Enterprise Architecture Evaluation Components

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ABSTRACT

Enterprise Architecture (EA) is a holistic view of an organization, including the viewpoints of business, information, systems and technology. It is stated to provide significant benefits to organizations, and is therefore of interest for both academics and practitioners. However, evaluating EA, or its benefits, is difficult. Moreover, the studies on EA evaluation are mostly inconsistent, and almost omit the planning aspect of evaluation. This study suggests the evaluation components that need to be addressed in EA evaluation planning, charted by a literature review supplemented and validated by a focus group interview. In addition, four evaluation components are further described.

Keywords

Enterprise Architecture, evaluation, evaluation components, evaluation planning

INTRODUCTION

Enterprise Architecture (EA) provides a holistic view of an organization through a set of architectural models, including the viewpoints of business, information, systems and technology [see e.g. 6, 14, 16]. It is an approach for managing and developing an organization, and is stated to provide a multitude of positive business impacts [see e.g. 10, 20]. Therefore, EA is of growing importance for both academics and practitioners. However, a great deal of resources has to be engaged to EA work (that includes EA planning, development and governance), and thus evidence of its positive impacts has to be presented through EA evaluation to rationalize the investments on EA [see e.g. 20]. Moreover, it is widely known that information gained through successful evaluation is crucial in the management and improvement of any initiative. Nevertheless, the research on EA is currently fragmented, focusing mostly on frameworks [see e.g. 12, 28, 31], and development methods and tools [see e.g. 3, 7, 18]. Only recently have EA evaluation issues gained some attention [see e.g. 20, 21, 26]. Still, the studies on EA evaluation are mostly inconsistent, focusing particularly on defining EA metrics and evaluation criteria, especially in the form of maturity models [see e.g. 9, 13, 24], but almost omitting the aspect of elaborate evaluation planning. However, we think that EA evaluation planning requires taking into account a broader set of aspects than metrics alone. Therefore, this study pursues to suggest the evaluation components needed to be addressed already in the EA evaluation planning phase, before organizations move on to the actual evaluation.

The paper is organized as follows. First, the research process is briefly described. Second, the components of EA evaluation are presented. Third, four components – EA objectives, evaluation objectives, evaluation targets, and audience of the evaluation results – are described in more detail. Finally, the last section concludes the paper.

RESEARCH PROCESS

The study was conducted in four stages. First, a literature review was carried out to compose a perception of program evaluation, its components, as well as to chart the possible content of the components in the EA context. Second, a focus group interview [see e.g. 17] of seven practitioners from five Finnish and international ICT user and service provider organizations was organized in August 2006 to validate the literature review results and to supplement additional, experience-based information. The organizations were either 1) independent companies, or 2) divisions, subsidiaries or other parts of domestic or global enterprises. Moreover, they represented different industries and employed from 14 to several thousand people. Three researchers conducted the interview; one moderated the discussion and two took notes. The interview was also audio-recorded for reviewing and completing the notes.

Third, the information from the literature and the focus group interview was analyzed with the help of the recordings and notes, and combined to describe the components of EA evaluation. Fourth, especially four evaluation components – EA objectives, evaluation objectives, evaluation targets, and audience of the evaluation results – were discussed in more detail. These can be regarded as the starting points for EA evaluation planning. After addressing these components, it is possible to go on to defining suitable evaluation criteria (quality attributes), and usable and simple metrics to evaluate each evaluation target.

DEFINING THE EVALUATION COMPONENTS

Even though the evaluation discipline lacks a general theory [19], some definitions can be found. **Evaluation** can be described as "the identification, clarification, and application of defensible criteria to determine and evaluation object's value, its merit or worth, in regard to those criteria [8]. Briefly, it is "a process of determining merit, worth, or significance" [19]. Basically, evaluation focuses on products or processes. This viewpoint has been adopted particularly in the discipline of quality management aiming at improving the quality of products and processes [5, 15].

Program evaluation refers to "the thoughtful process of focusing on questions and topics of concern, collecting appropriate information, and then analyzing and interpreting the information for a specific use and purpose" [30]. By program we mean a set of ongoing and planned activities aiming at a specific outcome [8, pp. 54]. Thus, EA can be regarded as a program.

