Enterprise Architecture Modeling for Business and IT Alignment

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Abstract. Efficient support of business needs, processes and strategies by information technology is a key for successful enterprise functioning. The challenge of Business and IT Alignment (BITA) has been acknowledged and actively discussed by academics and practitioners during more than two decades. On one hand, in order to achieve BITA it is required to analyse various focal areas of an enterprise, which motivates the benefits of Enterprise Architecture (EA) in this respect. On the other hand, it is also required to deal with multiple interests of involved stakeholders and create a shared understanding between them, which motivates the benefit of using Enterprise Modeling (EM). Therefore, this paper describes the idea of investigating the role of an integrated practice Enterprise Architecture Modeling in the context of BITA.

Key words: Business and IT Alignment, Enterprise Modeling, Enterprise Architecture, Focal Area

1 Introduction

IT is a key facilitator for a successful functioning of the today's enterprises. Through IT companies are able to change the way they organize business processes, communicate with their customers and deliver their services (Silvius, 2009). The quest of finding efficient IT support that satisfies business needs has been addressed in the literature as Business and IT Alignment (BITA) (Luftman, 2003; Chan and Reich, 2007). Currently research recognizes many dimensions of alignment between business and IT. In general it is possible to differentiate between four dimensions of BITA: strategic, structural, social, and cultural (Chan and Reich, 2007). Of these, the strategic dimension currently receives significantly more attention (ibid). However, consideration of all these four dimensions is required in order to increase 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).

S. España J. Ralyté, P. Soffer, J. Zdravkovic and Ó. Pastor (Eds.):
PoEM 2015 Short and Doctoral Consortium Papers, pp. 108-116, 2015.

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 *focal areas* that these states imply (Engelsman et al., 2011; Jonkers et al., 2004). The various focal areas of an enterprise can include organizational structure, business processes, information systems, and infrastructure, which together form an Enterprise Architecture (EA). There are many different EA frameworks available today, each defining a set of focal areas for viewing an enterprise in a comprehensive way.

Jonkers et al. (2004) define Enterprise Architecture (EA) as a coherent set of principles, methods and models that are used in the design and realisation of the various focal areas of an enterprise. Coherent description of various focal areas of EA is able to provide insights, enable communication among stakeholders and guide complicated transformation processes (Jonkers et al. 2004). There are different terms currently used when talking about how to organize and manage different focal areas of EA in a holistic and integrated way and address dynamic nature of EA evolution in whole. Buckl et al. (2009) refer to EA management as a way to deal with EA and argue that EA management is designed to integrate with the existing enterprise-level management functions to conjointly manage and develop the EA towards aligned business and IT.

The unambiguous description of EA components and their relationships requires a coherent modelling language (ibid.). In this relation, Enterprise Modeling (EM) is often addressed as an adjacent concept of EA that is able to describe various focal areas of an enterprise and EA to allow specifying and implementing the systems (Chen et al., 2008). However, a coherent modeling language cannot guarantee to solve the BITA problem (Jonkers et al., 2004). The problem of BITA is complicated by a numerous stakeholders having multitude of interests and agendas, which cannot always be captured by means of a modelling approach (ibid.). Existence of different, often contradicting, interests of the stakeholders, strengthen the need for active communication between them when it comes to enterprise transformation initiatives aiming to close the gap between business and IT. Here the benefits of participative Enterprise Modeling (EM) become noticeable. 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.

Despite the contribution that EM can offer to support BITA, social issues (as for example, the ability of EM to create shared understanding between business and IT stakeholders) receives scant attention in studies considering the role of EM in the context of BITA (McGinnis, 2007). However, EM practices that do not allow the integration of human issues in the modeling do not meet the needs of enterprise transformation initiatives (McGinnis, 2007). Thus, the main aim of my research is to investigate the contribution of Enterprise Architecture Modeling in solving the problems of BITA within its various dimensions, taking into account the participative approach in modeling. The main research question of this work is the following:

How can participative Enterprise Architecture Modeling contribute to BITA?

In order to answer this research question I have broken it down into several sub-questions, which are presented in Table 1 below. A set of knowledge contributions

will answer these questions and will be presented in a number of publications. All the knowledge contributions will be integrated in the Framework for EAM in the context of BITA, which will be the final deliverable of my doctoral thesis project. The first research question is related to participative EM. This group of question has to do with *how* aspect, i.e. how to use EM so that it contributes to BITA. The first research question was considered in a licentiate thesis (Kaidalova, 2015, supervisors: Ulf Seigerroth, Jönköping University; Anne Persson, Skövde University). The second research question is related to the ability of models to capture and represent various focal areas of EA. This question has to do with *what* aspect, i.e. what are the focal areas that need to be considered in order to deal with BITA.

