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Enterprise Architecture Compliance: the Viewpoint of Evaluation

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Abstract: Enterprise Architecture (EA) provides a holistic view of entire organization, including various viewpoints such as business, information, systems and technology. It is of interest for academics and practitioners alike. It has been suggested that EA is an approach for controlling the complexity and constant changes in the organization and its business environment, assisting organizations in realizing a multitude of positive business impacts. As the organization transforms from the current EA state towards the improved target state through a set of projects, at least the compliance between the projects and EA should be examined to assure that the organization is moving towards the desired direction. The concept of EA compliance has not been a target of academic research, but practitioners have addressed the concept more extensively in the form of compliance evaluation method descriptions, checklists, white papers and standards. The concept has especially been addressed in the US Government. Nonetheless, the area of research is fragmented, lacking a comprehensive perception of EA compliance and its evaluation, stressing only the regulatory and corporate governance connotation of the term, and focusing mainly on the EA compliance of projects. However, we consider this perception to be too narrow, and want to study if there are any other aspects that should be addressed. Therefore, in this paper, we address the concept more extensively, aiming to develop a broader, unbiased understanding of the concept of EA compliance. Particularly, based on a literature review and a focus group interview of EA practitioners from both information technology (IT) user and service provider organizations, we describe the various possible perspectives of EA compliance, and discuss various areas of its evaluation. Especially, EA compliance evaluation goals, evaluation targets and evaluators are addressed. This extensive view to EA compliance enables organizations to assure that the transition towards the target state is controlled more systematically, for example by guiding investments and development projects to comply with EA.

Keywords: Enterprise Architecture (EA), Enterprise Architecture work, compliance, evaluation

1. Introduction

Enterprise Architecture (EA) is an approach for supporting the management and development of an organization through a set of architectural models, usually including the viewpoints of business, information, information systems and technology (see e.g. de Boer et al. 2005, Kaisler et al. 2005, Jonkers et al. 2006). As well as the current architecture, EA also includes a description of the target architecture and a transition plan (Armour et al. 1999, Lankhorst 2005). A multitude of organizations are in the process of implementing the approach, seeking to realize several important business and information technology (IT) related benefits. Hence, EA is considered highly interesting by both academics and practitioners.

Typically, the transformation from the current EA towards the target EA is carried out through a set of projects (see e.g. The Open Group 2006). Therefore, these projects should be guided and controlled by EA to ensure that the projects and their output actually move the organization towards the target EA (see e.g. The Open Group 2006). In other words, the projects have to be compliant with EA.

Despite its importance, the concept of EA compliance has not received the attention in academia thus far – academic literature on the subject is extremely rare. Literature on the subject mostly consists of practical sources, such as US Government and other public administration method descriptions, industry white papers, and standards. Mainly, these sources deal with tools and procedures for supporting or conducting EA compliance evaluation, such as evaluation process descriptions (Eurocontrol 2006, The Open Group 2006, CIO Council 2001, NIH 2006, GAO 2003) or checklists (NIMA 1998, The Open Group 2006) developed by practitioners. Also, definitions exist for the levels or “amount” of compliance (The Open Group 2006, BTA 2006).

Currently, many organizations are actively developing their EA processes, and EA compliance related activities as a part of these processes. This indicates the importance of the concept of EA compliance in practice. The downside of the existing literature is that the concept of compliance seems to be

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vague, especially in the context of EA. In addition, it does not seem to be completely clear how to evaluate EA compliance. Hence, we consider EA compliance as an important area of further scrutiny: does EA compliance encompass only the compliance between projects and EA, or are there other aspects that should be addressed? Therefore, this paper aims to develop an extensive perception of EA compliance. Particularly, we want to describe the various possible perspectives of EA compliance, and clarify its evaluation by addressing the following issues: 1) what are the goals of EA compliance evaluation, 2) what are the specific targets of EA compliance evaluation, and 3) who should evaluate EA compliance.

