Towards Process Orientation in Enterprise Architecture Management

Philipp Gringel[1], Jürgen Sauer[2] and Ulrike Steffens[1]
[1]*OFFIS – Institute for Information Technology, Eschwergeg 2, 26121 Oldenburg, Germany*
[2]*Department of Business Engineering, Carl von Ossietzky University of Oldenburg, 26111 Oldenburg, Germany*

Keywords: Enterprise Architecture Management, Process Management, Tool Support.

Abstract: In present Enterprise Architecture Management there is a conceptual gap between very complex methodologies on the one hand and usually methodology-agnostic query-based tool support on the other hand. As a result, Enterprise Architecture Management is often unable to tap its full potential. Issues for possible improvement are described in this paper. We postulate the hypotheses that the indicated deficiencies can be corrected by using EAM tools which consider and model EAM methodologies and their underlying activities as processes and are able to actively manage, steer and support these processes. Initial architectural considerations for such a tool as well as a corresponding research roadmap are presented.

1 INTRODUCTION

During the past decade, many enterprises started to implement enterprise architecture management (EAM) (Lankhorst, 2005) to tackle increasing complexity and to better align their IT with their business (Henderson and Venkatraman, 1993). Since then many software products targeting the support of EAM have penetrated the market (Matthes et al., 2008). The purpose of those tools is to document and, in particular, to interconnect the different layers (Winter and Fischer, 2007) of enterprise architecture within a (potentially distributed) database. Different stakeholders of EAM can then query this database according to their respective roles.

To turn EAM into a valuable building block of business success, however, a sound methodological knowledge is required, which describes how to construct, use, assess, and continuously improve enterprise architecture. Several frameworks like for example TOGAF 9 (The Open Group, 2009) convey such methodological knowledge. Yet, the underlying material is often too comprehensive and diverse for a direct and intuitive utilization by enterprise architects. Furthermore, it is a consequential characteristic of such frameworks, that they have to be customized to properly fit a specific enterprise's context before they can actually be used. Against this background, today's EAM tools are suitable to solve partial EA problems in form of specific queries and simple workflows. Beyond, EAM tool usability is restricted to experts who have external knowledge about EAM methodology and underlying processes which are not implemented and supported by the tools.

At the same time, today's enterprises put a stronger focus on managament of business processes (BPM). One reason for this trend is that modern business process management systems (BPMS) enable the modelling and analysis of business processes as well as their straightforward technical realization, which integrates already existing IT applications by means of so called connectors. In most cases, a specific class of processes, for example customer relations management (CRM), is initially transformed with process orientation in mind (Hippner et al., 2004). More and more frequently, however, it can also be observed that BPMS represent an important component of enterprise-wide IT architecture (Slama and Nelius, 2011).

This paper motivates how a process-oriented view on EAM and in particular a technical support of EAM processes in EAM tools, can help to reduce the gap between EAM methodology on the one hand, and tool support for EAM on the other hand. The potential overhead costs caused by a BPMS, e.g. a person has to spend time on the system to document her progress in the system, are expected to

Gringel P., Sauer J. and Steffens U..
Towards Process Orientation in Enterprise Architecture Management.
DOI: 10.5220/0004131101450151
In *Proceedings of the International Conference on Knowledge Management and Information Sharing* (KMIS-2012), pages 145-151
ISBN: 978-989-8565-31-0

be outweighted by the monetary savings produced on the EAM side by preventing an EA initiative to choose wrong paths.

We describe existing weaknesses of EAM tools and explain how these can be reduced or even be eliminated by an appropiate process support. We present an initial architectural design to which future process-oriented EAM tools may refer. Furthermore we come up with a roadmap consisting of several open research questions, the solution of which is either a prerequisite or an important contribution for adequate realization of process-oriented EAM tools.

The remainder of this paper is structured as follows: Section two lists issues of possible improvement for EAM, as it is conceived today. Section three elaborates on our idea of process support for EAM and emphasizes where and why this this process support has to be particularly flexible. A respective architectural design is initially sketched in section four. Before this paper concludes with section six, we present a roadmap of research activities that have to be carried out to adequate EAM process support.