Table 1 Relationships between research questions, knowledge contributions and relevant publications

Research questions	Knowledge contributions	Related publications
1. How can EM contribute to BITA?	*The procedural EM framework for BITA*	Synthesized and presented in licentiate thesis
2. How can EA contribute in solving different dimensions of BITA problem?	The contribution of EA in BITA, considering different BITA dimensions	Paper X
2.1 What are the relevant and the sufficient sets of EA focal areas when dealing with BITA?	*Knowledge contribution 2.1: Sets of relevant and sufficient EA focal areas for dealing with BITA*	Kaidalova et al. (2015) – BIS 2015 Paper Y
2.2 How these EA focal areas are related to different dimensions of BITA?	*Knowledge contribution 2.2: The link between EA focal areas and BITA dimensions*	Paper Z

This doctoral consortium paper will focus on the second research question. The remainder of the paper is structured in the following way: Section 2 describes the planned research approach. In section 3 the relevant theories are described. It mostly covers the BITA, EA and EM areas. The results derived so far are presented and discussed in Section 4.

2 Research Approach

In order to answer the first research question a research process has been constructed and carried out as a part of my licentiate thesis project (for details see Kaidalova, 2015). This research process included three parallel parts: theoretical work, empirical work and conceptualization work. The division of the research process into these three parts is related to the grounding of knowledge described by Goldkuhl (1999), who suggests differentiating between empirical, external theoretical, and internal knowledge grounding. This research process resulted in generating the procedural EM Framework for BITA, which is marked with (*) in Figure 1 below. Elements with white filling represent steps of the research, whereas elements with grey filling represent results (knowledge contributions from Table 1).In order to answer the second research question the research process will be organized in a similar manner. Theoretical work, empirical work and conceptualization work will be carried out in parallel, each employing a different research method in a sequence of interlocking steps to produce a set of knowledge contributions. Literature review will be applied in

the theoretical work, interviews - in the empirical work, whereas 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.

The first step in the planned research process is a systematic literature review on Enterprise Architecture Modeling (step 1). The aim of this step is to understand the state of the art with regards to usage of the term "Enterprise Architecture Modeling" and the main interest areas in this area, including the attention which is currently given to participative approach. After that, the following knowledge contributions will be generated with the help of literature review and then validated via number of semi-structured interviews (steps 2a and 2b; steps 3a and 3b): a set of relevant and a set of sufficient EA focal areas relevant when dealing with BITA, the link between EA focal areas and BITA dimensions. Potential candidates for interviews are EA practitioners with experience of using existing EA framework and tools within enterprise transformation projects.

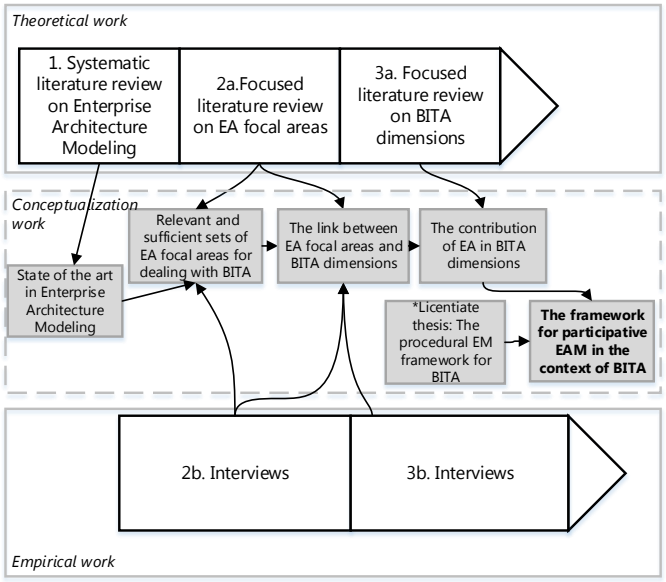

Fig. 1. Research process aimed to answer the main research question – theoretical, empirical and conceptualization work

Conceptual refinement of the derived knowledge contributions will allow to generate the contribution of EA in BITA dimensions, which is the knowledge contribution answering the second research question. Finally, after integrating the answers for the first and the second research questions it will be possible to generate the Framework for EAM in the context of BITA, which will answer the main research question of my doctoral thesis.