The study consisted of the following steps:

- *Literature review* was carried out systematically. First, a keyword search in four high-quality academic databases (Academic Search Elite, Electronic Journals Service, Science Direct and Web of Science), Google Scholar and Google was carried out by keywords such as “compliance” and “conformance” to investigate the concept on a general level. Second, keywords such as “architecture” and “enterprise architecture” were added to the search to scrutinize it in the EA context. On the basis of the review, the concept of EA compliance was described, and the selected aspects of EA compliance evaluation addressed.
- *Focus group interview* (see e.g. Krueger and Casey 2000) of seven EA practitioners representing five Finnish or international IT user and service provider organizations, employing from 14 to several thousand people, was arranged to validate the literature review results and to supplement additional, experience-based information. Two researchers conducted the interview; one moderated the discussion and the other took notes. The interview was also audio-recorded for reviewing and completing the notes.
- *Analysis and consolidation of the results* of both the focus group interview (later referred as interview) and the literature review was carried out with the help of the recordings and notes. Specially, the description of EA compliance was revised, and practical views on EA compliance evaluation targets and evaluators constructed on the basis of the interview results.

The paper is organized as follows. Next, we discuss the concept of EA compliance. Following this, EA compliance evaluation is discussed from the practical viewpoint in terms of evaluation goals, targets, and evaluators. Finally, the last section concludes the paper.

2. Concept of EA Compliance

In literature, compliance mainly refers to the conformance with rules – standards, regulations, laws, contracts and so forth (Quality Assurance Project 2006, PEER Center 2006, Internal Auditing Standards Board 1995, Allman 2006), but no single well-defined definition seem to exist. The same applies in the EA context as well. Instead, the literature review gave us the following perspectives.

First, it is suggested that EA compliance aims to ensure the compliance of individual projects with EA, which can be assessed with the help of two processes as described in TOGAF (The Open Group 2006):

- *Architecture Compliance Review Process* evaluates a single project against the agreed “architectural criteria, spirit, and business objectives” and
- *Project Impact Assessment* evaluates the “project-specific views of the enterprise architecture that illustrate how the enterprise architecture impacts on the major projects within the organization”.

Second, EA compliance may refer to the compliance between EA and standards, reference models, or principles, which can be evaluated via a compliance assessment process (The Open Group 2006). Third, EA compliance may also aim to the use and enforcement of EA in the every day decision making by the organization (Spurway and Patterson 2005). In order to ensure that real value is gained through EA, both *proactive and reactive compliance processes* are needed. The former is concerned with how and when EA artifacts are used in IT projects, and the latter is related to EA reviews and assessments carried out in IT projects. (Spurway and Patterson 2005) Fourth, it has been suggested that compliance between EA and organization’s procurement policies should also be considered (Aziz et al. 2006, GAO 2003, CIO Council 2001). Therefore, it seems that EA compliance is related to projects and investment processes alike.

Deriving from the various perspectives above, EA compliance encompasses at least three aspects:

- Compliance between organization’s projects or investments and agreed boundaries set by EA,

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- Guidelines and constraints induced to projects or investments by EA, and
- Compliance between EA descriptions and standards, reference models, or principles.

Finally, although literature generally considers it to be self-evident, we want to stress that EA should reflect the business strategies and objectives of the organization as closely as possible (see e.g. GAO 2003). Therefore, EA compliance should also take the aspect of business-drivenness into account.

The above perspectives of EA compliance were discussed by the interviewees, who brought out that they provide a too limited view of the concept. Instead, it was suggested that there could be two types of EA compliance:

- *Internal compliance* refers to the compliance between investments – as well as the projects that implement the investments – and EA with its policies and guidelines.
- *External compliance* is about the compliance between EA and business – are the EA guidelines and target state descriptions in line with the business vision, mission, objectives, strategies, and action plans. External compliance may also refer to EA's ability to react to the changing environment of the organization, as well as to the compliance of EA with the laws and regulations the organization needs to obey.

Next, these types of EA compliance are addressed from the evaluation viewpoint.