A substantial amount of literature exists on evaluation [see e.g. 4, 8, 11, 19, 27, 29, 30]. A literature review gave us a list of building blocks that need to be addressed in evaluation planning. In Table 1, these building blocks or components of evaluation are briefly described. While these components, that are rather generic in nature, are regarded as essential in (program) evaluation, and especially in its planning phase, we suggest that this is also the case in the context of EA evaluation. EA deals with both products (architecture artifacts, models etc.) and processes (development process, management process etc.), which are the focus of evaluation by its definition. Hence, all the components in the table need to be addressed in EA evaluation planning as well.

Table 1. The components of evaluation.

Component	Description	References
Evaluation Purpose	The purpose of evaluation: - Why is the program carried out? - Why should the evaluation be conducted? - What is desired to be accomplished by the evaluation?	[8, 30, 32]
Evaluation Target	The object under evaluation (to delimit the factors to be considered): - What are the evaluation targets (the whole program, a particular area, or a number of areas within the program)?	[8, 19, 30]
Evaluation Audience	Potential users of the evaluation information and results: - Who will use the evaluation results? - How will they use it? - What do they want to know? Which questions will the evaluation seek to answer?	[8, 11, 30]
Quality Attributes and Metrics	The characteristics of the target that are to be evaluated: - What information will help to answer the evaluation questions? - What information is needed to answer the questions?	[8, 19, 30, 32]
Yardstick or Standard	The ideal result against which the real result is to be compared.	[19, 32]
Data Gathering Techniques	The techniques needed to obtain data to analyze each characteristics of an evaluation target: - What sources of information will be used? - What data collection method(s) will be used? - Which instruments (e.g. recording sheet, questionnaire, video or audio tape) will be used? - When will the data be collected (e.g. before and after the program, at one time, at various times, continuously, over time)? - Will a sample be used? - Who will collect the data? - When will the data be gathered? What is the schedule?	[8, 19, 30, 32]

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: - How will the data be organized or tabulated? - What, if any, statistical techniques will be used? - How will narrative data be analyzed? - Who will organize and analyze the data? - How will the data be interpreted and by whom? - How will the evaluation findings be communicated and shared? To whom?	[8, 19, 30], see also [11]
Evaluation Process	Series of activities and tasks by means of which an evaluation is actually performed: - What steps are needed? (E.g. evaluation design, examination/data gathering, and decision making including synthesis, analysis, and documentation). - When will the steps be conducted? - How long will it take to conduct each step? - Who conducts the steps? - How will the results be documented, reported, communicated so that they are understood and regarded as credible? - Who will receive the report? Will it answer their questions?	[8, 19, 30, 32]
Evaluation Management	Issues related to responsibilities, resources required (people, budget, timeliness, and so forth) and risks. - What kind of expertise is needed to conduct the evaluation? - Who are available to work on evaluation (either from the organization the evaluation takes place in, or external evaluators)? - How much may the evaluation work cost? - When are the evaluation results needed? Flexibility is important; evaluation should be able to be completed at a point where it will have the maximum impact in the organization. - Are there any threats that may harm the validity or reliability of the results? Are there any other risks to be considered?	[11, 30, 32], see also [8]

According to Table 1, 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, even 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.

