Current State of Governance Roles in Enterprise Architecture Management Frameworks

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Abstract. Only if the right people equipped with the necessary competencies fulfill the tasks correctly that should be done in their designated roles, the full concept of Enterprise Architecture Management (EAM) can be deployed. This topic has been discussed quite rarely in the past. Therefore, this work systematically analyzes manifold EAM literature sources like technical literatures and research papers as well as EA frameworks in order to derive a set of roles in EAM. The results were validated by dint of an expert interview with an EAM practitioner. This paper contributes to the EAM discipline by presenting a generalized overview of EAM roles and relates them to certain EAM tasks and required skills. Finally, the proposed overview is validated by an expert interview.

Keywords: Enterprise Architecture Management, EAM, Roles, TOGAF, Enterprise Architecture, EA, Frameworks.

1 Introduction

EAM tries to maintain flexibility, cost efficiency and transparency within the EA [1]. Tools are provided to master the complexity and to strategically develop IT landscapes in a business-oriented way [2]. EA in turn provides a holistic view of the enterprise with respect to its elements and dependencies that are required for value creation. Numerous of contributions are dealing with the subject of EAM, but responsible persons and corresponding roles, which are accountable for the development, implementation and optimization of the EAM approach, are rarely taken into account, but exactly these persons determine success or failure. Even EA frameworks, which describe the issue much more accurately through different views and aspects [2], deal with roles only in few cases. Moreover, frameworks, that should help to establish an EA within the enterprise, are described as complex and need to be adapted to the enterprise [2]. In addition, EAM is not only used in large enterprises, but should also be applied in small and medium-sized enterprises [3]. The integration of EAM in the enterprise poses a greater challenge to the staff in this case, because the necessary roles and required skills are unclear [1]. Moreover, it can be ensured by a precise role description that a role is right staffed (skills, competencies) and thus can

complete tasks more productive or at lower costs. On that point, the following question should be answered: What tasks must be performed and which skills are necessary to do so?

To develop a generalized set of role concepts we analyzed more than 50 EA frameworks [4] in order to identify different role concepts, aggregated and pooled them. Why we do so, because this knowledge is of interest for both enterprises introducing EAM to orient themselves in the found role set and existing EAM structures to verify that all task aspects were included in the already established roles.

As already mentioned in the introduction and motivation, knowledge of executive roles in the EAM is important to establish them successfully in the company. This paper will provide a generalized overview of role concepts used in EAM. For this purpose, the concept of a role must be defined first. This raises the question:

RQ1: What is a role in EAM?

Furthermore, a classification scheme for the analysis of the roles found in the different resources has to be developed, as this is the only way the roles out of the single EA frameworks can be summarized unified later on. Hence the second research question emerges:

RQ2: Which general roles can be distinguished within an EAM team?

Based on the two questions, the objectives of this paper are defined. In the following, a review of the publications on EAM and an analysis concerning the introduced roles is made. In the second step, the found roles are classified using criteria in order to create an overview of the roles involved in the EAM process. The result has been tested in a further step by an expert interview only once (due to the uniqueness it should not be spoken of validation here). The study investigated whether the identified and classified roles could also be used in EAM practice and whether the names and descriptions have been developed with a practical orientation.

2   Research Approach

To answer our research questions a literature research was performed. Usually two methods could be applied for a literature research: The "systematic method" [5] and the method of concentric circles [5].

To find an entry point, the second method was used and it was looked for reference works. Therefore, the following search strings have been posted: "*Enterprise Architecture Management*", "*Enterprise Architecture Management & Rollen*", "*Enterprise Architecture Management & Roles*", "*Enterprise Architecture Management & Roles*", "*Enterprise Architecture" & "Framework*", "*Unternehmensarchitektur-management*", "*Unternehmensarchitektur*", "*Unternehmens-architekturmanagement & Rollen*".

The search in the library catalog of the University of Rostock has shown eleven results for "Enterprise Architecture Management". A wide overview of numerous frameworks and its classifications is given by the work of Matthes in [4]. After that, the literature research was also made with the help of the concentric circles in order to identify the literature that is helpful to answer the research questions.