3. Evaluating EA Compliance

In this section, the evaluation of EA compliance is discussed in terms of main goals of compliance evaluation (why to evaluate EA compliance), more precise evaluation targets (what is compared to what), and evaluators (who conducts the evaluation). These first two issues are discussed because they are the first aspects to begin any evaluation planning with (see e.g. Niemi and Ylimäki 2007). Evaluators are addressed because they have been disregarded in literature, and the diversified nature of compliance suggests that multiple evaluators may be required.

3.1. Key Goals of Evaluation

In literature, three major goals for EA compliance evaluation are suggested:

- *Directing a project or an investment to comply with EA – the proactive approach* (adapted from Spurway and Patterson 2005), see also (The Open Group 2006, NIH 2006, Aziz et al. 2006, CIO Council 2001, Paras 2005): this includes particularly direction and guidance of projects and the investment process to ensure that the organization is moving towards the target EA, supporting projects and the investment process by defining how and when EA artifacts are utilized, and encouraging the organization, especially IT projects, to utilize EA descriptions and guidelines.
- *Assuring the compliance between the output of a project or an investment process and EA – the reactive approach* (adapted from Spurway and Patterson 2005), see also (GAO 2003, NIH 2006): this includes EA reviews and assessments within projects and the investment process, and project and investment follow-up with regard to EA descriptions.
- *Assuring the compliance between EA and internal or external standards, reference models and principles* (adapted from The Open Group 2006): this includes evaluation of EA descriptions to be constructed according to defined standards, reference models and principles, by both the organization and external authorities.

Furthermore, based on our experiences in the ongoing research project, we suggest the following additional goal.

- *Ensuring the usability and appropriateness of EA policies, EA frameworks, EA descriptions, business objectives and so forth*: this provides basis for improvement, for example, by evaluating EA through experience-based feedback from projects and the investment process, or by identifying whether the EA descriptions, standards, policies and principles, or even the business requirements themselves require modification.

This notion has also been disclosed in the context of non-compliance, which may be a positive situation: it could provide feedback on the areas of EA to be potentially modified, or areas of project architecture that may be incorporated into EA (The Open Group 2006).

All these goals were considered essential by the interviewees as well. In addition to these high-level goals, a number of various benefits of EA compliance evaluation are defined in literature. Particularly, TOGAF (The Open Group 2006) provides an extensive list of project compliance review benefits, including benefits related to architecture quality management, project management, business, and EA visibility in the organization.

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3.2. Evaluation Targets

According to literature, EA compliance evaluation usually deals with the following three high-level objects: 1) the EA itself, 2) a project or an investment process, and 3) the output of a project or an investment process (The Open Group 2006, Spurway and Patterson 2005, GAO 2003, Aziz et al. 2006, CIO Council 2001, NIH 2006). The EA compliance evaluation target can therefore be defined as the relationship between these objects. The high-level objects are displayed in Table 1 together with the potential low-level items to be utilized in evaluating the relationship between the objects in EA compliance evaluation.

Table 1: EA compliance evaluation objects

<i>Evaluation Object</i>	<i>Items to be evaluated</i>	<i>References</i>
Enterprise Architecture	<ul style="list-style-type: none"> - Architectural descriptions (target architecture) - Transition plan - Principles and guidelines 	(Spurway and Patterson 2005, The Open Group 2006, CIO Council 2001, Aziz et al. 2006, GAO 2003, NIH 2006)
Project / investment process	<ul style="list-style-type: none"> - Architectural descriptions (project or system architecture) - Business case - Acquisition plan - Project plan 	(CIO Council 2001, Aziz et al. 2006, GAO 2003, NIH 2006)
Project / investment process output	<ul style="list-style-type: none"> - Architectural descriptions (project or system architecture) 	(NIH 2006, Spurway and Patterson 2005, GAO 2003)

However, the interviewees considered the above view of three evaluation objects, and therefore also the evaluation targets, to be insufficient in practice. Particularly, they stated that compliance between EA and business (vision, mission, objectives, strategies, and action plans) should not be taken for granted; instead, it should be regarded as a separate evaluation target. Moreover, the group expressed that projects and investments should not be paralleled as one evaluation object; in reality, project is a tool to implement an investment. Finally, they considered external partners, vendors and customers to be important evaluation objects as well in certain situations.

