

TOWARDS A CONCEPTUALIZATION OF ARCHITECTURAL SUPPORT FOR ENTERPRISE TRANSFORMATION

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Abstract

Enterprise architecture management (EAM) is supposed to be a helpful means to support the management of enterprise transformations, i.e., fundamental changes. However, in current corporate practice, there seems to be no regular application of EAM as leading authority or support service for enterprise transformation. Thus, we examine, which activities need to be conducted in order to manage enterprise transformation. We further identify the needed information inputs for these activities. Based on this foundation, we analyze, which of the information inputs can be provided by EAM. We identify eight major activity areas of enterprise transformation management (ETM). We further identify information inputs that these ETM activities need. Additionally, we identify content elements that EAM can provide by analyzing EAM meta models. Comparing the demand by ETM and the supply by EAM shows that EAM in general provides valuable inputs to the ETM activities but shows weaknesses when it comes to information about individual actors or environmental information. ETM information needs that are strongly supported are e.g. organizational goals, roles and actors. ETM information needs that are weakly supported are e.g. organizational culture, resistances or organizational rituals.

Keywords: *Enterprise Transformation Management, Enterprise Architecture Management, Literature Survey*

The original publication is available at:

Labusch, Nils ; Winter, Robert: Towards a Conceptualization of Architectural Support for Enterprise Transformation. In: Proceedings of the European Conference on Information Systems (ECIS) 2013, 2013. - ECIS 2013. - Utrecht, NL.

1 Introduction

While enterprise architecture (EA) describes the fundamental structures of an enterprise (e.g. company, government agency), EA management (EAM) is concerned with the establishment and coordinated development of EA in order to consistently respond to business and IT goals, opportunities, and necessities. According to the Open Group (2011), the notion of EAM goes beyond EA modeling and includes the management tasks of planning and controlling business and IT change from the afore mentioned enterprise-wide perspective.

From time to time, enterprises need to pass through major transformations that are not routine “but fundamental change that substantially alters an organization’s relationships with one or more key constituencies (Rouse, 2005)”. Enterprise transformation (ET) can involve new value propositions or change the inner structure of the enterprise. Further, ET could involve old value propositions provided in fundamentally new ways (Rouse, 2005). Examples are significant mergers & acquisitions, replacements of legacy IT systems or business model changes (Uhl & Gollenia, 2012).

EAM is believed to support the management of such ET’s (Asfaw et al., 2009) by guiding the necessary coordination efforts (Pulkkinen et al., 2007; Harmsen et al., 2009; Abraham et al., 2012) and providing information for top management support or strategy development (Asfaw et al., 2009). EAM can further prove useful as a discipline that provides necessary support for communication during transformations since it can provide EA models and principles that are understandable by manifold stakeholders (Asfaw et al., 2009). EAM is also supposed to support necessary decision processes on manifold hierarchical levels (Asfaw et al., 2009) and is able to provide design principles that safeguard the transformation process and restrict design freedom in a purposeful manner (Hoogervorst, 2009; Greefhorst & Proper, 2011).

However, in current corporate practice, there seems to be no regular application of EAM as leading authority or support service for transformations – even more, Lankhorst (2009) considers the term ‘architecture’ and the role of the ‘architect’ as heavily overloaded and facing serious inflation. Asfaw et al. (2009) state that EAM has kind of an “image” problem, since as soon as people use the word enterprise architecture, “eyes start to roll”. Possible reasons are that EAM is considered to be a discipline that is located in the IT departments and mostly about IT (Winter et al., 2012a). In addition, the coordination support by EAM currently performs worse than expected (Abraham et al., 2012). Concluding, there seems to be a difference between the information that EAM offers and the demand that transformation managers have.

When talking to architects, we often experience that, on the one hand, architects do not clearly know how to support ET managers – and on the hand these managers are not aware, how EAM might support their effort. While current research usually analyses, how EAM can support ET, we first need to understand, what ET managers need as inputs for their decisions in order to lead transformations. Subsequently, we can analyze, if EAM can offer this information and thus provide a first step towards a detailed conceptualization of EAM support for ET. This leads to the research question:

RQ: Which management activities of enterprise transformation can be supported by EAM?

