Beyond Enterprise Architecture Modeling – What are the Essentials to Support Enterprise Transformations?

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Abstract: In recent years, many different modeling techniques and languages were developed in order to allow for an efficient and appropriate enterprise architecture management (EAM). Recently, EAM is no longer only seen as a means to ensure business/IT alignment but further as a means to support fundamental changes of the organization, often called enterprise transformation (ET). In a joint project with a group of practitioners we aim at developing a framework that provides guidance on how EAM can support such ETs and thus leverage the benefit of modeling. Our design results after more than one year of research reveal different types of EAM, areas of action in ETs and ET activities that can be supported by EAM. The findings show that modeling techniques or languages should focus on constructs like transitions, benefits or risks in order to increase their value for ET support.

1 Introduction

While enterprise architecture (EA) describes the fundamental structures of an enterprise, EAM is concerned with the establishment and coordinated development of the EA in order to consistently respond to business and IT goals, opportunities, and necessities [Op11]. Core of EAM are manifold modeling techniques and models that document and consolidate the relevant information and allow for understanding cross-company relations [La13; St12; WF07].

In recent years, many different modeling techniques and languages were developed in order to allow for an efficient and appropriate EAM (e.g. the Archimate language as a standard [Op12] or vendor dependent languages). The traditional task of EAM is providing guidance on the achievement of business to IT alignment [BY07], many frameworks aiming at this task exist (e.g. TOGAF [Op11]). However, EAM increasingly claims to support tasks that are beyond traditional and often limited business to IT

alignment challenges. One major example is the support of complex and large scale changes in an organization.

These changes, often called enterprise transformations (ET), are not routine since they substantially alter an organization's relationships with its key constituencies like customers, suppliers or regulators. ETs may result in new value propositions, they may provide old value propositions in fundamentally new ways or they may change the inner structure of the enterprise [RB06]. Examples are transformations of the business model [As11], mergers & acquisitions [JM00] or introductions and replacements of enterprise information systems [BSS10; HTW97; SL99]. Many transformations fail for a variety of reasons [Ko95; SL99] like underestimated technical complexity, or lacks in either portfolio or benefits planning [FB12].

For these reasons, EAM is believed to support the management of ETs [ABA09] by guiding the necessary coordination efforts [AAL12; HPK09; PNL07] and providing information for management support or strategy development [ABA09]. IT is often an important part of the ET but further aspects are as important or even more important.

Thus, in the research project that we conduct with partners from corporate practice, we aim at investigating what the important parts of managing an ET are and how they can be supported by the models and techniques that EAM provides. Thus, we are guided in the project by the following research question:

RQ: How can the management of enterprise transformations be supported by EAM?

We proceed as follows: We present related work that explores the link between EAM and ET management (ETM). We go on with presenting our design approach and provide a brief description of the current work status concerning our designed framework. In section five we discuss the achieved state of work and conclude with a summary and implications for future work in the last section.

2 Related Work

Winter et al. [Wi12] illustrate the relation of EAM and ETM. Their main findings show that current EAM is primarily conducted in the IT and operations departments (whereas ETM is often part of the business departments), EAM primarily focusses on current and target states (whereas ETM focusses on the process in between these states) and EAM requires experts with analytical experience (whereas ETM requires people with very mature communication and politics skills). Keller & Price [KP11] take a managerial perspective and include "architect" as one of five transformation stages (within "aspire", "assess", "act" and "advance"). They describe activities like breaking down the transformation initiative into a manageable portfolio, identifying skills or setting up formal reinforcement mechanisms as part of the "architecting".

Authors that deal explicitly with EAM identify similar potentials. Harmsen et al. [HPK09] propose to use EAM as a governing function in order to streamline a

portfolio of transformation steps that need to be well aligned in order to be successful. The authors consider EAM suitable to ensure this – especially in areas like strategic direction (investigate alternatives), gap analysis, tactical planning (identify intermediate milestones), operational planning, selection of partial solutions, e.g. based on standards [BY07], or solution crafting (which describes the identification of tasks in projects). Radeke [Ra11] discusses, how EAM can contribute to the strategic change process. He finds that EAM has the potential to improve the strategic fit of an enterprise with its market environment, to improve business/IT alignment, and to improve the preparedness for change through standardization and modularization of the respective enterprise. According to Pulkkinen et al. [PNL07] EAM allows groups to interpret the related issues for their purposes. The guidelines and principles agreed on with the collaborative EAM work facilitate plans and designs for interoperability and synergy of systems.