3 Relevant Theories from the Problem Domains

In this section some relevant theories from the problem domains are presented. First, general description of the BITA problem and its various dimensions are introduced in sub-section 3.1. After this, the relevant theories regarding EA are presented in sub-section 3.2, and the participative EM – in sub-section 3.3.

3.1 Business and IT alignment - Dimensions and Domains

According to Chan and Reich (2007) there are several *dimensions* of alignment: strategic, structural, social, and cultural. The strategic 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 an accurate and up-to-date representation of an enterprise and its focal area, as it enables alignment of the considered focal areas and in this manner deals with the strategic and structural dimensions of BITA. On the other hand, BITA achievement requires to deal with numerous interests of involved stakeholders and create a shared understanding between them, which could allow managing the social and cultural dimensions of BITA.

In addition to BITA *dimension*, a term *domain* is used in relation to BITA. In my thesis I address BITA domain in a similar manner to Chan and Reich (2007) who differentiate between a BITA dimension and a BITA domain. A BITA domain is a bounded area that an enterprise structure contains and that together with other domains show the constitution of business and IT architecture. Generic framework for information management designed by Maes et al. (2000) contains three domains: business, information and communication and technology. Basically, in this framework technological aspects are divided into two parts: (1) Information and communication, i.e., software components for interpreting information, communication and supporting knowledge processes, and (2) Technology, i.e., infrastructure: hardware and middleware. Another approach is adopted by Pearlson and Saunders (2010) in the framework Information Systems Strategy Triangle. The framework focuses on relationship between three domains: information, business and organisational strategy, and also how Information System (IS) strategy can influence other strategies in a company.

3.2 Enterprise Architecture

EA community mostly doubts the existence of a general EA management process fitting to any size of enterprises (Buckl et al., 2009). Timm et al. (2015) point out the need for investigation of EAM practice in Small and Medium-sized enterprises (SME). Winter et al. (2010) emphasize the lack of research regarding EA management and argue that there is neither a common understanding of the scope and content of the main activities in EA management, nor has a commonly accepted reference method been developed. It motivates the need for new reference models and methods related to EAM.

At the same time, emerging new products and services require a tight integration of what often is separated in many enterprises into enterprise-IT (i.e. the IT supporting business and administrative parts) and product-IT (i.e., what is built into the products or supporting industrial automation). One potential benefit of such integration can be an ability to conveniently access to the data that a vast number of product-IT instances collect during their operation. Potentially, Enterprise Architecture Management (EAM) can serve as a mean to support both, continuous alignment of business and IT, and the integration of product-IT and enterprise-IT.

3.3 Participative Enterprise Modeling

EM is a practice for developing, obtaining, and communicating enterprise knowledge, like strategies, goals and requirements to different stakeholders (Stirna & Kirikova, 2008; Sandkuhl at al., 2014).

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 (Sandkuhl et al., 2014; Barjis, 2011). The participative approach also implies involvement of stakeholders in modeling for better understanding of enterprise processes (Sandkuhl et al., 2014). The role of the EM practitioner who leads this kind of EM effort becomes vital for the efficient creation and use of enterprise models (Sandkuhl et al., 2014; Rosemann et al., 2011).

4 Preliminary Results

So far, the author has investigated the first research question in the licentiate thesis and also has done some investigation related to the second research question. The answer for the first research question is the procedural EM framework for BITA, but it will not be presented in this paper due to the space limitation. The results existing so far for the second research question are presented in section 4.1. In particular, those are related to the sets of relevant and sufficient EA focal areas for dealing with BITA (knowledge contribution 2.1) (Kaidalova et al., 2015).

4.1 EA Focal Areas in the Context of BITA - Relevant and Sufficient

This section presents how EA focal areas (Zachman, 1987) can be positioned within the domains of the chosen BITA frameworks. As BITA frameworks the Generic framework for information management (Maes et al., 2000) and IS Strategy triangle (Pearlson and Saunders, 2003) are considered. Zachman framework has been chosen as an example EA framework for illustration, since it is one of the fundamental EA frameworks that contains a comprehensive set of well-defined EA focal areas. Focal areas are defined according to six basic questions: (1) data (what?) – data needed for the enterprise to operate, (2) function (how?) – concerned with the operation of the enterprise, (3) network (where?) - concerned with the geographical distribution of the enterprise's activities, (4) people (who?) - the people who do the work, allocation of work and the people-to-people relationships, (5) time (when?) – to design the event-to-event relationships that establish the performance criteria, (6) motivation (why?) – the description that depict the motivation of the enterprise, which typically focuses on the objectives and goals.

