling sessions: conducting EM without given guidelines; to anchor EM; to identify the purpose of EM; to gain access to the resources; to deal with “everyone is participating”; to identify the key stakeholders and make them participate; to identify the right method according to the purpose and participants.&lt;br&gt;2. Challenges that occur during modeling sessions: dealing with special interests; achieving consensus between various professional; to avoid taking the leading role; to identify “slow-doers”.&lt;br&gt;3. Challenges that occur after modeling session: the challenge of making models re-used</td>
</tr>
<tr>
<td>Issues in process modeling projects</td>
<td>Raduescu, Tan, Jayaganesh, Bandara, zur Muehlen, &amp; Lippe (2006)</td>
<td>1. Strategy-level related issues: lack of top management support; lack of governance; doubts about the economic value.&lt;br&gt;2. Process modeling lifecycle issues: lack of project setup guidelines, lack of modeling objectives, lack of modeling procedures, lack of common modeling methodology, lack of supporting infrastructure; model aspects and levels of granularity, model quality assurance; rework and update of models, variant management, consolidation and integration.&lt;br&gt;3. Resources-level related issues: modeler-related issues include skills of a modeler and familiarity with the application domain. The quality of a model depends on both the ability of the modeler to extract relevant information from business experts and on the modeler’s own knowledge of the business context.</td>
</tr>
<tr>
<td>The competence of EM practitioner</td>
<td>Persson and Stirna (2010)</td>
<td>1. Competences related to modeling (ability to model and ability to facilitate a modeling session)&lt;br&gt;2. Competences related to managing EM projects</td>
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<tr>
<td></td>
<td>Rosemann et al. (2011)</td>
<td>1. Communication style (talking vs. listening)&lt;br&gt;2. Power style (assertive vs. empathic)&lt;br&gt;3. Adaption style (static vs. flexible)&lt;br&gt;4. Disagreement style (embraces conflict vs. avoids conflict)&lt;br&gt;5. Control style (centralized vs. decentralized)&lt;br&gt;6. Model behavior (does model vs. allows model)&lt;br&gt;7. Facilitation behavior (do facilitation vs. allow facilitation)&lt;br&gt;8. Involvement style (involving vs. ignoring)&lt;br&gt;9. Work style (structured vs. unstructured)&lt;br&gt;10. Domain knowledge style (domain agnostic vs. domain expert)</td>
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Kaczmarek et al. (2012) has identified a set of four EM challenges. These challenges are mostly related to essential characteristics of the resulting enterprise models. The first one is the degree of formalism. The degree of formalism is closely related to notation and notation rules for different enterprise models. There are different modeling notations that are used depending on enterprise perspectives (focal areas) that are in focus. The degree of formalism in enterprise models can vary from formal machine interpretable languages to more informal rich pictures. The expressiveness of the selected formalism will have impact on the final models. The second challenge is related to the degree of detail. In practice it is usually a challenge to decide how much information a model should contain in order to describe a certain situation. The third challenge includes the accuracy of the view. It is a challenge to select the suitable point of view(s) during modeling and stay focused on the chosen point of view, i.e. the selection of suitable focal areas like process, problem, goal, resources etc. The fourth challenge is the change and model dependencies. This challenge refers to the fact that modeling is usually done in a dynamic and constantly changing environment. Models should usually be used as a support during enterprise change. In a dynamic and changing environment this means that models also need to continuously undergo changes. It is common that modeling is performed at different levels at the same time (i.e. business model, process, IS/IT infrastructure) where one or several focal areas can be modeled within or between different levels. This multilayered modeling and change means that one model or layer of the models might have consequences for other models within or between different layers. These four challenges have served as the most significant part of the theoretical basis when generating the preliminary EM framework.

Rexhepi (2012) identifies a number of EM challenges and divides them in three groups:

(1) challenges that can occur before modeling sessions;
(2) challenges that occur during modeling sessions;
(3) challenges that occur after modeling session.

The first group includes conducting EM without given guidelines; to anchor EM; to identify the purpose of EM; to gain access to the resources; to deal with “everyone is participating”; to identify the key stakeholders and make them participate; to identify the right method according to the purpose and participants. The second
group of challenges includes dealing with special interests; achieving consensus between various professional; to avoid taking the leading role; to identify “slow-doers”. The third group includes the challenge of making models re-used.

Delen et al. (2005) investigate the challenges of EM and identify four with regard to the decision maker’s point of view: heterogeneous methods and tools, model correlation, representation extensibility, and enterprise model compiling.

Raduescu et al. (2006) identify a framework of issues related to large-scale process modeling projects that are relevant for various involved stakeholders (e.g. business analysts, modelers, vendors and managers). They divide identified issues into three groups:

1. strategy-level related issues;
2. process modeling lifecycle issues;
3. resource-level related issues.

The first group includes the following issues: lack of top management support; lack of governance; doubts about the economic value. The second group includes the following issues during the setup phase: lack of project setup guidelines, lack of modeling objectives, lack of modeling procedures (Standards / Policy), lack of common modeling methodology (Standardisation), lack of supporting infrastructure; during the design phase: model aspects and levels of granularity, model quality assurance; during the maintenance phase: rework and update of models, variant management, consolidation and integration. The third group includes a number of issues for each of the involved roles. Modeler-related issues are related to the skill set of a modeler and familiarity with the application domain. It is also important to remember that the quality of a model depends on both the ability of the modeler to extract relevant information from business experts and on the modeler’s own knowledge of the business context.

One research topic that is related to EM challenges is the competence of EM practitioner. This topic focuses on key factors that determine competence of an EM practitioner and highlights, first and foremost, the questions that this actor is supposed to solve throughout the EM process. Persson and Stirna (2010) have presented an analysis that elucidates the competence needs for EM practitioners with regard to different steps in the EM process. They consider that the EM process consists of the following activities: project inception and planning, conducting modeling sessions, delivering a result that can be used for subsequent implementation. Two main competence areas that Stirna and Persson (2010) have identified are competences related to modeling (ability to model and ability to facilitate a modeling session) and competences related to managing EM projects. Among abilities that belong to the second group they mention the ability to select an appropriate EM approach and tailor it in order to fit the situation at hand; the ability to interview involved domain experts; the ability to define a relevant problem; the ability to define requirements on the results; the ability to establish a modeling project; the ability to adjust a presentation of project results and issues related to them to
various stakeholders; the ability to navigate between the wishes of various stakeholders while upholding the EM project goal; the ability to assess the impact of the modeling result and the modeling process in the organization.

Another view on the required competence of EM practitioner is presented by Rosemann et al. (2011) where they argue that the roles of the modeling facilitator has not been researched enough and they therefore present a framework that describes four roles that the EM practitioners can play. There are ten styles of facilitation behavior, which can characterize these four roles: communication style (talking vs. listening), power style (assertive vs. empathic), adaption style (static vs. flexible), disagreement style (embraces conflict vs. avoids conflict), control style (centralized vs. decentralized), model behavior (does model vs. allows model), facilitation behavior (do facilitation vs. allow facilitation), involvement style (involving vs. ignoring), work style (structured vs. unstructured), domain knowledge style (domain agnostic vs. domain expert).

Yet another topic related to EM challenges is EM critical success factors (Bandara et al., 2005, Rosemann et al., 2001). Bandara et al. (2005) divide these critical success factors of business process modeling into two groups: project-specific factors (stakeholder participation, management support, information resources, project management, modeler experience) and modeling-related factors (modeling methodology, modeling language, modeling tool). Rosemann et al. (2001) identifies the factors that influence process modeling success: modeling methodology, modeling language, modeling tool, modelers’ expertise, modeling team orientation, project management, user participation, and management support.

3.2.4 ENTERPRISE MODELING RECOMMENDATIONS – RESULTS OF FOCUSED LITERATURE REVIEWS

This section introduces theories that have been found in existing literature using a focused literature review according to the second part of section 2.3.1. The focused literature review at research step 3a has used enterprise modeling challenges, enterprise modeling recommendations or enterprise modeling guidelines as keywords.

Before introducing relevant theories it is important to clarify a few terms. There are two terms that have similar meanings and will be used – guidelines and recommendations. A guideline can be seen as an advice applicable to solving a certain problem in a certain situation (Persson, 2001). It encompasses a view of what is perceived as best practice in a specific situation and has a great deal in common with a pattern. Most documented patterns couple one problem with one solution (Fowler, 2003). Thus, guidelines are prescriptive in nature and contain instruction-like statements that are aimed on achieving a certain result. Goldkuhl et al. (1998) describe a specific type of guidelines, a procedural guideline, which prescribe how to work and what questions to ask in order to use an Information System Development method. This study differentiates guidelines from recommendations that are similar, but less prescriptive in nature. Recommendations can be represented in the form of suggestions that can assist in dealing with a certain type of problem or
in a certain situation. One of the purposes of this study is to propose some suggestions that can help to deal with identified EM challenges. Thus, this study generates recommendations – *statements that indicate a possible solution or a best practice to cope with a certain challenge*. Recommendations are in this licentiate thesis intended to serve as a piece of advice for a person who is considering applying participative EM in some practical context.

As it has been mentioned earlier, the focused literature review has used both *enterprise modeling recommendations* and *enterprise modeling guidelines* as keywords to search across the literature, as both of them can to some extent be used as a foundation when proposing EM recommendations for this study. There are a number of theories that were found and considered as contributing to a broader picture of EM recommendations for BITA. A summarized overview of these theories is presented below in Table 9. Together with the EM challenges from Table 8, this set served as the theoretical basis when generating the intermediate EM framework.

<table>
<thead>
<tr>
<th>Concept in focus</th>
<th>Study</th>
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| Situational factors that influence the applicability and application of participative EM | Persson (2001)             | 1. Organizational factor  
2. Project definition  
3. Resources factor  
4. Problem factor  
5. Competency factor  
6. Human factor |
| Generic principles for applying participative EM                     | Stirna et al. (2007)       | 1. Assess the organizational context  
2. Assess the problem at hand  
3. Assign roles in the modeling process  
4. Acquire resources for the project in general and for preparation efforts in particular  
5. Conduct modeling sessions |
| Anti-patterns for participative EM                                    | Stirna and Persson (2009)  | 1. Anti-patterns for the modeling product  
2. Anti-patterns for the modeling process  
3. Anti-patterns for the modeling tool support |
| Process modeling guidelines                                          | Mendling, Reijers, van der Aalst (2010) | 1. Number of elements should be minimized  
2. The structure of elements (one start and end element)  
3. The routes between elements should be minimized and others |

There are several studies, which introduce different kinds of guidelines for carrying out modeling. A significant part of these guidelines are non-procedural and they often deal with various quality aspects of modeling, (Becker, Rosemann, & von Uthmann, 2000; Koehler & Vanhatalo, 2007; Muehlen, Wisnosky, & Kindrick, 2010). Persson (2001) introduces a number of guidelines for six types of situational factors
that are specific for participative EM: organizational factors, project definition, resources factors, problem factors, competency factors, and human factors. Stirna et al. (2007) describe a set of experiences related to applying EM in different organizational contexts. They present a set of generic principles for applying participative EM. Their principles mark out five high-level recommendations of using participative EM: assess the organizational context, assess the problem at hand, assign roles in the modeling process, acquire resources for the project in general and for preparation efforts in particular, and conduct modeling sessions.

Stirna and Persson (2009) introduce guidelines for carrying out EM in the form of anti-patterns that reflect common and recurring pitfalls of EM projects. The presented anti-patterns address three aspects of EM: the modeling product, the modeling process, and the modeling tool support. These three groups include a number of anti-patterns—solutions that are quite commonly used, but that are wrong. For example, among anti-patterns related to the modeling process the following can be mentioned: everybody acts as a facilitator, the facilitator acts as a domain expert. Anti-patterns related to modeling tool support include the following issues: models keep themselves “alive”, professionals use only computerized tools, everyone embraces a new tool. These guidelines are mostly related to dealing with collaborative nature of EM, but not focusing on the desired characteristics of models.

A set of guidelines that aiming to create sound process models has been presented by Mendling et al. (2010). These guidelines focus on certain characteristics of models such as the number of elements (it should be minimized), their structure (one start and end element), routes between elements (it should be minimized), etc. This set of guidelines provides support for creating models, but it does not focus on dealing with the collaborative nature of EM.

3.3 THE ROLE OF ENTERPRISE MODELING IN THE CONTEXT OF BUSINESS AND IT ALIGNMENT

This section presents theories that can help to position EM in the context of BITA. Presented theories have been found in existing literature with the help of focused literature review on research step 4 (Figure 2) that has been described in the second part of section 2.3.1. The focused literature review searched through a significant amount of publications using the following keywords combinations: enterprise modeling AND business IT alignment, enterprise modeling AND alignment.

