

Evaluation Practices in Architecture Work

On this page, the following topics are addressed:

- **Evaluation Planning:** Overview of the evaluation planning components
- **Generic Evaluation Model for Enterprise Architecture:** Description of a model to evaluate the status (the maturity) of an organization's architecture work
- **Existing Architecture Evaluation Methods:** Description of the existing architecture evaluation methods

Evaluation Planning

EA evaluation literature focuses particularly on defining EA metrics and evaluation criteria, especially in the form of maturity models (see e.g. [GAO 2003](#); [IAC 2005](#); [OMB 2005](#)), but almost omitting the aspect of elaborate evaluation planning. However, as EA is extensive and can be approached from a number of viewpoints, EA evaluations need to be planned systematically and require taking into account a broader set of aspects than merely selecting and implementing metrics. Therefore, EA evaluation was approached from the program evaluation perspective and established literature (see [Chen 2004](#); [Fitzpatrick et al. 2003](#); [Grasso 2003](#); [Lopez 2000](#); [Shadish et al. 1991](#); [Stufflebeam 2001](#); [Taylor-Powell et al. 1996](#)) and a focus group interview of practitioners was used to define the building blocks - or components - that need to be addressed in EA evaluation planning. The components of EA evaluation are defined as follows:

- **EA Objectives:** The goals set for the EA approach in the organization.
- **Evaluation Purpose:** The reasons for the evaluation to be conducted.
- **Evaluation Target:** The object under evaluation (to delimit the factors to be considered).
- **Evaluation Audience:** The users of the evaluation information and results.
- **Quality Attributes and Metrics:** The characteristics of the target that are to be evaluated.
- **Yardstick or Standard:** The ideal result against which the real result is to be compared.
- **Data Gathering Techniques:** The techniques needed to obtain data to analyze each characteristic of an evaluation target.
- **Data Synthesis Techniques:** Techniques used to judge each characteristic of an evaluation target and, in general, to judge the target, obtaining the results of evaluation.
- **Evaluation Process:** Series of activities and tasks by means of which an evaluation is actually performed.
- **Evaluation Management:** Issues related to responsibilities, resources required (people, budget, timeliness, and so forth) and risks.

Figure below displays the components of EA evaluation. A number of potential relationships between them are depicted as well. The definition of evaluation purposes needs to start with answering the question 'why is the program carried out'. In the context of EA, this requires an understanding of EA objectives; what are the organization's goals of EA and EA work. EA objectives provide a valuable input to EA evaluation planning affecting both the purposes and the targets of EA evaluation, and can thus be regarded as an additional component to be taken into consideration.

Moreover, the evaluation purposes and targets are interrelated with each other. Evaluation audiences, on the other hand, have various evaluation needs and concerns, and thus affect both the evaluation purposes and targets.

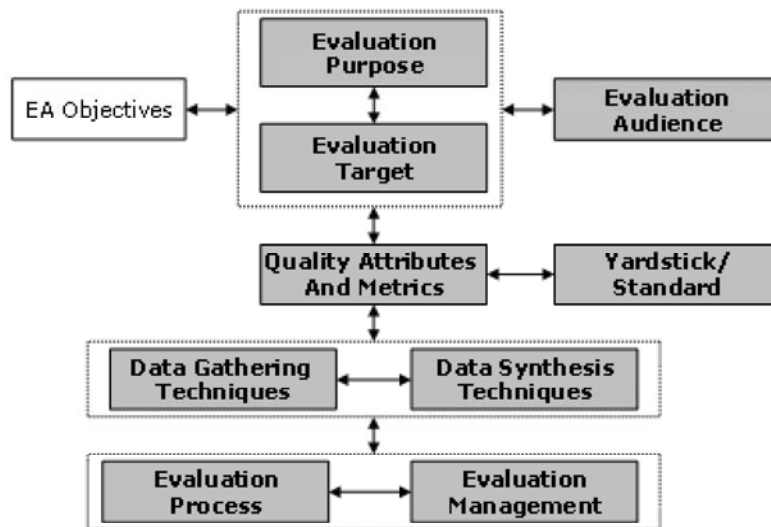


Figure: The components of EA evaluation.

It should be noted that the maturity of the organization's EA affects the selection of evaluation targets, as well as the definition of evaluation criteria and metrics. Thus, the EA maturity level of the organization, the evaluation targets, and the evaluation criteria and metrics need to be compatible. Organizations on lower levels of maturity should start with simple metrics (such as on/off-metrics or quantitative metrics). While the organization matures, more detailed business impacts can potentially be measured. In addition, it should be considered that the EA evaluation targets and metrics must be compatible with the other evaluation and measurement systems used in the organization (such as Balanced Score Cards).

