

Towards Guiding the Use of Enterprise Modeling in the Context of Business and IT Alignment

Julia Kaidalova^{1(✉)}, Ulf Seigerroth¹, and Anne Persson²

¹ School of Engineering, Jönköping University, P.O. Box 1026, 55111 Jönköping, Sweden
{julia.kaidalova,ulf.seigerroth}@ju.se

² University of Skövde, School of Informatics, Högskovlevägen Box 408,
541 28 Skövde, Sweden
anne.persson@his.se

Abstract. Today's dynamic business environment presents enterprises that wish to stay competitive with a great challenge. This is further complicated by rapidly advancing IT capabilities and the crucial role that IT plays in most organizations - a backbone for realizing visions and goals. The problem of eliminating the gap between business and IT within enterprises, i.e. the problem of Business and IT Alignment (BITA), has been acknowledged as a contemporary challenge and actively elaborated by academics and practitioners. One practice that is used to facilitate BITA is Enterprise Modeling (EM), which is considered as a catalyzing practice for capturing, visualizing and analyzing different aspects of enterprises. This paper presents a framework that illustrates the role of EM in the context of BITA and suggests recommendations to deal with EM challenges.

Keywords: Business and IT alignment · Enterprise modeling · Enterprise modeling challenges · Enterprise modeling recommendations

1 Introduction

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 [1]. However, while it is undeniable that suitable IT solutions are required in order to reach organizational goals, effective support of business operations with appropriate IT solutions is complicated due to the dynamic nature and intertwined relation between business operations and IT solutions [2]. In order to conceptualize this problem – how to align business and IT – practitioners and researchers have used a variety of terms such as harmony, linkage, fusion, fit, match, and integration, but in the long run the term alignment has gained widespread acceptance. In early studies, Business and IT Alignment (BITA) implied linking business strategy and IT strategy. Later, the view on BITA has expanded and current research recognizes many dimensions of alignment in BITA [3].

In the context of BITA, Enterprise Modeling (EM) can be considered as a useful practice. EM facilitates the creation of 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 [4, 5]. The essential ability of enterprise models to represent an enterprise from different perspectives allows EM to be used for providing a multidimensional view on an enterprise and to integrate these multiple dimensions into a coherent structure [4]. These capabilities of enterprise models also provide a powerful mechanism for dealing with the strategic and structural dimensions of BITA. On the other hand, EM is also able to provide solid support when there is a need to develop a common understanding of the current multidimensional praxis and an agreement on future vision and strategies [4, 5]. These characteristics of EM make it applicable for BITA when there is a need to consider the multiple views of stakeholders and to create a shared understanding between them [6–8].

Despite the fact that the literature recognizes various benefits of using EM to achieve BITA [4, 9–13], there are no studies that in an extensive way illustrate the role of EM in improving BITA. Thus, the research question of this work is the following:

How can EM contribute to business and IT alignment?

The main objective of the paper is to present a framework that includes EM challenges and recommendations that are relevant for BITA. It describes the existing results so far of a research project aiming to generate prescriptive guidelines for practitioners dealing with EM in the BITA context.

The remainder of the paper is structured in the following way: Sect. 2 describes the research approach. In Sect. 3 the theoretical foundation that served as a basis for this research is presented. It covers the BITA and EM domains. The overview of the EM framework is introduced in Sect. 4, while Sect. 5 describes the related challenges and recommendations in more detail. Finally, Sect. 6 concludes the paper.

2 Research Approach

The research process in this study has included three iterations in order to refine the EM framework. The framework has evolved through three versions: a preliminary EM framework, an intermediate EM framework and the final EM framework. Both theoretical and empirical foundations have been used to generate and validate the results iteratively. The theoretical foundation includes relevant theories from EM, BITA and other related domains. The empirical foundation has included interview data on the practice of EM.

A stepwise representation of the research process of this study is shown in Fig. 1. The figure schematically represents three parallel tracks 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).

