

## Critical Success Factors of Enterprise Architecture Implementation

Babak Darvish Rouhani<sup>1</sup>, Fatemeh Nikpay<sup>2</sup>, Reza Mohamaddoust<sup>3</sup>

*Payame Noor University Tehran, I.R.IRAN*

*darvishrouhani@pnu.ac.ir<sup>1</sup>, fa.nikpay@gmail.com<sup>2</sup>, rm1363@yahoo.com<sup>3</sup>*

**Abstract:** Enterprise Architecture (EA) is utilized by enterprises in order to align their business and Information Technology (IT). Well implemented EA helps an enterprise innovate and change by providing both stability and flexibility. Understanding the Critical Success Factors (CSFs) of EA implementation causes the positive effects on increasing the rate of success EA project. This paper firstly, compare existing CSFs model for EA and secondly it rank five significant CSFs. In this regard, we carried out a questionnaire to achieve intended result. It is informational and useful for Enterprise Architects and practitioners who seeking to assess the 'state-of- play'.

**Keywords:** Enterprise Architecture; Enterprise Architecture Implementation; Critical Success Factors; CSF; Ranking

### 1. Introduction

Enterprise Architecture (EA) provides the "blueprint" for systematically defining an enterprise's current and desired architecture, by considering process for implementation and

deployment. EA have a specific role to evolve Information Systems (ISs), developing new systems and incorporate new technologies to reach enterprise mission optimize [1, 2, 3, and

20]. In business strategic goals, EA is a strategic information asset that defines needed information to operate the business. In this regard, transitional plan is an essential part of EA for implementation appropriate ISs in response to the business changes [3, 21].

Most of the enterprises are encountering business processes changing, for instance a development of products and services or economic situations. According to these situations, they have to absolutely improve their business processes in order to be able to survive. In this regards, these enterprises, should adapt themselves to these changes effectively [4, 5, 20, and 21]. EA implementation provides some business benefits such as impressive IT operation, risk deduction, faster innovation and cover the gap between business and IT [6,7,8,19]. To increase rate of successful implementation it would be better to understand Critical Success Factors (CSFs) of EA implementation. The definition of CSFs is: “those things that must go well to

ensure the overall success of the project” and also, it caused satisfaction results to ensure successful competitive performance for the individual, department, or enterprises [8, 9].

An effective CSFs in EA for an Enterprises, should be maintain appropriate vision of future of business and IT alignment and the other characteristics [10, 11]. Most of the enterprise based on their business processes need to perform all their activities at acceptable levels for enterprise which contributes to perform effectively and properly in competitive business [3,12]. Comprehensive EA Implementation need some factors that have direct effects on enterprises, including: creating or having a high level of architecture awareness, creating and realizing high quality and practice-oriented architectures, which help to enterprises improve management capability and alignment between IT and business. Implementing architecture effectiveness evaluation periodically could increase Learning process of improving the architecture practice [6, 8].

The reminder of this paper is organized as following sections: research methodology is expressed in section 2, selected CSFs model of EA implementation and finding from them are described in section 3 and 4 respectively, section 5 is represented the ranking of identified CSFs, and finally conclusion of this study is expressed in section 6.

## **2. Research Methodology**

This study is a review of literature on CSFs of EA implementation. Our study focuses on papers that discuss on the CSFs of EA implementation. All the secondary sources which selected are published in peer-reviewed and prestigious journals. This research is focus on the articles above 2006 in order to obtain the appropriate results. We also rank identified CSFs by conducting a questionnaire.

## **3. Related Works**

In this section, we briefly describe the CSFs models on EA Implementation from reviewed papers.

Identifying CSFs on EA implementation can help enterprises to explain the nature and scope of resources that need to gather for permitting the EA team in order to focus on its efforts on priority issues to decrease wasting time in order to what the existence technologies will permit. As concisely, the following items are the characteristics of CSF:

- Conduct project into the right way
- Priority on project activities
- Support up to end of project
- Must cover all points of view such as:  
management, designer, developer,  
and others
- Increase quality of project performance
- Create collaboration between IT and  
business

### **3.1. Kamogawa and Okada CSFs Model**

According to Kamogawa and Okada, most of enterprises are encounter to changes in their business environment like new products and services. In this regards changing the business process is inevitable to survive in their business,

thus Information Technology (IT) departments should adapt themselves and develop new systems which are efficient and effective. Therefore the role of EA is critical because EA provides the way how IT adapt to business processes [3,6,16].implement new systems have direct effects to business environment so to achieve effective implementation, having business architecture like EA is significant. The following factors are suggested by the authors to have an effective implementation.