Additionally, the interviewees stressed that also the objectivity of evaluation and evaluation information need to be addressed. However, to some extent it must be accepted, that all evaluation information is not necessarily very objective, and different evaluators may come up with different results. To minimize the diversity of the results, both the evaluation process and the analysis techniques should be detailed enough to guide the evaluation work to ensure that the reliability of the evaluation results is acceptable. In Figure 1, a number of other relationships between the evaluation components are, to some extent, depicted as well. These will be addressed by further research in more detail.
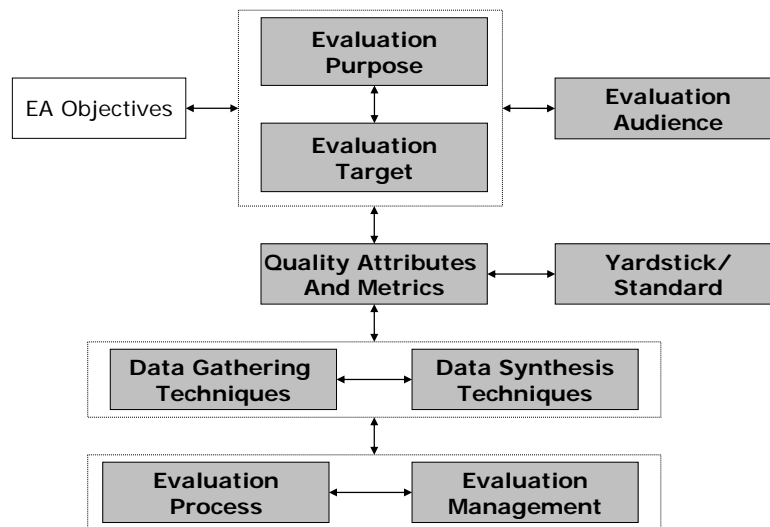

Figure 1. The components of EA evaluation.

FROM ENTERPRISE ARCHITECTURE OBJECTIVES TO EVALUATION TARGETS

This section describes the following EA evaluation components in more detail: 1) EA objectives, 2) evaluation purposes, 3) evaluation audiences, and 4) evaluation targets. These are the first components that have to be taken into account in EA evaluation planning, before any quality attribute or metrics selection and definition can be conducted.

EA Objectives

EA objectives define the goals of the EA approach in the organization; why it wants to apply the EA approach and what it wants to achieve through EA. Even though the EA objectives need to be defined in each organization based on, for instance, the business or IT strategy of the organization, some common features of these goals can be found.

Based on the literature review and the focus group interview, several possible objectives, based on the potential benefits wanted to be realized in the organization, were found to drive EA work. Some examples of these objectives are

- To improve business-IT alignment [see e.g. 6, 20]
- To improve change management [see e.g. 10, 26, 31]

- To improve communication [see e.g. 26, 31]

- To increase interoperability and integration [see e.g. 20, 26, 31]. According to the focus group, these issues could be related to e.g. legacy, migration and new information systems. Moreover, the conformance of new technologies to EA, and the effects of obsolete technologies should be taken into consideration, as stated by the focus group.

- To reduce complexity [see e.g. 20, 26, 31], also emphasized by the focus group.

- To reduce (IT) costs [see e.g. 13, 20, 26, 31], also emphasized by the focus group.

- To shorten cycle times [see e.g. 13, 20, 26, 31].

More detailed discussion on the various potential benefits of EA and EA work is provided by Niemi [22].

Evaluation Purposes

EA evaluation purposes provide justification for doing EA evaluation in the first place. They should answer questions like "why should the evaluation be conducted" and "what is desired to be accomplished by the evaluation". EA evaluation purposes are, to a great extent, dependent on the objectives of EA. Additionally, as it was brought up by the focus group, different audiences (stakeholders) have different needs for evaluation, and thus, different evaluation purposes are required. Especially, business management is mainly interested in financial measurement, while ICT organization may be more interested in technological aspects. Also, the time frame of evaluation affects the evaluation purposes; in the long run, an organization is more likely to be able to evaluate the business value of EA (the business impacts), than in the early phases of EA development cycle.

In literature, various evaluation approaches have been proposed and categorized. For instance, the approaches could be categorized by the areas of knowledge where evaluation is applied, such as education, business, or government [33]. In the beginning, our plan was to organize the EA evaluation purposes according to the categories described in [33]. However, this proved to be a non-trivial task because the categories are overlapping to some extent. Hence, instead, we suggest that most of the EA evaluation purposes seem to fall into the following areas:

- Aiding decision-making about the EA program itself and to steer the program [adapted from 2, 9, 29], or "to ensure that expected benefits from the EA are realized and to share this information with executive decision-makers, who can then take corrective action to address deviations from expectations" [9].

