

# Assessment of Enterprise Architecture (EA) Implementation Using The Open Group Architecture Framework (TOGAF)

Nini Aniza Zakaria, Rafidah Abd Razak, Zulkhairi Md Dahalin

College of Arts and Sciences  
Universiti Utara Malaysia, 06010 Sintok, Kedah  
Tel : 04-9284701, Fax : 04-9284753

## ABSTRACT

*Enterprise Architecture (EA) is an area within Information Management that deals with the alignment of IT and business in an organization. It is very recent and new discipline emerged in the new millennium as a result of the lack of comprehensive architecture that can describe the relationships among elements of the enterprise encompassing People, Processes, Business and Technology. The main objective of this study is to assess the level of implementation of EA in the designated organization. This study focuses on the four architecture domains listed in The Open Group Architecture Framework (TOGAF) namely: (1) Business Architecture; (2) Data Architecture; (3) Application Architecture; and (4) Technology Architecture. The outcome of this study is a set of guideline of an EA which should help the organization in aligning its business and IT strategy. This study should also benefit those who want to understand more on TOGAF and the implementation of EA.*

### Keywords

*Enterprise architecture, TOGAF, IT Strategy*

## 1.0 INTRODUCTION

Enterprise Architecture (EA) is an area within Information Management that deals with the alignment of IT and business in an organization. It is very recent and new discipline emerged in the new millennium as a result of the lack of comprehensive architecture that can describe the relationships among elements of the enterprise encompassing People, Processes, Business and Technology. Enterprise Architecture is a complete expression of the enterprise; a master plan which “acts as a collaboration force” between aspects of business planning such as goals, visions, strategies and governance principles; aspects of business operations such as business terms, organization structures, processes and data; aspects of automation such as information systems and databases; and the enabling technological business such as computers, operating systems and networks (Schekkerman, 2004). In other words, EA is a program supported by many frameworks, which is able to coordinate the many facets that make up the fundamental essence of an organization in a holistic way.

## 2.0 OBJECTIVE

This study encompasses the assessment on EA implementation of the organization, and to map it using The Open Group Architecture Framework (TOGAF). This study focuses on the four architecture domains listed in TOGAF namely: (1) Business Architecture; (2) Data Architecture; (3) Application Architecture and; (4) Technology Architecture.

## 3.0 ENTERPRISE ARCHITECTURE

Enterprise architecture provides a strategic context for the evolution of the IT system in response to the constantly changing needs of the business environment. The primary reason for developing enterprise architecture is to support the business by providing the fundamental technology and process structure for an IT strategy. This in turn makes IT a responsive asset for a successful modern business strategy. Good enterprise architecture enables an organization to achieve the right balance between IT efficiency and business innovation. It allows individual business units to innovate safely in their pursuit of competitive advantage. At the same time, it assures the needs of the organization for an integrated IT strategy, permitting the closest possible synergy across the extended enterprise.

When enterprise architectures work well, they are a tremendous asset in finding effective ways to better use technology. When they don't work well, they can be a huge counterproductive drain on precious organizational resources. All too often, it is the latter case that is realized (Sessions, 2006). Broader perspective on enterprise architecture needs to be drawn especially on governance aspects which determine the adoption and diffusion of National Enterprise Architecture (Madsen, 2007). Perspective of enterprise architecture has to be maintained as a management discipline not simply a methodology for managing technology, and has to be leveraged as the enabler of continual transformation (Sweden, 2006).

## 4.0 THE OPEN GROUP ARCHITECTURE FRAMEWORK

The Open Group is responsible for the birth of this framework in 1995. To date, the Open Group Architecture Framework (TOGAF) has evolved into a few versions. TOGAF intends to provide a practical, freely available, industry standard method of designing an EA, leveraging all relevant assets in the process (Schekkerman, 2004). However, the implementation of TOGAF is mainly for organizations whose products and services are in the business and industry domains and its technical infrastructure is based on open system building blocks. The Enterprise Architecture for this framework comprises of Business Process Architecture, Applications Architecture, Data Architecture and Technology Architecture. TOGAF provides a set of rules for developing good architecture principles, and they can be defined at three levels, which are; (1) Enterprise principles to support business decision making across the entire enterprise; (2) IT principle guide use IT resources across the enterprise; (3) Architecture principles govern the architecture development process and the architecture implementation.

There are four types of architecture that are commonly accepted as subsets of an overall EA, all of which TOGAF is designed to support:

- A Business (or Business Process) Architecture - this defines the business strategy, governance, organization, and key business processes.
- A Data Architecture - this describes the structure of an organization's logical and physical data assets and data management resources.
- An Applications Architecture - this kind of architecture provides a blueprint for the individual application systems to be deployed, their interactions, and their relationships to the core business processes of the organization.
- A Technology Architecture - this describes the logical software and hardware capabilities that are required to support the deployment of business, data, and application services. This includes IT infrastructure, middleware, networks, communications, processing, standards, etc.

## 5.0 THE STUDY

The first phase involves activities such as selecting case study, designing data collection protocol, and designing interview questions. This is then followed by case study data collection in the second phase. In phase three, analysis on gathered data is performed, and mapped using the selected framework, TOGAF. Finally, conclusion and suggestions are made based on study findings.

This study adopts TOGAF as a theoretical guideline in obtaining data regarding EA of the organization. There are four architecture domains in this framework, namely (1)Business Architecture; (2)Application Architecture; (3)Data Architecture; and (4) Technology Architecture.