2 ISSUES FOR IMPROVING EAM

Recent publications identify a number of still existing shortcomings in today's EAM practice. We've experienced similar issues in research activities as well as in consulting projects. The following subsections elaborate on these issues. Later, in section three, we get back to them and present approaches for possible solutions.

2.1 Insufficient Practices

(Lucke et al., 2010) summarize several EA weaknesses they have identified in literature. We partially follow their line of argumentation in this contribution. According to (Lucke et al. 2010) EAM initiatives often suffer from a lack of formality in their definition, realization, and maintenance. Potential for improvement in EA-/IT-governance is also attested by (Franke et al., 2010).

(Buckl et al., 2010) investigate EAM from a knowledge management perspective and come up with an example for this lack of formality. They state that the identification, collection, and maintenance of up-to-date EA data are addressed in sufficient detail only by few papers. How to practically gather EA knowledge is not clearly worked out and described yet.

In business reality, EAM turns out to be a laborious task. The inherent complexity is not only a result of internal organizational structures EAM initiatives have to conform to, but also of the constant change of the business environment (markets, regulations, technological innovations, …). The absence of precision and clarity goes beyond specific EAM methods. It impacts the scope of single work packages, which is often chosen too wide (Lucke et al., 2010) or defined only roughly, so that results are often too slow in arriving. Like this, the benefits of whole EAM initiatives might finally be put into question. To overcome this problem, EAM activity time schedules that yield for results within weeks instead of months are highly desirable.

2.2 Complex Coordination

Due to the very nature of of EAM, a new EAM initiative will typically have implications beyond the initiating department upon other enterprise divisions. The integration of different EA layers (Winter and Fischer, 2007), often reflected by corporate divisions, requires an increase in communication of the stakeholders involved (Lucke et al., 2010).

In this context, synchronization and alignment of enterprise architecture lifecycles with overall business management lifecycles, e.g. by the means of project portfolio management, are critical success factors of EAM (Kaisler et al., 2005). A consequent management commitment to EAM is essential to an EA program's payoff. As stated in (Lam, 2004), (Postina et al., 2009), and (Shah and El Kourdi, 2007) a lack of rigidity in the implementation of EA governance can finally even hinder EAM. For more other possible pitfalls in EA initiatives, we refer to (Addicks, 2011), (Armour et al., 1999), (Lam 2004), (Lucke et al., 2010), and (Seppänen et. al., 2009).

2.3 Lack of Measurability of EAM Success

The quality of an enterprise architecture and its parts should be objectively assessable utilizing metrics, to improve the quality step by step. Research has broght up approaches like (Addicks, 2011) and (Kaisler et al., 2005). In addition the assessment of the EAM initiative itself is crucial, because often the commitment of management and budget depends on a measurable success. Although there are research approaches leading in this direction (Gammelgård et al., 2007), in practice the assessment and the measurability of EAM success are still far from mature (Buckl et al., 2010).

2.4 Rigidity

A promising EAM approach is meant to be customizable to the specifics of the respective company. This requirement is often formulated but rarely met. It holds true for both the scalability of the enterprise architecture itself and the tool support where adaptability of tools is often lacking (Farwick et al., 2011); (Lucke et al, 2010); (Winter et al., 2010). Scalability, however, is a success factor, because an EA is expected to grow and mature over the years. Among others, (Kaisler et al., 2005) hold the pragmatic view that only crucial artefacts of EA should be actually documented. Best practices as (Buckl et al., 2008) can assist with the choice of artefacts.