- Describing results of the EA program to the stakeholders by demonstrating, for instance, alignment with business strategy, the (business) value of EA, the benefits of EA, or the value of IT and IT investments [adapted from 1, 2, 9].

- Determining whether the objectives of EA or the EA program are achieved, for instance, by evaluating the effectiveness of EA and the quality of (EA) processes and products, or by performing cost-benefit analysis [adapted from 1, 2, 9, 20, 29].

- Analyzing the status of the EA program by 1) examining the EA objective and benefit achievement trends (short or long term), such as progress towards the goals of the EA program as well as towards the target EA state [adapted from 2, 9, 29], or 2) by identifying and assessing various risks related to EA and business [adapted from 25, 29].

Evaluation Audiences

EA evaluation audience refers to potential users of EA evaluation information and results. While planning EA evaluation, the EA stakeholder groups that may need or require evaluation results need to be defined. Additionally, potential ways these stakeholder groups will use the information should be discussed and determined.

The potential stakeholders of EA are described in [23]. However, each organization has to discuss and determine the relevant stakeholders for its EA approach, as well as for its EA evaluation results. Each audience may have different evaluation needs and concerns because they are interested in different points of view (financial, strategic, efficiency, and so forth). As stated by the focus group, a balance, or priority, between these various needs has to be addressed. In practice, one or two of the audiences are usually dominating, and therefore, according to the focus group, their needs may be given first priority.

In Figure 2, some potential stakeholders – audiences – of EA evaluation results are displayed. Evaluation audiences that were added on the basis of the focus group interview are marked with an asterisk (*). Moreover, in the figure, R&D refers to research and development. An important stakeholder group, that is not actually an audience of the evaluation results, but assists the EA evaluation team (either internal or external evaluators) to format the evaluation information using a language that is comprehensible by each audience, is Internal Communications.
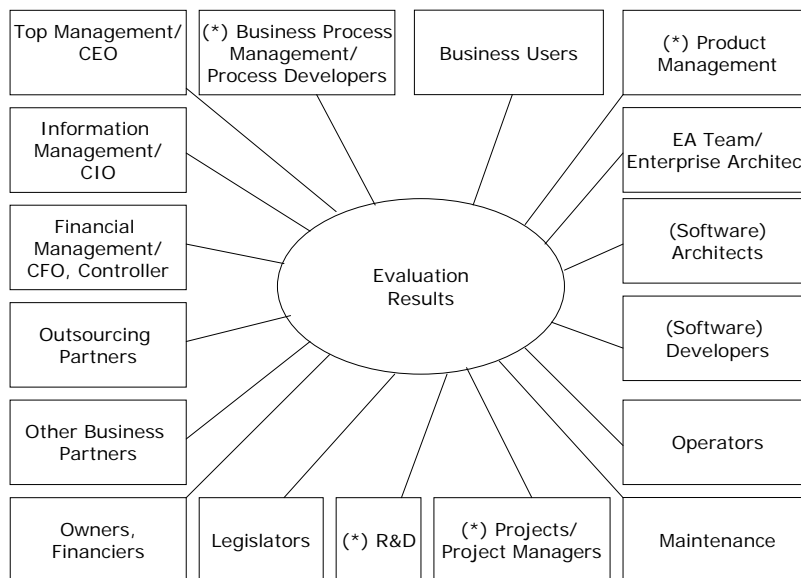

Figure 2. Possible audiences of EA evaluation results.

Evaluation Targets

Previously in our ongoing research project, we have defined a set of potential Critical Success Factors (CSFs) for EA, indicating the issues that have to be done exceedingly well in order to gain high quality EA, which in turn enables the business to reach its business objectives and gain more value [33]. The set of 12 potential CSFs for EA provided a starting point for determining the EA evaluation targets. However, it should be remembered that the evaluation targets are also dependent on the objectives of EA, the purposes of EA evaluation, and the various audiences (stakeholders) that may require the evaluation results; therefore, compatibility between these components should be assured.