In the *theoretical work* of this paper four literature reviews have been performed (steps 1, 2a, 3a, 4 in Fig. 1). The *empirical work* involved two rounds of interviews with EM practitioners, the results of which were the basis for developing the framework (steps 2b, 3b). In total, eight semi-structured interviews have been carried out in two rounds. The main criterion when choosing respondents was that they had significant experience

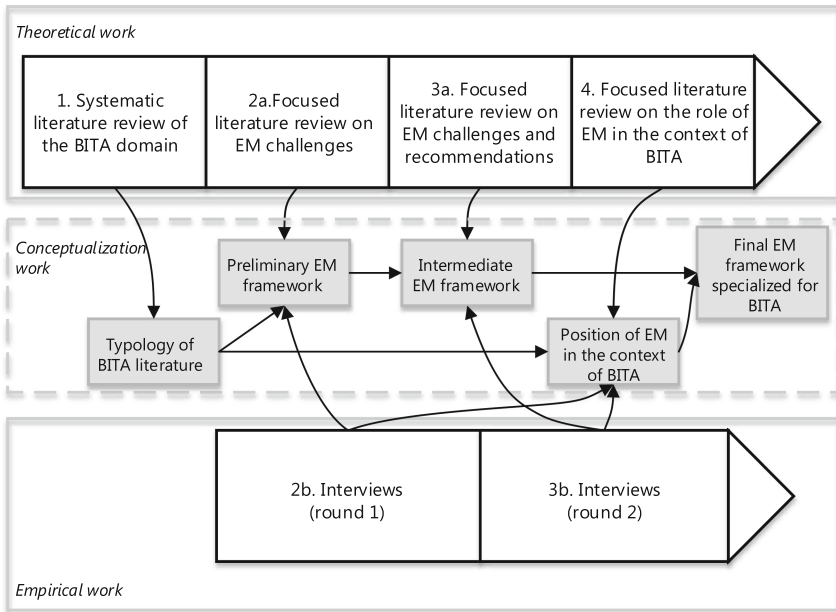


Fig. 1. Research process – theoretical, empirical and conceptualization work

in EM, including both managing modeling sessions and using created models for various purposes. All the chosen respondents had at least 5 years of experience in EM within enterprise transformation, systems development and other types of projects. The analysis of the collected data was done incrementally with analysis following each interview. The last interviews revealed to reach informational saturation. The respondents from the first and the second rounds of interviews will be addressed as *Respondent 1-x* and *Respondent 2-x* respectively in the remainder of the paper. The *conceptualization work* that resulted in the EM framework involved the continuous analysis and synthesis of various theoretical and empirical research results as well as their integration and refinement.

As Fig. 1 shows, the research started with a systematic literature review of the BITA domain (step 1), which allowed the generation of a typology of the BITA literature representing the main interest areas and identified existing knowledge gaps. The typology also provided an initial idea of 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, a Preliminary EM framework has been generated using 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 the typology of BITA literature supported the positioning of EM in the context of BITA. The intention behind it was to investigate the role of EM in the context of BITA. The 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.

The Preliminary EM framework has been presented in [14], whereas the Intermediate EM framework – in [15]. This paper aims to focus on the Final EM framework, which in the following will be addressed as *the EM framework*.

3 Theoretical Foundation

In this section the theoretical foundation for the study is presented. First, general description and relevant theories of the BITA domain are introduced in Subject. 3.1. After this the relevant theories from the EM domain are presented in Subject. 3.2

3.1 Business and IT Alignment and Strategic Alignment Model

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 [1]. The challenge of business and IT alignment is not new though, as it came with the use of information systems in organizations. There are two conceptual views on BITA – a process, i.e. a set of activities to reach a certain state of alignment, and a state, i.e. the amount of alignment [9]. 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 [9]. The second view implies that it is a state, for which it is possible to identify antecedents, measures, and outcomes.