For more information on EA evaluation planning, see paper [Enterprise Architecture Evaluation Components](#).

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Generic Evaluation Model for Enterprise Architecture

Several maturity models, which have their origins in the field of quality management (Chrissis et al., 2003; Fraser et al., 2002), have been developed to assess the stage of an organization's EA and to enhance its quality, such as the models developed by the Chief Information Officers Council (1999), the U.S. Department of Commerce (2003), and the Office of Management and Budget (2005).

The maturity of EA refers to an organization's capability of managing the development, implementation and maintenance of its architecture (van der Raadt, et al., 2004), which usually consists of four viewpoints: business, information, systems, and technical architecture (e.g. The Open Group, 2006). Furthermore, the idea of these maturity models is that maturity evolves over time from one level to a more advanced level, without skipping any level in between, eventually moving towards the ideal ultimate state (Klimko, 2001).

In the AISA Project, we regarded these maturity models as one means of advancing the quality of EA by providing at least an initial EA quality management system (see also [Cullen, 2006](#)). Something that we considered to be a downside with these maturity models was the fact that they seem to be more or less domain specific; especially developed for the various areas of the public administration (e.g. [DoC, 2003](#); [IAC, 2005](#); [NASCIO, 2003](#)). Publicly available maturity models, specifically suitable for evaluating the EA of heterogeneous private sector companies, are still hard to find. Hence, we decided to take another approach to the problem: we applied the concept of a Critical Success Factor (CSF) to the field of EA and defined the [potential CSFs for EA](#). These CSFs represent the factors that have to be carried out exceedingly well in order to attain successful EA, a high-quality EA.

Furthermore, we aimed at developing a generic evaluation model for Enterprise Architecture (later the model is referred to as gemEA), a model that is suitable for evaluating the stages of EA in private sector organizations, regardless of their line of business. Consequently, **the initial gemEA** consists of the following three parts:

1. the set of 12 potential [CSFs for EA](#) representing the areas to be evaluated,
2. the key questions assigned to each CSF, and
3. the maturity levels to evaluate the stage of each CSF.

The maturity levels, shown in the table below, were derived from the existing maturity models ([Chrissis et al., 2003](#); [DoC, 2003](#); [GAO, 2003](#); [NASCIO, 2003](#); [OMB, 2005](#)). The aim was to define the maturity levels in such a way that they can be used for evaluating the stage of all the diverse areas (the CSFs) in the gemEA.

Level	Level Name	Description
0	Undefined /None	No evidence of any kind of the particular area being taken into account.
1	Initial	The need for taking the particular area into account has been recognized. Artifacts and practices may exist, but they may be incomplete or inconsistent. Processes are mainly informal and ad-hoc.
2	Under Development	Artifacts and documented practices or processes exist. Some may be even complete. Implementation or deployment is not yet carried out. Practices or processes are not yet utilized.
3	Defined	Practices or processes and artifacts have been completed, accepted and communicated to the stakeholders. Implementation, deployment, and utilization have started.
4	Managed and Measured	Implemented or deployed. Practices or processes and artifacts are being utilized and considered as part of normal operations in the organization. Practices or processes and artifacts etc. are measured against a set of predefined and established metrics or criteria.
5	Optimizing (continuous improvement)	Practices or processes related to the particular area are continuously improved. More specifically, clear proofs of architecture benefits, e.g. demonstrable improvements in efficiency, cost savings and service quality, can be seen.

The initial gemEA was tested in the three organizations participating in the research project (see the section describing [the case studies](#)). Based on the trial use of the gemEA, it seems that the model briefly described above is suitable for evaluating the current stage of EA in various types of private sector organizations (representing IT user organizations). Furthermore, the gemEA provides a tool to evaluate an IT service-provider organization's ability to deliver EA development and management services and practices for its customers.

The CSFs in the gemEA take various viewpoints into account and provide a more holistic and extensive view to an organization's EA than most of the existing models. In addition, the gemEA is also generic enough to enable the evaluation of the state of EA in various organizations representing different lines of businesses; whereas, most existing maturity models that have been used in the EA evaluation are defined in terms of public sector organizations only.