In the following, examples of evaluation questions related to each potential target (or

a potential CSF for EA), particularly brought up by the focus group, are presented (see [33] for more information about the potential CSFs for EA):

- Scope and Purpose (of EA): Are the EA objectives derived from the business or IT strategies of the organization? How has the scope of EA changed or expanded during the last quarter (or year)? How controllable is the EA scope?

- Business Driven Approach: To what extent are business requirements prioritized and how they are prioritized? To what extent are they conflicting or competing? To what extent is the EA team aware of the changes in business requirements? Has the team all necessary information related to the business?

- Communication and Common Language: To what extent are the architects, the EA team, capable of communicating with different stakeholders using a language these stakeholders can comprehend?

- Commitment: To what extent is the (top) management aware of the EA approach of the organization? Does the management sponsor the EA approach?

- Governance: How is EA work and governance positioned in the organization (e.g. under the information systems management and CIO, or elsewhere in the organizational chart)? How successful has this solution been? Is there any need to relocate or reorganize EA work and governance? Does EA governance have necessary resources (time, money, etc.)? How helpful have the governance processes been considered by e.g. projects?

- IT Investment and Acquisition Strategies: How effective, viable, and practical is the investment decision making process?

- EA Development Methodology and Tool Support: To what extent are methodologies and methodology use evaluated? How effective are the methodologies? What are the costs of tool use? To what extent are verifiable benefits received from tool use? How does the tool use affect other features of system development, such as its production costs, flexibility, adaptability or expandability?

- EA Models and Artifacts: To what extent are EA document templates designed and how useful have the templates been? Are the models consistent enough to provide a holistic view of the organization?

- Assessment and Evaluation (of EA): To what extent are the purposes, targets and audiences of EA evaluation identified and approved? To what extent do these correspond with the maturity of the organization's EA? To what extent are the EA evaluation criteria and metrics aligned with the other evaluation metrics used in the organization? What is the time-frame of evaluation?

- Skilled Team, Training and Education: Does the EA team have the necessary resources (time, money, etc.)? To what extent does the team have various skills and experience (in business, technology, system development, architecture, etc.)?

- Organizational Culture: How aware are the organization members of the EA approach and its objectives? How has EA affected the organization, its structure and culture, after integrating or consolidating functions, for instance, in finance or personnel management? How long has it taken to make the required changes in the organization? Has it taken longer or shorter time than earlier?

- Project and Program Management: To what extent does the project methodology include EA guidance? To what extent has a project received EA guidance? How useful has the guidance been? How many projects have indicated a need to change or refine EA (e.g. EA plans or objectives)?

While some of the evaluation needs (or evaluation questions) cannot be incorporated into any specific CSF for EA, the entire EA program is considered a separate evaluation target as well. Evaluation questions related to the entire EA program, stressed by the

focus group, are particularly: How is the program progressing? What are the benefits of the EA approach to each stakeholder group? What kind of business impacts does EA provide? How have these impacts evolved or changed over time (in a quarter, year, etc.)? How has EA affected IT costs? Have they been decreasing or increasing? How mature is the organization's EA (program)? How has the maturity evolved over time?

CONCLUSIONS

In this study, the evaluation components of EA were defined by a literature review, supplemented and validated by a focus group interview of EA practitioners. Subsequently, four of the evaluation components were described in more detail, namely: 1) EA objectives, 2) evaluation purposes, 3) evaluation audiences, and 4) evaluation targets.

When evaluating our study, it should be remembered that it is mainly based on a literature review, only validated by a focus group interview of seven practitioners from organizations initiating EA work. Therefore, strong generalizations cannot be made. Our work was planned as a preliminary study of revealing issues – also other than metrics definition – to be addressed while planning EA evaluation.

The resulting model of components can be used by practitioners in organizations to structure the planning phase of EA evaluation, and help to assure that all evaluation components are addressed before moving on to the actual evaluation. As a result, organizations could expect better comparability between the results of different evaluations, and greater results validity compared to an ad hoc approach. In addition, we summarize the following practical implications from our study.