Focusing on a modeling perspective, Aier & Gleichauf [AG10] describe what is necessary in order to not only model to-be and as-is states but to model the transformation between these states. They describe different types of necessary intermediary transformation models. Steinhorst et al [St12] describe an approach that allows for an analysis of models on a structural and semantic level. The approach allows for a detection of weakness and best practice patterns concerning transformations in existing models. McGinnis [Mc07] provides conditions that models need to fulfill in order to be used in ETs. He claims that such models facilitate the education of employees and can be used as a foundation for large-scale IT implementations (like ERP or CRM systems). In addition they can be used to predict how the enterprise reacts to future scenarios or assess alternative processes, customer or supplier relations. He further states that such models need to be based on syntax and semantics that are driven from a business and non-IT implementation perspective.

Summarized, EAM is considered to have a high potential to support ETs. Lots of research about EAM is conducted and many practitioners are dealing with the topic. So far, however, EAM is mostly concentrating on business/IT alignment issues. Evidence for these problems can be found in the formal specifications of the EAM frameworks currently available. For example the content meta-model of TOGAF [Op11] is comprised half of IT related and half of business related elements. Other aspects beyond business/IT alignment that may be relevant to ET, e.g. skill development or role definitions, are less explicitly illustrated. Identifying these aspects and opening up the field of ET for EAM and its modeling core would leverage the manifold research in the modeling domain.

Thus, together with consortia partners, we aim at designing and consolidating a framework that prescribes where and how models and techniques from EAM can support the management of enterprise transformations. Such a framework aims at bringing together the ET and the EAM perspective and it aims at alleviating communication defects between the stakeholder groups involved.

3 Research Design

In the paper at hand we focus on the description and discussion of the design research process [Pe07]. Our research approach follows the general design cycle idea as introduced by Hevner et al. [34] and particularly follows the more recent understanding of design science that assumes alternating core activities of design and evaluation within one and the same cycle [WA12].

3.1 Research Setting

We conducted the design process in a consortium of researchers and practitioners [OO12] that met four times during the years 2011 and 2012 in order to develop the framework and to apply it within their organizations later on. The group was comprised of eleven experts being employed with seven organizations located in different industries (public sector, insurance, utilities). The participants had long-time experience in their domains and access to further experts within their companies [OO12]. Table 1 provides an overview about participants and their organizations.

Table 1**.** Design Partners

Company	Industry	Informants
A	Insurance	Head Enterprise Architecture IT Project Manager
B	Insurance	Head of IT Service Management Head of Enterprise Architecture
C	Public Sector	Head of IT Strategy
D	Utilities	Enterprise Architect
E	Insurance	Head of Enterprise Architecture Data Architect Enterprise and Data Warehouse Architect
F	Utilities	Enterprise Architect
G	Insurance	Vice President Enterprise Architecture

The meetings contained four major elements: First, keynotes in which one of the informants reported about practices from his organization. Second, external input by experts that where not participating regularly in the meetings but could provide the core group with new and challenging perspectives – we especially invited external experts to avoid biases and to ensure reliability. Third, academic input: the researchers presented findings and implications from theory. Finally, workshop sessions: the participants were asked to conduct different tasks and discussions moderated and supported by the research team. The meetings usually took two days.

In the time between the meetings with the practitioners, our research team conducted internal workshops and discussions in order to provide input to the practitioners. In order

to avoid biases for the design decisions by the research team, one person – similar to the external experts in the practitioner workshops – was taking the role of a devil's advocate [HE77] and thus purposefully provided an opposite opinion.

3.2 Design Process

The process itself contained four major iterations. In a *first iteration*, we identified the problem as stated above and ensured its relevance during discussions with the partners. Thus, EAM is perceived to support ET, but current approaches seem not to be fully sufficient to achieve this goal due to their focus on business/IT alignment. We conducted a first design-cycle in the research team where we surveyed the EAM knowledge base for appropriate kernel theories in order to allow for an approach "informed by theory" [Gr06]. Based on its explicit link to transformation and the focus of the project, we identified the body of knowledge about dynamic capabilities as a very helpful means. Barreto [Ba10] summarizes a dynamic capability as "the firm's potential to systematically solve problems, formed by its propensity to sense opportunities and threats, to make timely and market-oriented decisions, and to change its resource base." Teece [Te07] subdivides dynamic capabilities into the areas of sensing, seizing and transformation and thus includes the fundamental change as core. Abraham et al. [AAW12] consider EAM as a dynamic capability and thus link the areas of ET and EAM on a sound theoretical foundation. According to Abraham et al. [AAW12] each type of change needs a different type of EAM: A fast but lean type for unpredictable changes and a rather traditional type of EAM for planned changes. We further distinguished the traditional type into a business-related and a rather IT-focused type of EAM since these are the ones regularly mentioned in theory (e.g. [La09]) or seen in practice like in our group of practitioners. We applied the wording and content used in the theories also for the discussions during the practitioner discussions. For example, the theoretical view helped to understand that transformation activities could be distinguished into sensing, seizing and actually implementing the changes.

