

# A Method to Improve Test Process in Federal Enterprise Architecture Framework using ISTQB Framework

Hamideh Mahdavifar, Ramin Nassiri, Alireza Bagheri

**Abstract**—Enterprise Architecture (EA) is a framework for description, coordination and alignment of all activities across the organization in order to achieve strategic goals using ICT enablers.

A number of EA-compatible frameworks have been developed. We, in this paper, mainly focus on Federal Enterprise Architecture Framework (FEAF) since its reference models are plentiful. Among these models we are interested here in its business reference model (BRM).

The test process is one important subject of an EA project which is to somewhat overlooked. This lack of attention may cause drawbacks or even failure of an enterprise architecture project. To address this issue we intend to use International Software Testing Qualification Board (ISTQB) framework and standard test suites to present a method to improve EA testing process.

The main challenge is how to communicate between the concepts of EA and ISTQB. In this paper, we propose a method for integrating these concepts.

**Keywords**—Business Reference Model (BRM), Federal Enterprise Architecture (FEA), ISTQB, Test Techniques.

## I. INTRODUCTION

IN recent years, One may observe significant dependency of many organizations on information systems[1]. Organizations are faced with threats on their information assets every day.

This is while they are heavily dependent on these assets. Therefore, producing accurate and business aligned information environment is perceived as an inevitable need. Enterprise architecture (EA) is widely considered as a suitable solution in this context which recently has been strongly deployed by many organizations worldwide. Enterprise architecture is an approach for organizations to reach from current to target environment by extreme use of ICT enablers.

One of the main goals of the enterprise architecture is building robust alignment between business and technology aspects so that both may interoperate towards achievements of the organization's goals and so ended up to executives and managers confidence.

One of the main parts of enterprise architecture is business architecture. In organizations, a series of outputs is created just after accomplishing an enterprise architecture project such that if being used then, one will observe considerable improvement in the organization.

After conducting outputs we need to perform a test process to identify vulnerable points in the outputs and to detect any probable or unexpected deficiencies and shortcomings. This is the important subject that has now been frequently neglected. So, in this paper with considering this important subject, an innovative and also practical approach for enterprise architecture test process is to be presented.

This paper is organized into four sections. In the first, we introduce enterprise architecture in a brief. Then the standard framework of software testing used in this paper is introduced. In the second section the proposed method for enterprise architecture testing will be described. In the third section a few case studies are illustrated and in final section the conclusions and results are presented.

### A. Enterprise Architecture

An enterprise is an organization with a lot of complex features and contradictories. One of the ways to improve and/or restructure an organization is performing enterprise architecture project. An Enterprise architecture project should be known as how organization structures move from *Current or As-Is* state to *Target or To-Be* state.

Enterprise Architecture is a comprehensive plan which acts as a coordinator and/or hub between the different aspects of organization. In other words, enterprise architecture manifests a perfect image of an organization. In this case we can mention the aspects of business program, business operations, automation and technological infrastructure of organization [2]. Enterprise Architecture is capable to show the strategic adaption and/or deviation between the business architecture and information technology (IT) architecture [3]. While the architecture of information systems and specially information architecture is focused only on the information, in enterprise architecture we are coped with a variety of new engineering (Reengineering) in whole organization in view of information systems which tries to improve work processes of organization through the extensive use of information technology.

We need a framework to describe the concepts of enterprise architecture. One of these frameworks is the Federal Enterprise Architecture Framework (FEAF). In this paper, given that the applications of federal enterprise architecture are widespread and general, we focus on this architecture. Federal Enterprise Architecture (FEA) is being constructed through a collection of interrelated *reference models* designed to facilitate cross-agency analysis and the identification of duplicative investments, gaps, and opportunities for collaboration within and across Federal Agencies. These reference models are defined as follows [4]: PRM, BRM, DRM, SRM, TRM.

Federal Enterprise Architecture is Business-Driven. The basis of this architecture is located in Business Reference Model (BRM).

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This reference model describes the line of business of enterprise and its services for customers. In this paper the focus is basically on the BRM and also SRM (Service Component Reference Model). In the BRM, all processes required to achieve organization's goals are determined and then in the SRM, the services needed to perform this process are specified.