One of the most important EA work triggers was underlined by the focus group: the ever more complex and constantly changing environment the organizations have to deal with. There are complexities in the business environment, as well as in the existing information systems environment (legacy systems). It has become ever more challenging to control this multifaceted environment. EA has been suggested to be one possible approach for putting some structure into the chaos as well as to manage the changes needed for improving the business and the organization. To ensure that EA has actually achieved desired results, evaluation is required.

Usually, each organization has its own specific objectives for the EA approach. The purposes of evaluating the organization's EA program can be defined on the basis of these objectives. However, other sources may exist as well, such as the most important audiences and their various requirements for evaluation information – top-management may want information to support decision-making, while EA team would need to know how useful has EA guidance been considered by projects, or how many projects have effected EA. Once these aspects are clarified, the primary evaluation targets, compatible with the requirements set by different audiences, as well as with the evaluation purposes, can be defined.

If the organization has not yet clarified its EA program's objectives, it can stimulate the discussion and definition of the EA objectives with the help of the sample objectives presented in this paper. Similarly, discussion on evaluation purposes, audiences and evaluation targets can be assisted and supported by the given examples. Cross-tabulations can be used to depict dependencies between different evaluation components, such as

- EA objectives and evaluation purposes,
- audiences and evaluation purposes,
- evaluation purposes and targets, and
- audiences and evaluation targets.

In addition, it should be noticed that the maturity of the organization's EA affects the selection of evaluation targets, as well as the definition of evaluation criteria and metrics. Interviewees stressed that the EA maturity level of the organization, the evaluation targets, and the evaluation criteria and metrics need to be compatible. In particular, a 'young architecture organization' should start with defining simple metrics (such as on/off-metrics or quantitative metrics) indicating and demonstrating, for instance, the extent the stakeholders are aware of the EA approach and its objectives, or the support and guidance provided to projects implementing or changing EA. While the organization matures, more detailed business impacts can potentially be measured. However, in this study, evaluation targets and evaluation questions were not mapped to maturity levels.

The interviewees also emphasized that no matter what the EA evaluation targets and metrics are, they must be compatible with the other evaluation and measurement systems used in the organization (such as Balanced Score Cards). Especially, if the business is striving for substantial growth (in the sense of market share, sales volume, and so forth), IT cost metrics are not likely to show lower costs at the same time.

For researchers, the EA evaluation component model constructed provides a basis for further research on EA evaluation. Firstly, more research is needed to validate the evaluation component model. Secondly, the evaluation components and interrelationships not covered by our research, particularly EA quality attributes and metrics, should be further studied. Thirdly, the evaluation components could be mapped to EA maturity levels, highlighting the differences in EA evaluation on different levels of maturity.

Finally, even though the discussion in this paper has focused on EA evaluation, the evaluation components presented are generic in nature and thus applicable to many other evaluation endeavors as well.

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REFERENCES

1. Aziz, S., et al., 2006, Enterprise Architecture: A Governance Framework. Part II: Making Enterprise Architecture Work within the Organization (a white paper). Available:

2. Basili, V. R.; Caldiera, G.; Rombach, H. D., 1994, The Goal Question Metric Approach, in Encyclopedia of Software Engineering, Wiley,

3. Bernus, P.; Nemes, L.; Schmidt, G., 2003, Handbook on Enterprise Architecture, Springer-Verlag.

4. Chen, H. T., 2004, Practical Program Evaluation: Assessing and Improving Planning, Implementation, and Effectiveness, Sage Publications.

5. Dale, B. G., 2003, Managing Quality, Blackwell Publishing.

6. de Boer, F. S., et al., 2005, Change Impact Analysis of Enterprise Architectures, in Proceedings of the 2005 IEEE International Conference on Information Reuse and Integration (IRI-2005), Las Vegas, USA.

7. Fatolahi, A.; Shams, F., 2006, An investigation into applying UML to the Zachman Framework, Information Systems Frontiers, 8, 2, 133-143.

8. Fitzpatrick, J. L.; Sanders, J. R.; Worthen, B. R., 2003, Program Evaluation:

Alternative Approaches and Practical Guidelines, Allyn & Bacon.