Based on the literature review and the interview, we suggest the following high-level objects between which EA compliance evaluation can potentially be conducted:

- *Business*: particularly business vision, mission, objectives, strategies, and action plans.
- *Investment*: needed to fulfill certain business objectives.
- *Project*: the tool to implement an investment.
- *Enterprise Architecture*: a holistic view to the entire organization.
- *External Directions*: especially regulations, standards, or reference architectures that need to be taken into consideration in business operations or IT development.
- *Partners and Vendors*: may provide their own procedures, guidelines or constraints in outsourcing engagements or when an organization purchases commercial off-the-shelf (COTS) products.
- *Customers*: in some cases, the organization's customer's EA, practices or guidelines need to be evaluated for compliance as well.
- *Actual Impacts of a Project or an Investment*: indicating whether and how long a step or transition has the project or investment taken towards the target EA state.

These evaluation objects, as well as the evaluation targets of both internal and external compliance, are displayed in Figure 1. Compliance between the objects – the evaluation targets – is depicted with arrows. Block arrows depict primary internal or external compliance evaluation targets and small dotted arrows other possible targets to be evaluated. Additionally, examples of lower-level items belonging to each object are included to illustrate the possible documents that can be utilized in compliance evaluation.

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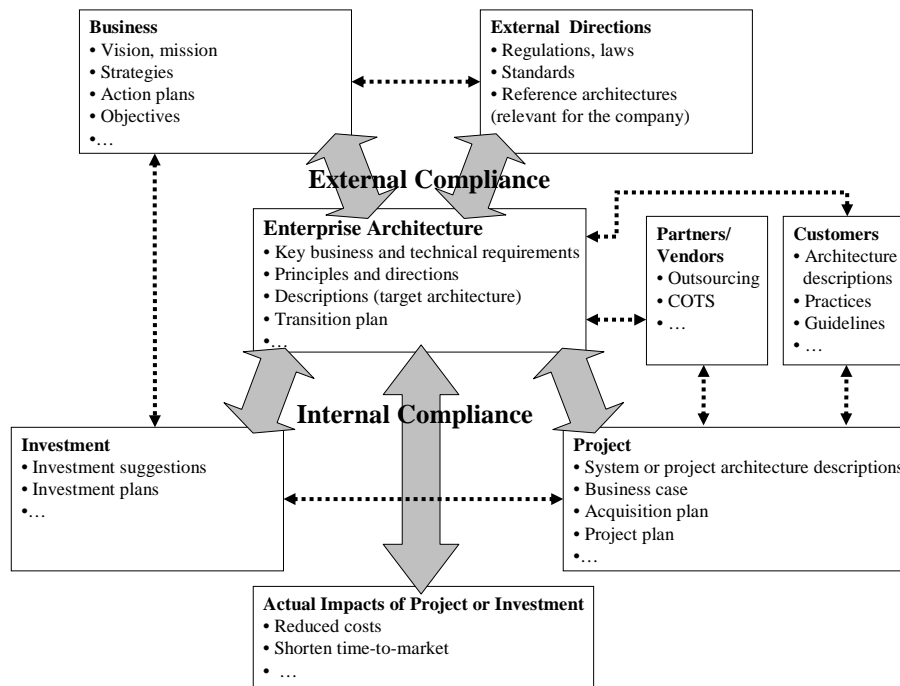


Figure 1: EA compliance objects and evaluation targets (derived from the interview results)

According to the interview, both internal and external compliance should be evaluated. In addition, there is a set of other possible evaluation targets between the evaluation objects that may require consideration in organizations. These aspects are briefly addressed in the following.

External EA compliance evaluation targets. First of all, compliance (on an acceptable level) is required between business and EA. According to the interviewees, it should be evaluated especially in the case of top management or strategy change, helping to assure that EA stays compliant with the altered business strategy, objectives, or other business requirements. Another external compliance evaluation target is the compliance between external directions and EA. Evaluation of this relationship is required especially if a reference architecture, such as TOGAF (The Open Group 2006), is applied.