The main improvement needs detected are the following:

- **Categorization of the questions attached to each CSF in the gemEA:** Two or three levels of questions for each CSF could be determined; general-level questions supported by more detailed questions. This categorization would make the application of the model more flexible.
- **Prioritization or weighting either 1) the CSFs, 2) the different parts of the CSFs, or 3) both:** During the analysis of the interview data, it was noted that difficulties may appear in assessing the maturity of a CSF if it consists of several different aspects; which part of a CSF should be emphasized and why? One solution to this problem would be the prioritization of the CSFs, or perhaps the weighting of them, as well as the different aspects within a CSF
- **Combining or dividing the CSFs in the gemEA:** Depending on the organization's needs (or the phase of the EA development), there may be a need to divide some CSFs into several separate parts (such as framework, development methodology and tool support), especially if there seems to be a lot of variation in the maturity or development activity among these parts
- **Organization of the CSFs:** Should the CSFs be organized or categorized further? How should they be categorized? One possible grouping for the CSFs was found, namely:
 1. **Architectural starting points** including Scoping and Purpose; Organizational Culture; Commitment; Communication and Common Language
 2. **Methods and tools for architecture work** including Development Methodology and Tool Support; EA Models and Artifacts; Assessment and Evaluation
 3. **Support for architecture work** including Governance; Skilled Team, Training and Education; Project and Program Management
 4. **Integration with the organization's other processes** including Business Driven Approach; IT Investment and Acquisition Strategies

This categorization provides one possible way of interpreting the results. For example, it may help in depicting the extent to which the organization has addressed the architectural starting points, which are crucial in facilitating the further EA development.

More information on the evaluation model can be found in the following articles:

- [Potential CSFs for EA](#) describing the CSFs and the questions related to these CSFs.

See also the related [report](#)

- [Towards a Generic Evaluation Model for Enterprise Architecture](#) describing the evaluation instrument and the results of its trial use. See also the section [Current status of architecture work](#).

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Existing Architecture Evaluation Methods

The evaluation of EA regarding its quality and benefits is rather difficult even though a large number of architecture evaluation methods have been introduced. In the AISA project, a research was conducted to review these existing methods. Methods were classified according to the general views of EA; business, information, software systems and technology architectures.

The methods suggested for the business architecture are

- governance modelling (e.g. [Yu & Deng, 2006](#)),
- business process modelling and simulation (e.g. [Vidovic, 2003](#)), and
- financial methods for assessing the value of an IT investment (prediction of expected benefits through IT investment) (e.g. [Symons, 2006](#)).

The needs concerning the enterprise's information architecture were addressed by the evaluation of the corporate data model which is a structured conceptual model of the organisation's data entities and their relations (see e.g. [Goodhue, Wybo et al., 1994](#)). The suggested methodology was the Moody's Framework ([Moody, Shanks et al., 1998](#)).

The systems architecture consists of software systems. A software system is described through software architectural artefacts. Therefore, the evaluation techniques suggested for the systems architecture are methods for software architecture evaluation

- questionnaires ([Bass, Clements et al., 2003](#)),
- scenario-based methods ([Clements, Kazman et al., 2002](#)),
- design metrics (see e.g. [Clements, Kazman et al., 2002](#)),
- prototyping (e.g. [Mårtensson, Grahn et al., 2003](#)), and
- mathematical modelling (e.g. [Bosch and Molin, 1999](#)).

Since the infrastructure which allows the deployment of software applications is also part of the software system the underlying execution environment can be evaluated within the software architecture evaluation. The methods concerning the software system evaluation enable predictions regarding the whole system life cycle. Especially, characteristics, such as performance, cost, reliability and maintenance are essential characteristics in the enterprise architecture context. The suggested methods, such as '4+1 Model of Architecture' ([Kruchten 1995](#)), are able to assess these criteria.

All reviewed methods, standards, and measures address EA related concerns and evaluation needs regarding business, information, systems, and technology. All of the reviewed techniques have been developed or tested and validated in a practical environment. Many of the introduced evaluation methods rely on conceptual models which improve the architectural awareness and knowledge sharing among stakeholders from different domains. As possibilities to evaluate the ICT architecture, SA evaluation methods and benchmarking are given. Furthermore, financial methods for assessing the

business value of ICT investments are presented. These methods result in the financial measures costs and benefits of ICT related investment decisions. The measures are adjusted to risks and possible change influences.

For more detailed information on existing architecture evaluation methods, see paper [Analysis of the current State of Enterprise Architecture Evaluation Methods and Practices](#) and report [Architecture Evaluation Methods](#).

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