IT governance is significant in implementation, kamogawa and okada also emphasize that IT governance specifies a decision making and responsibility structure that encourages intended behavior in the use of IT for internal control, risk management.

EA Cognition: EA effects on business process view and data architecture field, it is implemented in the scope.

Organizational management: the cognition of top management on enterprise and employees should

be higher than ever before. Identifying proper supporting of business Process with IT and alculation Return on Investment (ROI) are the key goal of this factor.

### **3.2. Schmit and Buxmann CSEs Model**

According to Schmidt and Buxmann , during the previous decade, IT have significant role and it caused specific role on business processes in the enterprises which want to have a comprehensive EA implementation. As mentioned in introduction, EA have a specific role to evolve ISs, developing new systems and incorporate new technologies to reach enterprise mission optimize and also, The appropriate and effective maintenance and implementation roadmap cause helping to optimize the interdependencies and interrelationships within the enterprise's business process and principle T [8]. Complexity of IT causes several problem, firstly, by improving the IT management of this progress has become difficult and therefore creates more operational risks moreover

operation cost is another effect of IT complexity. In this regards, most of the enterprises confront deviation between the business process and ISs to support and adapt themselves to these strategies, in this situation the alignment between these changes is principle [4,8].

Nowadays, comprehensive solution for having strategic alignment of IT environment is having holistic management on the EA specifically on IT part. For this purpose, most of the enterprises implemented Enterprise IT Architecture with proper management which is called EAM. It is like a role of EA in an enterprise .In this research the authors focused on two variables, IT flexibility and IT efficiency. IT efficiency is the quality of business process support within the provision, maintenance and operation of application systems for the required information processing tasks. The following factors are suggested by the authors to have an effective implementation, the following factors are expressed by the authors [4,8,13].

*EA documentation:* it refers to the activities of capturing and describing the existing EA with architectural description.

*EA planning:* based on enterprises goal, planning is a specific mechanism that managers or other employee uses descriptions of a target enterprise to achieve a desired outcome.

*EA programming:* programming is another mechanism that uses common rules to achieve a desired outcome. It is also define as the process of setting architecture rules and standards that it may use during any changes.

*EA communication and support:* This dimension refers to communication we mean the process of informing stakeholders about all EA-related issues. Moreover, active support may be provided to stakeholders in the planning and implementation of EA implementation.

*EA governance:* this dimension refers to decisions and guidelines are binding to the organization and may be enacted based on formal processes.

*EA stakeholder participation*: EA stakeholder participation refers to the extent that stakeholders are involved in decision making.

### **3.3. Aier and Schelp CSFs Model**

According to Aier and Schelp, most of the enterprise wants to implement EA due to IT improvement or changing in business processes, having appropriate implementation and management is fundamental, more over identifying critical success factors have strong effects on successful EA implementation [15].

EA is like a mechanism for agility, consistency, compliance and efficiency for both business and IT process. Recently, enterprises encounter barriers during the implementation of EA which cause redefining some processes because of lack of familiarity of some CSFs. The following factors are suggested by the authors to have an effective Implementation:

### **3.4. Van der Raadt CSFs Model**

According to Van der Raadt, most of the large enterprises, recognize the benefits of EA and

they desire to invest in it .proper and efficient EA are one of the significant factor that should be investigate during the implementation. He presented a framework known as NAOMI (Normalized Architecture Organization Maturity Index) which is providing three perspectives on Enterprise Architecture [14,17].

- Architecture awareness
- Architecture maturity
- Architecture alignment.