BITA as a state is often criticized for being a “fuzzy” target, as according to [16] practitioners are often facing 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. Significant attention in the current literature is given to strategic alignment. This refers to the degree to which the business strategy and plans, and the IT strategy and plans, complement each other [9]. Henderson and Venkatraman in [17] presented one of the most cited alignment frameworks - Strategic Alignment Model (SAM). This model defines alignment as the degree of fit and integration between four elements: business strategy, IT strategy, business infrastructure, and IS infrastructure. The multivariate alignment of SAM main elements includes six 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 [17]. The SAM framework has some limitations, however. 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 [18]. In addition, when aiming at functional integration in SAM, there is a need to understand the business processes and organization [16]. The business requirements often change 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, although there are many external factors that can influence BITA. Despite these limitations, the SAM framework represents the four essential elements of an enterprise and divides them between the strategic and operational levels, and the areas of business and IT, therefore in this study we will employ the SAM as a basis for the EM framework.

3.2 Enterprise Modeling – the Process and Intentional Perspective

There is a clear need to capture both organization (business) and technology issues during the design and implementation of IS [19]. Moreover, capturing these dimensions in a valid and comprehensive way requires the involvement of a large number of stakeholders. In this respect EM can serve as an effective practice. EM (sometimes also called business modeling, c.f. [20]) is a practice for developing, obtaining, and communicating enterprise knowledge, like strategies, goals and requirements to different stakeholders [20, 21].

EM is often used during development or refinement of enterprise IS. Researchers pay significant attention to the applicability of EM for software requirements engineering [21, 22]. According to [23], 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 perception of the enterprise practice and thus it fosters communication. It is a compact abstraction and thus it allows coping with complexity. Models are usually based on shared concepts and thus they facilitate shared understanding [24].

According to [4, 5, 24], 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 also increases the validity of models. The participative approach also implies involvement of stakeholders in modeling for better understanding of enterprise processes [4, 25]. One problem, which might occur here, is that the resulting enterprise models are often not enough formalized, which in some cases might complicate their further application. Therefore, the role of the EM practitioner who leads this kind of EM effort becomes vital for the efficient creation and use of enterprise models [4, 26].

In terms of the modeling process itself, [15] propose a model according to which EM process includes three basic activities that are usually performed in sequential order, but in some cases can roll back (Fig. 2). 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 at hand.

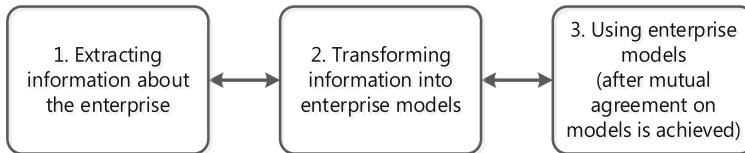


Fig. 2. EM activities [15]

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 has a leading role in eliciting and integrating opinions about various aspects of the enterprise. The ability of the EM practitioner to facilitate this process is crucial in order to extract the necessary information and then to transform this information into enterprise models (activity 2 in Fig. 2). Models are created during modeling sessions together with domain experts to make sure that existing viewpoints are considered and consolidated. A common practice is 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. 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 all three activities of EM. Common agreement among the stakeholders on creating enterprise models is crucial in order to use the created enterprise models for any purpose (activity 3 in Fig. 2).

Apart from development or refinement of an enterprise IS, EM can be used to create shared domain knowledge [8, 27, 28]. Both of these abilities play an important role in BITA, although the results of using EM depend on the purpose behind EM in a particular case. In [27] a hierarchy of EM intentions has been presented (Fig. 3), which shows possible purposes of using EM. It has been further refined in [29]. This model has been also used to generate the EM framework presented in this paper.