Internal EA compliance evaluation targets. Similarly, compliance evaluation is required between EA and an investment, a project, and the actual impacts of both investments and projects. The interviewees stressed that it is possible for a project to succeed and fulfill its objectives, but for the investment the project implemented to fail – the impacts of the investment were not as expected. Additionally, compliance between a project and EA may include two levels (adapted from The Open Group 2006): EA design process compliance (are we doing things right) and EA compliance (are we doing the right things).

Other possible EA compliance evaluation targets. First, compliance should be assured between external directions and business to ensure that all necessary regulations, laws, standards, and so forth, are conformed to. Second, it should be assured that there is compliance between business and an investment. Third, compliance is also required between EA and partners and vendors, especially in mergers and outsourcing cases. The merger or outsourcing partner may have their own EA policies and guidelines, and the organization may need to reach compliance with them. If a project utilizes COTS products, the products' characteristics may affect the compliance between EA, the project, and its impacts. In addition, IT vendors and service providers may provide practices, methods and architectural documents to projects, affecting EA compliance. Fourth, in close customerships, compliance (at least to some extent) may be required between an organization's and its customer's EA, practices and guidelines. Finally, it should be assured that a project stays compliant with the investment it is supposed to implement.

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3.3. Evaluators

Literature typically does not state precisely which stakeholders should conduct EA compliance evaluation. However, Spurway and Patterson (2005) provide examples on two classes of EA compliance evaluation roles:

- *Project roles*, which provide necessary project documentation needed in EA compliance evaluation, and
- *Architecture roles*, which carry out the actual compliance evaluation and support project roles in the identification and creation of necessary documentation.

Generally, the EA team seems to be considered a self-evident evaluator. Nevertheless, according to National Institutes of Health (NIH 2006), self-evaluation of EA compliance can also be carried out in projects. Hence, we initially proposed two types of stakeholders that carry out EA evaluation (adapted from NIH 2006, Spurway and Patterson 2005):

- *EA team*, which provides direction and guidance to projects and investment processes, and carries out formal EA compliance reviews. Compliance guidance is either 1) provided to projects or the investment process automatically or 2) asked by project or investment process representatives when needed.
- *Project or investment representative*, e.g. the project manager, who provides the EA team with documentation needed in EA compliance evaluation, but can also carry out self-evaluation of EA compliance.

However, the literature-based viewpoint of two major evaluators was considered too limited by the interviewees. Instead, they suggested that potential EA compliance evaluators are the stakeholders (or roles) that have responsibility in the area of each evaluation object. According to this perception, the possible evaluators are displayed in Table 2.

Table 2: Possible evaluators of EA compliance, based on the interview

<i>Evaluator</i>	<i>Description</i>	<i>Responsibility area</i>
Business Developer, Process Owner, or Business Architect	Has the responsibility of business (process) development or business architecture, and could perform or assist in evaluating the compliance between business and EA. Also, may perform or assist compliance evaluation between business and external directions or an investment.	Business
EA Team or Enterprise Architect	Provides direction and guidance for projects and performs or assists in evaluating both external and internal compliance. Also, may evaluate the compliance between EA and partners' or customers' policies and guidelines. Evaluation is possibly conducted with the help of (formal) compliance reviews.	Enterprise Architecture
Investment Representative, e.g. Controller	Participates in evaluating whether the planned investment is in line with the organization's strategies and goals.	Investment
Project Representative, e.g. Project Manager or Technical Architect	Has the responsibility of project management or project content. May carry out self-evaluation of compliance between the project and EA. In addition, may participate in conducting compliance evaluation between the project and partners, customers or the investment. However, the project manager may not be aware enough about EA to be able to do self-evaluation.	Project
Representative(s) of Out-sourcing or IT/service Provider Partner(s)	Assists in evaluating whether partner's policies and guidelines, or even its EA, are taken into account in organization's EA and projects.	Partners

In addition to the stakeholders mentioned in Table 2, there may be yet another stakeholder who could be regarded as an evaluator of EA compliance: the EA governance board, also referred to as the architecture board (see e.g. The Open Group 2006) or the EA steering committee (see e.g. CIO Council 2001). If an EA governance board exists in an organization (including representatives from various stakeholder groups), it may have – among many other things – the responsibility of evaluating

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EA compliance. Thus, possible problems encountered if any single stakeholder (such as a project manager or the EA team) evaluates its own work can be avoided.