One of the reasons contributing to the misalignment between business and IT is the lack of a common understanding between the business and information systems worlds (Singh and Woo, 2009). The achievement of BITA requires the alignment of the representations of the multiple viewpoints that an enterprise embodies. Many studies have acknowledged EM as a potential means to resolve this misalignment and facilitate BITA (e.g., Seigerroth, 2011; Chan & Reich, 2007a; Wegmann et al., 2007; Christiner et al., 2012; Gregor et al., 2007). As it has been described earlier, one of the most common reasons to use EM is for the development or refinement
of enterprise information system (IS). The core capability of enterprise models to capture different aspects of enterprise practice makes EM applicable for developing IS that supports business needs, processes and strategies (Silvius, 2009). Most of the studies that consider the role of EM with respect to BITA maintain that business and IT can be aligned via the alignment of their representations (c.f., e.g. Wegmann et al., 2007; Kaczmarek et al., 2012). However, according to McGinnis (2007), the challenging part of using EM in enterprise transformation efforts most often lies in dealing with the human roles and relationships involved, not in representing a desired IS. The issue of creating an understanding between business and IT people receives rather minor attention in the studies that consider EM and its role in BITA, which raises the need to investigate the social aspects that BITA implies.

There are numerous methods and tools for improving BITA. One way to classify them was proposed by Aversano, Grasso, & Tortorella (2012) in a BITA process model that includes three steps: (1) modeling of alignment-related elements, (2) alignment evaluation and (3) evolution execution (see Figure 8 below). This process model implies that first all elements that are involved in alignment analysis should be modeled, thereafter it is possible to evaluate the alignment degree and then objectively analyze if the estimated BITA reaches a satisfactory level or if evolution actions should be performed. Generally speaking, EM is mostly applicable during the modeling phase, but it is helpful also during alignment evaluation and evolution execution phases, since it provides a basis for discussions and actions in form of enterprise models.

Gregor et al. (2007) regard EM as one of catalyzing mechanisms for aligning the business and IT dimensions of an enterprise. According to Christiner et al. (2012) EM can support BITA by providing means for capturing, visualizing and improving different perspectives of an enterprise, including processes, organization structures, products, systems, and business objectives. Karlsen and Opdahl (2012) argue that EM supports strategic alignment, since it serves as a key tool in understanding business processes and as a prerequisite for business improvements, and what is more it can be used as a tool in conversation, communication and understanding in programs aimed at business change.
The contribution of EM in BITA achievement depends on the intentions behind specific EM efforts. Obviously, the effects and outcomes of an EM effort vary according to its intention. Thus, an important theory required for investigation of the role of EM with respect to BITA is the hierarchy of EM intentions introduced by Persson and Stirna (2001) (see sections 3.2.2).

3.4 SUMMARY OF THE CHAPTER

This chapter introduced the fundamental theories that this study relies on. First, the area of BITA was described, including its essential dimensions, which are strategic, structural, social and cultural. The results of the performed systematic literature review in the BITA domain were introduced, which highlighted the main interest areas and gaps within it. Strategic Alignment Model was presented as one of the fundamental models illustrating the components of BITA. Strategic Alignment Model was chosen as an underlying theory for further positioning of EM within BITA. In addition, the important theories from EM domain were presented. These theories include the overview of EM intentions, the process of EM, EM challenges and EM recommendations. The hierarchy of EM intentions suggests that EM can be used to ensure the quality of the business, to develop the business or to solve a specific business problem. This model was chosen to contribute to the further positioning of EM within BITA.
CHAPTER 4
RESULTS

This chapter describes the results of the study. The main constituents of the results are three versions of the EM framework.

All three versions of the EM framework have been developed through conceptualization upon various parts of results, from both theoretical and empirical work of the research process (section 2.1). The three version of the framework are the preliminary EM framework (see section 4.1), the intermediate EM framework (see section 4.2) and the final EM framework (see section 4.3).

Figure 9 The overview of the three version of the EM framework
The model of EM basic activities introduced in section 3.2.1 served as a foundation for all three versions of EM framework in this study. The evolution of the framework is presented in Figure 9 and relies on the basic activities of EM – (1) extracting information about enterprise, (2) transforming information into enterprise models and (3) using enterprise models.

The preliminary EM framework consists of challenges and recommendations for the activities (1) and (2). The intermediate EM framework consists of challenges and recommendations for all three EM activities. The final EM framework contains the challenges and recommendations that take into account EM positioning in the context of BITA. Each of the following sections introducing the three versions of the EM framework starts with a figure that shows how knowledge represented in a section has been grounded and whether a certain part of the results required generation, validation or both. It relates the reader to the grounding of knowledge described earlier in Section 2.2.

The results in each section are illustrated and supported with the help of quotations that have been selected from the interview data.

### 4.1 PRELIMINARY ENTERPRISE MODELING FRAMEWORK

In order to produce the preliminary EM framework the findings from the focused literature review (step 2a in Figure 2) have been validated with the help of the first round of interviews (step 2b in Figure 2). The focused literature review resulted in generation of a theory-based framework through internal and external theoretical grounding. The empirical material was then used to validate it and add new constructs to it. Internal grounding has been also used during validation of the framework.

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<thead>
<tr>
<th>Knowledge grounding</th>
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<td>External grounding</td>
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<tr>
<td>Empirical grounding</td>
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The preliminary EM framework includes a number of challenges that were identified for the following EM activities: (1) extracting information about the enterprise – section 4.1.1, (2) transforming information into enterprise models – section 4.1.2. Selected statements of interview respondents that have been considered when identifying and generating EM challenges are presented for each challenge. Together with the challenges it was possible to come up with a number of recommendations. While the recommendations were not the focus at this stage of the study, the interviews allowed revealing a number of them. The combination of challenges and recommendations, i.e. preliminary EM framework, is presented in section 4.1.3. The theoretical basis for this part of the results consisted of the theories presented in section 3.2.3, particularly on Kaczmarek et al. (2012).
4.1.1 CHALLENGES RELATED TO EXTRACTING INFORMATION ABOUT THE ENTERPRISE

This group includes challenges that EM practitioner face while obtaining information on enterprise operation during EM workshops and other fact-finding activities.

The right information

This challenge is related to the fact that it is usually quite problematic to get information that is really relevant for solving specific modeling problems. According to the respondents, quite often they need to be very persistent and ingenious while communicating with enterprise employees in order to make them share their knowledge about enterprise operation. This often leads to situations where EM practitioners finally have too much information, with different degrees of validity and accuracy. Respondents also mentioned the problem of information fuzziness, “blank spots” that the participants are not able to describe and possible inaccuracies in the obtained information. This makes the requirement for accurate, complete and clear information quite challenging to satisfy.

“You should find things that were hidden earlier. It can be quite problematic.” (Respondent 1-1)

"Often information is the first problem: you have too much information, so you do not know what to use, if it is accurate or inaccurate, or maybe you do not get information you need.” (Respondent 1-2)

“It is important to capture what they [participants] know for sure, not what they think is true.” (Respondent 1-2)

Group dynamics and human behavior

Another challenge is related to the fact that EM practitioners are dealing with group of people that have various tempers, models of behavior and, what is even more important, relations between them. This undoubtedly leads to creation of unique group dynamics during each EM session. This group dynamics has to be considered and controlled by EM practitioner in order to manage EM sessions efficiently.

“You need to manage group dynamics to get as good result as possible in the shortest amount of time.” (Respondent 1-2)

“People have relationships or they do not like each other, or they do not like the fact that I am a consultant that is trying to tell them what to do. All these human aspects are the most difficult aspects of modeling work.” (Respondent 1-3)

“Relations within a workshop group are extremely important. It usually takes a lot of effort to create the right group, depending on knowledge and social skills.” (Respondent 1-4)

Shared language and terminology

During EM projects different stakeholders usually have different backgrounds and consequently have different understandings of the terminology used. This leads to
various problems during EM sessions when stakeholders use different terms to address the same concept or, on the contrary, the same terms when talking about totally different things. Additionally, in some cases employees of an enterprise use some unique terminology that EM practitioners are not familiar with, so EM practitioners need to adapt on the go. All these factors lead to a strong need to create shared terminology between all EM project stakeholders in order to create a common ground for efficient communication.

“It is important to refer to material that is connected to the enterprise, to ensure that the terminology is connected to the content and purposes of the enterprise.” (Respondent 1-1)

“Having shared terminology is more than just having shared names on things; it is also having shared understanding how these things are connected to each other.” (Respondent 1-3)

The purpose of EM and roles of stakeholders within it

One of the most problematic issues during EM projects is to make project stakeholders understand the essence of EM as such, since in most of the cases they are not familiar with the details of EM and with the idea of EM in general. Clarifications might include: an introductory explanation of the purposes and goals of the EM project; a description of roles and relevant responsibilities that different stakeholders are supposed to have within the EM project together with description of the EM practitioner role; an explanation of key capabilities of enterprise models, for example, the difference between enterprise models and other representative artifacts.

“People must understand what we are doing and why.” (Respondent 1-1)

“I am trying to make participants to understand what a model is. It is not real life; it is a way of describing it either how it is now or how it should be. It is important that they do not mix it together.” (Respondent 1-2)

“We try to explain to the customer that this is a lot more than just modeling processes, it is all the way from business goals to concepts. After that they are starting to get that what you actually need to do is more than just describing processes.” (Respondent 1-3)

“Most of our customers tend to think about a model as about graphical representation, something which is just a picture. We consider that models include underlying relationships between different concepts or activities. And it is quite difficult to construct graphical representation in a way that is understandable to the customer and get sound model in a background.” (Respondent 1-3)

“It is sometimes a challenge to make people understand and accept that they are creating the models with my help.” (Respondent 1-4)

4.1.2 CHALLENGES RELATED TO TRANSFORMING INFORMATION INTO ENTERPRISE MODELS

This section describes challenges that EM practitioners face while transforming information about enterprise operation into enterprise models. In contrast to the pro-
cess of obtaining information, this EM activity does not generally involve collaboration with other stakeholders. It is a process of enterprise models creation in some tangible or intangible form, so that it will be possible to use them further.

**Degree of formalism**

This challenge is related to degree of formalism that is supposed to be used during whole EM project, since existing modeling notations vary from very formal, machine interpretable languages, to very informal, for example through the use of rich pictures (when EM practitioners decide how to document different kinds of findings). From one point of view, it is preferable to use formal notation, since in this case enterprise models can be used and reused further even during other projects or within IS development. However, using formal notation with some stakeholders can hinder the process of modeling, since they might become limited when following the chosen degree of formality. Describing enterprise operations in a too formal way might be tricky at the first stages of EM session. Thus, the choice of the degree of formality is a quite challenging task that EM practitioners need to solve.

“You need to create them [models] in a formal way, otherwise you will create something for you, not for anybody else. I think it [degree of formality] is one of the key things.” (Respondent 1-1)

“The problem when you make the model in a formal way is that, when you try to describe it, you can really get in trouble with communication and understanding.” (Respondent 1-1)

“I think it can improve the understanding of models if all models use the same notation.” (Respondent 1-2)

“If the model is so formal that it can be interpreted by machines it is often very difficult to understand by human.” (Respondent 1-2)

“In some cases people tend to use very informal [notations], but the drawback there is understanding. A picture means a lot, but it means a lot for those who were there when it was created, not for anybody else.” (Respondent 1-2)

“What you can have a problem with is how formal you are in workshops. I usually work with a plastic sheet, so those models are mostly not as formal as the finished models, because in workshops I am more interested in getting the result. I keep the rest in my head.” (Respondent 1-3)

“You have to adapt the level of formalism to the audience. Normally audience is not used to do modeling, so you have to be very pedagogical!” (Respondent 1-4)

**Degree of detail**

This challenge is about how much detail each layer of enterprise model should show. The degree of detail can be high (plenty of details within the model) and low (general view on enterprise operation). In many cases it is important to describe the enterprise operations with a high degree of detail, so that it will be possible to see as much of elements and interaction between them as possible. However, some-
times it is crucial to have a general view on enterprise functioning, since stakeholders are interested in the overall view. Thus, the challenge is to identify a sufficient degree of detail for a specific EM project, so that the enterprise models include important and required details.