BRM has four Business Areas. These areas include Services for Customers (or Citizens), Mode of Delivery, Support Delivery of Services, and Management of Enterprise (or Government) Resources [5].

Also, SRM is composed of the following services [6]:

- Customer Services
- Process Automation
- Business Management Services
- Business Management Services
- Business Analytical Services
- Back Office Services
- Support Services

#### B. An introduction to ISTQB

Software testing plays an important role in the process of creating software and is the indicator of the final review of software lifecycle stages. Daily increase of software as a main element in everyday's life and existence of the enormous costs of software failures are led to appearance of a variety of activities for software testing. Test is multi-dimensional. This means that depending on perspectives, these concepts are placed in different categories. In this paper, in most cases, the terms and definitions used are basically presented in the ISTQB glossary [7], [8].

International Software Testing Qualification Board, called ISTQB, was first established in November 2002 in Edinburgh of Scotland with the presence of members from eight countries (Australia, Denmark, Finland, Germany, Sweden, Switzerland, Netherlands and England) and up to now, it has developed the scope of its activities with the formation of national committees in many countries [9], [10]. Further topics for interested readers may be found in these references.

According to the ISTQB framework a test process consists of the following sub-processes: The *Test planning and control*, the *Test analysis and design*, the *Test implementation and execution*, the *Test evaluation exit criteria and reporting*, and the *Test closure activities* [11]-[13].

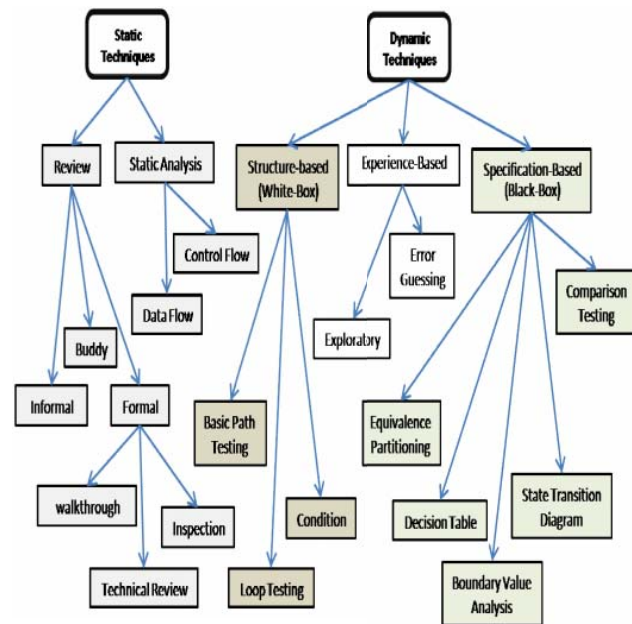


Fig. 1 Standard Software Testing [10]

#### II. OUR PROPOSED METHOD

Only when we are confident on the way upon that the enterprise architecture has been done then, enterprise architecture can provide us a good efficacy. One of the common ways to ensure accuracy of project steps is to perform a robust systematic test process. Unfortunately, the test process has been somewhat ignored in the field of enterprise architecture.

This challenge can cause failures in the enterprise architecture projects or the loss on the outcomes expected. Since the survival of organizations may depend on the success in enterprise architecture and enterprise architecture projects are extremely expensive and time consuming, so the assurance of the accuracy for enterprise architecture artifacts and outcomes is essential. If we do a comprehensive test process on enterprise architecture outputs, we can make sure of the accuracy rate of enterprise architecture outputs.

Nevertheless, enterprise architecture testing has been widely ignored. Currently, practitioners of Enterprise Architecture projects suffer from a lack of comprehensive and standard methods to do quality test.

In this paper, a method for enterprise architecture testing is presented. The main focus of this paper is on FEA, the FEAF introduced methodology. In our proposed method, the tester is accompanying the enterprise architecture team for the entire lifecycle.