The theoretical findings were discussed and further refined in the group of practitioners. Thus, with this step we were able to reduce the size of the relevant EAM knowledge base into smaller pieces, depending on which type of EAM should be considered in more detail.

In a *second iteration* we identified areas of action, where EAM potentially can support ETs. We first conducted this step openly in the group of practitioners to collect their experiences and perceptions. This resulted in four major areas: (1) *Rolls, skills & communication* deals with the question, which roles and skills are necessary during a transformation from the point of view of EAM and how communication with other stakeholders being involved in transformations can be improved. (2) *Governance & control* deals with the governance-processes that are necessary for transformations and can be supported by EAM. (3) *Planning & requirements management* is concerned with techniques and tasks that are relevant for planning ETs. The fourth identified area was (4) *organizational culture* that was considered to be an important context factor.

In the *third iteration*, we refined the results. For example, we considered the area of roles and communication. In the research team, we identified the kernel theory of boundary objects [DM12] as a helpful means to explain, how EA can foster the communication among different stakeholder groups. The theory shows that certain objects like models, commonly used frameworks etc. overcome barriers like different language between different areas of business or between business and IT. In the practitioner group boundary objects from the different companies were identified, e.g. capability maps, application landscapes but also more unusual objects like a project interaction room (a fixed room that is used to discuss a certain topic by different stakeholder groups).

While the design process up to this point was driven a lot by an architectural perspective on ET, we shifted the perspective towards a more business oriented approach in the *fourth iteration* by inviting external experts that deal on the one hand with a holistic transformation perspective and on the other hand with soft factors and a change-centered perspective. The overall goal for this meeting was to become more specific about activities that are necessary during transformations and could potentially be supported by EAM. We further aimed at integrating those in a consolidated framework. As a foundation we used the BTM^2 framework [UG12] that aims at covering the management of transformations, based on a holistic perspective. In the team of researchers we discussed, which of the given activities in the framework could be supported by EAM. In the next step, we handed over this discussion to the EAM practitioner group. In here, we even went one step further and asked, if EAM could support the transformation activities depending on the EAM type (lean, traditional, business) that we investigated in the first iteration. We conducted three cycles in total in this workshop session, in each cycle the groups were mixed again in order to ensure a direct evaluation of the findings (world-café method [Wo13]). As the result, some of the activities were marked as not supportable by any of the types, some only by one type and some by all three types of EAM. The overall design process that we conducted so far is illustrated in Table 2.

Table 2. Design Process

Iteration	Event	Meeting Program
1	Whole Group Meeting	• EAM for ET: Idea and Necessities (speech, researcher) • Exchange of experiences (workshop, all) • Consolidation of challenges and experiences (workshop, all)
	Research team internal discussion	• Learning from dynamic capabilities
2	Whole Group Meeting	• Identification of EAM capabilities for ET (workshop, all) • Mapping of EAM capabilities to solution areas (workshop, all) • Derivation of “areas of action”
	Research team internal discussion	• Learning from boundary objects

Iteration	Event	Meeting Program
3	Whole Group Meeting	• Architectural Support of ET – The perspective of transformation management (speech, researcher) • Boundary objects: roles, skills and communication (speech, informant) • Boundary objects: roles, skills and communication (workshop, all) • Controller and IT: the changing roles (speech, external expert) • Governance processes (speech, informant) • Governance processes (workshop, all) • EAM planning processes (workshop, all)
	Research team internal discussion	• Pre-consolidation of the framework
4	Whole Group Meeting	• BTM^2: Overview, development and application (speech, external expert) • Capability models as a management tool (workshop, all) • Value management as a connection to the business (workshop, all) • Change management: a practical view behind the scenes (speech, external expert) • Theoretical perspectives on culture and acceptance (speech, researcher) • Consolidating the Framework: Transformation from an architectural perspective (workshop, all)
	Research team internal discussion	• Refinement of the framework

4 Towards a Framework for the Architectural Support of Enterprise Transformations

In the following section we provide a brief overview of the results that we achieved so far with our partners in order to allow for an understanding of the framework.

