8 | Enterprise Architecture Realization Index

Leo Pruijt, Raymond Slot & Henk Plessius

The Enterprise Architecture Realization Index (EARI) is an assessment instrument to measure the effectiveness of the Enterprise Architecture (EA) function in realizing its goals. Enterprise architecture is a relatively young discipline and the introduction and elaboration of the EA practice often do not proceed without problems. Most EA practices are in the early stages of maturity and consequently there is a need for instruments to support and accelerate the development of these practices. The EARI is such an instrument and assesses the EA function in relation to the business goals, measures the progress and effectiveness of the goal realization and provides keystones to improve the EA realization process.

The assessment focuses on representative goals of the EA function. These goals are selected in dialog with the initiator of the assessment. For each goal, the relevant results, delivered during the EA realization process, are studied and analyzed by the assessors. Subsequently, interviews with relevant stakeholders are conducted to further discuss the results of the EA function. Arguments are assembled, and by means of indicators translated to scores. The EARI distinguishes five results. For each result, three aspects are scored: the product (quality), the acceptance and the scope. The scores are recorded at a scorecard, after which totals at result level and goal level can be calculated. The outcome of the assessment is an EARI scorecard that gives a graphical and numerical overview of the EA function's strengths and weaknesses. Additionally, the assessment outcome includes arguments concerning the scores, general findings and recommendations.

The application of the EARI in a large governmental organization delivered interesting outcomes: strengths and weaknesses were detected and

substantiated and recommendations were given. The assessment report was approved by the responsible manager and by the key stakeholders.

8.1 Enterprise architecture effectiveness

Over the last decades, many large organizations introduced Enterprise Architecture (EA), especially in financial intermediation and public administration. Also, a joint image emerged of what should be understood by enterprise architecture, partly thanks to the advent of The Open Group Architecture Framework (TOGAF). Conform The Open Group (2008) the purpose of enterprise architecture is, *"to optimize across the enterprise the often fragmented legacy of processes (both manual and automated) into an integrated environment that is responsive to change and supportive of the delivery of the business strategy"*.

The Enterprise Architecture Realization Index (EARI) is an assessment instrument that measures the effectiveness of the EA function in realizing its goals. Two concepts within this definition need to be defined: 'EA function' and 'effectiveness of EA':

- EA function: *"The organizational functions, roles and bodies involved with creating, maintaining, ratifying, enforcing, and observing Enterprise Architecture decision-making – established in the enterprise architecture and EA policy – interacting through formal (governance) and informal (collaboration) processes at enterprise, domain, project, and operational levels."* This definition is drawn from Van der Raadt and van Vliet[2] and includes three sub functions of the EA function: EA decision making, EA delivery and EA conformance.
- EA effectiveness: The EARI approach considers an EA function to be effective, when it is able to transform a given baseline situation into a target situation as specified by one or more goals, set out to the EA function. These EA goals should be aligned with the corporate strategy, as shown in Figure 37, but generally are not the same as the business goals, since the effect of architecture on the business goals is often indirect. An example of an EA goal of a governmental organization is: The organization should be able to implement a change in legislation within three months.

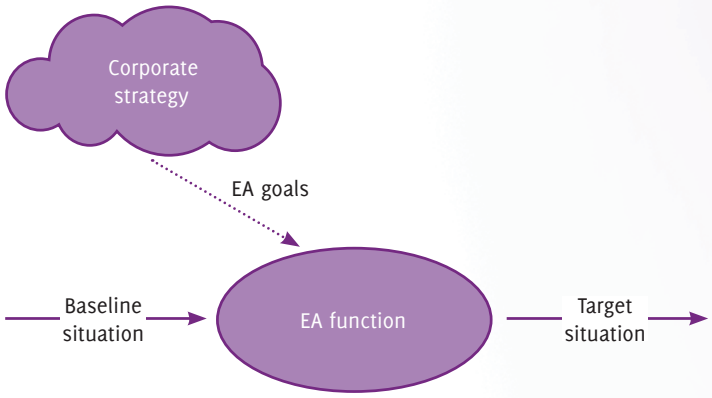

Figure 37 The role of the EA function

[2] Raadt, B. van der, and Vliet, H. van (2008) Designing the Enterprise Architecture Function. Proceedings of the 4th International Conference on Quality of Software Architectures, LNCS 5281, Springer-Verlag, Berlin, Heidelberg, pp.103-118.