At the end of the project, the architecture team receives certification of performance accuracy from tester as evidence which indicates that the cases have been implemented as they should be. In this paper, given the discussed reasons, standard testing techniques has been done on the BRM model.

At first, the processes of BRM areas were extracted. After extraction of testable items and according to the context of those items, the testing methods which are adapted with those items are selected and test is done.

In this method, pseudo-code is tried to be written for each process and then the provided code will be tested by software testing techniques. Some methods are workable on certain activities and some are not usable on that specific activity. In next section we show that more activities can be tested by software testing methods.

### III. CASE STUDY

Due to the extension of BRM's lines of business (LOBs), we decided to pay attention to the part of public affairs related to support delivery of services in this paper.

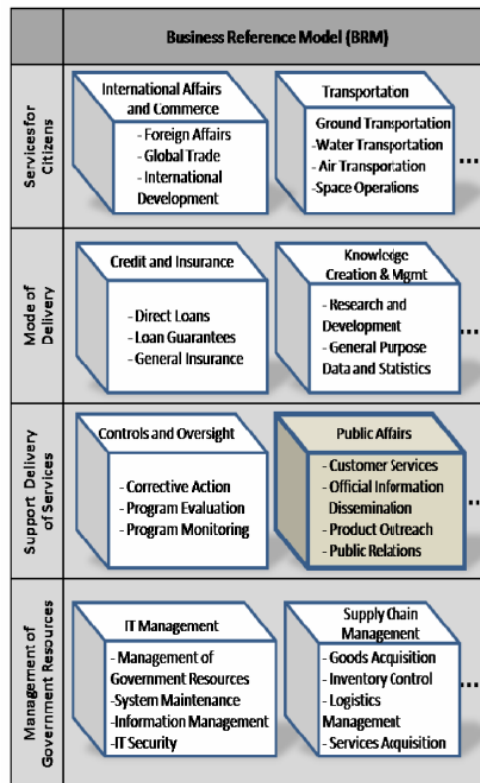


Fig. 2 A view of the BRM

Public Affairs involve the exchange of information and communication between the enterprise (or federal government), customers (or citizens) and beneficiaries in direct support of customer services, public policy and national interests [5].

All discussed cases can be considered in the extent of one organization or company.

Given the importance of keeping current customers and attracting potential customers in order to the profitability of organizations and companies, case study was done on the test of processes related to the customer services. One of the commonalities between BRM and SRM is the customer services activities. The method is seen in Fig. 3.

