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Enterprise Architecture Management Processes: Overview and IT Roadmap Development

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1 Introduction

Due to advancing digitalization and globalization, many companies are facing increasingly complex environments in which growing competitive factors and shorter innovation cycles are forcing enterprises to adapt continuously [1]. Companies need to pursue digital transformation in order to change or improve their business model [2], wherefore strategic goals can no longer be realized without the support of IT. Accordingly, IT-innovations increasingly represent the basis for business innovations and take on the key role of an innovation driver [1]. In order to leverage this new role of IT, it is necessary to shift the perspective on IT from a supplier to an enabler, so that the IT strategy can accordingly be incorporated into the business strategy. To achieve this, an enterprise's business and IT must be harmonized, which requires close cooperation between both sides. That is to say that business-IT-alignment plays a crucial role in the context of an enterprise's digital transformation [3]. In practice, however, enterprises are often confronted with rigid and complex organizational structures that lead to silos and impede the alignment of business and IT [2]. There is also the issue that IT is still seen as a cost factor, which once again complicates the harmonization of IT and business goals [1].

At this point, Enterprise Architecture Management (EAM) serves as a mediator to align business with IT and to support the enterprise transformation in a highly-competitive environment [4]. Thereby, EAM can be interpreted as a discipline that leads an enterprise's as-is-state into a desired to-be-state, while following the business strategy [3]. The current and the target scenario are connected by a migration plan, which guides the enterprise's transition from one state into the other. A widely used tool to express such a migration plan is the IT roadmap [5]. The execution of EAM is considered to be complex, wherefore frameworks and guidelines are used for the structured development and implementation of an Enterprise Architecture (EA) [6]. Current research provides a vast amount of literature on the topic of EAM frameworks and currently, a variety of over 50 frameworks can be found in this context [7]. Practitioners, however, proved to have difficulties in applying these frameworks, because related processes on EAM are not sufficiently supported [8]. This dynamic can also be observed in current literature. In contrast to the research field of EAM frameworks, which is already widely covered, a comprehensive research on the topic of EAM processes is lacking [8], [9]. This topic is relevant for the research field of EAM, because EAM processes describe the steps and activities that accompany the actual development and implementation of an EA and can, therefore, serve as best practices. Respectively, this topic is not only relevant for research, but also for practice. This master thesis is therefore aimed at theorists and practitioners who are involved in the development of an EA and seek to gain an in-depth insight into the topic of EAM processes. Accordingly, this work provides an overview of relevant EAM processes and underlying concepts. In this context, the notion of IT roadmap development, which depicts one important step within the development process of an EA, is

investigated in more depth in a practical case study. Accordingly, the following research questions are formulated within the scope of this work:

RQ 1: What is the state-of-the-art of EAM processes described in current literature?

RQ 2: How can EAM processes be classified?

RQ 3: How does the application of EAM processes and the harmonization of process, data and application structures look like in practice at the example of an IT roadmap?

The first research question aims to identify essential concepts with regard to EAM processes. Therefore, this work provides a state-of-the-art overview of this research field, based on literature analysis. The second research question has the goal to classify the EAM processes found. In this context, a framework is developed that serves to put EAM processes into relation with each other. Finally, the third research question is referred to by a case study with the company TenneT TSO GmbH. This company is a German transmission system operator and a subsidiary of the Dutch electricity network operator TenneT. TenneT TSO GmbH serves as a practical example of how EAM processes can be implemented in practice and what significance EAM has for a company from the non-producing, network operator sector. Using the development of an IT roadmap as an example, it is investigated how the EAM objective of business-IT-alignment can best be implemented. For this purpose, expert interviews were conducted with relevant stakeholders of TenneT TSO GmbH.