“I have worked on several projects where the level of detail has been the key thing. In some projects you have to keep it on a high level, but in some projects if you stay on a high level you will definitely fail and it will cost you a lot of money.” (Respondent 1-1)

“Sometimes we needed to make everything over again if we have done it [modeling] on a wrong level.” (Respondent 1-1)

“Describing business on the right level of detail, because sometimes you get too deep. When there are too many details then you do not get an overview that you need to understand the business. Sometimes you need to see it from “helicopter level” rather. You need to get a correct level and that is the hardest thing to achieve.” (Respondent 1-2)

“Normally I know what level of detail I want, but it sometimes it might be hard to step up from current level and start asking WHY question instead of HOW question.” (Respondent 1-4)

**Modeling perspective**

It is a challenge to select a point of view during EM. Certainly, enterprise models are able to represent various views on enterprise functioning, which makes them indispensable to deal with different views of stakeholders and with different aspects of enterprise operations. However, in some cases it can be problematic to understand the consequences of adopting certain points of view on one layer of modeling. In addition, it might be not easy to see how a point of view on one layer will affect other layers.

“I think that is a power of models to be able to model different aspects. You can see all different perspectives and based on that you can use the results for different purposes.” (Respondent 1-1)

“Different participants have different views, which means that they can describe the same thing, but in different ways.” (Respondent 1-2)

“Not always people that want you to help them with IT-system know that there is more than one aspect. Then you usually need to explain to them that they also need to check out their information model or business rules model, for instance.” (Respondent 1-3)

“There are several aspects (or perspectives, or viewpoints) that can be depicted on one model. Especially when you work with concept models: then you usually design what kind of stakeholders you want to have depending on different views you have, so then all of them have different process models. It is question of mapping the enterprise regarding HOW and WHAT question.” (Respondent 1-4)
**Change and model dependencies**

This challenge is related to the fact that EM is always performed in constantly changing environments, which cause the need to keep track of upcoming changes and update models accordingly. In multilayered EM it can be quite problematic to keep track of the influence a model change on one layer has on models on other layers. Some tools enable automatic fulfillment of this task, whereas others do not have such capability.

“To keep track of model dependencies is tricky! It depends on what modeling tool you are using, since some tools support this.” (Respondent 1-2)

“Sometimes the state of the business can be changed so much that models are no longer relevant.” (Respondent 1-2)

“From a technical point of view it [keep track of model dependencies] is not a challenge, but from an organizational point of view it is a mess!” (Respondent 1-3)

**Scope of the area for investigation**

This is a challenge that is related to limiting the scope of the interest during EM. On one hand, it is important to have a broad overview of an enterprise functioning, since it can provide a comprehensive and clear view on all actors and cause-effect relationships that take place within an enterprise being modeled. However, having a very broad view can hinder efficient EM, since in this case EM practitioners need to analyze an enormous amount of information instead of focusing on the most problematic areas. Thus, it can be quite problematic to define the scope of investigations sufficiently.

“We need to know what we should do and to focus on that. This is one of the most complicated parts - to stay in focus while we are modeling.” (Respondent 1-1)

“Broad knowledge has the possibility to create good models.” (Respondent 1-1)

4.1.3 IDENTIFIED CHALLENGES AND RECOMMENDATIONS – PRELIMINARY ENTERPRISE MODELING FRAMEWORK

After identification of the challenges it was possible to generate a number of recommendations that can help EM practitioners to cope with identified EM challenges (see Table 11 below).

Recommendations were generated using the interview data, despite the fact that the interviews were mainly aimed on identification of challenges. For example, recommendation R15 can help coping with the degree of formalism: “Keep the balance between readability of model and functionality of it depending on the given modeling task and audience”. In order to formulate this recommendation the following statements of Respondent 1-1 and Respondent 1-3 have been considered:

“The problem when you make the model in formal way is that, when you try to describe it, you can really get in trouble with communication and understanding.” (Respondent 1-1).

“Sometimes you end up in a need to decide what would be the best: to create a good graphical representation or to create a sound and valid model. In some cases
customers want to generate code from the model, so if the model is inconsistent they definitely get problems with their code generation.” (Respondent 1-3)

Another example is recommendation R23 that can help dealing with the challenge of defining the scope of the area for investigation, which was formulated considering the following statements of Respondent 1-1 and Respondent 1-2:

“We need to know what we should do and to focus on that.” (Respondent 1-1)

“If you have a problem and stakeholders think it lies in this area, it is not enough to look at that area, because you need a larger picture to really understand the problem. That is why you always need to look at a bigger area in the beginning to get a total picture. It is important that you do not go too narrow too soon!” (Respondent 1-2)

<table>
<thead>
<tr>
<th>EM activity</th>
<th>Challenges</th>
<th>Recommendations</th>
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<tbody>
<tr>
<td>1. Extracting information about enterprise</td>
<td>The right information</td>
<td>- R1. Capture what stakeholders know for sure, not what they believe is true.</td>
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<tr>
<td></td>
<td></td>
<td>- R2. Build group of participants for modeling session from people with relevant knowledge and suitable social skills.</td>
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<td></td>
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<td>- R4. Work with session participants as with group.</td>
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<td>- R5. Avoid working with too large groups of participants during EM sessions.</td>
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<td>- R6. Make sure that you are solving the right task that is given by right people.</td>
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<td></td>
<td>Shared language and terminology</td>
<td>- R7. Conduct some kind of education for EM sessions participants (for example, warm-up introduction as start of EM sessions).</td>
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<td>- R8. Depending on audience ground your explanation on literature, experiences from previous projects or even on cases from everyday life.</td>
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<td>- R9. Consider specific terminology that is used by employees of particular enterprise (for example, some enterprises have word lists with definitions of key terms).</td>
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<td>- R10. Use concept model in order to create shared understanding between EM stakeholders.</td>
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<td></td>
<td>The purpose of EM and roles of stakeholders within it</td>
<td>- R11. Make participants understand what model is.</td>
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<td>- R12. Clarify the role of EM practitioner who is supposed to lead modeling process.</td>
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<tr>
<td>2. Transforming information into enterprise models</td>
<td>Degree of formalism</td>
<td>- R13. Be consistent with chosen modeling notation throughout the project, even on conditions that you adjust formalism degree to the audience.</td>
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<td>- R14. Avoid being too formal on early stages of EM, since it can make modeling process too complex for other participants.</td>
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<td>- R15. Keep the balance between readability of model and functionality of it depending on the given modeling task and audience.</td>
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<td></td>
<td>Degree of detail</td>
<td>- R16. Lift a focus if models are unnecessary detailed.</td>
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<tr>
<td></td>
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<td>- R17. It is usually reasonable to work with different degree of detail, since often it is important to see business on different levels.</td>
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R18. When communicating with participants it is usually reasonable to step up from the current level of detail and start asking WHY question instead of HOW question.

R19. Define the degree of detail on initial stage of EM taking into consideration goals and purpose of EM project.

Modeling perspective

- R20. Modeling perspectives that you will work with need to be defined and clarified for other stakeholders on the initial stage of EM.

Change and model dependencies

- R21. Use capabilities of CASE-tools that are able to keep track of relationship and changes between models.
- R22. Create enterprise models directly after modeling sessions, so that information that you have extracted will not become outdated.

Scope of the area for investigation

- R23. On the initial stage of EM look at a larger area than on what stakeholders are describing, however, stay focused on identified problematic areas during further stages.

4.2 INTERMEDIATE ENTERPRISE MODELING FRAMEWORK

In order to produce the intermediate EM framework the preliminary EM framework was refined with the help of the focused literature review (step 3a in Figure 2) and then with the help of the second round of interviews (step 3b in Figure 2).

Table 12 Knowledge grounding that has been used for generation (G) and validation (V) of the intermediate EM framework

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<thead>
<tr>
<th>Knowledge grounding</th>
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<td>Internal grounding</td>
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<tr>
<td>External grounding</td>
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<tr>
<td>Empirical grounding</td>
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Thus, empirical (interviews) and external theoretical (literature reviews) groundings were used for generation of the intermediate framework. First, the existing preliminary EM framework was validated with the help of the focused literature review, which means external theoretical grounding was used for validation. After that, the empirical material was used to validate the framework and add new constructs to it, which means that empirical grounding was used for validation. Internal grounding in terms of conceptualization of the findings was also used during the generation and validation of the framework.

According to the description presented in Chapter 2, the intermediate EM framework was generated on the basis of the preliminary one. The intermediate EM framework contains a set of challenges and recommendations for all three EM activities: (1) extracting information about the enterprise – section 4.2.1, (2) transforming information into enterprise models – section 4.2.2, and using enterprise models – section 4.2.3. Challenges related to the first two activities for the most
part overlap with the ones in the preliminary EM framework, as the interview respondents have recognized most of the challenges from the preliminary EM framework presented for their validation. However, in some cases challenges have been modified in terms of naming and wording according to the respondents’ suggestions. For each challenge a number of recommendations are also presented. Recommendations from the preliminary EM framework have been modified based on the interviews, i.e. some recommendations have been reformulated, and others have been added. Selected statements of interview respondents were considered to generate and refine EM challenges. The combination of challenges and recommendations, i.e. the intermediate EM framework, is presented below.

4.2.1 CHALLENGES RELATED TO EXTRACTING INFORMATION ABOUT THE ENTERPRISE

This section presents challenges that EM practitioners face while obtaining information about the enterprise during EM workshops and other information capturing activities. After an explanation of challenges recommendations for dealing with them are presented.

Obtaining reliable information

This challenge is related to the fact that it is usually quite problematic to get information that is really relevant for solving a problem at hand. According to the respondents, EM practitioners often need to be very persistent while communicating with workshop participants in order to get their knowledge about the enterprise. Interviews also brought forward a problem with fuzziness in respect to the pieces of information received, due to “blank spots” that the participants do not know about or due to inaccuracies in the information that they provide. One dimension of this is the subjectification of information with the information being valid from a local or isolated individual perspective, but not from a shared inter-subjective perspective.

“It is difficult to separate facts from opinions.” (Respondent 2-4)

These issues pose a challenge for EM, as enterprise models should be based on accurate and complete information. An even more challenging issue is the objective to obtain a non-contradictory view on enterprise functioning shared among the participants.

Recommendations:

- R1. Capture what stakeholders know for sure, not what they believe is true. Cross-check with available company documentation regarding the subject matter, but be aware that corporate documents themselves may not be entirely valid.

- R2. Put together a group of participants for the modeling sessions with relevant knowledge and suitable social skills.

- R3. Make sure that the key stakeholders are involved. Stakeholder diagram can be helpful.
Dealing with group dynamics and human behavior

Another challenge is that EM practitioners have to deal with people who behave differently, and who have different inter-personal skills. These aspects must be considered and handled by the EM practitioner in order to coordinate the modeling sessions efficiently. Group dynamics and human behavior are competence areas not directly related to EM but part of what the EM practitioner needs to be capable to manage. As soon people with relevant knowledge are involved in modeling sessions, the EM practitioner needs to make sure that all participants contribute to the EM sessions with their domain knowledge. This can be tricky in some cases, for example, when people are involved in EM sessions together with their managers.

“If managers are attending modeling sessions then you should treat them in a special way to make other participants express their true opinions about things. Also if someone has dominant personality then you should treat them differently in order to get the best possible contribution from all participants.” (Respondent 2-4)

This is also an area where enterprise models and methods have significant deficiencies when it comes to “common sense” and useful recommendations.

Recommendations:

- R4. Make sure all modeling session participants are involved and committed to the results.
- R5. Make sure the modeling sessions are attended by participants who can contribute to the modeling purpose.
- R6. Work with the participants as a group taking into account their different personalities.
- R7. Avoid working with too large groups, 4 - 8 participants per session are recommended.
- R8. Make sure that you are solving the right task that is given by the right people. Root-cause analysis can be helpful.

Creating shared language and terminology

During an EM project stakeholders usually have different backgrounds and consequently different understandings of various concepts and their relations. This can lead to problems during EM sessions when stakeholders use different terms to address the same phenomenon or the same terms when talking about different phenomena. In addition, employees can use some unique terminology with which the EM practitioner is not familiar, so there is a need to learn and adapt rapidly. All these factors lead to the need to create a shared terminology and a common understanding between the EM practitioner and the stakeholders in order to create a solid ground for efficient communication.

“Day by day we stumble on the fact that we have different perceptions of terminology. What is a customer? What is a product? If there is a word list available for a modeled enterprise then use it to answer such questions!” (Respondent 2-4)

A shared terminology or business language is vital along three dimensions, 1) during the specific modeling sessions, 2) within the enterprise as a whole, and 3) in the
produced models. Often the vocabulary within an enterprise differs, and even when the vocabulary is the same people have different perceptions about the meaning of a concept. This issue can be managed through concept modeling at the beginning of a project.

“It is good to start with concept modeling, as it can help you to settle the language for the group of participants.” (Respondent 2-4)

Perhaps the most important part of this process is to reach rational mutual agreements in the specific situation in order to establish a common ground for the modeling work. In this context the aim ought to be to create a common understanding that is “good enough” given the situation and the purposes at hand.