The hierarchy of EM intentions differentiates between three high-level intentions. The first intention 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, and (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. 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

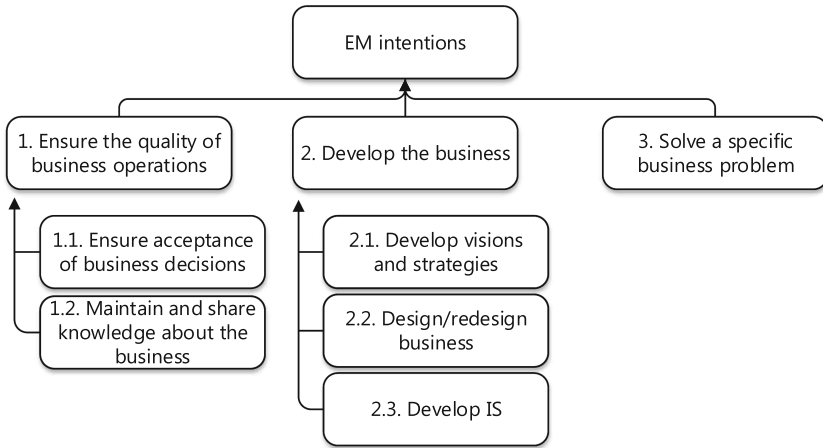


Fig. 3. The main elements of the EM intentions hierarchy, adapted from [27]

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 to use 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. Various intentions behind an EM initiative can aim for different results, and subsequently can affect various perspectives of BITA [30].

4 Overview of the EM Framework

The EM framework consists of (1) positioning of EM intentions in the SAM model and (2) challenges and recommendations when using EM for BITA. The challenges (numbered 1–4) and recommendations will be introduced in detail in Sect. 5. In order to position EM in the context of BITA, the elements of hierarchy of EM intentions according to (Fig. 3) have been positioned in the SAM framework (Fig. 4).

The presented positioning of EM intentions in SAM indicates that EM can facilitate BITA in a number of ways. First, it allows the alignment of business strategy with IT strategy, i.e. **strategic integration**, when EM is applied for developing business vision and strategies. In this relation 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 we approach it is an EM workshop.” (Respondent 2–1)

Using EM for developing supporting IS allows the alignment of IT strategy with underlying IT structure, i.e. **strategic fit on the IT side**. EM provides a description of

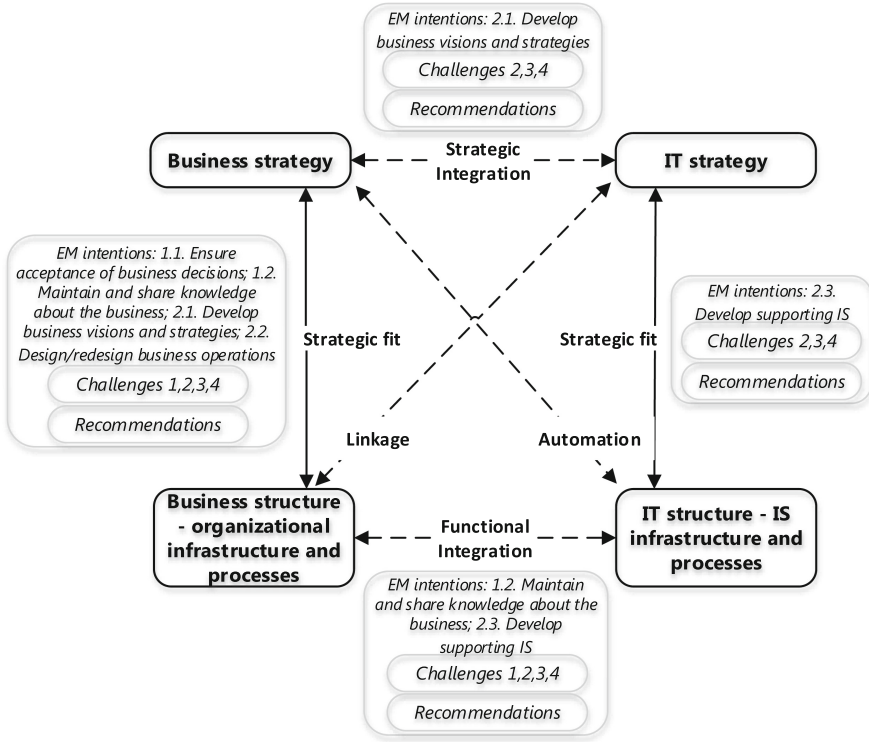


Fig. 4. Positioning of Enterprise Modeling within the Business and IT Alignment context

the AS-IS state of the business, possibly including a description of the business processes. In other words, EM provides a clear picture of how the business operates, which then serves as a basis for developing the required IS.

