

# Methods of the Assessment of Enterprise Architecture Practice Maturity in an Organization

Andrzej Sobczak

Department of Business Informatics, Warsaw School of Economics,  
6/8 Madalińskiego St, Warsaw, Poland  
Andrzej.Sobczak@sgh.waw.pl

**Abstract.** Both enterprises and public sector units take advantage of Enterprise Architecture concepts in an increasing manner. Therefore, a periodical assessment of its effectiveness (maturity) and suggesting certain improvements on the basis of obtained results is recommended (e.g. by TOGAF, a de facto Enterprise Architecture development standard). This article is an overview of existing approaches in this area, and identifies its weaknesses and strengths. Also, the author's approach to assessment of enterprise architecture practice is discussed and directions of further research work in this area are presented.

**Keywords:** Enterprise Architecture, architecture maturity assessment, architecture practice, CMM, TOGAF.

## 1 Introduction

Organizations which take advantage of Enterprise Architecture<sup>1</sup> concepts should provide periodical reviews of existing architecture practices and outcomes obtained by using them. In this article, the author defines architecture practice as follows: a coherent set of services, processes, roles and bodies (together with responsibilities assigned to them) which participate in the creation, maintenance and modification of architecture deliverables, and in the assistance in making certain decisions, putting them into effect and observing how these decisions are being realized.

If there exist areas where it is necessary to improve architecture practice, they should be identified and some actions in this field should be taken. Reviews should refer to a degree to which architecture practice is aligned to the organization's strategic goals, to how effectively measures which assess architecture practice are used (i.e. do they serve to perform architecture activities), and finally to whether the architectural undertaking delivers the planned outcomes (both at a business and IT level).

---

<sup>1</sup> Enterprise Architecture – a formal description of the enterprise, or a detailed plan of the enterprise at component level to guide its implementation. The structure of components, their inter-relationships, and the principles and guidelines governing their design and evolution over time [9].

These reviews must also include analysis of effectiveness of architecture processes and quality of architecture deliverables. Moreover, it is recommended that an organization assess human capability of developing architecture skills and knowledge. This is going to be a basis for the identification of competence gaps and reduction of them through training, recruitment and/or employment of external Enterprise Architecture experts.

This article aims to: analyze existing approaches to assess architecture practice maturity with the intention to identify its weaknesses and strengths and recommend the author's method for the assessment of architecture practice on the basis of obtained results. Because of these aims, this work should be constructed as follows: point 2 provides a review of approaches to the assessment of architecture practice; point 3 presents the author's method for the assessment of architecture practice; point 4 summarizes current discussions and indicated directions of further research work.

## 2 Analysis of Existing Approaches to the Assessment of Architecture Practice

Nowadays, there exist many methods for the assessment of architecture practice maturity. Three sources for models for the assessment of architecture practice maturity are available at the moment, namely:

- consultancies (such as Forrester, Gartner),
- public administration (mainly in USA),
- standardization organizations (e.g. The Open Group).

Most of these approaches are based on the maturity assessment model<sup>2</sup> CMMI for Development<sup>3</sup>. Starting from 1991, this model has been adapted to needs of various disciplines such as systems engineering, integrated product and process development. Also, a CMM-based approach for Enterprise Architecture has been adapted – there appeared Extended Enterprise Architecture Maturity Model developed by Institute for Enterprise Architecture Developments [4] and NASCIO Enterprise Architecture Maturity Model developed by National Association of State Chief Information Officers [8], among others. Also, a model used by the US Department of Commerce, i.e. A-CMM – Architecture Capability Maturity Model – [9], is frequently applied.

---

<sup>2</sup> M. Kohlegger, R. Maier and S. Thalmann put forward the following definition of a maturity model: „a model which represents quantitatively or qualitatively stages of increasing capabilities of the model element of performing particular tasks in order to assess them regarding the defined areas”. See [6].

<sup>3</sup> Capability Maturity Model Integration – a model developed by Software Engineering Institute (SEI) which serves to assess the software development process. CMMI defines five levels of maturity: initial, repeatable, defined, managed and optimized. For each level, except the first, so-called key process areas and corresponding goals are defined. In this approach, an organization attains a certain level of maturity if it realizes all the goals belonging to all the areas assigned to each level and the lower ones. See [Błąd! Nie można odnaleźć źródła odwołania.].

Maturity models, including those adapted to Enterprise Architecture's specific features, have three functions:

- descriptive function which helps determine real organization's maturity level,
- prescriptive function which describes a desired target state and determines a gap between the current state and the desired state,
- function defining a transition scope, which tells how many and which actions should be taken in order to pass from the current state to the desired state.