3 PROCESS SUPPORT FOR EAM

Frameworks like TOGAF 9 (The Open Group, 2009), and other publications like for example (Engels et al., 2007) assume that EAM and its subtasks are knowledge-intensive processes (Steffens and Uslar, 2005). Nevertheless, it is usually assumed for EAM tool support that stakeholders use the tools to query the integrating EA repository, with at best tacit methodological EAM knowledge in their minds. Following this simple query-centric perspective, several research works focus on the integration of heterogeneous information sources within a company (Farwick et al., 2011); (Fischer et al., 2007), on the database's fundamental modelling concepts (Frank, 2002); (Iacob et al., 2009), on specific data analysis (Johnson, et al., 2007) and visualization of the results (Kruse et al., 2009); (Wittenburg, 2007), or on a combination of the above (Buckl et al., 2008). All in all, the question of "what" is clearly in the foreground of such query-based EAM tools and the related research. The shortcomings we have listed in section two, however, demand for also answering the question of "how", i.e. guidelines and detailed instructions for EAM are needed. Such guidelines can be made explicit by the structuring use of processes.

Since processes of many corporate divisions can be technically supported by business process management systems (BPMS), a potential benefit of process-oriented tool support can also be anticipated for EAM. The ability of accessing information in a standard EA repository as given by standard tools might hence be complemented by process control delegated to a BPMS. Yet, the shift towards process-oriented EAM raises a number of challenges with regard to the flexible process control in a BPMS-based support system. These challenges are described in the following subsections.

3.1 Flexible Process Modelling

In the same manner as the documented EA entities, EAM processes will differ in different enterprises according to the current state of the underlying EA and the enterprise-specific problems to be solved by EAM support. Hence, EAM processes managed by a process-oriented EAM tool will have to be adaptable to enterprises' particular characteristics. Therefore, a process-oriented EAM tool should not prescribe fixed EAM processes but can only provide process templates that are customizable using EAM-specific patterns (Buckl et al., 2008), complemented by blueprints or suggestions for adequate reports and visualizations.

3.2 Flexible Process Execution

As stated above, EAM processes can be regarded as knowledge-intensive processes, whose execution benefits from the knowledge of the executing stakeholders. Therefore, processes within a process-oriented EAM tool should be adaptable, at least configurable at runtime by their respective users (Dadam et al., 2011).

3.3 Flexible Process Schema

The process schema, i.e. the definition of an EAM process, has to be modifiable, because it can be expected that process flows will be improved over time in the sense of evolving best practices. These improvements have to flow back into the process schema for future process executions. Analogously to emergent EAM like proposed by (Buckl et al., 2009); (Matthes et al., 2011) for EAM entities, emergent EAM with regard to EAM processes is likely to develop.

3.4 Addressing Existing EAM Shortcomings

In section four, we will present an architecture design draft addressing the mentioned requirements. This draft is based on current available components and may serve as a manufacturer-independent blueprint for process-oriented EAM tooling. At the same time, it can be used to conceptually identify still existing technological gaps and hence to define

a roadmap with open research questions that we will elaborate on further in section five. Regardless of an implementation of the architectural draft, the process-oriented view on EAM contributes to the reduction or even elimination of the weaknesses that we have listed in section two, as we illustrate in the following.

- Precise Definition of Practices. In a process-oriented EAM tool, the respective EAM processes are unambiguously modelled and explicitly guide EAM practice. Stakeholders who execute a process can deviate from the process schema. Such deviations can later be channelized in methodological alternatives. The BPMS component for process support requires a detailed process modelling, which allows for a better and more realistic estimation of size and effort of single EAM tasks. This leads to work packages with an appropriate size and to manageable EAM processes.
- Coordination. The automated coordination of different process participants is an inherent functionality of BPMS and can be done both task driven and cockpit driven (Slama and Nelius, 2011), so that stakeholders from different fields of responsibility can be appropriately involved according to their individual workload. A BPMS cannot only support single process steps of EAM that are intense in communication but little creative, e.g. collecting data from a large number of stakeholders. It can also involve the management by explicitly relating documented IT entities with management entities and, possibly more important, by delivering proper information about the current state of running EAM process instances.
- Measurability. Using automatic process control, the measurability of an EAM function's success can be improved in different ways. First, an assessment of individual tasks can be integrated into the process schema as an inherent part. Second, against the background of the enterprise architecture as a whole, a periodical control of success can be established and supported as an independent higher-level process. Third, success control could utilize standard monitoring and logging features of the BPMS for statistical analyses.
- Flexibility. The above requirements are already essentials with regard to the flexibility of a process-based EAM tooling. They can to a great extend be met by the majority of currently available BPMS. However, this alone won't be sufficient, since it neglects the important aspect of EAM tool customizability to enterprise specifics. Therefore, architecture draft for a process-based EAM tool presented in section four does not only comprise a BPMS as execution platform, but complements it with additional components for more flexibility with regard to enterprise specifics, e.g. with a wiki system for EA entity and meta model evolution.