“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)

Alignment of business and IT structures, i.e. **functional integration**, can be facilitated by applying EM for developing IS, as it helps to develop IS according to particular requirements from the business side.

“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)

Also, functional integration can be facilitated by 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 this case, EM can describe the way the business works and the types of infrastructure that exists to support 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)

EM can facilitate the alignment of business strategy and business structure, i.e. **strategic fit on business side**, in a number of ways. In order to redesign business operations EM can be used to define the way the business should work in coherence with the existing business strategy. For this purpose a number of business process models can be created, taking into account the vision and the strategy. Additionally, a clearly modeled and documented business strategy has a better chance to be followed by enterprise employees than one that is not.

“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 to ensure acceptance of business decisions is a way to make people committed to the business decisions, which in turn helps to actually realize strategical decisions in practice. Communication between stakeholders that happens during EM sessions can play an important role in stakeholders’ commitments and can help to 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)

Realizing business strategy can also be facilitated by using EM as a tool for creating shared knowledge and understanding, as enterprise models can serve as a compact source for articulating business strategy. 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.

“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)

5 Guiding EM in the Context of BITA

The positioning of EM intentions in the context of BITA as presented in Fig. 4 provides a structure for discussing EM challenges and recommendations. Related EM challenges and recommendations are presented in Table 1, which is followed by their detailed description in the subsequent sections below.

Table 1. EM challenges and recommendations relevant for the context of BITA

Challenges	Recommendations
1. In time discussion of technical solutions	- Start modeling with a group of participants who have strong domain knowledge of problematic areas
	- 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
2. Reuse of enterprise models	- Make sure the existing models are maintained in a repository and that they are kept up to date
	- The benefit of models maintenance should be clarified for enterprise management
3. Dealing with diverse backgrounds, knowledge and interpretations	- Provide the participants with a brief reminder of the purpose of the models being presented and with a summary of the notation
	- When using models as a basis for explanation and discussions, the diverse backgrounds and knowledge of the involved stakeholders should be considered and consolidated
4. Presenting relevant information in an understandable way	- Take benefit from the power of a good visualization when using models for different purposes
	- Make sure that the targeted audience can understand the models

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 from the business perspective. 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.

“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)

This challenge is typical for scenarios where EM is used with the following intentions: (2.1) developing business vision and strategies, (2.2) redesigning business operations, and (2.3) developing the supporting information systems.

Recommendations:

- Start modeling with a group of participants who have strong domain knowledge of problematic areas.
- 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)

This challenge is relevant when using EM for: (1.1) ensuring acceptance of business decisions through committing the stakeholders to the decisions made, and (1.2) maintaining and sharing knowledge about the business, its vision, and the way it operates, (2.1) developing business vision and strategies, (2.2) redesigning business operations, and (2.3) developing the supporting information systems.

Recommendations:

- Make sure the existing models are maintained in a repository and that they are kept up to date.
- 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 different groups 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.

“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)

Diverse backgrounds and interpretations among stakeholders might affect 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)

This challenge is relevant when using EM for: (1.1) ensuring acceptance of business decisions through committing the stakeholders to the decisions made, and (1.2) maintaining and sharing knowledge about the business, its vision, and the way it operates, (2.1) developing business vision and strategies, (2.2) redesigning business operations, and (2.3) developing the supporting information systems.