The topic of roles rarely appears in the EAM literature. The term role is not always named in connection with the definition used in this paper. The initial search was conducted by using the stated search terms in databases like *Scopus, EBSCOhost* or *World of Science*, as well as the literature database of the University of Rostock.

After the selection of suitable literature, the application of the method of concentric circles [5] followed, which is visualized by Fig. 1. This required insight into the bibliography and looking up appropriate literature. Special attention was given to sources that occurred in different bibliographies. For validation the method of the expert interview was used. The validated EAM Roles description are presented in chapter 5.
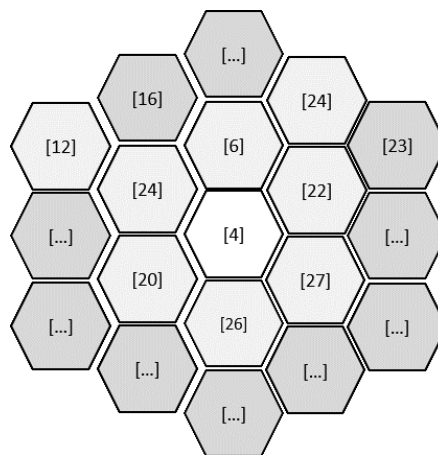

Fig. 1. Method of Concentric Circles [cp. 5]

3 State of the Art (Felix)

Before describing the process of identifying EAM roles this chapter focuses on the foundation of EAM and EA Frameworks, on which the role identification is based on. Further, a distinction between the notion of actor and role is made since these terms often are mistakenly used as synonyms. This intends to clarify the authors' understanding of an EAM Role.

3.1 Enterprise Architecture Frameworks

Numerous EA frameworks are available. Dirk Matthes has identified and examined over 50 of them in detail [4]. Usually these are established approaches to accelerate the

implementation of EAM in the enterprise, reduce the risk of failure and to increase the efficiency and effectiveness of EAM [1]. EA frameworks define and develop a detailed description of the architecture [1] on the basis of different views and aspects [2]. In general, frameworks help with the development of an EA within the enterprise, using described methods and tools to create coherences between the sub-architectures [2], [6]. These tools and methods help with the analysis, design and implementation of an EA [4]. However, the focus of EA frameworks concerning scope and purpose can be set differently, as they are mostly based on experience gained through realized projects [4].

3.2 Enterprise Architecture Management

EAM is an interdisciplinary management approach, building on techniques and practical approaches from computer science, business administration, change management, process management and other areas [1]. In order to overcome IT complexity tools are provided. EAM develops the IT landscape in a strategic and business oriented way" [2]. TOGAF and Niemann describe an EA as a representation of the processes and all systems of an enterprise, which aim for supporting the business objectives in combination. EAM has the tasks to create an EA that represents the current state in the enterprise and to implement it within the enterprise. Based on this, a catalog of measures for the target architecture is developed [7].

The aim of EAM is to produce transparency across the entire IT landscape. In addition, a lot of information can be obtained from the EA, which help to answer questions of the participants in the enterprise, such as management, project managers and others [2]. Hanschke gives some examples of how such questions can look like: "Which business processes are affected by the failure of an IT system?" or "Who is responsible for which business processes and IT systems?"

Furthermore, it is important to visualize the coherences and dependencies so that an understanding is possible without IT expertise. Only if this is the case, the interaction of business and IT is possible. The IT is aligned to the objectives of the enterprise that way [2].

EAM aims for meeting the information needs, increasing transparency and reducing risks. On the one hand, it makes gathering information easier, as there is a common database through the sub-architectures in the EA. On the other hand, discretion to act is shown. Furthermore, coherences between processes and systems can be understood better and the preparation time for new projects is reduced [2].

3.3 Notion of Role and Actor

Often, the term "actor" is used alongside the term "role", but they should not be used as synonyms. Especially sociology often deals with action and actors theories [8]. Still, a generally accepted definition of the term "actor" does not exist. Schimank examines four sociological actor models [32]. An actor always performs an action within a certain context. Actors are people or organizations that are composed of several people. Human actors have certain characteristics: they have a meaningfully oriented behavior, exist in

their environment and act objective-oriented [32]. Their objectives are determined by them or their environment. He or she is the holder of tasks with several competencies to fulfill them [9].