8.2 EARI assessment

The purpose of the Enterprise Architecture Realization Index is to assess and rate how well an EA function is able to realize its goals. The EARI approach aims to do this by selecting some representative goals, by successively measuring the results produced in the context of an EA goal, and by giving numerical valuations.

The EARI differs from other assessment approaches in that it is result oriented and not maturity oriented and that numerical valuations are given. The next steps are a general roadmap for an EARI assessment:

1. Prepare the assessment with responsible manager.
2. Interview the stakeholders.
3. Process the findings into a scorecard, arguments and recommendations.
4. Present the outcomes of the assessment.

During the first step a number of decisions need to be taken, such as the specific assessment goals and the goals that have to be assessed.

Assessment goals

An EARI assessment gives an organization insight in the orientation, approach and effectiveness of the EA function. This insight can be used for various purposes, such as:

- Awareness and improvement: How effective is an EA function in realizing its goals? What are the strengths and weaknesses? Which improvements can be made?
- Governance with respect to the progress and quality regarding an EA goal: What is the progress of the EA function in the realization of a specific goal?
- Determining Value: What value does an EA function add to the organization by the realization of the given goals? The EARI itself does not quantify the value of EA, but the outcomes of the assessment can be used as input to value research (see Chapter 10).

EA goal(s)

The selection of the EA goals takes place in dialog with the client. In general a small set of goals suffices, if the selected goals are representative for all EA goals. Some other considerations should be taken into account as well:

- Select goals that were leading for the organization in the recent past.
- Select goals that determine the current track of the organization. Because goals nearly realized are more suitable for an EARI assessment then goals that have hardly been picked up by the organization. However, the stakeholders should still be aware of the choices and arguments related to the goal and the architectural decisions. Otherwise the interviews with the stakeholders will not give reliable output.
- Select goals which remained stable over the years.

Assessment planning

When the goals for the assessment are clear and the EA goals to be studied are selected, the stakeholders to be interviewed can be appointed by the responsible manager. To cover all the types of result, stakeholders with different interest in the goal should be included, like business manager, information manager, portfolio manager, project architect, project team member, operational manager.

The number of interviewees needed may depend on

the organization and the goals. The EARI approach appeared to be quite efficient during the case study, because after five of the ten interviews, the image was sufficiently sharp and the results could be rated. So five to six interviews with stakeholders may suffice for an average assessment. For the purpose of reach and broad involvement within the organization more interviews can be planned. Before the interviews are conducted, relevant documents (strategy, architecture, et cetera) should be gathered and explained by the architect(s) and studied by the assessors.

8.3 The EARI instrument

The Enterprise Architecture Realization Index is an instrument to assess and rate how well an EA function is able to realize its goals. The instrument is partly based on the body of knowledge of (IT) governance, since measuring the organizational and IT performance is a well-established practice within this field. The principles of the CobiT framework were used as a base of the EARI concept. One proposition, based on CobiT, is that to realize an EA goal, the EA function should execute a (repeatable) EA realization process, composed of a logical sequence of activities. In the EARI, five pair of EA activities with their results are discerned, which are shown in Figure 38. Also in line with CobiT, metrics were specified for each result to enable the measurement of the performance.

The EA activities distinguished by the EARI are aligned with the general accepted Architecture Development Method (ADM) of the open architecture standard TOGAF 9. The EARI distinguishes five EA activities while ADM recognizes nine phases, so the mapping is not one to one. The EARI approach focuses on clearly recognizable and assessable results rather than on activities or processes and some of the EARI activities comprise more than one ADM phase. Table 10 explains the EARI activities and links them to the four ADM phases. Note that some ADM phases relate to more than one activity.