Recommendations:
- R9. Make sure all modeling participants have clear understanding of the key concepts used throughout the EM project. Concept modeling in the beginning of modeling can be helpful.
- R10. In case certain concepts require special attention, it is helpful to use explanations from literature, previous projects, or even examples from everyday operations.
- R11. Consider specific terminology that is used by employees in the enterprise. Use an enterprise word list or “enterprise glossary” with definitions of key concepts if available, otherwise create it.

Explanation of the purpose of EM and the roles of involved stakeholders

One challenging issue of EM projects is to make project stakeholders understand the essence of EM as such, since they are usually not familiar with the idea and potentials of EM.

“It was hard to make people understand why we use models at all! If you do not have this clarified then you will never get to the rest.” (Respondent 2-3)

Clarification of EM might include different aspects like general explanation of purposes and goals of the EM project, description of roles and responsibilities that stakeholders (including the role of EM practitioner) have during EM, and explanations of key capabilities of the enterprise. Most of the respondents assert that people quite often do not understand what a model is and do not appreciate the illustrative and semantic power of a model.

Recommendations:
- R12. Make participants understand what a model is, explain limitations and strengths of using models.
- R13. Clarify the different rules during modeling sessions and the roles of participants involved, including the leading role of EM practitioner.
- R14. Express the expectations from the EM project and each modeling session in a clear way.
4.2.2 CHALLENGES RELATED TO TRANSFORMING INFORMATION INTO ENTERPRISE MODELS

Transforming information about the enterprise into models is a process of model creation using different tools, for example, plastic sheets, post-it-notes, whiteboards and/or computerized tools. Models are created during modeling sessions together with the modeling sessions participants until a common agreement is achieved. Challenges and corresponding recommendations for this activity are presented below.

Dealing with degree of formalism

The notation of enterprise models can vary in formalism from formal machine interpretable languages to informal models (as for example “rich pictures”). On one hand, it is preferable to conform to formal notational rules in the models, since this would make it easier to reuse enterprise models in other EM projects.

“Being consistent and formal with modeling notation is very important, since created enterprise models then can be used in the long-run, in future projects.” (Respondent 2-3)

However, formal notation can also impede the modeling process as some participants might become overloaded by describing the enterprise in a way that is unfamiliar to them.

“Too formal modeling notation that is difficult to understand can hinder modeling progress, since the energy of participants will be consumed by understanding the models instead of contributing with their knowledge.” (Respondent 2-2)

“Be careful with following your modeling method “by the book” instead of adjusting it to the situation. You can skip one or several steps in order to become more practical and flexible.” (Respondent 2-1)

Opinions regarding the degree of formalism vary. Deciding upon the right level of formalism will be a challenging task for the EM practitioner to handle. The actual modeling situation quite often also calls for different degrees of formalism in different models. In this case another challenge emerges in terms of how to maintain the alignment between models that have different degree of formalism.

Recommendations:

- R15. Be consistent with chosen modeling notation throughout the project and conditions for adjustment of the degree of formalism.
- R16. Avoid being too formal in early stages of EM, since it can make the modeling process too complex for the participants.
- R17. Keep a balance between readability and functionality of the models given the specific modeling task and audience. Decomposing complex parts of models can be helpful.

Dealing with degree of detail

Models vary in the level of detail they provide. From one point of view it might be beneficial to describe an enterprise with a high degree of detail to allow seeing as
many elements and relations as possible. This should not be an end in itself, as it decreases the readability of enterprise models.

“Sometimes models become too large, so in order to get good visualization of things you need to simplify a lot.” (Respondent 2-4)

“If you need to have a detailed view on only one sub-process then you should not add details to the whole process model! We tend to detail too much, which sometimes just makes us busy.” (Respondent 2-2)

“We are often wasting time if we dig into details that are not required. Discussions on unnecessary details should be stopped!” (Respondent 2-4)

The goal of a modeling session is to reach a level that is “detailed enough” for the specific situation. The degree of detail is usually dependent on two things, 1) what is being communicated, and 2) the audience. Respondents stated that it is often hard to guide modeling session participants to a suitable level of detail in their discussions. The main reason for this is that participants often provide too many details to describe things that they consider important. Thus, such situations require that EM practitioners formulate rational and mutual agreements with the domain experts about suitable levels of detail in the models.

Recommendations:
- R18. It is reasonable to work with different degrees of detail, since it is often important to see businesses at different levels of abstractions.
- R19. Raise the level of abstraction if the models are too detailed. This can be done through stepping up from current level of detail and start asking WHY questions instead of HOW questions.
- R20. Define a suitable degree of detail in the initial stage of the EM session taking into account the goals and purpose of the project.

Selecting modeling perspectives

Selecting modeling perspectives involves deciding on a suitable points of view (focal areas) for the actual EM situation. In addition to choosing such perspectives, this also includes selection and tailoring of suitable EM method(s). Enterprise models can represent different focal areas of enterprises, which make them indispensable in dealing with the requirements of different stakeholders.

However, it can also be problematic to understand the consequences of adopting certain perspectives on one layer of modeling when models need to be aligned both within the specific layer and between different layers. Therefore it might be not easy to see how certain perspectives (focal areas) on one layer will affect models on other layers or within a certain layer.

“Some methodologies are fine to make changes in interconnected focal areas, but some are not that flexible.” (Respondent 2-1)

In addition, it can be hard for EM practitioners to explain to the involved participants the difference between different perspectives within a project and the difference between AS-IS and TO-BE in the representation of the models.
Recommendations:
- R21. Modeling perspectives need to be defined and clarified for involved stakeholders on the initial stage of EM.
- R22. Simple examples illustrating required perspectives (focal areas) and clarifying difference between AS-IS and TO-BE perspectives can be helpful.

Dealing with change and model dependencies
This challenge is related to the reality that EM is usually undertaken in a constantly changing environment, creating the need to keep track of changes and updates to the models. During multilayered EM it can be quite challenging to keep track of how models influence models on other layers or within the same layer and it becomes even more challenging when there are different versions of the models. Some tools have partially automatic mechanisms for this purpose and the respondents suggested that these issues can be handled by using the capabilities of existing CASE tools.

“If you have a good tool like [tool A], you can work with all models that you have loaded and see how models are related to each other.” (Respondent 2-2)

It is even more beneficial if the perspectives that are supported by the tool are specified through some kind of meta-model or ontology; unfortunately such a feature is absent from many of the existing tools. These technical deficiencies for dealing with the problem of model dependencies and model versioning are an inhibitor to success with BITA.

Recommendations:
- R23. Capabilities of CASE-tools can be used to keep track of relationship and changes between models.
- R24. As modeling progresses document enterprise models, so that the extracted information does not become outdated. It is important though that models are of sufficient quality and stakeholders have agreed on models versions as they evolve.

Defining the scope for the investigation
Scoping the area of investigation needs to satisfy two, sometimes conflicting, criteria. From one point of view it is important to have a rather broad overview of the enterprise, since this can provide a comprehensive view of all actors, actions, and cause-effect relationships in the enterprise. From another point of view there is also a need to stay focused and to delimit the area of investigation in order to be efficient.

“In some cases you retrieve a lot of information, but you are not really focused on what information you need. If you do not know what question you are asking then you will not get the fundamental work done.” (Respondent 2-3)

It is usually recommended to find a balanced mix between delimitation and focus, and to remember that there is also a need for the broad view (so called “helicopter view”). This broad view is needed in order to understand and to put details into context, whilst the detailed view is needed in order to represent knowledge specific
enough to satisfy the project goals. A problem with the broad view is that the EM practitioners can end up analyzing enormous amount of information instead of focusing on the most problematic areas.

Recommendations:
- **R25.** In the initial stage EM ought to address a larger area than the stakeholders are describing to identify the most problematic areas. Root-cause analysis can be helpful as a means of scoping the investigation.

### 4.2.3 CHALLENGES RELATED TO USING ENTERPRISE MODELS

Challenges related to the third EM activity, the usage of enterprise models, have been classified according to the purposes behind the EM initiative. The interviewed respondents have validated the purposes for using enterprise models presented by Persson and Stirna (2001): (1) using enterprise models for developing the business (developing business vision or strategy; redesigning business operations; developing supporting IS) (2) using enterprise models to ensure the quality of the business (sharing knowledge about the business; supporting decision making). Table 13 presents the purposes of using EM and challenges that are specific for each of them.

<table>
<thead>
<tr>
<th>General Purpose</th>
<th>For developing the business</th>
<th>To ensure the quality of the business</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Specific purpose</strong></td>
<td>developing business vision or strategy</td>
<td>designing or redesigning business operations</td>
</tr>
<tr>
<td><strong>Challenge</strong></td>
<td>1. In time discussion of technical solutions</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Reuse of enterprise models</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Dealing with diverse stakeholders backgrounds, knowledge and interpretations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Presenting relevant information in an understandable way</td>
<td></td>
</tr>
</tbody>
</table>

In the table there is one challenge – in time discussion of technical solutions – that relates only to enterprise model usage for developing the business. This challenge itself is not specific to the other EM intentions, as it is mostly related to the situations where specific IS/IT solutions should be implemented. Other challenges are relevant for both groups of EM intentions. Each of the challenges is presented below together with the corresponding recommendations.

**In time discussion of technical solutions**

During EM there is a tendency to involve technical people in the discussion process quite early, which can divert the discussions and create a risk of getting stuck in implementation details instead of discussing alternative solutions. The respondents highlight the inclination of IT specialists to take over the analysis as soon as they get involved in the modeling sessions. That is why it is important to not let technical specialists dominate the modeling sessions.
“In many cases IT representatives want to take over the analysis too early. First experts from operations should make models explaining how operations are running (process models, concept model, etc.). If that is ready, then we start the dialogue with IT representatives.” (Respondent 2-2)

“It is hard to get beyond discussion of particular IT solutions. People representing different part of the business end up talking about IT solutions. It is really hard to make people say what they want to achieve in the business, and only after this look at what type of IT support is needed.” (Respondent 2-3)

The analysis of the interviews have shown that EM practitioners recommend to start the modeling efforts with a smaller group with strong domain knowledge that can identify key areas for continuing work. The analysis also shows that it is recommended that people with technical domain knowledge (IT experts) should not be involved until the key areas and problematic issues have been identified. Then the EM effort can move on and focus on HOW to deal with these key areas, which then could initiate the involvement of IT experts.

“Experts in operations should create models about how operations are running. When we are done with that we can involve IT representatives in the dialogue.” (Respondent 2-2)

"It is good to have technical details, but not before enterprise models are ready and have good quality. This is the best basis that you could have in order to set demands for the IT.” (Respondent 2-2)

Recommendations:
- R26. Start modeling with a group of participants who have strong domain knowledge of problematic areas.
- R27. Make sure that IT experts are involved in the process only after the key areas have been identified and a general understanding of WHAT should be changed has been created.

**Reuse of enterprise models**

This challenge is related to the fact that enterprise models are mainly only used once for a specific purpose and for the project for which they were created. This is highly inefficient but unfortunately, in many cases, a common practice.

“Resulting enterprise models might be hard to reuse. They can be too specific or incomplete, since they were aimed to be used for developing one particular IT system.” (Respondent 2-4)

It requires considerable effort to ensure the continuous value of enterprise models over time. One way to deal with this could be to appoint someone responsible for model maintenance and reuse through the use of model repositories. The respondents have emphasized the importance of repositories to store and maintain enterprise models. Enterprise models maintenance is an important task due to the dynamic nature of today’s business environment, especially if the enterprise is captured and described in models that represent different parts and states of the enterprise. The reuse of enterprise models from previous modeling projects can be
facilitated by the adoption of a restricted set of notation rules for modeling, covering methods and tools.

“Explain to people what is the value of models maintenance!” (Respondent 2-4)

“What is really needed is a repository that is used in the whole company, so that all new models can be related to old ones.” (Respondent 2-4)

“For one company (sometimes for a business unit) you need to select a modeling technique, notation and tool to document and store models and put them into place. Then you can use enterprise models efficiently.” (Respondent 2-4)

Recommendations:
- R28. Make sure the existing models are maintained in a repository and that they are kept up to date.
- R29. The benefit of models maintenance should be clarified for enterprise management.

**Dealing with diverse backgrounds, knowledge and interpretations**

Stakeholders that are involved in EM projects usually have different backgrounds and knowledge. For example, the skills and abilities of people from administration differ from those of staff working in operations. This means that a separate group of stakeholders may have significantly different interpretations of the situation facing the enterprise. Creating mutual agreements about different enterprise aspects is therefore crucial during any EM effort. This means that an EM practitioner has to consider the varied backgrounds of involved stakeholders and to negotiate between people in order to create mutual agreements about different enterprise aspects.