To answer the research questions, the thesis is structured as follows: **Chapter 2** provides fundamental knowledge about the notions of EA and EAM. **Chapter 3** introduces the research methodologies, which serve as a foundation for the main analysis of this work. **Chapter 4** elaborates the EAM process overview and the EAM process framework with regard to the first and the second research questions. Here, literature distinguishes two main concepts on the description of EAM processes, a model-based and an activity-based approach, which are discussed subsequently in this chapter. In order to develop the EAM process framework, these approaches are brought together through mapping. **Chapter 5** goes into depth on the topic of IT roadmap development with regard to the third research question. The development process of an IT roadmap is explained in more detail and classified into the context of the framework developed in the previous part. The case study and expert interviews are introduced at this point to serve as a practical example for the execution of EAM. Concluding to this chapter, recommendations for action are provided for the IT roadmap development. **Chapter 6** critically evaluates and discusses the findings and limitations of this thesis and derives implications for further research. The thesis concludes with **chapter 7**.

7 Conclusions

This thesis examined the current state of research in the field of EAM processes. In this context, this work further addressed how the identified EAM processes should be classified in order to generate a holistic state-of-the-art overview. The results of this analysis served as the basis for a practical case study in which the topic of IT roadmap development was examined in depth.

The starting point of this work was a literature analysis that identified two main concepts towards EAM processes. The first concept is a top-down approach, which addresses EAM processes in the form of high-level models. EAM processes are regarded as phases, so that an iterative EA lifecycle is described. The literature provides a wide variety on such models. Here, TOGAF, which was identified as probably the strongest of all frameworks, is offering an equally widely accepted process model for the execution of EAM, namely the TOGAF ADM. The second concept towards EAM processes is subsumed as a bottom-up analysis. EAM processes are considered from a fine-granular perspective and broken down into functional components and activity patterns. In this context, the pattern-based approach of the EAM Pattern Catalogue is gaining wide acceptance in both research and practice. Moreover, the newly developed ISO/IEC/IEEE 42020 standard represents the first official standard towards EAM processes.

One difficulty encountered is that both the top-down and the bottom-up approach are difficult to apply on its own. To overcome this problem, an EAM process framework was developed in this work by mapping both approaches. TOGAF ADM served as a reference procedure model and a connection between the top-down and the bottom-up approach. The EAM process framework enables to present a categorized overview of EAM processes as well as a structured approach to conduct EAM, which can be applied by both theorists and practitioners.

Beyond a theoretical investigation of EAM processes, this thesis also examined their practical application to connect current research with practice. In this context, an in-depth analysis on the development of an IT roadmap was executed. A roadmap serves to visualize the transition process from a current to a target state of an enterprise information system and can therefore be considered as a key component of the EA lifecycle. Therefore, the IT roadmap development process was primarily analyzed and classified into the EAM process framework, which allowed to derive first implications towards relevant activities and capabilities in that context. In order to gain insights from a practical perspective, expert interviews served to investigate which capabilities but also challenges are relevant in practice for aligning business with IT in the context of an IT roadmap. These interviews were conducted with relevant stakeholders of the transmission system operator TenneT TSO GmbH. The interview results served to derive recommendations for action on the development process of the IT roadmap.

The central contribution of this work comprises the aforementioned framework for the overview and classification of relevant EAM processes as well as recommendations for action for the development of an IT roadmap. A central finding is that current research does not sufficiently support essential processes that are considered important in practice. This refers to activities related to the management of a project or application portfolio. This is also applicable to those processes that are specifically relevant for the development of an IT roadmap, such as the analysis of dependencies between various EA aspects. In addition, a fluid transition between EAM-related activities and business processes is perceived in practice. This is not only related to the enterprise's distinct

EAM maturity level, but also to the fact that EAM can be adapted to specific situations. Accordingly, this gap is visualized in the mapping of EAM activity patterns and phases of the TOGAF ADM. This finding also reflects in the proposed EAM process framework, which is based on this procedure model. With regard to future research, the framework can be extended by investigating how IT roadmap-related and practice-relevant processes can be included in the model. Likewise, an investigation of other enterprises with respect to other characteristics and industries as well as a different EAM maturity level is interesting in order to verify and extend the results of this work. This work contributed to the body of knowledge on EAM processes and provided a basis for the further convergence of theory and practice.