Recommendations:

- Provide the participants with a brief reminder of the purpose of the models being presented and with a summary of the notation.
- 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 contextualize 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)

This challenge is relevant when using EM for: (1.1) ensuring acceptance of business decisions through committing the stakeholders to the decisions made, and (1.2) maintaining and sharing knowledge about the business, its vision, and the way it operates,

(2.1) developing business vision and strategies, (2.2) redesigning business operations, and (2.3) developing the supporting information systems.

Recommendations:

- Take benefit from the power of a good visualization when using models for different purposes.
- Make sure that the targeted audience can understand the models.

6 Conclusions

In the broad sense, this work 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 paper identifies 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 so far has not been described in a structured manner in the literature.

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 result of this study, the EM framework, contains challenges and recommendations for using enterprise models for various intentions, which imply both of the aforementioned aspects.

References

1. Silvius, A.J.G.: Business and IT alignment: what we know and what we don't know. In: The Proceedings of International Conference on Information Management and Engineering, pp. 558–563 (2009)

2. Luftman, J.: Assessing IT-Business Alignment. *Inf. Syst. Manage.* **20**(4), 9–15 (2003)
3. Schlosser, F., Wagner, H.-T., Coltman, T.: Reconsidering the dimensions of business-IT alignment. In: *The Proceedings of the 45th Hawaii International Conference on System Science*, pp. 5053–5061 (2012)
4. Sandkuhl, K., Stirna, J., Persson, A., Wissotzki, M.: *Enterprise Modeling– Tackling Business Challenges with the 4EM Method*. Springer, Heidelberg (2014)
5. Stirna, J., Persson, A.: Anti-patterns as a means of focusing on critical quality aspects in enterprise modeling. In: Halpin, T., Krogstie, J., Nurcan, S., Proper, E., Schmidt, R., Soffer, P., Ukor, R. (eds.) *BPMDs 2009 and EMMSAD 2009*. LNBIP, vol. 29, pp. 407–418. Springer, Heidelberg (2009)
6. Jonkers, H., Lankhorst, M., van Buuren, R., Hoppenbrouwers, S., Bonsangue, M., van der Torre, L.: Concepts for modelling enterprise architectures. *Int. J. Coop. Inf. Syst.* **13**(3), 257–287 (2004)
7. Kearns, G.S., Lederer, A.L.: A resource-based view of strategic IT alignment: how knowledge sharing creates competitive advantage. *Decis. Sci.* **34**(1), 1–29 (2003)
8. Reich, B.H., Benbasat, I.: Factors that influence the social dimension of alignment between business and information technology objectives. *MIS Q.* **24**(1), 81–113 (2000)
9. Chan, Y.E., Reich, B.H.: IT alignment: what have we learned? *J. Inf. Technol.* **22**(4), 297–315 (2007)
10. Gregor, S., Hart, D., Martin, N.: Enterprise architectures: enablers of business strategy and IS/IT alignment in government. *Inf. Technol. People* **20**(2), 96–120 (2007)
11. Wegmann, A., Regev, G., Rychkova, I., Le, L.-S., de la Cruz, J.G., Julia, P.: Business-IT alignment with SEAM for enterprise architecture. In: *Proceedings of the 11th IEEE International EDOC Conference*, pp. 111–121 (2007)
12. Seigerroth, U.: Enterprise Modeling and Enterprise Architecture: the constituents of transformation and alignment of Business and IT. *Int. J. IT/Business Alignment Governance (IJTBAG)* **2**(1), 16–34 (2011)
13. Christiner, F., Lantow, B., Sandkuhl, K., Wissotzki, M.: Multi-dimensional visualization in enterprise modeling. In: Abramowicz, W., Domingue, J., Węcel, K. (eds.) *BIS 2012 Workshops*. LNBIP, vol. 127, pp. 139–152. Springer, Heidelberg (2009)
14. Kaidalova, J., Kaczmarek, T., Seigerroth, U., Shilov, N.: Practical challenges of enterprise modeling in the light of business and IT alignment. In: Sandkuhl, K., Seigerroth, U., Stirna, J. (eds.) *PoEM 2012*. LNBIP, pp. 31–45. Springer, Heidelberg (2012)
15. Kaidalova, J., Seigerroth, U., Bukowska, E., Shilov, N.: Enterprise modeling for business and IT alignment: challenges and recommendations. *Int. J. IT/Business Alignment Governance* **5**(2), 43–68 (2014)
16. Silvius, A.J.G.: Business & IT alignment in theory and practice. In: *The Proceedings of the 40th Hawaii International Conference on Systems and Sciences*, p. 211b (2007)
17. Henderson, J., Venkatraman, N.: Strategic Alignment: A model for organizational transformation through information technology. In: Kocham, T.A., Useem, M. (eds.) *Transforming Organizations*, pp. 97–117. Oxford University Press, New York (1992)
18. Chan, Y.E., Reich, B.H.: IT alignment: an annotated bibliography. *J. Inf. Technol.* **22**(4), 316–396 (2007)
19. Gibson, C.F.: IT-enabled business change - an approach to understanding and managing risk. *MIS Q. Executive* **2**(2), 104–115 (2003)
20. Kirikova, M.: Explanatory capability of enterprise models. *Data Knowl. Eng.* **33**(2), 119–136 (2000)
21. Persson, A.: *Enterprise Modelling in Practice: Situational Factors and their Influence on Adopting a Participative Approach (Doctoral Dissertation)*. Department of Computer and Systems Sciences, Stockholm University (2001). ISSN 1101-8526