4 ARCHITECTURAL SKETCH

In the preceding sections, we motivated process support of EAM. This section presents an architectural draft of an enterprise architecture process management system (EAPMS, cf. figure 1).

EA processes as well as other business processes of the company are regarded as enterprise-specific processes. They are composed of one or more activities that are defined in a certain order, e.g. sequentially, and are carried out by persons and / or IT systems.

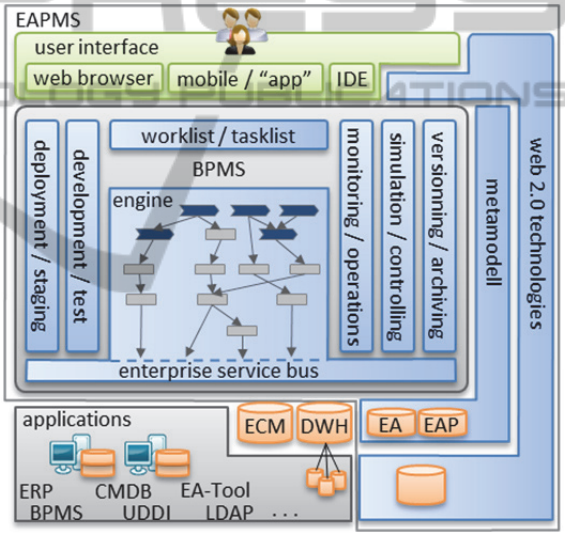

Figure 1: Architecture of an enterprise architecture process management system.

The core of the suggested EAPMS is a BPMS, which assists its users with the definition, development, and testing of processes. Some vendors (SAP, BonitaSoft, Inubit) of BPMS rely on BPMN as process definition language. BPMN models are more or less directly interpreted and executed by the BPMS's core, the engine. After development and testing of new processes, a suitable staging mechanism ensures the transition of the processes from a development via test into production (final deployment).

Running process instances can be monitored (addressing 3.4. bullet point three), which provides information on for example the number of processes

handled in parallel by the system, the number of ceasing processes, or the number of currently active process instances of a certain type (schema).

Processes can change during operation. Hence, the BPMS has to provide a means to modify process schemata during active operation. Process versioning can be used to have an engine executing different versions of the same process at the same time. From a given point in time onwards, only the latest version of processes is instantiated. Archiving mechanisms are useful to preserve access to older process versions and to learn from the execution of older processes (addressing 3.4. bullet point four).

A work list (or task list) informs a BPMS user about the tasks she has to fulfill to enable a specific process instance to progress.

The execution environment of a BPMS that is responsible for the order and coordination of service execution is called engine. Depending on the BPMS used, an enterprise service bus (ESB), more or less separated from the engine, allows to access systems that are not part of the BPMS. Services offered by those systems, e.g. data base operations, can be used in process orchestration.

Furthermore, BPMS can integrate human activities, which for example call for more complex decisions, into a process. Rules of delegation as well as for escalation can be applied (addressing 3.4. bullet point two).

In addition to the BPMS, a central meta model is a key component of the envisioned EAPMS. One part of the meta model describes the EA itself, the other part describes the processes to manage the EA (EAP). This meta model is defined in an enterprise-specific way and offers extension points to cover future EAM requirements. Hybrid Wiki systems (Buckl et al., 2009; Matthes et al., 2011), as representatives of "Web 2.0" technologies ("Enterprise 2.0" in Figure 1), offer the chance to intuitively involve stakeholders into the development and maintenance of the EA meta model. This ensures the meta model to remain relevant to the enterprise (addressing 3.4. bullet points one and two).