“If you have a workshop with people with different backgrounds – financial persons, engineers, HR department, operations, product development – they are looking at reality differently. They often have different solutions depending on their preferences, backgrounds and knowledge.” (Respondent 2-1)

“One very important thing is to have a common understanding of the vision, to really interpret it in the same way and have the same understanding of what the vision is about.” (Respondent 2-1)

Diverse backgrounds and interpretations among stakeholders might impact EM and this can be an obstacle for using models for any purpose. It is crucial to have a mutual understanding about the meaning of different models before analyzing or implementing them. To deal with this diversity it is therefore suggested to explain what the models really represent in the enterprise. It can also be useful to start with a brief explanation of the adopted modeling notation and/or method to get everyone on the same page. However, the respondents have emphasized that at this stage, of using enterprise models (both for developing the business and for ensuring the quality of the business), it is reasonable to keep such introductions quite short.

“Some participants might know how to read models, others might not. If you mix them together you have to do a "warm-up" – a short method introduction, so that all know how to understand the models.” (Respondent 2-2)
Recommendations:

- **R30.** Provide the participants with a brief reminder of the purpose of the models being presented and with a summary of the notation.
- **R31.** When using models as a basis for explanation and discussions, the diverse backgrounds and knowledge of the involved stakeholders should be considered and consolidated.

**Presenting relevant information in an understandable way**

This challenge is closely related to the previous one. It emphasizes the need for EM practitioners to represent and deliver relevant information to stakeholders and to decision makers in a clear and understandable way. This can be challenging due to the diversity of stakeholders backgrounds and requires that EM practitioners have relevant pedagogical and communication abilities.

“It is hard to implement a model, since first people need to really understand it.” (Respondent 2-1)

“We are more likely to make decisions to act if we have clear understanding about the subject matter. If we do not understand then we resist making decisions. It is important to make the situation clear for key decision makers.” (Respondent 2-2)

“If you are really into the model you can fail to explain it. People are not here to learn the model, but to solve the problem.” (Respondent 2-3)

The interviews have shown that enterprise models are often used for decision making. One suggestion in this context is to use illustrative models of satisfactory quality. It was also suggested by the respondents to use models as a foundation for explanation. The main reason for this is that models have greater explanatory power than ordinary textual and verbal descriptions. However, textual and verbal explanations are still important, since models themselves also need to be explained. One thing to keep in mind is to situate the explanations when presenting the models to the stakeholders.

“Good visualizations might work as a self-playing piano, since you will not need to give instructions – people can act by themselves if they have clear directions (regarding how to implement models).” (Respondent 2-1)

“Use their language and talk their talk! Try to see, feel and understand their perspectives of the company and environment. Then you can have a dialogue and communicate.” (Respondent 2-1)

“Ask yourself: How would I communicate this to [management position X]? What is the suitable language? What is on the agenda? How do I translate things into the [management position X] situation?” (Respondent 2-1)

“You need to explain in other words!” (Respondent 2-3)

**Recommendations:**

- **R32.** Take benefit from the power of a good visualization when using models for different purposes.
- **R33.** Make sure that the targeted audience can understand the models.
4.2.4 PROPOSED CHALLENGES AND RECOMMENDATIONS – INTERMEDIATE ENTERPRISE MODELING FRAMEWORK

Table 14 summarizes the overview of EM challenges and corresponding recommendations for the three activities of EM.

<table>
<thead>
<tr>
<th>EM activity</th>
<th>Challenges</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extracting information about an enterprise</td>
<td>1.1 Obtaining reliable information</td>
<td>- R1. Capture what stakeholders know for sure, not what they believe is true. Check available company documentation regarding subject matter.</td>
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<tr>
<td></td>
<td></td>
<td>- R2. Build group of participants for modeling session from people with relevant knowledge and suitable social skills.</td>
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<td>- R3. Make sure that the key stakeholders are involved. Stakeholder diagram can be helpful.</td>
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<tr>
<td></td>
<td>1.2 Dealing with group dynamics and human behavior</td>
<td>- R4. Make sure all modeling session participants are involved and committed to the results.</td>
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<td>- R5. Make sure participants who can contribute to the modeling purpose attend the modeling sessions.</td>
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<td>- R6. Work with the participants as a group taking into account their different personalities.</td>
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<td></td>
<td></td>
<td>- R7. Avoid working with too large groups, 4 - 8 participants per session are recommended.</td>
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<td></td>
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<td>- R8. Make sure that you are solving the right task that is given by the right people. Root-cause analysis can be helpful.</td>
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<td></td>
<td>1.3 Creating shared language and terminology</td>
<td>- R9. Make sure all modeling participants have clear understanding of the key concepts used throughout the EM project. Concept modeling in the beginning of modeling can be helpful.</td>
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<td></td>
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<td>- R10. In case certain concepts require special attention, it is helpful to use explanations from literature, previous projects, or even examples from everyday operations.</td>
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<td></td>
<td></td>
<td>- R11. Consider specific terminology that is used by employees in the enterprise. Use an enterprise word list or “enterprise glossary” with definitions of key concepts if available, otherwise try to create it.</td>
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<tr>
<td></td>
<td>1.4 Explanation of the purpose of EM and the roles of involved stakeholders</td>
<td>- R12. Make participants understand what model is, explain limitations and strengths of using models.</td>
</tr>
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<td></td>
<td></td>
<td>- R13. Clarify the rules that are valid during modeling sessions and roles of participants involved, including the leading role of EM practitioner.</td>
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<td>- R14. Express your expectations from EM project and each modeling session clearly.</td>
</tr>
<tr>
<td>Transforming information into enterprise models</td>
<td>2.1 Dealing with degree of formalism</td>
<td>- R15. Be consistent with chosen modeling notation throughout the project and conditions for adjustment of the degree of formalism.</td>
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<td></td>
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<td>- R16. Avoid being too formal in early stages of EM, since it can make modeling process too complex for the participants.</td>
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<tr>
<td></td>
<td></td>
<td>- R17. Keep a balance between readability and functionality of the models given the specific modeling task and audience. Decomposing complex parts of models can be helpful.</td>
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</tbody>
</table>
### 2.2 Dealing with degree of detail
- R18. It is reasonable to work with different degrees of detail, since it is often important to see businesses at different levels of abstractions.
- R19. Raise the level of abstraction if the models are too detailed. This can be done through stepping up from current level of detail and start asking WHY questions instead of HOW questions.
- R20. Define a suitable degree of detail in the initial stage of the EM session taking into account the goals and purpose of the project.

### 2.3 Selecting modeling perspectives
- R21. Modeling perspectives need to be defined and clarified for involved stakeholders on the initial stage of EM.
- R22. Simple examples illustrating required perspectives (focal areas) and clarifying difference between AS-IS and TO-BE perspectives can be helpful.

### 2.4. Dealing with change and model dependencies
- R23. Capabilities of CASE-tools can be used to keep track of relationship and changes between models.
- R24. As modeling progresses document enterprise models, so that the extracted information does not become outdated. It is important though that models are of sufficient quality and stakeholders have agreed on models versions as they evolve.

### 2.5. Defining the scope for the investigation
- R25. In the initial stage EM ought to address a larger area than the stakeholders are describing to identify the most problematic areas. Root-cause analysis can be helpful as a means of scoping the investigation.

### 3.1 In time discussion of technical solutions
- R26. Start modeling with a group of participants who have strong domain knowledge of problematic areas.
- R27. Make sure that IT experts are involved in the process only after the key areas have been identified and a general understanding of WHAT should be changed has been created.

### 3.2 Reuse of enterprise models
- R28. Make sure the existing models are maintained in a repository and that they are kept up to date.
- R29. The benefit of models maintenance should be clarified for enterprise management.

### 3.3 Dealing with diverse backgrounds, knowledge and interpretations
- R30. Provide the participants with a brief reminder of the purpose of the models being presented and with a summary of the notation.
- R31. When using models as a basis for explanation and discussions, the diverse backgrounds and knowledge of the involved stakeholders should be considered and consolidated.

### 3.4 Presenting relevant information in an understandable way
- R32. Take benefit from the power of a good visualization when using models for different purposes.
- R33. Make sure that the targeted audience can understand the models.
4.3 FINAL ENTERPRISE MODELING FRAMEWORK

The final EM framework considers all the challenges and recommendations from the intermediate EM framework, but structures and filters them taking into account the position of EM in the context of BITA. Thus, first the positioning of EM in the context of BITA is presented (see section 4.3.1), and then EM challenges and recommendations relevant to BITA are presented in a structured manner according to the generated positioning (see section 4.3.2).

4.3.1 POSITIONING OF ENTERPRISE MODELING IN THE CONTEXT OF BUSINESS AND IT ALIGNMENT

In order to position EM in the context of BITA a focused literature review (step 4 in Figure 2) was performed and then its findings validated with the help of interviews (steps 2b and 3b in Figure 2). Internal and external theoretical groundings have been used to generate the theory-based positioning first. Then these were validated with the help of internal and empirical grounding. Empirical grounding has also served as a source for generation of new constructs to the resulting position of EM in the context of BITA.

Table 15 Knowledge grounding that has been used for generation (G) and validation (V) of the position of EM in the context of BITA

<table>
<thead>
<tr>
<th>Grounding</th>
<th>G</th>
<th>V</th>
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<tbody>
<tr>
<td>Internal grounding</td>
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<tr>
<td>External grounding</td>
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<tr>
<td>Empirical grounding</td>
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</table>

The theories that influenced generation of this part of the results have been presented in section 3.1.1, 3.2 and 3.3. A special role was played by SAM (Henderson and Venkatraman, 1992) and by the hierarchy of EM intentions (Persson and Stirna, 2001). These theories served as the theoretical basis when defining the role of EM in the context of BITA. The description of how this was accomplished is available in 2.3.1. Thus, in this section the hierarchy of EM intentions is positioned within the SAM framework. As it has been mentioned earlier in 3.2.2, the benefits and effects of using EM are tightly connected to the intentions behind a particular EM initiative. Therefore an intention behind an EM effort can play different roles in improving different BITA perspectives (Figure 10). Descriptions of each EM intention in terms of effects on one or several BITA perspectives is presented in the following sections and supported with relevant interview quotations.
Using EM to ensure the quality of business operations

Interview respondents have often used EM to ensure the quality of business operations. Two important success factors for doing this are that stakeholders understand the business, and that stakeholders accept and commit to business decisions. Here, the role of EM is to create a multidimensional picture of the business and provide a common platform for communication between stakeholders. The commitment of stakeholders to carry out business decisions is one of the critical success factors for achieving high quality business operations.

a. Ensure acceptance of business decisions (EM intention 1.1)

The commitment of stakeholders to carry out business decisions is one of the key factors for achieving high quality business operations. EM, particularly the participative approach, helps revealing and discussing different opinions about the business, which in turn enables finding a consensus. Communication between stakeholders that happens during EM sessions motivates stakeholders to commit and carry out the discussed business decisions.

“The owner of created model should be committed to apply and realize it in the business.” (Respondent 2-1)

The enterprise models created serve as documented instructions for further implementation, which enables strategic fit on the business side, as it allows to improve the way business coherently operates with existing business strategy.
b. *Maintain and share knowledge about the business (EM intention 1.2)*

Keeping employees informed about how business is carried out and about existing business vision and strategies is an important step to ensure the quality of the business. It has great importance for enterprise employees, who need to get clear understanding about the way business works, the types of infrastructure that exists to support it, and the vision and strategies that determine it.

“If you would like to share knowledge about business operations then EM, i.e. creating models together during particularly EM workshops, is an excellent way to do that!” (Respondent 2-4)

Therefore, using EM for maintaining and sharing knowledge about the business can contribute to BITA from two perspectives – it facilitates strategic fit on the business side (the alignment of business strategy and business structure) and functional integration (the alignment of business and IT structures) (see Figure 10).

**Using EM to develop the business**

Interviews revealed that business development is one of the most common purposes that EM is used for. Business development often requires dealing with business change, for example, change that is required to achieve the visions and objectives of an enterprise. Developing the business can entail one or several of the following intentions.

a. *Developing business visions and strategies (EM intention 2.1)*

Using EM for development of business vision and strategies potentially enables strategic integration, i.e. the alignment of business and IT strategy, since in this case EM is used as a tool for clarification and documentation of business and IT strategies for an enterprise.

“It is quite time-consuming to create and communicate a vision and strategy. It is especially tricky to really make people understand and accept vision and strategies. The way to approach it is EM workshops.” (Respondent 2-1)

An articulated and documented vision and strategy can then be discussed, refined and referred to if needed. In some cases, clearly modeled and documented visions and strategies can help people to actually follow them in their daily work, which facilitates strategic fit on the business side. A similar effect for strategic fit on IT side could not be indicated from interview data, though.