In order to answer the question, we proceed as follows. We first introduce related work and go on with illustrating our research approach. We present the results and provide a discussion. We close with a summary and implications.

2 Related Work

Many partial problems within ET can be addressed by EAM. Harmsen et al. (2009) propose to use EAM as a governing function for ET since a portfolio of transformation steps needs to be well aligned in order to be successful and EAM has the potential to ensure this. The authors see potentials

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 (Boh & Yellin, 2007) or solution crafting (identify tasks for projects). Radeke (2011) discusses, how EAM can contribute to the strategic change process. He claims potentials of EAM to improve the strategic fit with the market environment, business-IT alignment and the preparedness for change by standardization and modularization of parts of the enterprise. According to Pulkkinen et al. (2007) who are focusing on the coordination capability of EAM, “EA enables groups to interpret the related issues for their purposes. The guidelines and EA principles agreed on and mediated with the collaborative EA work facilitate plans and designs for interoperability and synergy of systems.” Lankhorst (2009) points out that due to IT-driven transformation the scope of EAM changes from single enterprises to a business network point of view which fosters concentrating on roles rather than actors and linkages between the network partners. Therefore, the architect needs to be firm with communication and negotiation with different stakeholders in order to be beneficial for the enterprise.

There is a certain stream of research that discusses benefits of enterprise architecture without a focus on ET. Foorthuis et al. (2010) identify for example benefits when it comes to the achievement of key business goals, management of organizational complexity, integration and standardization, communication or project success. Lange et al. (2012) identify artifact quality, infrastructure quality, service quality, culture and use of EA as major success factors. However, they do not distinguish, which of these benefits are explicitly linked to transformation.

In order to provide a more holistic overview of the ET support by EAM, Asfaw et al. (2009) divides ET into three categories (communications, management support and structure as much as process). Within these categories they identify success factors like communications, stakeholder involvement and guided application development. However, the authors conclude that architecture as such cannot cope with all challenges and e.g. change management is also needed. Winter et al. (2012a) discuss how EAM and ET management (ETM) differ and what both have in common. Especially the to-be designs and change project roadmaps that EAM creates, are seen as an integrated implementation component and input for ET. However, neither Asfaw et al. (2009) nor Winter et al. (2012a) identify necessary management activities that guide transformations before analyzing its support by EAM.

Summarized, related work focusses on how EAM can support ETM from an EAM point of view (e.g. Pulkkinen et al., 2007; Harmsen et al., 2009; Lankhorst et al., 2009). The demand perspective (e.g. transformation managers) of ET is not available in the current discussion. We investigate, which information inputs the demand side needs and elaborate, if current EAM is able to provide them.

3 Research Approach

In order to assess, which ETM activities can be supported by EAM, we need to identify those. Since no existing source explicitly provided the activities and the necessary information inputs, we applied a structured literature search process. We applied the guidance given by Webster and Watson (2002) in order to avoid reinvestigation of already known and thus increasing rigor and relevance of the research (vom Brocke et al., 2009). In line with Elliot (2011) we had to be strict with our search terms since a huge body of literature from academic and non-academic sources is available in the topic area. Hence, we concentrated our search on top journals of information systems, management and organizational science based on the Jourqual ranking (Schrader & Hennig-Thurau, 2009) and the AIS basket of eight in order to include the mature and established knowledge. We further conducted a database search in the major management databases (Web of Knowledge, Springerlink, Ebsco) to include more recent or practise-based sources. We further added specific journals and conferences (e.g. “Journal of Enterprise Transformation” or the PRET conference proceedings) to the survey. We identified articles in the journals based on the title keyword “transformation” and in the databases based on the title search term “(organizational OR strategic OR business OR enterprise OR corporate OR large-scale) AND transformation AND management”. Based on the abstract we decided if the article was relevant

concerning the research goal. Our search revealed 561 articles in total and 85 articles for further analysis.

We started with the identified research papers and used the software ATLAS.ti to assign codes for identified ETM activities. We consolidated 271 codes during multiple iterations based on their semantic similarity (Bailey, 1994). We further identified information objects that are input of these groups. We reflected our consolidated activities using two ETM frameworks (Baumöl, 2008; Uhl & Gollenia, 2012) to ensure validity and reliability. When the frameworks added activities or information inputs that did not emerge from the other data, we added those.