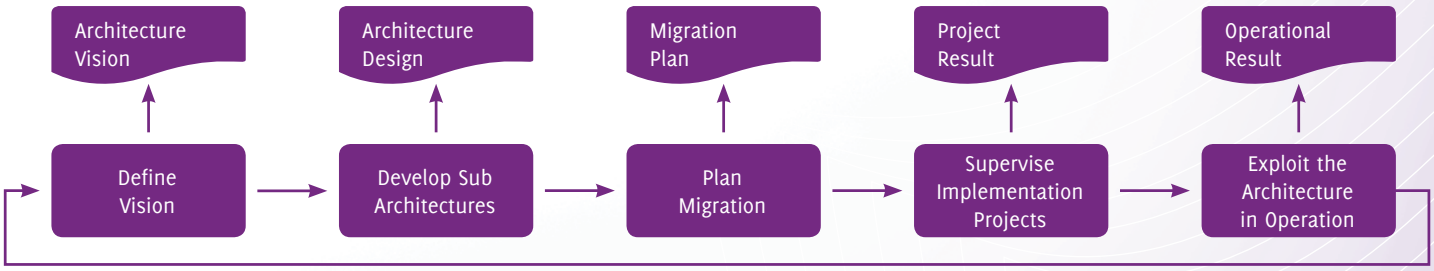

Figure 38 The five distinguished EARI activities

Id	EA Activity	EA Activity Goal	Result	ADM Phase
#1	Define Vision	Determine the EA goals in scope of the architecture iteration, develop a high level, integrated and approved solution direction towards matching these goals and create a concise plan to realize them.	Architecture Vision	A
#2	Develop Sub Architectures	Develop the required subsets of architectures to support the agreed architecture vision.	Architecture Design	B, C, D
#3	Plan Migration	Search for opportunities to implement the architecture and plan the migration.	Migration Plan	E, F
#4	Supervise Implementation Projects	Ensure conformance to the architecture during the development and implementation projects.	Project Result	F, G
#5	Exploit the Architecture in Operation	Assess the performance of the architecture in operation, ensure optimal use of the architecture, and ensure continuous fit for purpose.	Operational Result	G, H

Table 10 The characteristics of the five activities distinguished in the EARI

Valuing the results

During an assessment a few representative EA goals are selected. For each goal the extent to which the EA function was able to realize the goal (up to the moment of the assessment) is determined. This is done by valuing the results so far. The EARI distinguishes five results, one for each EA activity.

For each result the assessment focuses on the product quality, as observed from the EA goal combined with the goal of the EA activity related to the result. Examples of questions for the product aspect of each result are specified in Table 11.

Id	EA Result	Important question for the product aspect
#1	Architecture Vision	Is the EA goal incorporated and is a solution direction indicated and approved?
#2	Architecture Design	Can the goal be achieved with the solutions as described in the business, data, applications and/or technology architectures?
#3	Migration Plan	Are all projects needed to realize the goal started or included in the project portfolio?
#4	Project Result	Are the architectures, relevant for this goal, implemented correctly by the implementation projects?
#5	Operational Result	Is the goal achieved in the operational environment, after implementation of the architecture(s) by the project(s)?

Table 11 The five results within the EARI with examples of questions for the product aspect

Apart from the product aspect, two other aspects (acceptance, scope) of a result are distinguished to enable an objective way of measuring and scoring. This is done, because an architect can design a top quality solution (product aspect), but if it is not accepted (acceptance aspect), nothing is gained. On the other hand, if the solution is limited (scope aspect) to one architectural domain, e.g. technology, the goal may never be achieved. The three aspects with their focus, question and scale are described in Table 12. Product and acceptance are valued on a scale from 1=low to 10=high, while scope is marked on a continuous scale ranging from 0 (very incomplete) to 1 (complete). Result ratings are also transferred to a scale of 1=low to 10 = high realization level.

Result Aspect	Description/Question	Scale
Product	Focus: The quality of the proposed architectural product. Question: To which extent will the EA goal be realized with it?	1-10
Acceptance	Focus: The acceptance and commitment of the stakeholders. Question: To which extent do they know, understand and agree with the product, and do they act committed?	1-10
Scope	Focus: The completeness of the architectural product. Question: Does the product provide the complete architecture/solution? E.g.: Does the architecture focus on the technology aspects only? Is only a part of the projects needed, included in the project portfolio?	0-1

Table 12 The aspects to be valued per result

During an assessment, for each result the three aspects are scored separately. All scores are recorded at the EARI Scorecard and subsequently the totals can be calculated. An EARI scorecard summarizes the assessment result.

Id	Result	Aspect	Aspect Score	Scope Score	Aspect Total	Result Total
#1	Architecture Vision	Product	9	1.0	9.0	8.5
		Acceptance	8		8.0	
#2	Architecture Design	Product	9	0.7	6.3	5.3
		Acceptance	6		4.2	
#3	Migration Plan	Product	5	0.8	4.0	4.0
		Acceptance	5		4.0	
#4	Project Result	Product	8	0.3	2.4	2.1
		Acceptance	6		1.8	
#5	Operational Result	Product	1	0.3	0.3	0.3
		Acceptance	1		0.3	
	Goal total				**40.0**	