“Good visualization (a model) of business vision and strategy might work as a self-playing piano, since there will be no need for instructions for making people follow these vision and strategy in day-to-day operations.” (Respondent 2-1)

b. *Redesigning business operations (EM intention 2.2)*

Sometimes organizations decide to reorient their business processes, which implies restructuring or redesigning business operations. For this purpose a number of business process models are usually created and used. In addition, existing vision and business strategy should be actively consulted.
“Often company would like to pick up some opportunities on the market. In some cases the board should make a decision if the company should enter another market. In other cases – the board should decide if the company should start producing another type of products. In both cases we start EM by going through the vision and strategy. Based on that it is possible to set goals for new things.” (Respondent 2-2)

Using EM for this purpose enables a strategic fit on the business side, i.e. the alignment of business strategy and business structure.

c. **Developing the supporting IS (EM intention 2.3)**

In many cases EM is used for IS development. Using EM for this purpose gives an illustration of the AS-IS state of the business, possibly including a description of the business processes. In other words, EM provides a clear picture on how the business operates, which then serves as a basis for developing the required IS.

“I have used EM a lot to identify the need for some kind of IT solution. When such a need exists I have to create a functionality description based on business processes. Based on it I can see possible business use cases.” (Respondent 2-3)

“You need to visualize IS – parts of it that are useful and those parts which are not useful. Then it can be possible to take actions regarding those, which are not useful anymore. (Respondent 2-1)

“We start from creating process models. After that we add a resource layer, where we can indicate the main areas for setting demands on new IS.” (Respondent 2-2)

“Mostly you use enterprise models to show smarter ways of working that enterprise can realize. Often implementation of new IT system is one way of fulfilling these changes.” (Respondent 2-4)

Thus, using EM for IS development enables functional integration (the alignment of business and IT structures) and strategic fit on the IT side (the alignment of IT strategy and IT structure). The interviews did not clearly reveal an applicability of EM for cross-functional alignment of IT strategy with business structure or business strategy with IT structure though.

**Use EM as a problem-solving tool**

EM can also be helpful for capturing, delimiting, and analyzing some problematic situation, which then provides a ground for deciding on a required problem solving action. Problematic situations can include, for example, a flaw in enterprise operations or inefficient distribution of roles and responsibilities among the staff. In such cases EM is mostly used as a communication tool. Enterprise models are used for documenting the problem at hand and not meant to be used for further development work.

“In many cases the problems that company has in operations are in fact symptoms, so it is first required to identify the root of the problems.” (Respondent 2-2)

This scenario often ends up with one of the scenarios described above (using EM to ensure the quality of business operation or using EM to develop the business). This scenario of using EM does not directly influence BITA.
“EM workshops is an excellent way of sharing knowledge about business and the way it operates. But if knowledge sharing is the only purpose of using EM then it is quite an expensive way go!” (Respondent 2-4)

**An overview of the performed positioning**

The positioning of EM intentions in the chosen alignment framework indicates that EM can facilitate BITA in a number of ways. First, when EM is applied for developing business vision and strategies, it allows aligning business strategy with IT strategy, enabling *strategic integration*. Secondly, using EM for developing supportive IS allows the alignment of IT strategy with the underlying IT structure, i.e. IS infrastructure and processes. Thus, EM facilitates *the strategic fit on the IT side*. Third, the alignment of business and IT structures (organizational and IS infrastructures and processes) can be facilitated by applying EM for developing IS, as it helps to develop IS according to particular requirements from the business side, or when using EM for maintaining or sharing knowledge about the business, as it provides a common ground for the dialogue between the business and IT sides. Therefore EM can facilitate *functional integration*. Also, EM can facilitate the alignment of business strategy and business structure, i.e. the way business actually operates.

In case of EM being used for redesigning business operations, it is possible to define the way the business should work together with the existing business strategy. Additionally, a clearly modeled and documented business strategy is easier to follow in practice by enterprise employees than one undiscussed. Using EM to ensure acceptance of business decisions is a way to make people committed to the business decisions, which in turn helps to realize strategical decisions in practice. Using EM as a tool for creating shared knowledge and understanding, as enterprise models can serve as a compact source for articulating business strategy, can also facilitate realizing business strategy. Thus, EM enables *strategic fit on the business side* in a number of ways. However, the generated positioning does not show if EM can facilitate alignment of business strategy with IT structure (*automation*), and alignment of IT strategy with business structure (*linkage*).

**4.3.2 ENTERPRISE MODELING INTENTIONS, CHALLENGES AND RECOMMENDATIONS FOR THE BUSINESS AND IT ALIGNMENT PERSPECTIVES**

To produce such components of the final EM framework as EM intentions, challenges and recommendations, the intermediate EM framework has been conceptually structured according to the position of EM in the context of BITA. This conceptual positioning has been supported by internal grounding – both for generation and validation.

Table 16 Knowledge grounding that has been used for generation (G) and validation (V) of the final EM framework

<table>
<thead>
<tr>
<th>Grounding Type</th>
<th>G</th>
<th>V</th>
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<tbody>
<tr>
<td>Internal grounding</td>
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<tr>
<td>External grounding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Empirical grounding</td>
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</table>
After generating the intermediate EM framework with its EM challenges and recommendations (section 4.2) and EM positioned in the context of BITA (section 4.3.1), it was possible to conceptually refine the set of identified EM challenges and recommendations taking into account the presented positioning of EM within BITA.

In other words, knowing EM challenges and recommendations that are specific for various EM intentions from the intermediate EM framework (Table 13), and EM intentions that support certain BITA perspectives (Figure 10), it was possible to relate some of the EM challenges and recommendations to the alignment perspectives. This conceptual refinement resulted in the final EM framework that is presented in Figure 11 below.

The main connective role in the refinement was played by the EM challenges identified for various EM intentions (Table 13), which was presented in the intermediate EM framework (section 4.2) for the third EM activity: (3) using enterprise models. Challenges related to the other two EM activities, i.e. (1) extracting information about enterprise and (2) transforming information into enterprise models, have not been placed on the final EM framework, since the explicit connections of these challenges to the intentions of using EM has not been identified.
Figure 11 presents the overview of the refined framework, whereas the details are available in Table 17, Table 18, Table 19 and Table 20 where the different alignment perspectives are described. The alignment perspectives that are described below are: strategic integration, strategic fit on business side, strategic fit on IT side and functional integration.

Alignment perspectives that are not included are linkage and automation, as the positioning of EM intentions within the SAM perspective did not identify a connection between EM intentions with neither of these two (see section 4.3.1). Each alignment perspectives is described with a number of EM challenges that are specific to it. Specified challenges are numbered according to the numbering used in Table 14. To deal with the specified EM challenges the recommendations from Table 14 are applicable.

Table 17 EM intentions and challenges specific for strategic fit on business side

<table>
<thead>
<tr>
<th>Strategic fit on business side</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>EM intentions</strong></td>
</tr>
<tr>
<td>1.1 Ensure acceptance of business decisions</td>
</tr>
<tr>
<td>1.2 Maintain and share knowledge about the business</td>
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<tr>
<td>2.1 Develop business visions and strategies</td>
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<tr>
<td>2.2 Design/redesign business operations</td>
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</tbody>
</table>

Table 18 EM intentions and challenges specific for strategic fit on IT side

<table>
<thead>
<tr>
<th>Strategic fit on IT side</th>
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<tbody>
<tr>
<td><strong>EM intentions</strong></td>
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<tr>
<td>2.3 Develop supporting IS</td>
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</table>

Table 19 EM intentions and challenges specific for strategic integration

<table>
<thead>
<tr>
<th>Strategic integration</th>
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<tbody>
<tr>
<td><strong>EM intentions</strong></td>
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<tr>
<td>2.1 Develop business visions and strategies</td>
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</table>
4.4 SUMMARY OF THE CHAPTER

This chapter presented the results of the study. The results were created using theoretical, empirical and conceptualization work that the research process of this study included. The main results are different versions of the EM framework – the preliminary, the intermediate and the final. All three versions of the framework rely upon three basic EM activities – (1) extracting information about the enterprise, (2) transforming information into enterprise models and (3) using enterprise models. These three versions of the EM framework evolved iteratively, as every new version has been grounded on the previous one. The preliminary version of the EM framework identified four challenges when it comes to extracting information about the enterprise, and five challenges for transforming the information into enterprise models. The intermediate version of the EM framework identified yet another four challenges when it comes to using created enterprise models for with various intentions. The final framework contains EM challenges and recommendations that are specific for alignment perspectives of SAM – strategic fit on IT side, strategic fit on business side, strategic integration and functional integration. EM was positioned in the BITA context by placing different EM intentions in the frame of SAM. For example, using EM to develop a supporting IS can facilitate alignment within strategic fit on IT side and functional integration. After that it was possible to identify EM challenges and recommendations that are specific for various EM intentions to the alignment perspectives. For example, for the strategic fit on IT side it was possible to indicate three challenges: reuse of enterprise models, dealing with diverse backgrounds, knowledge and interpretations, presenting relevant information in an understandable way.
CHAPTER 5
DISCUSSION AND FUTURE WORK

This chapter discusses the results and introduce some potential aspects of future work. First a reflection regarding the way research questions have been answered is presented. After that the knowledge contributions that this study generated are discussed from both an academic and a practical point of view. Then the applied research process including the chosen research methods is discussed. Finally, several aspects of future work are presented.

In the broad sense, this thesis investigated the role of EM in the context of BITA. To position EM in the context of BITA, the Strategic Alignment Model was used as a frame. The positioning was done considering the intentions of EM use, since the effect of EM is highly dependent on the purpose behind a particular EM effort. The resulting positioning suggests that EM can facilitate BITA in a number of ways. Particularly, it contributes to strategic alignment and functional integration, and what is more it facilitates fit between infrastructure and processes (both business and IS) and corresponding strategies. In addition to the positioning of EM in the context of BITA, this thesis identified challenges that EM practitioners face when using EM for BITA and suggested recommendations to deal with these challenges. Together these results are presented as the framework with a set of conceptually structured EM challenges and recommendations that are specific for different alignment perspectives. The framework provides a detailed view on the implication of EM in the light of various alignment perspectives, which has not been described in a structured manner in the literature so far.

In order to connect EM challenges and recommendations to alignment perspectives the hierarchy of EM intentions was used. In order to generate EM challenges and recommendations for the final EM framework two versions of the framework have been generated first: the preliminary EM framework and the intermediate EM framework. These frameworks consisted of EM challenges and recommendations that were structured according to three activities: (1) extracting the information that is related to enterprise operations, (2) transforming the information into models, and (3) using enterprise models for certain purposes. Challenges for all three activities have been identified in the intermediate EM framework.
The first activity included such challenges as: obtaining reliable information, dealing with group dynamic and human behavior, creating shared language and terminology, explaining the purpose of EM and the roles of stakeholders within it. The second group of challenges involved: dealing with degree of formalism, dealing with degree of detail, selecting modeling perspective, dealing with change and model dependencies, and defining the scope for the investigation. The third group included such challenges as: in time discussion of technical solutions, reuse of enterprise models, dealing with diverse backgrounds and knowledge of involved stakeholders leading to a diversity in interpretations, and presenting relevant information for decision makers in understandable way.

The final EM framework includes only a part of these challenges – those that appeared to have a relation to certain alignment perspectives. However, the preliminary EM framework and the intermediate EM framework served as an important step towards generating the main result of the study – the final EM Framework. Thus, the final EM framework presents EM challenges that are specific for a number of alignment perspectives and that are intention-specific. In addition, the final EM framework introduces a number of recommendations that can help EM practitioners to deal with the identified challenges. In fact, the final EM framework provides much more narrow view on EM than the intermediate one, as it concentrates on the applicability of EM for BITA, whereas the intermediate EM framework gives a comprehensive overview of EM challenges and recommendations that are structured according to the generic model of main EM activities: extracting information about an enterprise in focus, transforming this information into enterprise models and then using these models for a certain purpose.

An important characteristic of the study is related to the aspects of EM being considered. Most contemporary studies on EM challenges and recommendations focus on either (1) the collaborative nature of EM or (2) the required characteristics of created enterprise models, whereas only a few provide a combined view. Consideration of both of these aspects gives an opportunity to get a broader view on EM practice and to generate more comprehensive support for EM practitioners. This study considered both. Various aspects of collaboration in EM were analyzed when investigating the extraction of information about the enterprise in participative settings and the creation and the usage of enterprise models. The desired characteristics of enterprise models have been taken into account when investigating how extracted enterprise-related information is usually transformed into enterprise models and how created models can be used for various purposes. The main result of the study, the final EM framework, contains challenges and recommendations for using enterprise models for various intentions, which imply both of the aforementioned aspects.