In a second step, we conceptualized the information inputs that EAM can provide to the ETM activities. We started our conceptualization with the content meta-model of TOGAF (TOG, 2011) because it is a mature industry standard that on the one hand is maintained by companies and research partners and on the other hand is used as a foundation for many corporate EAM frameworks. The meta-model provides a conceptual overview of the information that EAM can provide without being on the level of detailed individual reports (like capability maps or application landscapes) and thus allows for a more generic discussion. Again we ensured reliability and validity by comparing the identified content elements with other meta-models like ARCHIMATE (TOG, 2012), GERAM (Bernus & Noran, 2010), Zachman (Chen & Pooley, 2009), DODAF (DoD, 2012) and IEEE (IEEE, 2000). We further conducted an additional literature review in order to include latest developments of EAM. We considered the same sources like in the first step (including additional EAM specific journals) but applied the keywords “(enterprise or business) and architecture” in the journal title search and “Abstract: (literature or survey or review) and Title: (enterprise or business) and architecture” in the database search. In the latter we focused on literature surveys on EAM in order to efficiently identify relevant concepts. The search revealed 55 relevant articles for further analysis.

After identifying the needed information inputs of ET and the available information outputs of EAM, we mapped both in a third step. Major challenges were the different languages apparent in both disciplines that inhibited a straightforward one-to-one mapping. Therefore, we first decided based on the meta-model specification and additional literature, which of the information that EAM can provide is part an ETM information need. We afterwards analyzed by checking back with the ET literature, if the information provided by EAM is sufficient to satisfy the requested information input of the activity or if additional information besides EAM is necessary. We rated this on a five point scale ranging from one “ET activity almost not supported by EAM” to five “full support”.

4 Results

4.1 ETM Activities and Inputs

We identified eight major groups of ETM activities: *ET Meta Management* includes the management of the ET itself. It includes activities like managing the overall process and governance, identifying transformation drivers, managing risks and communication (Kotnour & Bollo, 2011). *ET Performance Management* includes the financial performance but also additional progress and performance control (Ward et al., 2012). The *ET Strategy Management* deals with the conformance of the ET with the corporate strategy (Uhl et al., 2012). The *ET Execution Management* includes the overall project and program management of the ET (Rosemann et al., 2012). Furthermore, identifying unplanned issues and stable intermediate steps is part of this group (Baumöl, 2008). *ET Human Resource Management* is concerned with managing the employee’s skills and concerns (Fry et al., 2005) during the ET. It needs to take care about cultural issues (Morgan & Ogbonna, 2008) and training of necessary skills (Pimmer et al., 2012). *ET Information Technology Management* takes care of managing the transformation of the IT landscape (Basole et al., 2012), while *ET Structure Management* is concerned about the horizontal structure in terms of processes (Caverlee et al., 2007) and the vertical structure in terms of the hierarchy (Hellström & Peterson, 2006). *ET Relationship Management* is concerned with including customers (Madu & Kuei, 1994) and suppliers (Ashurst & Hodges, 2010) into the ET.

In figure 1 we illustrate the different activity groups and information needs of ETM. Whenever it is not especially mentioned the inputs are related to the transformation (e.g. “strategy” is the transformation strategy while “organizational strategy” is the overall corporate strategy).