22. Rolland, C., Prakash, N.: From conceptual modelling to requirements engineering. *Ann. Softw. Eng.* **10**, 151–176 (2000)
23. Stirna, J., Persson, A., Sandkuhl, K.: Participative enterprise modeling: experiences and recommendations. In: Krogstie, J., Opdahl, A.L., Sindre, G. (eds.) *CAiSE 2007 and WES 2007*. LNCS, vol. 4495, pp. 546–560. Springer, Heidelberg (2007)
24. Barjis, J.: CPI modeling: collaborative, participative, interactive modeling. In: Jain, S., Creasey, R.R., Himmelspace, J., White, K.P., Fu, M. (eds.) *Proceedings of the 2011 Winter Simulation Conference*, pp. 3099–3108. IEEE, Piscataway (2011)
25. Front, A., Rieu, D., Santorum, M.: A participative end-user modeling approach for business process requirements. In: Bider, I., Gaaloul, K., Krogstie, J., Nurcan, S., Proper, H.A., Schmidt, R., Soffer, P. (eds.) *BPMDs 2014 and EMMSAD 2014*. LNBIP, vol. 175, pp. 33–47. Springer, Heidelberg (2014)
26. Rosemann, M., Lind, M., Hjalmarsson, A., Recker, J.: Four facets of a process modeling facilitator. In: *The Proceedings of the 32nd International Conference on Information Systems*, pp. 1–16 (2011)
27. Persson, A., Stirna, J.: Why enterprise modelling? an explorative study into current practice. In: Dittrich, K.R., Geppert, A., Norrie, M. (eds.) *CAiSE 2001*. LNCS, vol. 2068, pp. 465–468. Springer, Heidelberg (2001)
28. Lind, M., Seigerroth, U.: Team-based reconstruction for expanding organizational ability. *J. Oper. Res. Soc.* **54**(2), 119–129 (2003)
29. Bubenko Jr., J.A., Persson, A., Stirna, J.: An intentional perspective on enterprise modeling. In: Salinesi, C., Nurcan, S., Souveyet, C., Ralyté, J. (eds.) *Intentional Perspectives on Information Systems Engineering*, pp. 215–237. Springer, Heidelberg (2010)
30. Kaidalova, J.: Positioning Enterprise Modeling in the context of Business and IT alignment. In: Abramowicz, W., Kokkinaki, A. (eds.) *BIS 2014 Workshops*. LNBIP, vol. 183, pp. 202–213. Springer, Heidelberg (2014)