Table 13 Example of an EARI scorecard

Table 13 is an example of a completed EARI scorecard for the effectiveness of the EA function of an imaginary organization with respect to the ability to realize the EA goal: 'The organization should be able to implement a change in legislation within three months'. The scorecard shows high scores for the vision (#1), because there is an integrated vision, the solution direction to the goal is good and complete and it is approved. The architecture design (#2) shows a solution suitable to the goal (product), but it was not properly communicated (acceptance) and

the business architecture was not developed (scope). At migration level (#3) only half of the defined work packages of the roadmap are assigned to projects in the project portfolio (product and acceptance), while a number of work packages needed for the goal were not defined in the roadmap at all (scope). As project result (#4), a part (scope) of the architecture was correctly realized (product) although not with enthusiasm (acceptance). The operational result (#5) scores nearly zero, because until now none of the project results are implemented in the operational environment (product) and the scope, taken from #4, restricts the benefits to be expected.

The aspect totals and result totals are generally the most interesting marks. They show on a scale from zero to ten how well the architectural result contributed to the EA goal. The aspect total is calculated as the multiplication of the aspect score (product or acceptance) with the scope score. The result total is calculated as the average of the two aspect totals for a result of a goal. The sum of the aspect totals constitutes the goal total, expressed on a scale from zero to hundred. The well-known scales for the scores and totals enhance the easy interpretation of the outcomes.

The general question during an EARI assessment is: To which extent is an EA goal realized and can this be related to the effort of the EA function? A satisfying answer to this question should lead to a high score for the goal total. The value of the goal total can be used to mark progress regarding the EA goal, but generally it will not show the underlying reasons for the score, which can be very diverse. So generally, more interesting are the other totals and scores of an assessment. They show the strengths and weaknesses of the EA function in achieving its goals.

Indicators

During the valuation of a result, a number of considerations should be taken into account, like the EA goal, the activity goal and the three aspects with their questions. To support the assessors and to objectify the rating, indicators were developed for each combination of result and aspect. The technique of scaled coverage percentage was used to classify and prioritize the indicators. An example set of indicators is shown Table 14.

Aspect	Indicator for the aspect score		
Product	Id	Description	Weight (%)
	1	The baseline architecture is described.	20
	2	AND Specified is which parts are affected by the goal.	10
	3	The target architecture is described AND the solution to the goal is correct and realistic/realizable.	20
	4	AND Architectural requirements and guidelines are specific enough to direct decisions of (solution) architects.	20
	5	AND The solution to the goal is integrated with the solutions of the other goals (into an integrated architecture).	20
	6	AND A gap analysis (impact analysis) is included.	10
Acceptance	Id	Description	Weight (%)
	1	The architecture design is well known by the stakeholder.	20
	2	The stakeholders understand the solution to the goal and its implication in the architecture design.	20
	3	The stakeholders agree with the solution to the goal and its implications.	30
	4	The stakeholders feel committed to (this part of) the architecture design.	30
Scope	Id	Description	Weight (%)
	1	The architecture vision covers the business, data, application and technology domains, regarding the goal. Take the relative importance of the domains into account.	20

Table 14 Example set of indicators associated to the result #2, Architecture Design

8.4 Application of EARI

This section presents an application of the EARI instrument in 2011 at a large governmental organization in the Netherlands. It illustrates the application process and the several results. Please contact the authors when you want to apply the EARI assessment. We will provide you with the necessary information. Optionally, we can provide support in using the instrument and in interpreting the outcomes.

EARI was applied in an organization that has been practicing enterprise architecture for some years. The application focused on the EA function responsible for a large organizational domain with more than 10,000 employees. The goal of the assessment was to deliver an assessment focused on awareness and improvement of the EA function.

Two EA goals were leading: 'Provide clarity to customers more quickly' and 'Reduce the complexity of the processes'. These goals were representative for the complete set of EA goals and the organization was well on its way achieving these goals. The next step was to consult the responsible architect and collect documents relevant to the goals for analysis. Then the interviews were conducted by two investigators. They interviewed ten people for about one and a half hour per interviewee. After the meetings, minutes were written and submitted for approval to the interviewees. Subsequently, the most interesting statements were processed into arguments, on which the scores for the results are based.

After the interviews all results were processed and the assessment report was prepared. It contained the EARI scorecard, the arguments on which the scores are based, the general findings and finally the recommendations. The scorecard proved useful to give an overview of the strengths and weaknesses in the EA realization process of the organization. However, of equal importance were the arguments and findings, which described the causes and the recommendations. The report was discussed with the responsible manager and some key stakeholders and it was approved after some minor adjustments. The strengths and weaknesses indicated by the assessment were recognized by the organization

The outcomes of the assessment are included as examples in this publication: the EARI scorecard is shown as Table 15. A graphical representation of the result totals is shown in Figure 39. The arguments for the scores of the result '#2 Architecture Design' are described in Table 16.