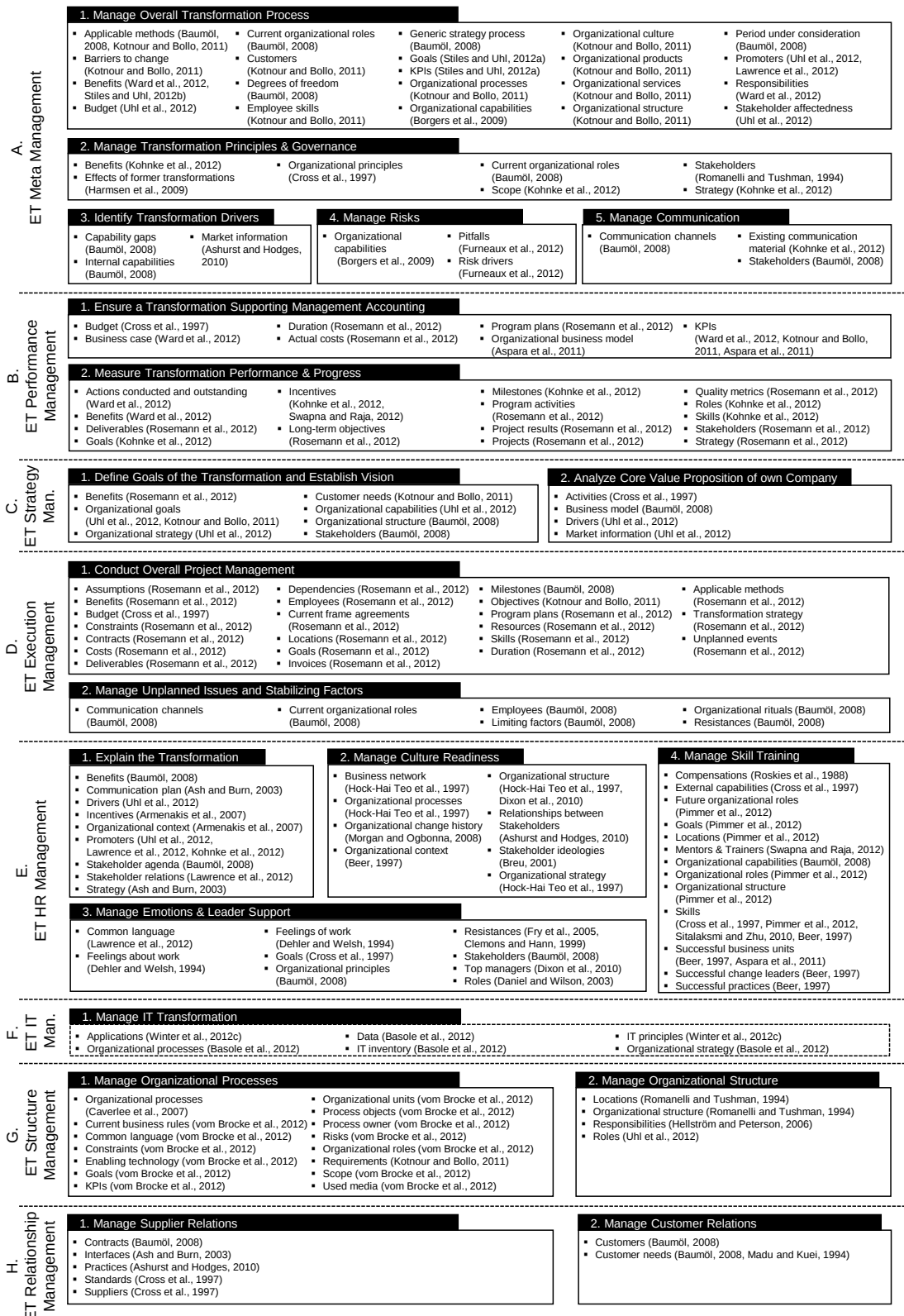


Figure 1. ETM Activities and Necessary Information Needs

4.2 EAM Outputs

After identifying the information inputs for the ETM activities, we illustrate, which information EAM can provide by following the basic structure of the TOGAF content meta-model (TOG, 2011). It contains general elements that are connected to all other elements in the meta-model in a one-to-one manner. The other elements are differentiated into business, data, application and technology architecture. We summarize the consolidated content elements in figure 2.