A basic idea of an architecture practice maturity model is to give a possibility of assessing it in selected areas at one of five available subsequent maturity levels which are characterized in table 1.

**Table 1.** Maturity levels in Enterprise Architecture management

Level name	Level indicators
Initial level – no structured architecture practice elements	Enterprise Architecture activities in the organization are performed ad hoc. Many activities are performed chaotically. Few elements of activities are defined before the kick-off of works, and a final effect of many of them is dependent on an individual effort of particular organization's units. No historical knowledge on previous Enterprise Architecture initiatives.
Repeatable level – repeatable practice elements	Basic Enterprise Architecture activities in the organization are defined at a high level of abstraction; they have been mastered in management terms. Historical knowledge is a basis for the development of a plan for further Enterprise Architecture works.
Defined level – defined practice	A coherent set of Enterprise Architecture definitions and standards. Works intended for the identification of threats and inconsistencies regarding the course of performed activities are done before negative effects of these threats and inconsistencies influence another tasks. Smaller dependence of performed activities on single units.
Managed level – fully managed practice	Enterprise Architecture activities in the organization are of stable nature, but areas which require improvements can be still found. Detailed measurements and control of particular architecture activities.
Optimized level – continuously improved practice	All the Enterprise Architecture issues are well documented, structured and managed. Architecture activities' feedback loop is put into practice (the organization's learning process is present). More requirements for particular architecture activities. The organization can afford pilot projects which check new Enterprise Architecture initiatives in practice, both in financial and organizational terms. Only after such verification an initiative may become valid in the organization.

Source: the author's own study and [9].

In an analyzed unit, the model A-CMM included in TOGAF is used by an expert team in collaboration with the organization's representation team. They assess a maturity level in nine identified areas. Then a graphic analysis is prepared, e.g. in the

form of a radar chart. It can be a basis for the assessment how a maturity level of selected Enterprise Architecture management aspects has changed over time.

By applying architecture maturity models, one can presume one of two ways of representing them: Staged or Continuous. In the representation Staged, the organization can be classified at one of five maturity levels, where the first level means the lowest maturity level. In this approach, it is possible to calculate the factor  $\gamma$  which describes an Enterprise Architecture management maturity level:

$$\gamma = \frac{\sum_{k=1}^n P_k}{n},$$

where:  $n$  – a number of identified areas in which a maturity level of selected Enterprise Architecture management aspects is assessed;  $P_k$  – a maturity level of the area  $k$  of Enterprise Architecture management.

In the representation Continuous, each Enterprise Architecture area is assessed separately. In this way, it is possible to align the order of improvements to the organization’s specific features and prioritize areas which are considered crucial or which involve the greatest risk.

Apart from the open architecture maturity assessment methods (like A-CMM), there exist other approaches, for example developed by consultancies. Unfortunately, in order to use them we should buy an appropriate license. We must also remember that they can be used only by customers of these consultancies. Table 2 summarizes properties of existing architecture practice assessment approaches.

**Table 2.** Comparison of properties of existing architecture practice assessment approaches

	Detailed description	Versatility	Support of IT tools	Licensing
Approaches developed for public administration units	Description is available free of charge, it gives much information about a given approach	Very little, intended for public units in a given country	Average or little	Free of charge for all interested parties
Approaches developed by consultancies	Few details available free of charge	Big or very big	Average or big	Necessity of paying license fees for use
Approaches developed by standardization organizations	Description if available free of charge, but gives relatively little information about a given approach	Big or very big	Average or little	Free of charge for all interested parties

Source: the author's own study.

### 3 Author's Concept of an Enterprise Architecture Practice Assessment Technique

The author's experiences with the deployment of Enterprise Architecture practice maturity assessment approach called TOPAZ. In TOPAZ, 15 control blocks regarding particular architecture practice aspects (see figure 1) are together assessed.

250 control question were defined in total. However, they are not related with a concrete architecture framework (thus, they can be used with regard to architecture practice based on the Gartner framework, for example), but they refer to TOGAF to a certain degree. Each question has a certain origin (e.g. TOGAF, but also the author's own experience).

An undoubted advantage of the approach is that we can use many variants of it, that is can use the architecture practice assessment technique for a full concept of Enterprise Architecture, and for Enterprise IT Architecture as well. The effect is that we have a various number of questions in particular control blocks (41 questions less in total for Enterprise IT Architecture than for Enterprise Architecture).

Information obtained in answers to control questions is a basis for the assessment of maturity level for a given control block. This technique provides an aggregated and normalized index which presents total maturity of the organization for 15 control blocks (the index takes values from the range 0-1) and a one-column matrix consisting of 15 elements for particular control blocks.