An EAPMS is a socio-technical system and as such, it explicitly takes the user into account as part of the system. Web 2.0 technologies may be used to create a stakeholder-specific user experience, since a uniform user interface is neither suitable for all possible roles, nor for all tasks. Mobile applications, "apps", deployed on smartphones that are for example used by managers to approve a process step while not in office impose different requirements than portals that are used to interact with the EAPMS using a web browser to finish tasks according to the work list. Process developers are used to work with an integrated development environment (IDE), which may raise yet other requirements. An IDE could also be utilized by the enterprise architect and his team so technically realize specific EAM processes within the EAPMS.

5 RESEARCH ROADMAP

During the conception of the architectural draft presented in the previous section, we identified several research activities that have to be conducted before process orientation in EAM can be successfully realized with support of an EAPMS.

We assume there are enterprises that already use a "classical", i.e. non-process-oriented, EAM tool which has to be integrated with our approach. Existing tools often provide either a rigid meta model or a minimal meta model, which has to be customized. The fact that an EAPMS contains an additional meta model raises the question how to deal with the most likely different models in both systems. Adequate alternative solutions would either be to also base EAPMS on the existing model, to migrate one model into the other or to dynamically map the elements of both models. The chosen solution should be able to preserve the flexibility of the EAPMS. The similarity of the meta models and the flexibility of the existing EAM tool could provide decision criteria for an adequate choice. Closely related to the question of model synchronization is the question of data storage. If the already existing EAM tool is the leading system for EA related data the EAPMS should be able to use this data without the need of replication. However, existing EAM tools themselves also often replicate data, which makes the synchronization of data more difficult. Current BPMS use connectors to easily access external systems, sometimes without programming effort. Analogously, special EA connectors could, on the one hand, ease the access to existing EA systems and, on the other hand, integrate special EA services offered by external systems into an overall EAM process. We predict different integration scenarios with the EAPMS depending on the meta model and the main focus of already existing non-process-oriented EAM tools.

When modelling EAM processes in an EAPMS, one has to weigh out, which activities can be supported effectively by such a system and which are potentially too "creative" and should take place without process support. We expect the support for

modelling and execution of ad-hoc processes to improve in future BPMS – a development from which an EAPMS would directly benefit. Regardless of that, it has to be investigated whether and how EAM processes differ from typical business processes in their specific characteristics. If there are fundamental differences, it has to be evaluated if existing process modelling capabilities are sufficient to define EAM processes and their specifics. Existing languages like BPMN 2.0 (Object Management Group, 2011) have to be evaluated in this respect and if necessary, "annotated" with EA specifics. Potentially the design of a domain-specific language is necessary to meet the requirements of EA processes. Such a language should be complemented by an adequate modelling method, which for example could guide the decision whether an activity is automatable or not. It should provide hints for the granularity of activities and for the categorization of processes. Ultimately, such a modelling method could also be realized as a higher-level process, a meta process, in an EAPMS.

Blueprints and patterns can support and accelerate knowledge-intensive processes. For this purpose, one can think of a reference model for EAM processes, similar to industry-specific process models like eTOM. The reference model would contain typical EAM processes which could be used as a basis and be customized according to the enterprise's situation.

An often discussed research question in EAM is the alterability of the meta model and the resulting consequences for tool support. A change of the meta model can cause costly and time-consuming changes in for example reporting and visualization components. In the sections above, we have pleaded process flexibility for an EAPMS. This process flexibility is based on an alterable process schema and exacerbates the challenge of meta model alterability, since a changed process schema can imply meta model changes, and vice versa.

Hybrid wikis have been suggested as a potential solution for emergent modelling of EA data (Buckl et al., 2009). The transfer of this concept into the world of EAM processes has still to be evaluated. It seems to be promising, to condense successful process changes or proven ad-hoc processes to new process schemata.