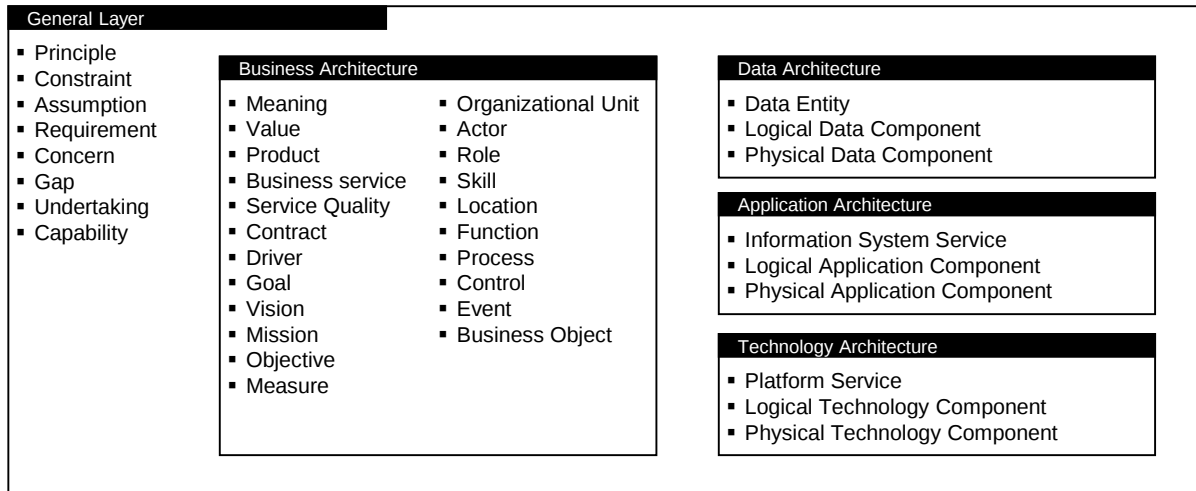


Figure 2. Consolidated EAM Content Elements

The general layer contains *principles*. Further it contains *constraints* like standards (Bradley et al., 2012) or common vocabulary (van der Beek et al., 2012). Included are *assumptions* that need to be taken, if validated information or objectives are not available at that point of time (TOG, 2011). *Requirements* express specific needs, based on their character. This also includes “critical success factors” that are explicitly modeled in the Zachman framework’s meta-model (Chen & Pooley, 2009). The concept of *gaps* needs to be understood in wider terms – according to the TOGAF definition, a gap provides “a statement of difference between two states (TOG, 2011)”. Thus, it includes further concepts like time, states, plans (Chen & Pooley, 2009) or scenarios (van der Raadt & van Vliet, 2008). We replace the concept of work packages by *undertakings* in order to cover different aggregation levels that other authors explicitly provide (e.g. projects (van der Raadt & van Vliet, 2008; Bernus & Noran, 2010) or programs (Winter & Fischer, 2007)). *Capabilities* are “a business-focused outcome that is delivered by the completion of one or more work packages (TOG, 2011)” and aggregated into “domains”.

The business architecture contains the TOGAF content elements *product*, *business service*, *service quality*, *contract*, *driver*, *goal*, *objective*, *measure*, *organizational unit* (includes further organizational refinements (Chen & Pooley, 2009)), *actor*, *role* (also covers stakeholders (IEEE, 2000) or performers (DoD, 2012)), *location*, *function*, *process* (including activities (Chen & Pooley, 2009)), *control* (including authority (Chen & Pooley, 2009)) and *event*. Based on the analysis of further sources we added *vision* (Chen & Pooley, 2009), *mission* (Chen & Pooley, 2009), *meaning* (TOG, 2012), *value* (de Kinderen et al., 2012; TOG, 2012) and *skill* (Chen & Pooley, 2009). Further information objects like business model and strategy (Mikaelian et al., 2011) or decisions (Chen & Pooley, 2009) are covered implicitly by combinations of existing objects.

The data architecture contains according to TOGAF (TOG, 2011) *high-level data entities*, *logical data components* and *physical data components*. The application architecture contains *physical application components*, *logical application components* and the *information system service* that directly automates parts of the business service. The technology architecture contains the *physical technology components*, *logical technology components* and the *platform service*.

4.3 EAM Inputs for ETM Activities

Based on the descriptions in the EAM meta-models and the ETM sources, we analyzed for each ETM information need the extent to which it can be provided by EAM. During this analysis, it became apparent that some ETM information needs can be (almost) fully provided by EAM, some almost not. A huge group can be provided partially. In figure 3 we provide an example for an ETM information need of each of the three groups (please contact the authors for additional material that could not be presented for space reasons).