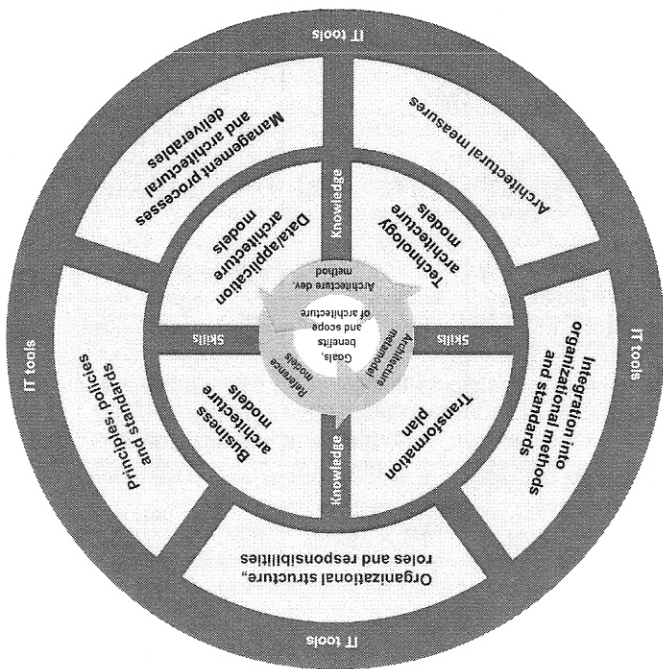


Fig. 1. Structure of control blocks in TOPAZ. Source: the author's own study.



Within the first control block the following aspects are assessed:

- Is a scope of the deployment of Enterprise Architecture defined, and how?
- Are goals of the deployment of Enterprise Architecture defined, and how?
- Are benefits of the deployment of Enterprise Architecture defined, and how?

Within the second control block the following aspects are assessed:

- Is an Enterprise Architecture development method defined, and how?

Within the third control block the following aspects are assessed:

- Is a content metamodel of architecture models defined, and how?

Within the fourth control block the following aspects are assessed:

- Is the use of reference models considered in the organization?
- How are reference models used during the creation of architecture models?
- Are architectural patterns used during the creation of architecture models, and how?

Within the fifth control block the following aspects are assessed:

- Are business architecture models defined (the architecture's as-is state, target state, transitional states, modeling scope), and how?

Within the sixth control block the following aspects are assessed:

- Are data and application architecture models defined (the architecture's as-is state, target state, transitional states, modeling scope), and how?

Within the seventh control block the following aspects are assessed:

- Are technical architecture models defined (the architecture's as-is state, target state, transitional states, modeling scope), and how?

Within the eighth control block the following aspects are assessed:

- Are transformation strategy and plan defined on the basis of architecture models, and how?

Within the ninth control block the following aspects are assessed:

- Are organizational structure, roles and responsibilities regarding architecture practice defined, and how?

Within the tenth control block the following aspects are assessed:

- Are architecture principles defined, and how?
- Are organizational policies defined, and how?
- Are architecture standards defined, and how?

Within the eleventh control block the following aspects are assessed:

- Are management processes defined, and how?
- How are management processes realized?
- Are management deliverables defined, and how?
- How are management deliverables used?

Within the twelfth control block the following aspects are assessed:

- Are architectural measures (KPI) defined, and how?
- Are the measures used systematically?

Within the thirteenth control block the following aspects are assessed:

- Is architecture practice integrated into organizational methods and standards – in particular areas (such as: strategic planning, software development, portfolio management, project management, security management) and how?

Within the fourteenth control block the following aspects are assessed:

- How is architectural knowledge communicated across the organization?
- How are architectural skills improved in the organization?

Within the fifteenth control block the following aspects are assessed:

- Are IT tools supporting the work of Enterprise Architects deployed in the organization (in particular modeling tools and architectural knowledge repository tools), and how?

This technique uses a simple tool (an MS Excel application) which allows to generate radar charts and to consult a dashboard (see figures 2 and 3, these figures present results of the deployment of a pilot method in a Polish company; because of signing an NDA, the author must not give more details apart from that the company employs almost 2000 people in Poland, the IT department personnel is about 60 people, and the organization has just started to deploy architectural approach).