This reveals the difference towards the notion of roles, which are seen as logical functions with the aim to fulfill a task by conducting certain activities [9], [10]. An actor can be assigned to numerous roles whose required competencies he or she meets. Thus, each role is related to a certain set of required skills necessary to conduct the relevant activities (cf. [11]) while an actor possesses competencies that fulfil these required skills.

This is in line with the perception of the concepts business role and business actor from the perspective of the EAM research discipline. In the newest version 3.0 of the ArchiMate standard – the modelling language for the TOGAF Framework – a business actor is defined as *"...business entity that is capable of performing behavior"* [12]. A business role is understood as *"...the responsibility for performing [...] behavior, to which an actor can be assigned"* [12]. Further, the standard points out, that this responsibility is always related to behavior (e.g. a business function) and skills. Table 1 represents our understanding about both concepts based on these elaborations.

Table 1. Distinction between Role and Actor

	Role	**Actor**
Definition	A role describes a certain behavior for which a specific set of skills is required.	An actor holds competences and performs behavior by being assigned to one or more roles.
Describes	behavior/tasks, responsibility, set of required skills	human person, organizational entity, competencies

4 Role Identification Process

The identification of roles was performed based on the identified literature on EAM and EA Frameworks. Each source was analyzed regarding mentioned EAM roles. These descriptions must include at least one task, responsibility or required skill. The mention of the role without one of these facts will be considered as a not existing description. This chapter is separated by the type of sources utilized for role identification.

Enterprise Architecture Frameworks Analysis
Starting point for finding roles in the EA framework is the "Enterprise Architecture Framework Compendium" listing over 50 EA Frameworks [4]. Furthermore, EA

Frameworks not considered in [4] have been analyzed, e.g. the General Enterprise Framework (GEF) [13].

The categorization of the frameworks by [4] was applied, which distinguished (1) management, (2) military and (3) government frameworks. For each EA framework the same analysis approach was conducted. Initially, each framework was checked for free availability, it was excluded from the analysis. Accessible documentation was analyzed for whether the terms "role" or "actor" were used and a precise description was given. In the (1) management category twelve EA frameworks were not freely available and thus, had to be excluded. Some frameworks, such as the Architecture of Integrated Information Systems (ARIS), focus on methods for the optimization of processes [14] without examining which roles are related to these activties. In summary, only the toolbox for Enterprise Architecture Management (t-eam), TOGAF, Virtual Enterprise Reference Architecture and Methodology (VERAM) and the Zachman EA Framework defined roles related to EAM [15].

In most cases of the (2) military field access was not possible. Some of these were written neither in German nor in English (e.g. the "Atelier de Gestion de l'Architecture" was only available in French [16]) or the download was not publicly released (such as the Australian Defence Architecture Framework [4]). From nine identified frameworks four meet the requirements for role identification. For instance, the NATO Architecture Framework could not be investigated in the latest version since it is not completed yet [17]. However, it should be based on UK Ministry of Defence Architectural Framework (MoDAF) and TOGAF [18], which were be analyzed.

In the area of (3) government seven EA Frameworks were identified, which cover area like public transport and healthcare. In two frameworks identification was not possible because of accessibility reasons. For the Treasury Enterprise Architecture Framework (TEAF) secondary literature was available [19], but without going into roles. In three other frameworks, however, no roles with the meaning of section 3 could be found. The National Institutes of Health Enterprise Architecture Framework, for example, covers only the persons who perform a task in the processes [20]. In the end two frameworks provided information regarding EAM roles, namely the Federal Enterprise Architecture (FEA) and the Queensland Government Enterprise Architecture Framework.