ETM Information Need \ EAM Content Element																																								
	Principle	Constraint	Assumption	Requirement	Concern	Gap	Undertaking	Capability	Meaning	Value	Product	Business Service	Service Quality	Contract	Driver	Goal	Vision	Mission	Objective	Measure	Organizational Unit	Actor	Role	Skill	Location	Function	Process	Control	Event	Business Object	Data Entity	Logical Data Component	Physical Data Component	Information System Service	Logical Application Component	Physical Application Component	Platform Service	Logical Technology Component	Physical Technology Component	
Organizational rituals																																								
Promoters																						x	x	x																
Process owner																						x	x				x													

Figure 3. Example of ETM Information Needs and Related EAM Content Elements

Organizational rituals like illustrated above are not part of the content provided by EAM since they are usually hidden within the organization (Baumöl, 2008). Thus, EAM support for this information input is not possible. In order to identify *promoters*, EAM can partially support this process since it is able to provide potential actors, roles and skills that potential promoters need to have as an input for further in-depth analysis. However, it lacks information about the character of promoters and thus is not able to provide information about the final adequacy of the person (Kohnke et al., 2012; Lawrence et al., 2012). The situation is different with inputs like *process owners* (vom Brocke et al., 2012) – here EAM can fully provide the requested input. In figure 4 we summarize the findings of the mapping process, focusing on the information needs that can be well supported (rated five during the analysis) by EAM and those that can be less supported (rated one or two during the analysis).

Major Support by EAM		Minor Support by EAM	
- Applications - Benefits - Common language - Contracts - Current organizational roles - Data - Deliverables - Drivers - Employee skills - Employees - Goals - Interfaces - Internal capabilities - IT inventory - IT principles - KPIs - Locations - Long-term objectives - Mentors & Trainers - Milestones - Objectives - Organizational capabilities	- Organizational goals - Organizational principles - Organizational processes - Organizational products - Organizational services - Organizational structure - Organizational units - Process objects - Process owner - Program activities - Program plans - Project results - Projects - Quality metrics - Requirements - Responsibilities - Roles - Scope - Skills - Standards - Suppliers - Top managers	- Applicable methods - Communication channels - Compensations - Customer needs - Effects of former transformations - Enabling technology - Existing communication material - External capabilities - Feelings about work - Feelings of work - Generic strategy process - Incentives - Invoices - Organizational context - Organizational culture - Organizational rituals - Practices - Relationships between stakeholders - Resistances - Stakeholder affectedness - Stakeholder agenda	- Stakeholder ideologies - Stakeholder relations - Unplanned events - Used media

Figure 4. EAM Support for ETM Information Needs

Transferred to the identified activity groups (figure 1), the conducted analysis shows that EAM can contribute to each of them. However, the intensity differs (like illustrated in figure 3). Based on the meta-model descriptions, the areas *ET IT Management*, *ET Structure Management* and *ET Performance Management* are well supported and most of the necessary inputs can be provided by EAM. In the other areas we need to differentiate more: The *ET Meta Management* is well supported concerning governance, principles and drivers but rather weak supported when it comes to

communication management. Managing the overall ET process is well supported, however many necessary inputs are generated by other ET activities. The situation is similar for *ET Strategy Management* where EAM can provide central corporate goals and vision but additional information e.g. about culture is needed. In comparison to the former ones, ET Execution, HR and Relationship Management are less strongly supported. While in *ET Execution Management* the project management is well supported, there are lacks in identifying unplanned issues and stabilizing factors. In *ET HR Management* the activities about management and training of skills are very well supported, however, gaps are apparent when it comes to explaining the transformation, ensuring leadership support or ensuring organizational culture readiness (e.g. when ideologies of stakeholders need to be known). In the area of *ET Relationship Management*, EAM can contribute by providing e.g. lists of the stakeholders. Gaps occur when it comes to concrete relations or practices that emerged over the time.

We based the former results on investigating if the meta-model elements contribute to providing the necessary ETM activity input. This reveals some meta-model elements that are more important for ET support than others. Especially knowledge about actors, roles and processes is needed for almost half of all transformation activities that we identified. Sometimes they are directly requested (e.g. in terms of employee lists), sometimes in combination with the general EAM elements like principles or constraints. Elements that are less often needed are constructs like drivers, meaning or the especially IT-related elements like physical application or technology components. However, how often the elements are used does not imply information about their importance.