5.1 ADDRESSED RESEARCH QUESTIONS AND KNOWLEDGE CONTRIBUTIONS

The main research question of this study includes three research questions (Table 21). Each of the questions has resulted in a knowledge contribution. Investigation
of the main research question is motivated by explicitly and implicitly specified requests from the existing literature described in detail in section 1.1. The main argument that calls for raising the research questions of the study is that despite the overall recognition of EM’s potential to contribute to the achievement of BITA, there are currently no studies that illustrate the role of EM in solving BITA problem including its various perspectives, from a holistic point of view. Thus, the problem that this thesis addressed is grounded in relevant, clearly formulated and outlined research questions (SISA requirements for a thesis, SISA, n.d.).

<table>
<thead>
<tr>
<th>Research Questions</th>
<th>Knowledge Contributions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. How can EM contribute to BITA?</td>
<td></td>
</tr>
<tr>
<td>1.1 How can EM be positioned in the context of BITA?</td>
<td>Knowledge contribution 1.1: Position of EM in the context of BITA</td>
</tr>
<tr>
<td>1.2 What challenges are associated with EM in the context of BITA?</td>
<td>Knowledge contribution 1.2: EM challenges in the context of BITA</td>
</tr>
<tr>
<td>1.3 What could be suitable recommendations to deal with these challenges?</td>
<td>Knowledge contribution 1.3: EM recommendations in the context of BITA</td>
</tr>
</tbody>
</table>

Thus, this thesis presents three knowledge contributions. These knowledge contributions will be discussed in the sections 5.1.1, 5.1.2 and 5.1.3 below. The discussion will address the extent to which generated knowledge contributions answer the research questions of the study and also similarities and differences between generated knowledge contributions and existing literature. Together the discussed knowledge contributions form the final EM framework (see section 4.3) that answers the main research question.

### 5.1.1 POSITION OF ENTERPRISE MODELING IN THE CONTEXT OF BUSINESS AND IT ALIGNMENT

The position of EM in the context of BITA has been presented in section 4.3.1 where EM intentions have been placed within the alignment perspectives of the Strategic Alignment Model. This conceptual positioning has then served as the main constituent of the final EM framework. This knowledge contribution shows that EM can facilitate strategic integration, and functional integration, strategic fit on the IT side and strategic fit on the business side. The ability of EM to influence linkage and automation has not been identified by the performed investigation, which is possibly caused by the limited empirical base of the study, as a larger set of respondents could possibly provide more viewpoints on the questions in focus. This knowledge contribution answers research question 1.1 by illustrating the position of EM in the context of the Strategic Alignment Model. Strategic Alignment Model can be considered as one of the most suitable frame-models in the BITA area due to its clearness and conciseness. However, this model has a strong focus on the strategic per-
spective of BITA, whereas other perspectives (structural, cultural and social) receive rather insignificant attention. This raises one of the issues for future work that will be discussed in more detail in section 5.4.

Existing theories that discuss the role of EM in the context of BITA have been described in section 3.3. In general these theories emphasize the applicability of EM for development or refinement of IS/IT solutions according to particular business needs. EM serves in this respect serves as a means for representing the requirements and the details of a corresponding IS/IT solution. This view is usually based on the position that business and IT can be aligned via the alignment of their representations (Wegmann et al., 2007; Kaczmarek et al., 2012). This way of considering EM to achieve BITA is associated with the strategic and structural alignment dimensions.

Existing theories also point out another benefit of using EM for BITA, which advocates that the challenging part of using EM in enterprise transformation efforts mostly lies in dealing with the stakeholders, not in representing a desired IS/IT solution. This view can be associated with the cultural and social alignment dimensions and it receives much less attention in existing literature. This thesis illustrates the position of EM in the Strategic Alignment Model that mostly focuses on the strategic and structural alignment dimensions. However, the important characteristic of this study is that it has considered cultural and social aspects when investigating EM practice and identifying challenges and recommendations. Thus, it is possible to say that this study covers all four alignment dimensions to different extents, despite focusing on structural and strategic dimensions in the final EM framework. In addition, all existing studies considered in the course of this research do not illustrate the role of EM in the context of BITA in a structured and detailed manner. It makes this presented knowledge contribution, i.e. the positioning of EM in the context of BITA, go beyond the high-level acknowledgement of EM potential to facilitate BITA, by providing a more detailed and structured overview of its applicability for different BITA perspectives.

5.1.2 ENTERPRISE MODELING CHALLENGES IN THE CONTEXT OF BUSINESS AND IT ALIGNMENT

This study presents the following challenges related to usage of EM for BITA: in time discussion of technical solutions; reuse of enterprise models; dealing with diverse backgrounds, knowledge and interpretations; and presenting relevant information in an understandable way. After these challenges have been identified, they have been structured according to the hierarchy of EM intentions introduced by Persson and Stirna (2001). All four of these challenges are relevant for using EM for business development, which can include either developing business vision or strategy, redesigning business operations, or developing supporting IS. When using EM to ensure the quality of the business, which can include either sharing knowledge about the business or support decision making, the challenge of in time discussion of technical solutions is not relevant, since these two purposes of using EM do not imply discussion or implementation of a technical solution. This contribution answers research question 1.2 by identifying challenging factors that take place when EM is used for BITA.
According to the results of the literature reviews, there is only one study that explicitly describes challenging factors of EM practice in relation to BITA (Kaczmarek et al., 2012; see section 3.2.3). Other existing literature that describes challenging factors of EM does not deal with the potential contribution of EM to BITA. Kaczmarek et al. (2012) identify four EM challenges in the light of BITA: dealing with the degree of formalism, degree of detail, accuracy of the view, and change and model dependencies. These four challenges are mostly related to the essential characteristics of the resulting enterprise models and do not take into account the collaborative nature of EM.

Kaczmarek et al. (2012) is a significant part of the theoretical foundation for this study, but their study has been complemented and refined taking into account the collaborative aspect of EM. Particularly, apart from the challenges that are specific for the creation of enterprise models, a number of challenges related to the extraction of enterprise-related information in participative settings and using created models for various purposes were identified in the intermediate EM framework. The challenges that are related to extracting information about an enterprise are not included in the final EM framework though, since the connection of these EM challenges to the alignment perspectives were not identified.

An important aspect of the identified EM challenges is that they are structured according to the intentions of EM usage. This is related to the idea that the outcomes of an EM effort are tightly connected to the intentions behind it.

5.1.3 ENTERPRISE MODELING RECOMMENDATIONS IN THE CONTEXT OF BUSINESS AND IT ALIGNMENT

There are a number of recommendations for dealing with BITA-specific challenges that are presented in this study (Table 14, recommendations for using enterprise models for various purposes). For instance, to avoid discussing the details of technical solutions too early it is suggested to start modeling with a group of participants who have strong domain knowledge of problematic areas. It is also strongly recommended to make sure that IT experts are involved in the process only after the key areas have been identified and a general understanding of what should be changed has been created. There is a number of recommendations to deal with EM challenges that are specific for BITA presented, i.e. to reuse enterprise models, to deal with diverse backgrounds, knowledge and interpretations and to present relevant information in an understandable way. This knowledge contribution answers research question 1.3 by proposing ways to overcome the challenging factors that have been identified specifically for BITA.

A number of recommendations and guidelines that existing literature suggests to improve EM practice have been presented in 3.2.4. There are no studies that provide BITA-specific recommendations or guidelines, though. From this point of view, recommendations that are presented in this thesis represent an important step forward that provides a support for EM practitioners that would like to use EM specifically for BITA.
5.2 SUITABILITY OF THE APPLIED RESEARCH APPROACH

In order to generate the results, the research approach of this thesis included specifically designed research process and a number of research methods (Figure 2). The research process employed literature reviews and interviews. Literature reviews supported the theoretical part of the research process (steps 1, 2a, 3a and 4 in Figure 2), whereas empirical part of the research process was supported by interviews (steps 2b and 3b in Figure 2).

A systematic literature review (step 1 in Figure 2) was used to investigate literature in the BITA domain and to generate a typology of the literature in this domain. Focused literature reviews (steps 2a, 3a and 4 in Figure 2) were used to discover existing studies regarding EM challenges and EM recommendations, and to identify what the literature says about the role of EM in the context of BITA. The systematic literature review allowed obtaining a detailed overview of BITA literature, which was particularly important at the beginning of the research process. Later, when generating the preliminary and intermediate versions of the EM framework, and the position of EM in relation to BITA, it was sufficient to use focused literature reviews, since it allowed paying significant attention to the empirical and conceptualization work.

Interviews (steps 2b and 3b in Figure 2) were used to collect empirical data for answering the research questions. Interviews allowed the identification of challenges and recommendations for EM practice, and also provided empirical material to investigate the role of EM in relation to BITA. The fundamental advantage of using interviews as a data collection technique in this study is that they allowed discovering and analyzing the cumulated experience of EM practitioners obtained through many years of practice. The same effect would be hardly possible to achieve in case of applying case study for collecting empirical material, at least not within the allocated timeframe. Two rounds of semi-structured interviews have been carried out, which allowed collecting empirical data to answer the research questions. It would be beneficial though to interview more respondents, on conditions of more time available, as this would provide a broader empirical base.

It is important to mention that together with the description of the research process and the descriptions of the applied research methods, this thesis also presents the description of knowledge groundings used in the study. Applied knowledge groundings are explained in section 2.2 (Table 3) and ensure the validity and reliability of the presented results. Knowledge grounding applied in this work rely on the level of action knowledge as such (corresponding to conceptualization work), the level of other knowledge (corresponding to theoretical work), and empirical level (corresponding to empirical work). The detailed description of the research process of the study together with applied research methods and knowledge grounding in a broad sense are supposed to satisfy requirement for well-expressed and reflected research design (SISA, n.d.). Detailed description of the findings of the literature reviews (Chapter 3) and interviews (Chapter 4) are aimed on the requirements for the cu-
cumulative character of research with well-chosen and described theoretical foundation, well-described empirical basis and reliability that is satisfied by empirical and theoretical groundings of the results (SISA, n.d.).

5.3 ACADEMIC AND PRACTICAL CONTRIBUTIONS

The presented EM challenges and recommendations presented in the final EM framework are valuable results from a practical point of view. There are a number of recommendations presented for the identified EM challenges that suggest a possible way to overcome them. From a practical point of view, the identified EM challenges and recommendations for each of the alignment perspectives can provide initial support for EM practitioners that use EM aiming to achieve BITA. Still, some of the identified challenges cannot be solved completely due to technical issues. Thus, the proposed recommendations can serve as a set of guidelines to deal with the identified challenges, but they should not be considered as instructions that alone can be used to solve the identified problems.

Nevertheless, identification and structuring of EM challenges are important steps on the way towards suggesting solutions for them. In addition, discussing EM challenges with EM practitioners has served as a trigger for analysis and explanation of the challenges they face and it has provided an opportunity to conceptualize EM practice. Presented in the final EM framework, challenges and recommendations have been produced by refinement of the intermediate EM framework, which has a much more generic character. Despite the fact that the intermediate EM Framework is an intermediate knowledge contribution of this study, it is a valuable practical contribution on its own. The intermediate EM framework provides a broad set of the challenges and recommendations for the three EM activities: extracting enterprise-related information in the participative settings, creating enterprise models out of the extracted information and using created models. It can be used by EM practitioners who use EM in a participative manner.

The study contributes to the EM domain by consideration and application of the existing theories – the hierarchy of EM intentions (Persson and Stirna, 2001), and the process of EM (Persson and Stirna, 2012; Lind and Seigerroth, 2003). Application of existing theories for building new ones provides contributes to the EM domain from an academic point of view. Another valuable contribution of this study from academic point of view is the positioning of EM in the context of BITA. It provides an initial conceptual illustration of the applicability of EM to achieve BITA, as at the moment there are no studies that could holistically illustrate the role of EM in terms of BITA facilitation.

5.4 FUTURE WORK

Each of the three knowledge contributions are discussed below in terms of possible future work and then there is a general discussion of the results and possible ways to continue and expand the study.
Knowledge Contribution 1.1: Position of EM in the context of BITA.

The presented positioning of EM on the Strategic Alignment Model indicates that EM can facilitate BITA in number of ways. First, it allows aligning business strategy with IT strategy when EM is applied for developing business vision and strategies. Secondly, using EM for developing supportive IS allows the alignment of IT strategy with the underlying IT structure, i.e. IS infrastructure and processes. Third, alignment of business and IT structures (organizational and IS infrastructures and processes) can be facilitated by applying EM for developing IS, as it helps to develop IS according to specific requirements from the business side, or when using EM for maintaining or sharing knowledge about the business, as it provides a common ground for the dialogue between the business and IT sides. In a number of ways EM can facilitate the alignment of business strategy and business structure, i.e. the way business actually operates. However, this study could not identify if EM can facilitate the alignment of business strategy with IT structure and the alignment of IT strategy with business structure. This is possibly due to the limited empirical base of the study, as larger set of respondents could potentially provide more viewpoints on questions in focus.