To summarize, it can be stated that only a fractional part of the EA framework was freely available, while access to most documents was not possible. Furthermore, only few approaches concretely investigated EAM roles as we define them. TOGAF provides the most comprehensive overview of roles and their required competencies. Table 2 shows the analysis at a glance. It demonstrates how many EA frameworks have been identified, how many could be investigated and how many enabled the identification of roles. Hence, 21 out of the total 33 EA Frameworks had a matching documentation. Roles were identified in only 7 of these 21 frameworks.

Table 2. Analyzed EA Frameworks

Type	EA Frameworks	Accessible	*Chosen Frameworks*
(1) Management	17	12	*4*
(2) Military	9	4	*1*
(3) Government	7	5	*2*
Overall	**33**	**21**	*7*

Literature Analysis

During the literature review five contributions have been identified dealing with the EAM structure and its roles. Hanschke covers necessary roles multiple times in [2] and [21]. However, the same roles are named in this case and the role description is nearly identical. For this reason only [21] because of currency reasons.

Moreover, in [1] Glen Hobbs deals with the EAM structure, although most roles are only named and not explained in more detail. In [22] Niemann examines individual areas, where the roles are not explicitly mentioned, but divided into the single areas business architecture [22], application architecture [22] and more. Roles like business architect or application architect can be derived from them. Dern describes the roles related to the management of EA in high detail in [23], where the understanding of a role has been added to each role. In [24] the role of the "Enterprise Architect" [24] was examined more closely. In this case, roles and responsibilities were explained and practical examples were given. In [25], Mannmeusel describes how EAM can be established even in small and medium-sized enterprises. At it, there is an enterprise architect (also called EA manager), who gets the information from roles that are already present in the enterprise. Thus, the process owners, the IT controlling, project managers and the IT infrastructure provide the necessary information, but are not part of the EAM structure themselves [25].

In total, roles for EAM could be identified in 12 sources. However, the detail of the role descriptions, tasks, competencies and abilities varies widely in literature. While TOGAF describes the roles and the needed skills high detailed [6], Veram only provides short statements about the respective roles [26].

Table **3** clearly shows the number of sources in the two types of literature, how many roles were identified in total in each area and how many of them have been described. After the analysis of the individual sources, 70 roles with description were finally identified and listed. After the roles out of the various sources have been identified and analyzed, a classification of these roles is made in the following chapter. The aim is to develop a classification scheme that helps to assign the roles out of the various sources to specific role classes.

Table 3. Identified Roles in Literature

	Sources	Identified Roles	Roles with description
EA Frameworks	7	42	40
Literature	5	39	29
Overall	**12**	**81**	**69**

5   Role Analysis

Based on a literature review, a total of eleven roles were identified, which may be included in EAM. In addition to the literature review, an expert interview was conducted, which was used for designation and the contentual homogenization of the aggregated roles. The following eleven roles are the compact result of the analysis of the found 70 roles and its validation by dint of the expert interview.

The *Enterprise Architect* is one of the most common roles. This role describes the tasks of the head of EAM who ensures the completeness and quality of the architecture from a cross-departmental perspective. Thus, it requires profound technicals as well as strategical knowledge [6]. In small and medium-sized enterprises, the tasks can also be performed by other roles, with other people/roles of the enterprise supporting the architecture development [25]. In larger enterprises, the role can be assigned to several actors working together in an EAM team and perform the development and design of the EA [21]. The Enterprise Architect also looks for synergies between the sub-areas (business, information, application, and infrastructure architecture). Solutions developed by the role of a Solution Architect is tested for compliance with standards and specifications.

The *Standard Manager* is responsible for developing and maintaining of standards, which new projects or initiatives need to comply with. Furthermore, he or she supports the usage of standards [21]. These tasks could also be assigned to the actor performing the Enterprise Architect – depending on the EAM initiative's size.

The *Business Architect* is responsible for the design, documentation and development of the business architecture and reports to the Enterprise Architect. He or she also takes care of the analysis of business processes [27]. In addition, he or she conducts information demand analyses for each business process.

The *Information Architect* designs, documents and develops the information architecture [21], [23]. He or she determines its interfaces to business and technology architecture [21] to connect them to the business architecture. That way, it is shown

which business processes are supported by which information systems [28]. The Information Architect is responsible for the design, maintenance and implementation of a consistent data model. Moreover, the Information Architect checks where the business objects are created and processed in the system.