5 Discussion

The findings in general show that EAM has the potential to support the management of ET or even to manage parts of ET by itself. This support is not limited to the traditional area of business-IT alignment but rather focused on the general layer and the business architecture (see figure 2). Our results further show that there are some information components that EAM can provide with comparably low efforts since the relevant information output exists directly and is maintained regularly (e.g. goals or roles). Other information inputs need more analysis by the architects in order to be a valuable input to the requesting ETM activity.

Activities that are well supported by EAM share some commonalities: First, they do not focus on individuals (e.g. individual agenda, resistances) but cover a broad perspective (e.g. IT landscape, skillset within the enterprise). Activities that take a narrower focus would be better supported by other disciplines like human-focused management or psychology. Second, the activities have a strong focus to the internal perspective of the enterprise. They are about the hierarchies, structures, existent IT foundation, etc. Therefore, information that needs to be collected outside the company like market opportunities, enabling IT opportunities, external capabilities offered by outsourcing providers, etc. are not part of the current EAM portfolio. Such external information is comparably hard to collect for EAM (due to the limitations in the meta-models) and thus should be rather conducted by other disciplines like corporate marketing departments or special projects that sense for such information. Third, EAM mostly supports ETM activities that are based on formal requirements. Inputs that are related to informal or cultural aspects are usually not supported and provided by EAM.

Having these theoretical potentials, the identified mismatch of EAM supply and ETM information demands surprises. The reasons might be that the theoretical potentials of EAM are not yet realized in practice (thus EAM departments are focusing on aspects that are not that much relevant for ET). Further, we were surprised that the meta-model does not include an element like “methods” that formalizes the method support and guidance which EAM could provide to ETM. We would expect that enterprise architects can especially provide this input to the ETM because they are familiar with manifold methods and frameworks. Furthermore, explicit communication channels are not part of the EAM meta-models. Therefore, on the one hand, the architect is considered to be in need of communicating the transformation (Asfaw et al., 2009; Winter et al., 2012a). On the other hand such communication is difficult since the formal support in the method is weakly given.

6 Summary & Implications

We discussed which ETM activities EAM can support. We contribute a detailed literature survey to identify ETM activities and the needed information inputs in order to understand, what ET actually is comprised of and to provide a solid foundation for further research in the topic area. We further provide a consolidated overview of EAM outputs. The results of our comparison show that EAM in general is well-suited to support the different ETM activities (especially concerning ET performance management, ET IT management and ET structure management). However, EAM is lacking support when it comes to activities that need input focusing on stakeholders' individual needs or activities that need inputs that deal with the environment (e.g. market or regulation) of the transforming enterprise.

Some limitations became apparent during the research project. The meta-models reflect the information that current EAM can provide but do not integrate specific further potentials for topic areas that EAM could additionally cover. We took mitigation steps for this limitation by including additional EAM literature during the mapping procedure. Further, we considered EAM as much as ETM as two monolithic blocks and did neither differentiate different types of ET (e.g. business model change vs. large-scale IT replacement) nor different types of EAM (e.g. strategic vs. IT-driven). We also did not compare ETM and EAM based on the relations between the activities or information components. In the paper at hand, we concentrated on the core concepts by themselves. Therefore, the paper at hand is a foundation for further iterations that include the differentiation of different ET situations and relations. We concentrated on EAM's potentials to support ETM and did not discuss the question, if the inputs currently are provided by EAM, or why they are not provided. Now that we reduced the overall complexity of the field by identifying the potentially supported activities and providing the conceptual foundations in this paper, further research can be conducted in terms of surveys that elaborate on the actual EAM support of ET as much as success and hindering factors.

The inputs that EAM can successfully provide should be maintained by architects with priority when striving after supporting ET. The ET manager further should request such information from the company's architects since they can provide it with relatively low efforts. In contrast, architects should carefully consider whether to provide information inputs that EAM supports less strong. It might make more sense to concentrate on the strengths in order to shape the service of EAM within the company.

Acknowledgement:

This work has been partially supported by the Swiss National Science Foundation.

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