4. Conclusions

In this paper, we presented a study which aimed at discussing the various perspectives of EA compliance, and address its evaluation in terms of evaluation goals, targets and evaluators. In this section, the main conclusions of this study are highlighted and themes for further research provided. When judging our study, it should be remembered that it is based on a literature review validated and supplemented by a focus group interview of seven practitioners from five organizations initiating EA work. Our work was planned as a preliminary study: we have attempted to elucidate the vague concept of EA compliance and to start a discussion on the subject.

The concept of EA compliance seems to include more aspects than the compliance with laws and regulations alone. It was suggested that EA compliance can be divided into internal and external aspects. The former refers to ensuring that investments, projects implementing the investments, as well as their actual impacts, are conformant with EA and its policies and guidelines. The latter refers to ensuring that EA is conformant with the business objectives and strategies. It may also refer to the EA's ability to react to the changing environment of the organization, as well as to the conformance with the laws and regulations the organization needs to obey.

Subsequently, EA compliance evaluation was addressed in terms of evaluation goals, evaluation targets and evaluators. The main goal of EA compliance evaluation is to ensure that the organization is moving towards the target architecture. Basically, this can be done in two ways: 1) by directing a project or investment to comply with EA, or 2) by assuring the compliance between the actual impacts of investment or project and EA. Additionally, EA compliance evaluation helps ensure the usability and appropriateness of EA policies, descriptions and so forth and provides valuable feedback to the architecture group: is there a need to change something in the EA, or should even the business requirements be reconsidered?

A set of evaluation objects between which compliance may be evaluated were suggested. These objects include: business, investments, EA, projects, external directions, partners, customers, and the actual impacts of an investment or a project. Therefore, compliance evaluation targets are the relationships between these objects. Several targets were described, divided into external, internal and other possible evaluation targets. Moreover, stakeholders conducting or assisting the EA compliance evaluation were suggested to be those stakeholders who deal with or are in charge of the above mentioned evaluation objects. Usually, the EA compliance evaluation is conducted with the help of documents related to each evaluation object.

Furthermore, the interviewees stressed that also the following two aspects should be kept in mind when planning and conducting EA compliance evaluation:

- *EA compliance has a dynamic nature:* organizations' environment is constantly changing, and so are their EAs. Therefore, compliance can be evaluated to be on an acceptable level at the moment, but it does not guarantee that this is the case in future.
- *EA compliance seems to depend on the EA maturity level:* both the meaning and the content of EA compliance may vary according to the EA maturity level. It was suggested that in the lower levels of maturity (in the beginning of EA development work), EA compliance and its evaluation actually equals quality assurance, and especially the impacts of EA work are a focal issue. After the EA process has become a more established, more profound aspects of EA compliance will become increasingly important. However, the maturity level dependence was not studied further in this research.

The extensive view of EA compliance enables organizations to address the issue more comprehensively. It can be used to make sure that all the important aspects of EA compliance have been considered – judging from the literature reviewed, the concept has not been comprehensively addressed before, even in official compliance processes and practices. In practice, this paper may provide ideas and views on how to deploy EA guidance, descriptions and principles to projects and investment processes, which in turns enables the organization to assure that it is moving towards the desired target architecture. These perceptions, together with the various aspects of EA compliance evaluation presented, may also serve as a stimulus for organization-specific planning of EA compliance evaluation, which is eventually required if the organizations want to endorse EA

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compliance. However, each organization needs to make its own decisions on the actual steps of the evaluation process, and to implement it as a continuous EA governance activity.

For researchers, the results provide a foundation for which to build further research. Especially, more generic practices, guidelines and reference models for systematic EA compliance evaluation could be developed. Furthermore, the relationship between EA compliance and EA maturity could be studied in more detail to clarify how the organization's EA maturity level affects the meaning and content of EA compliance and its evaluation.

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