World Academy of Science, Engineering and Technology
International Journal of Economics and Management Engineering
Vol:9, No:1, 2015

Current Issues on Enterprise Architecture Implementation Evaluation

Fatemeh Nikpay, Rodina Binti Ahmad, Babak Darvish Rouhani

Open Science Index, Economics and Management Engineering Vol:9, No:1, 2015 publications.waset.org/10000170/pdf

***Abstract*—**Enterprise Architecture (EA) is employed by enterprises for providing integrated Information Systems (ISs) in order to support alignment of their business and Information Technology (IT). Evaluation of EA implementation can support enterprise to reach intended goals. There are some problems in current evaluation methods of EA implementation that lead to ineffectiveness implementation of EA. This paper represents current issues on evaluation of EA implementation. In this regard, we set the framework in order to represent evaluation's issues based on their functionality and structure. The results of this research not only increase the knowledge of evaluation, but also could be useful for both academics and practitioners in order to realize the current situation of evaluations.

***Keywords*—**Current issues on EA, implementation evaluation, Evaluation, Enterprise Architecture, Evaluation of Enterprise Architecture Implementation.

I. Introduction

ENTERPRISE ARCHITECTURE (EA) is employed by enterprises for providing integrated Information Systems (ISs) in order to support alignment of their business and Information Technology (IT) [1], [2]. In EA the framework represents the structure to model enterprise's business and IT entities [3], [4]. There are different models for various perspectives in EA Framework (EAF), each with different scope and activities [5], [6]. The outcomes of EAF are EA's artifacts that consist of models, diagrams, documents and reports. Since EA artifacts are not sufficient for enterprises by their own, enterprises are looking to find a method to address theirs challenges on competiveness by implementing those artifacts. In addition, well EA implementation needs to be evaluated in order to keep useful and valuable [7], [8]. Developing, implementing and maintaining of EA should cover all business value. These activities need to have a particular plan. In this case, plan is a framework which means that for reducing complexity of models and diagrams, EA needs a roadmap with defined models in each section. The three components of EA framework are [9]-[11]:

Fatemeh NikPay is with the Department of Software Engineering, Faculty of Computer Science and Information Technology, University of Malaya, P.o.box 50603 Kuala Lumpur, Malaysia (corresponding author phone: +60176200369, e-mail: fa.nikpay@siswa.um.edu.my).

Rodina Binti Ahmad is with the Department of Software Engineering, Faculty of Computer Science and Information Technology, University of Malaya, P.o.box 50603 Kuala Lumpur, Malaysia (e-mail: rodina@um.edu.my).

Babak Darvish Rouhani is with the Department of computer Engineering, Payame Noor University, Tehran, I.R. Iran (e-mail: darvishrouhani@pnu.ac.ir).

- Views: It is provide the mechanisms for communicating information about the relationships that are important in the architecture
- Methods: provide the discipline to gather and organize the data and construct the views in a way that helps ensure integrity, accuracy and completeness.
- Training/Experience: support the application of method and use of tools.

Most of the organization used EA to overcome their complexity of business process and their Information Systems (ISs). In this regards appropriate EA implementation can help the principles organizational issues. To increase rate of successful and desired implementation, it would be better to understand satisfaction and effectiveness of EA implementation for future activities [6], [12], [13].

EA emphasizes to have holistic implementation of enterprise business objectives. The clear description of enterprises assist enterprise architect to identify main business processes in order to have a well implementation. Most of enterprises based on their activities, encounter IT changes. All changes in ISs and business process should run in same direction .EA have specific role in adoption of business process and IT [14]-[16]. 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 [17]. Briefly, it is "a process of determining merit, worth, or significance". 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 [17]-[19].

There are several conditions that affect EA project. Some of these come from selection EA framework and implementation method, such as [20]-[22]:

- Cover scope of project
- Collaboration based (inside the project team)
- Alignment driven (align enterprise's business and IT)
- Dynamic environments (adoption with future changes)
- Documenting the EA (appropriate documenting current and future of enterprise)
- Standardization of Design Patterns, Development Processes and Application Architectures
- Architecture Governance in place and working
- Stakeholder participation

Having proper definition and accurate implementation pattern assists enterprises to have entire interdependencies. Holistic EA cause enterprises do not perform previous risks that due to incompatible and unnecessarily maintenance and

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integration. EA describes major structure of enterprises by having accurate view point on As-Is and as To-Be structure, it can cover all the requirements of enterprises.

EA is an approach for managing and developing an organization, and is stated to provide a multitude of positive business impacts. Therefore, it has significant for both academics and practitioners [23]. 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. Moreover, it is widely known that information gained through successful evaluation is crucial in the management and improvement of any initiative [24], [25].

Recently EA evaluation issues gained some attention. Still, the studies on EA evaluation are mostly inconsistent, some current evaluation focusing particularly on defining EA metrics and evaluation criteria, especially in the form of maturity models, but almost omitting the aspect of elaborate evaluation planning [26]-[28]. 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 current issue on EA evaluation. Comprehensive evaluation results are having fundamental effects for both organization and software improvements, organizations can achieve their goals and mission better. Moreover evaluation describes and explain target EA [2], [29].

The reminders of this paper are divided as following parts: the research method is represented in Section II, the results and discussions are stated in Sections III and IV respectively, finally the conclusion of this study is expressed as Section V.

II. Research Method

As a whole, appropriate research methodology create platform to have a proper activity in relevance area and it guides the researchers in right direction .In order to obtain intended result we set the specific research framework. This research framework focuses on evaluation of EA implementation. These processes contain both generic EA attributes and components that are uniquely found in EA.