NAOMI model consist of following variables:

- Architecture governance
- Architecture processes
- Communication through and about architecture
- Organizational support for architecture
- Organizational scope of architecture
- Human and other architecture resources

### **3.5. Tanja Ylimaki CSFs Model**

Tanja Ylimaki mentioned that most of the managers in practical and academic field have consideration on enterprise architectures

(EAs) in section of information systems and their business process, for monitoring the innovation and changes in business environment, EA can be efficient method to align the business process and IT [18]. EA is a roadmap for governing the complexity and continual process within enterprise's business environment. Tanja Ylimaki investigation in the existing EA maturity models and some related domain of EA such as enterprise resource planning, business process reengineering, the following categorized factors identified [18,19].

#### 4. Review Findings

In order to find fundamental factors on EA implementation, we compare all selected CSFs models with few variables. Table 1 represents the result of this comparison.

#### 5. Ranking

We carried out a questionnaire in order to find the first five CSFs which are more importance rather than the others. Our target sample was academic persons and practitioner as well. We

asked them to rank five CSFs based on factors which are indicated in Table 1.

Authors *Factors	KO	SB	AS	VR	T
Governance	✓	✓	✓	✓	✓
Cognition	✓				
Management	✓	✓	✓	✓	✓
Planning	✓	✓	✓	✓	✓
Documentation	✓	✓	✓	✓	
Programming		✓			
Communication &support	✓	✓	✓	✓	✓
Stakeholder participation		✓		✓	✓
Process			✓	✓	✓
Scope			✓	✓	✓
Economic pressure			✓		
Culture			✓		✓
Skill of architect			✓	✓	✓
Tools/methodology			✓		✓
Coverage			✓		
Rules and EA process			✓		
EA model/artifact					✓
Business driven approach					✓
Assessment/evaluation					✓
Training/education					✓

TABLE I. Comparison Of Csfs Models

Table 2 shows the rank of identified CSFs. The questionnaire was distributed through the web. We asked the participants to answer the questionnaire by sending the link of the questionnaire web page via email.

	FACTORS
First	Governance, Communication and support
Second	Management,
Third	Stakeholder Participation
Fourth	Organizational Culture
Fifth	Planning, Methodology

**Table 2.** Rank Of Csfs Model

## 6. Conclusion

This study compared five models of CSFs of EA implementation. Then, it represented the five first rank of CSFs of EA implementation. The aim of this is to represent the five significant CSFs, which affect the success of EA implementation. The following results are achieved from this study:

- Planning, Governance, Management, Communication and Support are essential factors which cited by all models.
- Documentation, Stakeholder participation, Process, and skill of architect are also important factors which need to consider in EA projects.

Although there are several fundamental factors which influence EA implementation, each EA project has particular characteristics which need

to find specific factors. However, the five significant CSFs, which are mentioned in this study can be used in most EA project.

## 7. Acknowledgments

The authors would like to thanks Payame Noor University (Alborz Province) for financial support on this research.

## References

- [1] Alwadain, Ayed, et al. "Where do we find services in enterprise architectures? A comparative approach." Proceedings of the 22nd Australasian Conference on Information Systems (ACIS 2011). 2011.
- [2] Medini, Khaled, and Jean-Pierre Bourey. "SCOR-based enterprise architecture methodology." *International Journal of Computer Integrated Manufacturing* 25.7 (2012): 594-607.
- [3] Iyamu, Tiko. "The Factors Affecting Institutionalisation of Enterprise Architecture in the Organisation." *Commerce and Enterprise Computing, 2009. CEC'09. IEEE Conference on.* IEEE, 2009.
- [4] Sun, Jianguang, and Yan Chen. "Building a Common Enterprise Technical Architecture for an Universal Bank." *Management and Service Science*





(MASS), 2010 International Conference on. IEEE, 2010.

[5] Lankhorst, Marc. Enterprise architecture at work: Modelling, communication and analysis. Springer, 2013.

[6] Kamogawa, Takaaki, and Hitoshi Okada. "Enterprise Architecture and Information Systems: In Japanese Banking Industry." *Applications and the Internet, 2008. SAINT 2008. International Symposium on. IEEE, 2008.*

[7] Malta, Pedro Maia, and Rui Dinis Sousa. "Dialogical action research for better enterprise architecture implementation." (2012)

[8] Schmidt, Christian, and Peter Buxmann. "Outcomes and success factors of enterprise IT architecture management: empirical insight from the international financial services industry." *European Journal of Information Systems* 20.2 (2010): 168-185.