The application landscape is maintained by the *Application Architect*. He or she is responsible for its documentation [27] and addresses the stakeholders involved in the applications.

The *Infrastructure Architect* takes over responsibility for the technologies, certain services and operating systems and their optimization. For this purpose, he or she creates the system architecture of an enterprise [22]. The Infrastructure Architect is also charged with the development of the infrastructure [22] and the documentation of the system environment such as operating systems or networks [27]. He or she ensures an active reuse of systems and technologies in new projects.

Planning software solutions for concrete projects is the task of the *Solution Architect*. He or she supports the Business Architect, who hence has not to deal with the technologies and systems used [6]. The Solution Architect also examines the project requirements in order to use technologies and systems that are already existing in the enterprise. This task is based on the infrastructure architecture, which is managed by the Infrastructure Architect.

Another member of the EAM team is the *Demand Manager*. This role sets clearly structured requirements for each department, which are later transformed into concrete plans by the Solution Architect through.

Furthermore, the role of the *Security Manager* considers safety aspects within the EA and addresses the process security [27]. He or she monitors the safety matters of the enterprise, the models and performs security assessments.

The *Risk Manager* performs risk assessment and evaluation in terms of the probability of occurrence and amount of damage. Additionally, precautions for the event of loss are taken.

Finally, the *Process Owner* takes responsibility over certain processes within the enterprise and thus holds the knowledge about them [23]. He or she documents, plans and implements the processes in the enterprise. This includes the training of actors who are affected by a new process [29]. According to the expert, the Process Owner does not directly belong to the EAM team, but is an important counterpart for the other roles.

The required competencies of the roles differ from each other only in a few points. In this regard, the Enterprise Architect must have leadership skills [6], [24], since he or she is responsible for the complete overview of the architecture [6]. All roles require high communication skills for technical matters and teamwork, as the architects work

with the enterprise's employees, both in IT, as well as in the several departments [21], [6]. Comprehensive IT knowledge is in demand especially for the Information Architect, Application Architect, Infrastructure Architect and Solution Architect [6]. Necessary skills are only discussed for the Enterprise Architect in detail in different sources, whereas this aspect of the other roles is only examined by TOGAF. While background knowledge of a specific competence is sufficient for some roles, another role must have an expert status to fulfill the tasks with the required quality. A summary of the roles of an EAM team in terms of their main tasks and the required skills is provided in

Table 4.

6 Conclusion & Outlook

The aim of EAM is to master the complexity in the IT environment and to align it simultaneously to the enterprise's objectives [2]. According to that, the tasks that an EAM team has to deal with are extensive and important [2]. One of the research questions was therefore: RQ1: *What is a role in EAM?* To answer this question, the definition of the term role was elaborated, isolated to the notion of actor and related to EAM in chapter 3 and 4. A role describes an activity for which certain skills and competencies are required [10], while an actor is a human person who is able to execute one or more roles [7]. On this basis, the roles in EAM were identified. At that, the literature was divided into EA frameworks and scientific literature and analyzed regarding the presence of roles. Of the total 33 EA frameworks, 21 contained a documentation that were freely available. However, roles could be identified only in seven of these 21 frameworks. This underlines the statement that in spite of the knowledge about the importance of roles they are rarely discussed. In the field of professional literature, roles in EAM were treated in five sources and finally, a scientific contribution that names roles in EAM was identified.

Overall, 70 roles with description were found (cf. chapter 5**Error! Reference source not found.**). The 70 role descriptions were analyzed and aggregated in the next step. In chapter 5, the results were discussed to answer RQ2: *Which general roles can be distinguished within an EAM team?* For generalization, the role descriptions were analyzed for their tasks and clustered according to task types. As criteria for the different roles of an EAM team the result clusters were used. Each role type had to be associated with at least two types of tasks. Further applies that at least two roles of the initial set can be assigned. Ultimately, eleven different roles for EAM have been created on the basis of the task descriptions, from which especially the Enterprise Architect gains attention from research. This role was examined in eleven out of 70 roles, while the roles Process Owner or the Security Architect only appeared twice.