Target studies that we investigated them are selected by searching on reliable databases, including: science direct, springer, IEEE, and ACM. The intended papers were selected by using the related search keywords, including “Enterprise Architecture Evaluation”, “Enterprise Architecture Assessment”, “Evaluation of Enterprise Architecture Implementation”, “Assessment of Enterprise Architecture Implementation” and reading the whole parts of them in order to obtain appropriate studies. In addition, we consider the studies, which published after 2010 in order to collect latest issues on EA evaluation. This study aim is to collect current issues on EA implementation evaluation based on defined research framework especially in current decade.

III. Findings

This section represents collected information about evaluation methods and practices of EA implementation based on defined research method.

A. Lack of Support from EAF

Enterprise architecture framework (EAF) is a logical structure for the classification of several descriptions of an organization which is principal for all the enterprise management and all the system improvement and development in that enterprise [30], [31]. Existing Enterprise Architecture Framework (EAF) such as Zachman, FEAF, and TEAF do not proposed evaluation method for EA implementation, they present the specific method or well-defined approach for EA implementation without considering evaluation of EA artefacts [9], [15].

Besides the complexity of practices of existing EAFs make the EA evaluation difficult and variety of concerns complicates reaching an established overall evaluation approach. As results, developing a method for enabling the evaluation of EA in a coherent, efficient, and practical way is vital [8], [16], [17].

B. Lack of Academic Foundation

Employing evaluation method for EA implementation plays critical role in order to assess business and IT values of enterprise. There are some maturity and assessment frameworks that have not scientific foundation and they are developed based on practice and experience of practitioner for some specific enterprises and EAF. Consequently, there is no generalization inside them [8], [14], [32].

These types of evaluation method cannot support all EA implementation due to lack of understanding the concepts and principles of EA implementation as whole. The evaluation method should have scientific foundation in order to answer EA implementation quality and values [8], [18].

Besides, non-academic evaluation methods do not have coherent view on EA implementation. They proposed different concepts, modelling techniques, tools, and visualization techniques for evaluating.

C. Lack of Holistic View

Evaluation should consider EA as whole. All components of EA implementation need to be evaluated during the evaluation phase. So, evaluation should have a holistic approach for EA implementation in order to have a better evaluation of outcomes of the decisions. Lack of such a plan or an existence of a weak design cause several problems like inconsistency and resource wasting and this rises from the fact that business environments are changing and information systems are growing inevitably [19]-[21].

Beside the followings issues are still open:

- Evaluate the overall EA process landscape are not available yet
- There is no methodology for enabling the EA evaluation by considering the whole EA.
- There is no method which fulfils evaluation tasks for the

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entire EA,
- Existing EA evaluation methods mostly focus either on business and IT alignment or architecture maturity and do not consider all part of implementation.

D.Lack of Quality Support

There are several issue is evaluation of EA implementation that can be located in this title as follows [16], [22]:
- Study of related work has shown that existing EA analysis approaches lack architecture for qualitative evaluation of architecture solutions.
- Lack of accurate decisions on improvement or redesign of its architecture based on missions, goals and restrictions of the organization
- Institutionalizing of evaluation of EA implementation within an enterprise remains a challenging issue.
- Neglecting the prioritizing criteria and inaccuracy in existing evaluation method
- Lack of consideration on evaluation the effectiveness of EA implementation selected.

IV. Discussion

As mention in section three the evaluation of EA implementation still is immature and needs to improve. This section discusses more about identified issues on EA evaluation method in details.

There is no fixed practice or method for evaluation of EA implementation, however enterprises are looking for evaluable EA implementation in order cope with their current problems and answering the future needs. So Enterprise Architects are trying to handle this issue by developing a customized method based on their experience from previous projects. This kind of evaluation method has not appropriate for all kind of enterprises and does not provide any useful value for EA implementation as whole. Besides, there is no scientific foundation behind these types of evaluation and it is difficult to teach and govern them.

Existing EAFs mostly try to answer implementation and developing EA artefacts requirements and do not provide comprehensive evaluation method for implementation. This leads to lack of supporting on evaluation phase and may EA implementation project faces to: dissatisfaction of project's stakeholders, lack of quality of EA products, and complexity of implementation.

Existing evaluation methods do not support some qualitative approaches in their practices including: evaluating the effectiveness of EA implementation, prioritizing criteria, institutionalizing, and decision making.

Existing evaluation methods do not consider all parts of EA implementation. They mostly focus either on business and IT alignment or architecture maturity and do not consider all part of implementation. Consequently, they cannot guarantee the whole of implementation and the enterprises may do not reach to defined goals.

Since EA involves heterogeneous stakeholder groups such as application owners, business developers, software developer, system analyzer, enterprise architect, and the others may create complexity requirements in an enterprise, an appropriate Evaluation documentation of the enterprise artefacts are vital.

V. Conclusion

This paper represented current issues on evaluation of EA implementation. In this regards, we set the criteria in order to represent evaluation's issues. In order to obtain the primary studies the defined keywords were searched in selected databases. The following outcomes could be extracted from this research and they are useful for both scientific and practitioner in order to understand current situation of EA evaluation methods:
- Developing scientific based evaluation method for EA implementation
- Supporting evaluation of EA implementation by Enterprise Architecture Frameworks
- Considering qualitative aspect of evaluation such as effectiveness of EA implementation
- Developing holistic evaluation method, which considers all aspects of EA implementation
- Considering interoperability for making good decision on developing.

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Fatemeh Nikpay received her MSc in Information Technology (IT) Management from University Technology Malaysia (UTM) in 2014. She is PhD candidate at University of Malaya (UM) in IT engineering. Nikpay research interests include Enterprise Architecture, IT-Management, Software Project Management and Information System.