[9] Pereira, Carla Marques, and Pedro Sousa. "A method to define an Enterprise Architecture using the Zachman Framework." *Proceedings of the 2004 ACM symposium on Applied computing. ACM, 2004.*

[10] Schekkerman, Jaap. How to survive in the jungle of enterprise architecture frameworks: Creating or choosing an enterprise architecture framework. Trafford Publishing, 2004.

[11] Janssen, Marijn, and Bram Klievink. "Can enterprise architectures reduce failure in development projects?." *Transforming Government: People, Process and Policy* 6.1 (2012): 27-40.

[12] Stankovic, Dragan, et al. "A survey study of critical success factors in agile software projects in

former Yugoslavia IT companies." *Journal of Systems and Software* (2013).

[13] Ojo, Adegboyega, Tomasz Janowski, and Elsa Estevez. "Improving Government Enterprise Architecture Practice--Maturity Factor Analysis." *System Science (HICSS), 2012 45th Hawaii International Conference on. IEEE, 2012.*

[14] Van der Raadt, Bas, et al. "The relation between EA effectiveness and stakeholder satisfaction." *Journal of Systems and Software* 83.10 (2010):1954-1969.

[15] Aier, Stephan, and Joachim Schelp. "A reassessment of enterprise architecture implementation." *Service-Oriented Computing. ICSOC /Service Wave 2009 Workshops. Springer Berlin Heidelberg, 2010.*

[16] Arnold, Heinrich, et al. "Enterprise Architecture in Innovation Implementation." *Applied Technology and Innovation Management. Springer Berlin Heidelberg, 2010. 132-144.*

[17] van der Raadt, Bas, Raymond Slot, and Hans van Vliet. "Experience report: assessing a global financial services company on its enterprise architecture effectiveness using NAOMI." *System Sciences, 2007. HICSS 2007. 40th Annual Hawaii International Conference on. IEEE, 2007.*

[18] Ylimäki, Tanja. "Potential critical success factors for enterprise architecture." Evaluation of enterprise and software architectures: critical issues, metrics and practices:[AISA Project 2005-2008]/Eetu Niemi, Tanja Ylimäki & Niina Hämäläinen (eds.). Jyväskylä: University of Jyväskylä, Information Technology Research

Institute, 2008.-(Tietotekniikan tutkimusinstituutin julkaisuja, ISSN 1236-1615; 18). ISBN 978-951-39-3108-7 (CD-ROM). (2008).

[19] Meyer, Martin, Markus Helfert, and Conor O'Brien. "An Analysis of Enterprise Architecture Maturity Framework s." *Perspectives in Business Informatics Research*. Springer Berlin Heidelberg, 2011. 167-177.

[20] Babak Darvish-Rouhani, Fatemeh Nikpay, "Agent-Oriented Enterprise Architecture: new approach for Enterprise Architecture", *IJCSI International Journal of Computer Science Issues*, Vol. 9, Issue 6, No 1, Dec 2012

[21] Rouhani, B. D., Shirazi, H., Nezhad, A. F., & Kharazmi, S. (2008, May). Presenting a framework for agile enterprise architecture. In *Information Technology, 2008. IT 2008. 1st International Conference on* (pp. 1-4). IEEE.

### Authors Profile:

**Babak Darvish Rouhani** received his MSc in Software engineering from the Payame Noor University, Tehran-Iran in 2008. He has been faculty of Information and Communication Technology department (Payame Noor University- Alborz Province) since 2009. Darvish Rouhani research interests include Software Engineering, Enterprise Architecture, Agent-Oriented Architecture, and Agile Oriented Architecture.

**Fatemeh Nikpay** is currently PhD candidate in University Malaya (UM). Nikpay research interests include: Knowledge Management, ICT strategy planning, Enterprise Architecture, and IT management.

**Reza Mohamaddoust** received his MSc in IT in 2010. He is currently faculty of Information and Communication Technology department (Payame Noor University- Alborz Province). Mohamaddoust research interests include Computer Networks, Information Technology, Enterprise Architecture, and Information Systems.