4.1 Overall Structure

The main constructs in the framework are the identified types of EAM, the respective areas of action concerning ETM and the ETM activities that according to our research process (described above) can be supported by EAM. Like described above, we identified a lean type of EAM to deal with rather sudden transformations, a traditional type of EAM for planned changes concerning mostly IT issues and a business-related

type of EAM. The framework is further comprised of areas of action that can be supported by EAM during a transformation. These are “rolls, skills & communication”, “governance & control”, “planning & requirements management” and “organizational culture”. In order to deal with the complexity, each ETM activity belongs to one ET area of action but can, of course, be supported by more than one type of EAM. This is summarized in Table 3.

Table 3. Overall Relation

Transformation Activity	**EAM Type**			**ET Area of Action**			
	IT oriented EAM	Business oriented EAM	Lean EAM	Rolls, skills & communication	Governance & Control	Planning & requirements management	Organizational culture
Setup communication	X			X			
Establish communities of practice	X			X			
Manage training	X			X			
Orchestrate skills & disciplines	X				X		
Manage and measure principles	X				X		
Conduct lifecycle management	X				X		
Monitor change	X				X		
Develop roadmap plan	X					X	
Analyze cultural environment	X						X
Establish common language	X	X		X			
Conduct stakeholder management	X	X		X			
Establish transformation lifecycle	X	X			X		
Establish potentials for further benefits	X	X			X		
Analyze initial situation	X	X				X	
Develop integrated transformation plan	X	X				X	
Analyze needs & maturity level	X	X				X	
Develop detailed business case	X	X				X	
Manage requirements	X	X				X	
Define overall goals		X				X	
Develop high-level business case		X				X	

Transformation Activity	EAM Type			ET Area of Action			
	IT oriented EAM	Business oriented EAM	Lean EAM	Rolls, skills & communication	Governance & Control	Planning & requirements management	Organizational culture
Define KPIs and benchmark		X				X	
Plan benefit realization		X				X	
Perform 360° strategic risk assessment		X				X	
Define risk strategy		X				X	
Conduct program planning		X				X	
Manage program scope		X				X	
Assess change readiness		X				X	
Analyze & set cultural environment		X					X
Orchestrate skills & disciplines: propose experts		X	X		X		
Evaluate risk for transformation business case		X	X			X	
Manage communication and translation			X	X			
Review and evaluate results			X		X		
Conduct ex-post program alignment			X		X		
Conduct risk monitoring	X		X		X		
Manage communication	X	X	X	X			
Align with risk management	X	X	X			X	
Assess as-is capabilities	X	X	X			X	
Design to-be architecture	X	X	X			X	
Perform gap analysis	X	X	X			X	

Consider, for example, the activity “Manage Communication”. In the table above we can see that it was considered important concerning all three types of EAM and belongs to the “rolls, skills & communication” area of action. At the current stage of the research project, we aim at investigating, how EAM can support ETM in terms of currently available techniques and models. Thus, we discussed this issue in the workshop and documented the findings in a structured way. We used a structure that is similar to Bucher & Dinter [BD12] and the TOGAF framework [Op11]. The most important parts are the actual activities (what is done) and techniques (how is it done). Figure 1 provides an example of the “manage communication” activity.

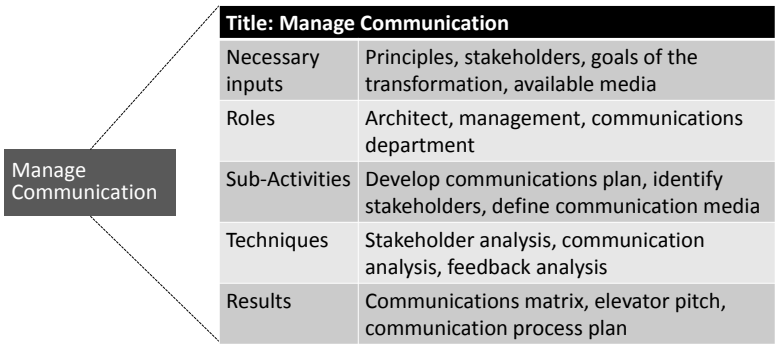

Figure 1. Example of an Activity

The example shows that transformation managers need inputs like principles, stakeholders etc. in order to successfully conduct the activity. EAM can offer support by e.g. using models that include the stakeholders and provide those to ET managers or, depending on how EAM is established in the organization address the stakeholders by themselves.