As part of our research activities, we have started to realize a sample process, "As-Is-Analysis of an Application Landscape", using the software "Bonita Open Solution". Particularly, the first steps of the process (cf. Hanschke, 2009), which are concerned with data acquisition activities, have been successfully realized. We chose that process as first item of evaluation for two reasons. First, it is one of the typical initial processes executed during EA initiatives. Second, we have executed As-Is-Analyses several times in real-world consulting projects and are therefore well acquainted to process details. After an As-Is-Analysis has been completed, and the To-Be-Landscape has been planned, usually a gap analysis is conducted. As a next step, we plan to also realize gap analysis on an EAPMS basis. For this realization, we can fall back to existing preliminary work (Gringel and Postina, 2010; Postina et al., 2009).

6 CONCLUSIONS

In this paper, we identified existing drawbacks of EAM and proposed the concept of process-oriented EAM as a possible solution. We presented the architectural draft for an enterprise architecture process management system (EAPMS), which we are currently substantiating and refining. Drafting the architecture revealed a number of open research questions to be solved for successfully realizing process-oriented EAM. We have listed these questions in order to encourage further research and development work.

REFERENCES

Addicks, J. S., 2011. *Bewertung betrieblicher Anwendungen im Kontext ihrer Unternehmens-sarchitektur*. Dissertation, OlWIR Verlag, Edewecht.

Armour, F.J., Kaisler, S.H., Liu, S.Y., 1999. *Building an Enterprise Architecture Step by Step*. IT Professional, 1(4):31–39.

Buckl, S., Ernst, A. M., Lankes, J., Matthes, F., 2008. *Enterprise Architecture Management Pattern Catalog* (Version 1.0, February 2008). Technical Report TB 0801, Chair for Informatics 19 (sebis), Technische Universität München.

Buckl, S., Matthes, F., Neubert, C., Schweda, C. M., 2009. A Wiki-based Approach to Enterprise Architecture Documentation and Analysis. In *Proceedings of the 17th European Conference on Information Systems (ECIS2009)*.

Buckl, S., Matthes, F., Schweda, C. M., 2010. Future Research Topics in Enterprise Architecture Management – A Knowledge Management Perspective. In *ICSOC/Service Wave 2009*, LNCS 6275, 2010. Heidelberg.

Dadam, P., Reichert M., Rinderle-Ma, S., 2011. *Prozessmanagementsysteme.* Informatik Spektrum, 34(4):364-376.

Engels, G., Hess, A., Humm, B., Juwig, O., Lohmann, M., Richter, J.-P., Voß, M., Willkomm, J., 2008. *Quasar Enterprise: Anwendungslandschaften serviceorientiert gestalten*. dpunkt.verlag GmbH, Heidelberg.

Farwick, M., Agreiter, B., Breu, R., Ryll, S., Voges, K., Hanschke, I., 2011. Automation Processes for Enterprise Architecture Management. In *Proceedings of the 15th IEEE International Enterprise Distributed Object Computing Conference Workshops (TEAR@EDOC 2011)*.

Fischer, R., Aier, S., Winter, R., 2007. A Federated Approach to Enterprise Architecture Model Maintenance. In *Enterprise Modelling and Information Systems Architectures - Concepts and Applications, Proceedings of the 2nd International Workshop on Enterprise Modelling and Information Systems Architectures (EMISA'07)*, St. Goar.

Frank, U., 2002. Multi-perspective enterprise modeling (MEMO) conceptual framework and modeling languages. In *Proceedings of the 35th Annual Hawaii International Conference on System Sciences, HICSS 2002*.

Franke, U., Ekstedt, M., Lagerström, R., Saat, J., Winter, R., 2010. Trends in Enterprise Architecture Practice – a Survey. In *Trends in Enterprise Architecture Research (TEAR 2010)*, LNBIP 70, 2010. Heidelberg.

Gammelgård, M., Simonsson, M., Lindström, A., 2007. *An IT management assessment framework: evaluating enterprise architecture scenarios.* Information Systems and E-Business Management, 5(4):415-435.

Gringel, P., Postina, M., 2010. I-Pattern for Gap Analysis. In *2nd European Workshop on Patterns for Enterprise Architecture Management (PEAM)*.