Another potential weak point in the study lies in the choice of BITA framework, particularly the Strategic Alignment Model (SAM), which served as a frame for positioning. There is an obvious advantage of SAM - it contains the core components of business and IT and can ground further conceptualizations of strategic and operational alignment. However, the interview respondents emphasized mostly the business-driven character of today’s enterprise transformation. To a large extent, it corresponds to the attitude towards transformation among most of today’s enterprises. However, this attitude does not entirely correspond to the underlying idea exposed in Henderson and Venkatraman’s framework, as out of its four approaches for enterprise transformation two are business-driven, and the other two are IT-driven. In general, SAM suggests that the IT use of an enterprise can be driven both by IT and non-IT factors and by both internal and external forces. This issue can be related to one of the limitations of SAM mentioned by Burn and Szeto (2000) who argue that the underlying assumptions of SAM not always hold in reality. This mismatch can serve as a hint to choose another alignment framework as a base for EM positioning. One candidate theory could be the IS strategy triangle (Pearlson and Saunders, 2010) that highlights that organizational and information strategies are driven by the business strategy, but at the same time these three elements mutually influence each other. In addition, it could be interesting to investigate BITA across several enterprises instead of BITA within an enterprise, which might require going beyond the boundaries of a single enterprise. This would require finding a suitable framework from the BITA domain or modify an existing one.

In addition, it is important to view the BITA problem in a holistic way, which requires taking into account not only the strategic and structural aspects of alignment, but also the cultural and social (Chan and Reich, 2007). It means that there is a need to further investigate the contribution of EM to all these aspects, whereas SAM concentrates mostly on strategic and structural aspects. On the other hand, the positioning of EM in the context of BITA might require the analysis of various
focal areas that are usually included in EM and their contribution to BITA dimensions.

Knowledge Contribution 1.2: EM challenges in the context of BITA

This study presents the following challenges related to usage of EM for BITA: in time discussion of technical solutions; reuse of enterprise models; dealing with diverse backgrounds, knowledge and interpretations; and presenting relevant information in an understandable way. According to the results of literature reviews, there is only one study (Kaczmarek et al., 2012) that explicitly describes challenging factors of EM practice in relation to BITA, which means that this study has made an initial step into this specific topic. Future investigation is nonetheless required to understand if there any other challenging factors that can be identified for EM application for BITA. This investigation would in turn require a broader empirical basis.

Knowledge contribution 1.3: EM recommendations in the context of BITA

There are a number of recommendations that are presented in this study for dealing with BITA-specific challenges. Similarly to the identified challenges, these recommendations have a preliminary character, as there are no studies that provide BITA-specific recommendations or guidelines. Future work with respect to recommendations for EM for BITA might require a broader empirical basis, which potentially could provide more answers for both the WHAT (related to created enterprise models) and the HOW (related to EM process) dimensions of applying EM for BITA.

The main contribution of this study has been formed from these three parts and resulted in the final EM framework. The final EM Framework links EM challenges and recommendations against the background of multi-intentional application of EM for BITA. Having EM challenges and recommendations in the framework is a fundamental part to assist EM practitioners, but there is a need for further validation and more thorough investigation of their applicability for the purpose of BITA. Such investigation would require the positioning of EM in the context of BITA considering various EM focal areas, as processes, actors, resources and alignment dimensions, and various BITA dimensions, such as strategic, structural, social and cultural. This way of considering EM and BITA would provide the grounds for understanding identified challenges and for applying recommendations in a more reasonable way.

From Enterprise Modeling to Enterprise Architecture Modeling

It is important to mention that the final EM framework contains just a part of the EM challenges and recommendations that have been identified in the intermediate EM framework in this thesis. The intermediate EM framework has much more generic character than the final one and provides challenges and recommendations for EM with respect to both the quality of the created enterprise models (see activity “Transforming information into enterprise models”) and the process of EM (see activities “Extracting information about an enterprise” and “Using enterprise models”). It means that in general the intermediate EM framework can be used as a basis to analyze the applicability of EM not only for the purpose of BITA, but also for other purposes. For example, it can be interesting to move from Enterprise
Modeling to Enterprise Architecture Modeling and verify how the challenges and recommendations from the intermediate EM framework can be specified for that specific context.

5.5 SUMMARY OF THE CHAPTER
This chapter discussed the generated knowledge contributions, how they answer research questions of the study, and how the presented knowledge contributions differ from existing theories. The chapter also provided a reflection regarding the research approach and the applied research methods that allowed to generate the results. Academic and practical contribution of the presented results were also addressed. Finally, several issues for future work were presented.
REFERENCES


APPENDIX A

Part 1 - Challenges

1.1. Is it usually the case that you first create models and then apply (implement) them?

1.2. When creating and/or applying enterprise models what modeling-related factors do you usually consider as important?
   - Before modeling
   - During modeling
   - After modeling

1.3. When creating enterprise models what challenges do you usually face?
   - Do you consider degree of formalism of modeling notation as a crucial issue?
   - Do you consider degree of details of a model as a crucial issue?
   - Do you consider accuracy of the view of a model as a crucial issue?
   - Do you consider model dependencies as a crucial issue?

1.4. When applying enterprise model what challenges do you usually face?
   - Do you consider degree of formalism of modeling notation as a crucial issue?
   - Do you consider degree of details of a model as a crucial issue?
   - Do you consider accuracy of the view of a model as a crucial issue?
   - Do you consider model dependencies as a crucial issue?

1.5. How do you usually deal with stakeholders that do not share the same terminology within modeled domain?
   - Do you refer to some sort of external sources? (for example, on-line dictionaries, available taxonomies from Internet, classifications and definitions you have form your previous projects, classification and definitions that already exist within enterprise that is supposed to be modeled)?
   - Do you create some sort of classifications and definitions of the most important terms within the domain?
## Part 2 - Consequences on enterprise modelling and enterprise models

In the context of our research we assume that here people deal with two key processes:

1. Creation of enterprise models
2. Application of enterprise models for the purpose of business and IT alignment

| What consequences does degree of formalism have on enterprise models creation? | • How do you choose formalism for particular modeling case? (Do you often choose the most familiar formalism? How often do you use totally new formalism that seems more suitable for particular modeling task?)
| What consequences does degree of formalism have on enterprise models application? | • Have you faced the situation when chosen formalism was not suitable for further improvement or use of model or for further model application?
| | • Have you ever changed chosen formalism during or after modeling has started?
| | • Have you faced difficulties with implementing models that had unsuitable for application formalism degree (too formal, too informal)

| What consequences does degree of detail have on enterprise models creation? | • How do you choose detail degree for particular modeling case?
| What consequences does degree of detail have on enterprise models application? | • Have you faced the situation when detail degree was not suitable for further improvement or implementation of model?
| | • Have you changed details degree of the model (redo the model) after it was already created?
| | • Can you see missing details of the model at the final stage of model creation? Is it often the case that you enrich model with some missing details at the final stage of model creation?
| | • Have you faced the situation when it was needed to elaborate model in terms of increasing/decreasing the detail degree in order to implement it?

| What consequences does accuracy of the view have on enterprise models creation? | • How do you select the point of the view (aspect to represent) during the modeling?
| What consequences does accuracy of the view have on enterprise models application? | • Do you often create enterprise models that depict only one aspects of enterprise?
| | • Do you often create enterprise models that depict more than one aspects of enterprise?
<table>
<thead>
<tr>
<th>What consequences do <strong>change and model dependencies</strong> have on enterprise models creation?</th>
<th>Have you faced the situation when created enterprise models did not depict all required aspects of enterprise functioning?</th>
</tr>
</thead>
<tbody>
<tr>
<td>What consequences do <strong>change and model dependencies</strong> have on enterprise models application?</td>
<td>In case of using models to implement IT solution, is it often the case that this solution adopt only one aspect of business?</td>
</tr>
</tbody>
</table>

What issues would you consider as Top-3 challenges in EM?
# APPENDIX B

## Part 1

1. Could you specify what are typically the intention of using enterprise models?
   - Have you ever used enterprise models with intention to:
     - Developing business vision or strategy
     - Redesign business operations
     - Develop supporting IS
   - Have you ever use enterprise models with intention to:
     - Sharing knowledge about business (vision/the way it operates)
     - To support decision making

2. Do you use enterprise models to represent the following aspects:
   - IT aspect (AS-IS, TO-BE)
   - Business aspect (AS-IS business processes and organizational structure, TO-BE business operation and organizational structure)
   - What are the key challenges that are related to it?
   - How do you address these challenges?

3. Is it often the case when you need to **analyze** how these aspects are interconnected? (practitioner and his/her thinking)
   - What are the key challenges that are related to it?
   - How do you address these challenges?

4. Is it often the case when you need to **describe** how these aspects are interconnected to involved stakeholders?
   - What are the key challenges that are related to it?
   - How do you address these challenges?

5. Have you ever created models that represent the following aspects:
   - Business
   - Process
   - Integration
   - Software
   - Technology (infrastructure)
   - What are the key challenges that are related to it?
   - How do you address these challenges?
Part 2

1. Read through challenges related to the two Enterprise Modelling (EM) activities (1, 2 presented on diagram in the beginning) and mark those which you recognize. Are there any challenges missing and require to be added?

2. Read through general recommendations of how to deal with identified challenges and mark those which you recognize. Are there any recommendations missing and required to be added?

<table>
<thead>
<tr>
<th>EM activity</th>
<th>Challenges</th>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Extracting information about enterprise</td>
<td>The right information</td>
<td>R1. Capture what stakeholders know for sure, not what they believe is true. R2. Build group of participants for modeling session from people with relevant knowledge and suitable social skills.</td>
</tr>
<tr>
<td></td>
<td>Group dynamics and human behavior</td>
<td>R3. Make everyone involved. R4. Work with session participants as with group. R5. Avoid working with too large groups of participants during EM sessions. R6. Make sure that you are solving the right task that is given by right people.</td>
</tr>
<tr>
<td></td>
<td>Shared language and terminology</td>
<td>R7. Conduct some kind of education for EM sessions participants (for example, warm-up introduction as start of EM sessions). R8. Depending on audience ground your explanation on literature, experiences from previous projects or even on cases from everyday life. R9. Consider specific terminology that is used by employees of particular enterprise (for example, some enterprises have word lists with definitions of key terms). R10. Use concept model in order to create shared understanding between EM stakeholders.</td>
</tr>
<tr>
<td></td>
<td>The purpose of EM and roles of stakeholders within it</td>
<td>R11. Make participants understand what model is. R12. Clarify the role of EM practitioner who is supposed to lead modeling process.</td>
</tr>
<tr>
<td>2. Transforming information into enterprise models</td>
<td>Degree of formalism</td>
<td>R13. Be consistent with chosen modeling notation throughout the project, even on conditions that you adjust formalism degree to the audience. R14. Avoid being too formal on early stages of EM, since it can make modeling process too complex for other participants. R15. Keep the balance between readability of model and functionality of it depending on the given modeling task and audience.</td>
</tr>
<tr>
<td></td>
<td>Degree of detail</td>
<td>R16. Lift a focus if models are unnecessary detailed. R17. It is usually reasonable to work with different degree of detail, since often it is important to see business on different levels. R18. When communicating with participants it is usually reasonable to step up from the current level of detail and start asking WHY question instead of HOW question.</td>
</tr>
<tr>
<td>R19. Define the degree of detail on initial stage of EM taking into consideration goals and purpose of EM project.</td>
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<tr>
<td>R20. Modeling perspectives that you will work with need to be defined and clarified for other stakeholders on the initial stage of EM.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R21. Use capabilities of CASE-tools that are able to keep track of relationship and changes between models. R22. Create enterprise models directly after modeling sessions, so that information that you have extracted will not become outdated.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R23. On the initial stage of EM look at a larger area than on what stakeholders are describing, however, stay focused on identified problematic areas during further stages.</td>
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PUBLICATIONS IN THE DISSERTATION SERIES
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Julia Kaidalova has a background in information engineering with a focus on formal and semiformal knowledge representations. She holds a Master of Science degree in Information Management Systems and Technologies from Kharkiv National Aerospace University, Ukraine, and a Master of Science degree in Information Engineering and Management from Jönköping University, Sweden.

In this licentiate thesis Julia investigates the applicability of enterprise modeling in the light of business and IT alignment and proposes a framework that positions the intentions of EM application within the frame of the strategic alignment model. The framework conceptually shows the contribution of enterprise modeling in the context of business and IT alignment and identifies a number of challenges and recommendations to suggest how enterprise modeling can be used to facilitate it.