Summarized, the framework provides two degrees of abstraction: (1) The overview level with types and areas of actions shows where the EAM knowledge and models could be used in order to support ETM. (2) The concrete activities and the included details illustrate how EAM could be used in detail.

4.2 Framework Application

The proposed framework can be further customized for single organizations and the scope of the future EAM in the specific company can be determined. If e.g. a company has an EAM rooted in the IT department and dealing with IT questions only, the information that such EAM can provide are relevant for most transformations. However, the department should focus on supporting ET activities that they are familiar with (e.g. development of roadmaps). The situation is different, if EAM should be set up as an ET supporting discipline, rooted in the business departments. Further activities, like defining key performance indicators (KPI), should be considered relevant. These two examples illustrate that an incorporation of the framework differs on the concrete enterprise it is applied in. The artifact can provide guidance in both (and more) cases by providing direction on techniques and results that the EAM knowledge base can provide.

An implementation in one specific enterprise requires workshop sessions with the most important stakeholders in this organizational environment in order to get insights about necessary priorities and preferences.

5 Discussion

In the paper at hand we ask, how important parts of managing enterprise transformations can be supported by EAM and thus, how the potential of the manifold existing modeling techniques and languages can be leveraged in a promising field.

Our research shows that EAM can provide useful inputs to the management of transformations – not just business/IT alignment but also business/business alignment. In the group discussions it became clear that "the business" is not a monolithic unit and their interests are heterogeneous. The term business to business alignment might be sufficient when it comes to transformations. It became clear during the discussions that certain transformation activities are supported rather natively by EAM. These are characterized by a utilization of "native" EAM outputs like risk assessments, IT-application landscapes etc. Concerning these activities it is straight forward for EAM to support the ET and provide appropriate models.

Concerning other ET activities, EAM has a high development potential in order to become a supportive means. Such activities can be the support of staffing (by providing capability and skill information on an employee level) or establishing a common language crossing organizational boundaries (e.g. by providing catalogues or corporate languages). Further, EAM could focus on the assessment and modeling of benefits that certain stakeholders want to achieve during the transformation. Such models could support the early identification of conflicts.

Some activities that ET management needs to conduct however, are hardly supported and will be hard to support by future EAM. These are especially related to psychological aspects like management of employee's perception of work or further ones. Modeling such aspects might be an interesting future field for the development of new modeling languages and techniques.

The field of enterprise transformation seems to represent a significant potential for modeling research. So far, most languages focus on the different states during an ET. What is still lacking are approaches that allow for modeling the transformation itself, including factors like risks, benefits and other critical issues. When conducting a search on modeling and transformation literature on Google Scholar, most approaches found focus on transforming models by themselves. Solid work on specifics of transformations and their documentation are underrepresented. This offers an interesting and relevant field for future work.

Apart from the potential that new modeling languages or methods might have, the existing ones could be leveraged further by understanding the activities that are conducted during transformations and the capabilities that are needed. The results of the first design iterations that we present in this paper could be a helpful means for practitioners in order to identify, which activities they might be able to support with enterprise models. In consequence, the framework provides guidance where "self-marketing" activities can be applied or in which areas the internal EAM approach could become improved.

6 Summary & Conclusion

In the paper at hand we presented results from a research project that aims at the development of a framework for the architectural support of enterprise transformations. We focused on the presentation of the design process itself and presented some of the recently achieved results.

Of course, some limitations occur. Some colleagues might consider the lack of a one-time large-scale evaluation of the presented artifact. Nonetheless, due to the chosen one-cycle approach of design science research, the single steps were evaluated intermediately and immediately during design. Thus, the validity and reliability of the artifact is ensured. In addition, two of the research partners are planning to incorporate a version of the framework in their companies. We will report on the experiences in future work. We are aware that the details presented in the paper at hand can only be part of the whole artifact description and result. However, such reduction is necessary due to space limitations and the current state of the project. The industry mix of the research partners might also have an influence on the result. Nevertheless, not only partners that are primarily dealing with information (e.g. banks or insurances) but also more production oriented companies like utilities participated.

The next steps in the research process will be a more detailed catalogue that includes, how exactly (e.g. by which EAM artifacts) the identified ET activities can be supported. Further we aim at identifying context factors that lead to favor one introduced EAM approach over the other.

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