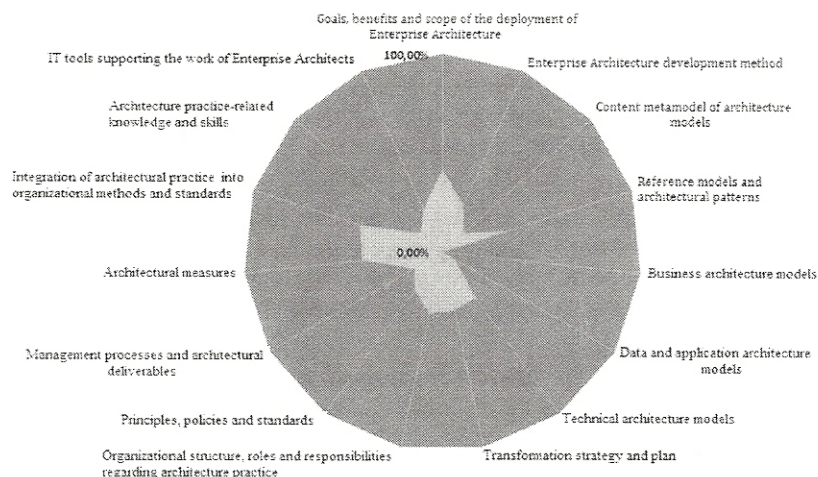


Fig. 2. Results of the use of TOPAZ in a Polish company. Source: the author's own study.

#	Area name	Index
1	Goals, benefits and scope of the deployment of Enterprise Architecture	42%
2	Enterprise Architecture development method	26%
3	Content metamodel of architecture models	14%
4	Reference models and architectural patterns	36%
5	Business architecture models	0%
6	Data and application architecture models	7%
7	Technical architecture models	28%
8	Transformation strategy and plan	30%
9	Organizational structure, roles and responsibilities regarding architecture practice	32%
10	Principles, policies and standards	24%
11	Management processes and architectural deliverables	16%
12	Architectural measures	41%
13	Integration of architectural approach into organizational methods and standards	44%
14	Architecture practice-related knowledge and skills	15%
15	IT tools supporting the work of Enterprise Architects	24%

Fig. 3. Dashboard for a Polish organization. Source: the author's own study.



As findings of the pilot deployment of TOPAZ show, graphic elements (such as a dashboard) used for the assessment of architecture practice allow to bring final results to decision-makers more easily. Hence, it is easier to convince them to take improvement actions.

## 4 Summary and Further Research

Raising architectural maturity in organizations involves certain costs. We must answer one question: is that rational from a business point of view? In 2011, SAP carried out research whose findings proved that organizations which represent a high level of architectural maturity invest more in innovative IT solutions and have definitely lower complexity of IT environments, what makes them more competitive on the market [5].

At the moment, there exist a number of architecture practice maturity assessment methods. In practice, it turns out that only general assumptions of the methods are available free of charge, they have no implementation details, or using them costs money (e.g. by paying license fees). The technique TOPAZ, the one proposed by the author, is distributed free of charge, with a detailed description (including a full list of control questions) and an IT tool supporting its use. Each organization may adapt it for its own needs in any scope. Initial verification of the method in a large Polish company proved its applicability. With the experience gained so far, the author is planning to extend the approach, he is planning to transform the existing architecture practice assessment technique into an architecture practice optimization technique (then assessment is only an initial stage of optimization).

## References

1. van den Berg, M., van Steenberghe, M.: Building an Enterprise Architecture Practice. Springer, Netherlands (2006)
2. Commerce Maturity Model, Department of Commerce, Office of the Chief Information Officer (May 2003), <http://ocio.os.doc.gov/ITPolicyandPrograms/> (last visit: April 04, 2013)
3. Enterprise Architecture Use across the Federal Government Can Be Improved, GAO, USA (February 2002)
4. Extended Enterprise Architecture Maturity Model, Institute for Enterprise Architecture Developments, ver. 2.0 (2004)
5. Gupta, S.: Building Effective Enterprise Architecture Developing a Business Case and Road Map for Mature, EA Practices to Maximize Value in IT Investments, SAP White Paper (2012)
6. CMMI Product Team, CMMI for Development, Version 1.3 (CMU/SEI-2010-TR-033). Software Engineering Institute, Carnegie Mellon University, Pittsburgh, PA (2010)
7. Kohlegger, M., Maier, R., Thalmann, S.: Understanding Maturity Models Results of a Structured Content Analysis. In: Proceedings of I-KNOW 2009 and I-SEMANTICS 2009, Austria, September 2-4 (2009)
8. NASCIO Enterprise Architecture Maturity Model, National Association of State Chief Information Officers, ver. 1.3 (December 2003)
9. The Open Group Architecture Framework, The Open Group, version 9.1 (December 2011)