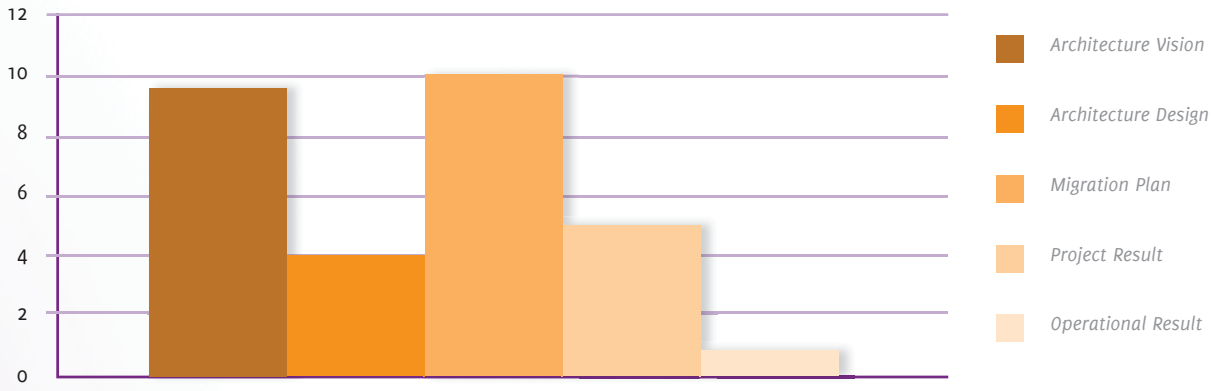

Figure 39 The result totals of the EA goal 'Provide clarity to customers more quickly'

Id	Result	Aspect	Aspect Score	Scope Score	Aspect Total	Result Total
#1	Architecture Vision	Product	9	1.0	9.0	9.5
		Acceptance	10		10.0	
#2	Architecture Design	Product	4	1.0	4.0	4.0
		Acceptance	4		4.0	
#3	Migration Plan	Product	10	1.0	10.0	10.0
		Acceptance	10		10.0	
#4	Project Result	Product	4	1.0	4.0	5.0
		Acceptance	6		6.0	
#5	Operational Result	Product	1	0.5	0.5	0.5
		Acceptance	1		0.5	
	Goal total				**39.7**	

Table 15 The EARI scorecard of the EA goal: 'Provide clarity to customers more quickly'.

Aspect	Indicator for the aspect score		
Product	Id	Description	Contribution
	1-2	The architectural documents describe (per goal or solution) what to do and especially where it has an impact (process, applications, ...).	3
	3	Some of the architectural documents show the beginning of a target architecture, but it is only the beginning.	½
	4	Concrete frames, principles or guidelines, where the solutions must comply, are missing.	0
	5	An integrated target architecture is missing. The architecture documents describe the solutions separately.	0
	6	A real gap analysis is missing, but short and long-term aspects of the solutions are discussed.	½
Acceptance	Id	Description	Contribution
	1-4	The stakeholders understand and approve the proposed solutions to the goal and they feel committed. (+) But an integrated target solution is not known and approved. (-)	4
Scope	Id	Description	Contribution
	1	All the architectural domains are covered.	10

Table 16 Arguments for the scores of the three aspects of the result: '#2 Architecture Design'.

The EARI scorecard shows large differences between the five results. The scores for the Architectural Vision are very high, because there is an approved, high-level description of what is necessary to realize the goal. Additionally, the impact of the changes is known. The high acceptance score is due to the fact that the architects work in close cooperation with the decision makers. The score for the Architectural Design is relatively low, as specified in more detail in Table 16. At the moment of the assessment the architecture was focused on the baseline architecture, needed to perform a proper impact analysis of changes. However, the target architecture was mostly missing.

Migration Plan scores high, because all four projects needed to realize the selected goal were included in the project portfolio and already under development or beyond. The low score for Project Result is partly related to the missing target architecture, as discussed under Architecture Design. Consequently, the projects were not provided with architectural definitions and requirements. Positive was the collaboration with the project architects in the early stages of the project. Negative was the lack of checking of the conformance of the implementation to the architecture. This is not surprising, earlier studies showed that the related maturity focus area 'Monitoring' scores very low in most organizations. Finally, the low score for Operational Result is because the most important implementations were not yet operational. Positive returns are expected from 2012.