In summary it can be said that the classification into role classes allows a first overview of the range of tasks of EAM. Especially for the introduction of EAM, statements about the roles that have to be assigned can be made faster. At the same

time, the tasks of the roles and competencies required for them are shown. In this regard, an employee can perform several roles or it can be distributed among several actors. Thus there are several Enterprise Architects, Business Architects and Demand Managers in large enterprises, which are responsible for only one particular business area then.

There is already extensive literature on the subject of EAM that pays close attention to the subject. In addition, many EA frameworks were developed over time. Such were clearly shown by [4] for example. A need for further reviews is the reexamination of EA frameworks that have not yet been investigated. Morover, we are aware that this kind of review procedure comes along with limitations. The systematic literature review was conducted based on conferences and journals available over the University of Rostock library network in the defined period of time. The number of the relevant papers should rise when taking other journals, conferences, books and time spans into account. However, concrete EAM roles are considered only rarely, although its importance is recognized in the literature [1].

This paper provides a first approach for roles an EAM team may consist of. A first validation was applied by dint of an expert interview. Further validations need to be applied. Another critical aspect of the study is the fact that not all books and articles were freely available. Many EA frameworks are not freely available. While TOGAF can be downloaded for evaluation purposes immediately after a short registration, an activation through the vendor was necessary for t-eam, which lasted about a week. Other EA frameworks anon, such as the CLEAR Framework [4], could be downloaded not at all. For this reason, this paper provides only an extract of literature and identified roles. A starting point for further work is given by the information supply of the identified roles. The information demands depend on the tasks of a particular role [30]. Since the information demands in EAM are large and the roles have to be provided constantly with current information, it is recommended to create information demand patterns for the eleven roles so that the right information can be given to the right person at the right place at the right time [30]. Thus, the information demands of the role have to be determined, the quality criteria of the information needs have to be ascertained considering the time aspect [31].

Finally, a need for research concerning the connection of roles with certain committees is possible [21]. For example, Hanschke describes the IT Board, the EAM Board, the Project Portfolio Board and the Blueprint Board [21]. In [1] Hobbs defines the Enterprise architecture council, Architecture review board and Architecture forum. Even in TOGAF the Architecture board is discussed [6]. Thus, a classification of these committees could be done and, based on that, an assignment of role classes to individual committees could take place.

Table 4. Identified Roles in Enterprise Architecture Management

ROLE	MAIN TASKS	REQUIRED SKILLS
Enterprise Architect	Ensures completeness of the EA; identifies synergies between the subdomains; communicates results	Leadership skills, teamwork, project experience, profound IT and business knowledge, communication skills
Business Architect	Design, documentation, development of business architecture; formulates which information is required in each business process	Teamwork, communication skills, knowledge of business processes and business models
Information Architect	Design of the information architecture; review of the business objects in terms of their creation and processing in the system	Teamwork, communication skills, knowledge of business processes and excellent IT skills
Application Architect	Documentation of the application environment with the aim of creating plans for the construction of new software systems and components	Teamwork, communication skills, knowledge of business processes and good IT skills
Infrastructure Architect	Documentation of the system environment for re-use of systems and technologies	Teamwork, communication skills and extensive IT knowledge
Solution Architect	Planning the concrete implementation of solutions based on existing systems and technologies	Teamwork, communication skills, extensive business and IT knowledge
Standard Manager	Development and maintenance of standards	Teamwork, communication skills, project experience
Process Owner	Plans, maintains and optimizes certain processes in the company	Leadership skills, teamwork, communication skills
Security Manager	Monitoring of security issues; performing security reviews	Expert in the field of IT security, knowledge of legal requirements and regulations, knowledge of the model
Risk Manager	Risk assessment and evaluation in terms of probability and extent of damage; making precautions for the damage event	Knowledge of IT risks, knowledge of the model
Demand Manager	Creating clearly structured requirements in each department	Knowledge of business processes, understanding of the business

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