The positioning of Zachman's six focal areas within the domains of the Generic Framework for Information Management is presented below in Figure 2, the left-hand side.

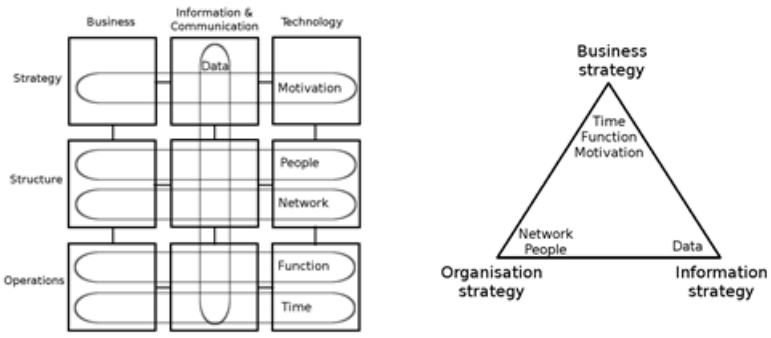

Fig. 2 The positioning of EA focal areas (Zachman, 1987) within the BITA domains of Generic Framework for Information Management (Maes et al., 2000) (left-hand side) and the positioning of EA focal areas (Zachman, 1987) within the BITA domains of IS Strategy triangle (Pearlson and Saunders, 2003) (right-hand side)

Data focal area provides a support for dealing with Information & Communication domain of BITA, since it provides various kinds of information that are fundamental for enterprise functioning. It does not have direct connection to Technology domain, which has to do with infrastructure of the enterprise in terms of hardware and middleware. Focal areas function and time are able to facilitate dealing with the operations domain, as together these two focal areas are able to describe business processes of the enterprise and the way it operates. Focal areas of people and network provides a strong support for the structure BITA domain, as it allows describing the hierarchy and disposition of business units and employees within it. Motivation-

related issues contributes to the clear picture regarding an enterprise strategy, as it gives an understanding regarding visions and goals of an enterprise.

The positioning of Zachman's six focal areas within the domains of the IS strategy triangle is presented in Figure 2, the right-hand side. An important point here is that the domain of the IS strategy triangle are considered to imply not only strategies, but also operational issues to a certain extent. The focal area of data can facilitate dealing with the domain of Information Strategy, as it enables analysis of various information needed to make an enterprise operational. Relations within networks and between people is able to contribute to analysis of organisation strategy, as it gives a clear picture of how responsibilities are distributed in an enterprise between employees and units, the hierarchy of units that form an organisational structure and the disposition of this structure. Focal areas of time and function provides a clear picture of business processes within an enterprise, and thus plays an important role in dealing with the domain of business strategy. Focal area of motivation is able to contribute to the domain of business strategy, as it represents vision and goals of an enterprise that have a decisive role in business strategy.

A set of sufficient EA focal areas would allow to minimize the usage of resources within EA modeling, by enabling to model an enterprise in a "good enough" way. In that case it might be suitable to decrease the number of modelled focal areas. Possible way to do it would be to unite people and network focal areas into an organisational structure, and unite function and time into business processes. By doing so the total number of focal areas to be modelled would decrease from six to four: motivation, data, organisational structure and business processes. This would be still a sufficient set of focal areas to deal with various BITA domains. The presented positioning considers only enterprise-IT, whereas the product-IT remains disregarded. It definitely calls for further investigation, since integrated view on enterprise-IT and product-IT within EAM would be a benefit and enable competitive advantages as discussed in 3.2.

Also, as it has been mentioned earlier in section 3.1, apart from BITA domains, it is possible to differentiate between four dimensions of BITA: strategic, structural, social and cultural. Each BITA framework has its own focus and puts an emphasis on certain BITA dimensions. It is equally important to deal with all four dimensions, but currently strategic and structural dimensions of BITA receive more attention than social and cultural (Chan and Reich, 2007). The chosen BITA frameworks provide rather minor support for dealing with social and cultural dimensions, particularly Generic Framework for Information Management includes Information & Communication domain that is to a certain extent related to these alignment dimensions. It is therefore interesting to investigate which of the existing BITA frameworks allow to deal with cultural and social alignment dimensions, which calls for a comprehensive state-of-the-art study in the BITA domain.

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