9.   GAO, 2003, A Framework for Assessing and Improving Enterprise Architecture Management, v. 1.1. Available:

10.   Goethals, F., et al., 2006, Managements and enterprise architecture click: The FAD(E)E framework, Information Systems Frontiers, 8, 2, 67-79.

11.   Grasso, P. G., 2003, What Makes an Evaluation Useful? Reflections from Experience in Large Organizations, American Journal of Evaluation, 24, 4, 507-514.

12.   Greefhorst, D.; Koning, H.; van Vliet, H., 2006, The many faces of architectural descriptions, Information Systems Frontiers, 8, 2, 103-113.

13.   IAC, 2005, Advancing Enterprise Architecture Maturity, version 2.0, Industry Advisory Council, USA.

14.   Jonkers, H., et al., 2006, Enterprise architecture: Management tool and blueprint for the organization, Information Systems Frontiers, 8, 2, 63-66.

15.   Juran, J. M.; Godfrey, A. B., 2000, Juran's Quality Handbook, McGraw-Hill Companies.

16.   Kaisler, S. H.; Armour, F.; Valivullah, M., 2005, Enterprise Architecting: Critical Problems, in Proceedings of the 38th Hawaii International Conference on System Sciences (HICSS'05), Hawaii, USA.

17.   Krueger, R. A.; Casey, M. A., 2000, Focus Groups. A Practical Guide for Applied Research, Sage Publications.

18.   Lankhorst, M., 2005, Enterprise Architecture at Work. Modelling, Communication, and Analysis, Springer-Verlag.

19.   Lopez, M., 2000, An Evaluation Theory Perspective of the Architecture Tradeoff Analysis Method (ATAM), The Software Engineering Institute, Carnegie Mellon University, Pittsburg, USA.

20.   Morganwalp, J. M.; Sage, A. P., 2004, Enterprise Architecture Measures of Effectiveness, International Journal of Technology, Policy and Management, 4, 1, 81-94.

21.   Niemi, E., 2006, Enterprise Architecture Work Overview in Three Finnish Business Enterprises, WSEAS Transactions on Business and Economics, 3, 9, 628-635.

22.   Niemi, E., 2006, Enterprise Architecture Benefits: Perceptions from Literature and Practice, in Proceedings of the 7th IBIMA Conference on Internet & Information Systems in the Digital Age, Prescia, Italy.

23.   Niemi, E., 2006, Towards a Unified View of Enterprise Architecture Stakeholders, Submitted to the 15th European Conference on Information Systems (ECIS 2007).

24.   OMB, 2005, Federal Enterprise Architecture Program EA Assessment Framework 2.0, OMB FEA Program Management Office, The Executive Office of the President, USA.

25.   Rajput, V., 2004, Strategies for Operational Risk Management, Enterprise Architect, 2, 3, 6-11.

26.   Schekkerman, J., 2005, The Economic Benefits of Enterprise Architecture, Trafford.

27.   Shadish, W. R.; Cook, T. D.; Leviton, L. C., 1991, Foundations of Program Evaluation: Theories of Practice, Sage Publications.

28.   Sowa, J. F.; Zachman, J. A., 1992, Extending and Formalizing the Framework for Information Systems Architecture, IBM Systems Journal, 31, 3, 590-616.

29.   Stufflebeam, D. L., 2001, Evaluation Models, Jossey-Bass.

30.   Taylor-Powell, E.; Steele, S.; Douglah, M., 1996, Planning a Program Evaluation, Report G3658-1, Program Development and Evaluation, University

of Wisconsin-Extension, Madison, USA.

31.   The Open Group, 2006, The Open Group Architecture Framework version 8.1.1,
        Enterprise Edition (TOGAF 8.1.1). Available:
        http://www.opengroup.org/architecture/togaf/.

32.   Titcomb, A., 2000, Key Questions for Evaluation Planning, ICYF Newsletter,
        University of Arizona, Tucson, USA.

33.   Ylimäki, T., 2006, Potential Critical Success Factors for Enterprise Architecture,
        Journal of Enterprise Architecture, 2, 4, 29-40.