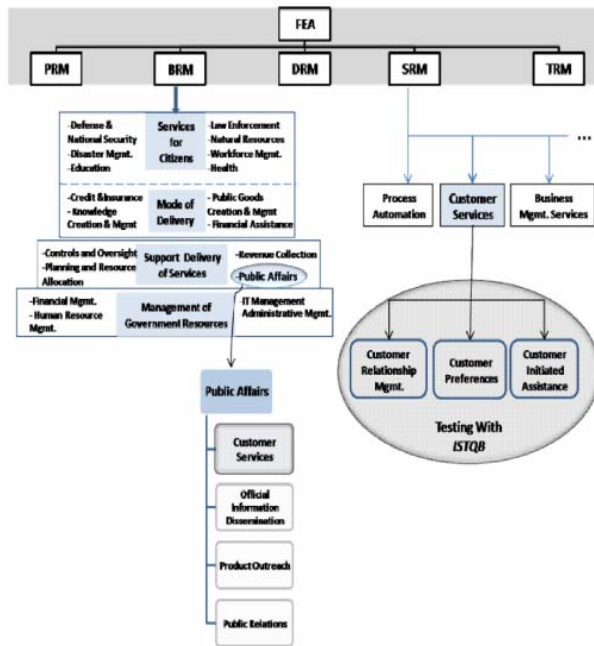


Fig. 3 A view of the overall procedure

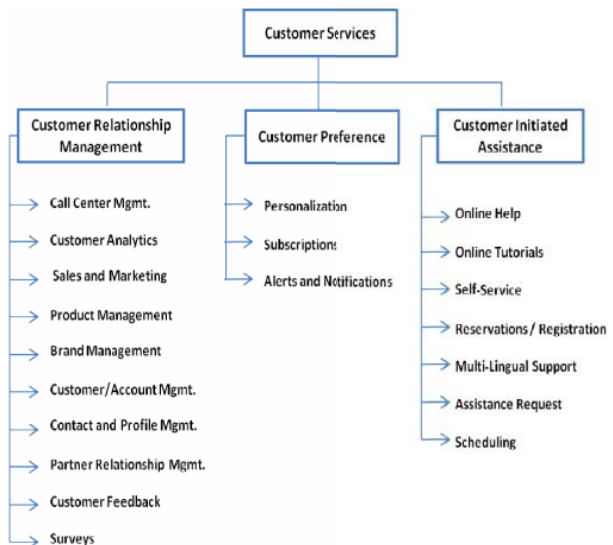


Fig. 4 Capabilities of customer services

For case study in this paper, 11 processes of customer services, 55 test items and 80 test cases were extracted to investigate the productivity rate of test techniques and were investigated by 16 test techniques. It is obvious that each process can be tested by using a set of techniques. For example in Table I, two of the rows of this case study is shown.

TABLE I  
A PART OF CASE STUDY

BRM			ISTQB Test Techniques															
Activity	Test Item	Test Case	Static Techniques						Dynamic Techniques									
			Review				Static Analysis		Experienced-base		Specification- based (Black-Box)				Structured-based (White-Box)			
			Informal Review	Walkthrough	Formal Review		Data Flow	Control Flow	Error Guessing	Exploratory	Equivalence Partitioning	Boundary Value Analysis	State Transition Diagram	Decision Table	Comparison Testing	Basic Path Testing	Condition Testing	Loop Testing
					Technical Review	Inspection												
Customer Analytics	Register Customer Attribute	C_ID C_Sex C_Name C_Tel C_Email C_Add C_Job .....	√	√	×	×	√	√	√	√	√	√	√	×	×	√	√	×
Contact and Profile Mgmt.	Methods of communication with the customer	Alarm in important dates of the customer (e.g. date of birth and marriage, the contract completion date, payment due date, maturity date checks	√	√	×	×	√	√	√	√	√	√	√	×	×	√	√	√

In fact, the main focus of this review is the efficiency rate of each technique to test enterprise architecture processes. In Fig. 5, the degree amount of using each technique to the investigated processes is listed. Results from case study indicate the testability of enterprise architecture processes by ISTQB test techniques.

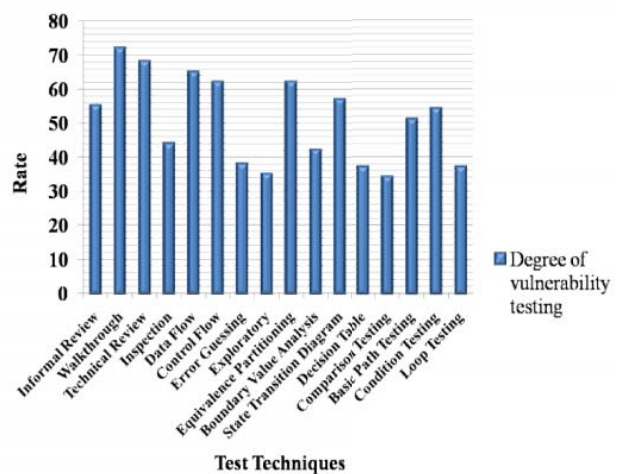


Fig. 5 Degree of vulnerability testing

## IV. CONCLUSION

Test process supports enterprise architecture in the movement of one organization structures from current state to target state so that goes on this way accurate.

Generally speaking, the presence of authorized tester in any enterprise architecture project supports the desired results, risk mitigation and reduction of cost and time loss.

Standard testing frameworks should be used to test enterprise architecture processes. In this paper, an approach was presented to integrate the concepts of a software testing framework and enterprise architecture processes testing.

The proposed framework by using the strength points of ISTQB test techniques provides a practical method for enterprise architecture processes testing. As this an undergoing project we are currently involved, further findings and evidences will be published within later papers in new future by authors.

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