Hanschke, I., 2009. *Strategisches Management der IT-Landschaft: Ein praktischer Leitfaden für das Enterprise Architecture Management*. Carl Hanser Verlag, München.

Henderson, J. C., Venkatraman, N., 1993. *Strategic Alignment: Leveraging Information Technology for Transforming Organizations*. IBM Systems Journal, 32(1):4-16.

Hippner, H., Merzenich, M., Wilde, K. D., 2004. Analyse und Optimierung kundenbezogener Geschäftsprozesse. In *Management von CRM-Projekten*, Gabler Verlag, Wiesbaden.

Iacob, M.-E., Jonkers, H., Lankhorst, M. M., Proper, H. A., 2009. *ArchiMate 1.0 Specification*. Van Haren Publishing, Zaltbommel.

Johnson, P., Ekstedt, M., 2007. *Enterprise Architecture – Models and Analyses for Information Systems Decision Making.* Studentlitteratur, Lund, Schweden.

Kaisler, S. H., Armour, F. J., Valivullah, M., 2005. Enterprise Architecting: Critical Problems. In *Proceedings of the 38th Hawaii International Conference on System Sciences (HICSS 2005).*

Kruse, S., Addicks, J. S., Postina, M., Steffens, U., 2009. Decoupling Models and Visualisations for Practical EA Tooling. In *ICSOC ServiceWave Workshops.* Stockholm.

Lam, W., 2004. *Technical Risk Management on Enterprise Integration Projects*. Communications of the AIS, 13(1):291–316.

Lankhorst, M., 2005. *Enterprise Architecture at Work: Modelling, Communication, and Analysis.* Springer, Berlin.

Lucke, C., Krell, S., Lechner, U., 2010. Critical Issues in Enterprise Architecting - A Literature Review. In *Proceedings of the 16th Americas Conference on Information Systems (AMCIS 2010).*

Matthes, F., Buckl, S., Leitel, J., Schweda, C. M., 2008. *Enterprise Architecture Management Tool Survey 2008.* Chair for Informatics 19 (sebis), Technische Universität München.

Matthes, F., Neubert, C., Steinhoff, A., 2011. Hybrid Wikis: Empowering Users to Collaboratively Structure Information. In *6th International Conference on Software and Data Technologies (ICSOFT 2011)*.

Object Management Group, 2011. *Business Process Model and Notation (BPMN), Version 2.0*.

Postina, M., Sechyn, I., Steffens, U., 2009. Gap Analysis of Application Landscapes. In *Proceedings of the IEEE International Enterprise Distributed Object Computing Conference Workshops, EDOCW*.

Seppänen, V., Heikkilä, J., Liimatainen, K., 2009. Key Issues in EA-Implementation: Case Study of Two Finnish Government Agencies. In *Proceedings of the 12th IEEE Conference on Commerce and Enterprise Computing (CEC 10).*

Shah, H., El Kourdi, M., 2007. *Frameworks for Enterprise Architecture.* IT Professional, 9(5):36–41.

Slama, D., Nelius R., 2011. *Enterprise BPM: Erfolgsrezepte für unternehmensweites Prozessmanagement.* dpunkt.verlag GmbH, Heidelberg.

Steffens, U., Uslar, M., 2005. Wissensinfrastrukturen für ein projektorientiertes Wissensmanagement. In *Wissens- und Werte-Management in Theorie und Praxis*, VDM Verlag, Saarbrücken.

The Open Group, 2009. *TOGAF 9 - The Open Group Architecture Framework v. 9.*

Winter, K., Buckl, S., Matthes, F., Schweda, C. M., 2010. Investigating the State-of-the-Art in Enterprise Architecture Management Methods in Literature and Practice. In *Proceedings of the Mediterranean Conference on Information Systems (MCIS 2010).*

Winter, R., Fischer, R., 2007. *Essential Layers, Artifacts, and Dependencies of Enterprise Architecture.* Journal of Enterprise Architecture, 3(2):7–18.

Wittenburg, A., 2007. *Softwarekartographie: Modelle und Methoden zur systematischen Visualisierung von Anwendungslandschaften.* Dissertation, Technische Universität München, München.