### 5.1 Select Cases

The initial step in selecting the case organization is contacting the potential organizations. Due to time and geographical constraints, 3 private organizations in the northern region of peninsular Malaysia is listed and contacted, but only one organization is selected as the case study.

Upon verbal agreement in participating in this study, further appointment is made for the interview session. The main target of that enterprise would be the IS department, and the individuals involved in this study would be those involved directly with the IT or IS department.

### 5.2 Data Collection

This research adopts the case study method as tools in acquiring data, focusing on one organization as the research subject. An interview was performed, selecting the Financial Controller as the interviewee, whom is also responsible the Management Information System (MIS) department. The interview was recorded and transcribed, script was then returned to respondent to ensure validity of the response. Documentations such as annual report and the enterprise's business strategy are analyzed to gain information on organization's main concern in achieving its business strategy success. Information obtained through observations is scripted down in note book.

### 5.3 Analyzing Case Data

The data analysis method adopted for the case study data analysis is "Within-Case Analysis". Within case analysis involves detailed write-ups of case study. The write ups follow the case study database development procedure. The database organizes data gathered in the case interview those obtained from interview scripts, researcher's field notes, and documents collected during data collection. The data was then mapped

against the TOGAF phases to assess the extent of EA practice of the organization.

## 6.0 THE CASE

Due to confidentiality reasons, the name of the organization shall be remained anonymous. The selected organization is a medical device manufacturing company subsidiary of a U.S based company. They manufacture catheters, and export them overseas. The company consists of around 500 staffs, inclusive of administrative and operational workers. The IT Department consists of 5 staffs, consisting of 1 Programmer, 1 IT Assistant, and 3 Data Entry Clerks.

The MIS department is responsible for the whole IS operations of the organization. The two MIS personnel are responsible in managing the main server, e-mail server, data backup, installation and maintenance of applications. Software applications are bought off the shelf and some are developed in-house. Those bought off the shelf are such as the MRP system, human resource management, payroll management and antivirus systems. Applications developed in-house are such as programs to assist in invoicing, batch-cards data entry, reject tracking, packing, and other programs that generate report as per user requirement.

Aligning the company's business and IT strategy with the main company's business and IT strategy is vital, for the corporate audit is done from time to time to ensure the sub complies to given standards and regulations. The IT Department is responsible to ensure that the systems bought off-the shelf or developed in-house that directly affects the quality system, is properly validated, conforming to the US FDA Part 11 software validation requirements. Other than that, they have to ensure the data and system security, such as password organization, training is given to users and user access restrictions.

In terms of maintenance, MIS personnel are responsible for first-hand trouble shoot of all computer hardware. So far, they tackle problems such as formatting, hard disk data recovery and simple problems such loose peripheral connections. Other than that, the hardware are outsourced to local computer shops. Their local area network (LAN) is designed and setup by local networking company. Maintenance however, is performed by IT personnel. If they were not able to solve them, only then it will be outsourced. Documentation regarding their network structure however is very basic, and difficult to understand. The documentation is not done by the vendor, but by the IT personnel, by observing and documenting the visible networking peripherals, hence making it not dependable to be used for network troubleshooting.

In terms of IT investment, the person responsible is the Financial Controller, with the approval from the Plant Manager.

However, no planning is performed or documented formally for expenditure is based from current needs and necessity deemed important for company's IT security and efficiency, or as directed by main company, to comply with their given standards.

The upgrading of the whole company's IT system done only at several units involved directly with product manufacturing, hence needs to conform US FDA Security standards. Selective unit upgrading is done due to financial constraints. Usage of low-end machines however lead to other difficulty i.e. installation of software which requires high-end machines to run on. As a result, certain business functions could not be addressed whilst there is existing solution for it.

When asked about EA, the financial controller admits that he has vague idea of what it's all about. They do not have IT objectives; hence they do not focus IT planning. But change regarding there IS is tracked, such as the recent e-mail system transformation. This is regarded as one of the IT project. The factor that drives the organization to change their e-mail system is due to the old system could not bear the high speed communication need of the organization. Since the company is based in US, communication is very important between both sub and main company, and one of the important modes of communication is through e-mails. Timeline is set or IT projects, and completion is achieved within timeline. Implementation monitoring is also done. The given timeline varies depending on the scale of the project ranging from 1 to 2 months.

## 7.0 ANALYSIS OF CASE

Based on the Open Group Architecture Framework, determining the people involved in this whole process of developing enterprise architecture is the first step. This has never been practiced by this organization since they have never performed EA development before. They do, however have a business plan, laid out by the incorporating the enterprise's business plan (lined out by the main company) and the organization's own objectives, or the organization's own business plan. This is done formally, unlike IT planning which is done informally. The respective people involved in providing business information throughout the whole phase of planning their business and IT strategies are the top management consisting of the financial controller and plant manager. Based on the adapted framework, the initial business principle is outlined here, i.e.: (1) Maximize Benefit to the Enterprise; (2) Information Management is a teamwork; (3) Robust Business Continuity; (4) Compliance with Standards & Regulations ; (5) IT Responsibility ; (6) Protection of Intellectual Property. These principles are the basics of all output on future architecture that is to be developed.

### 7.1 Architecture Vision

This phase is where information architects should deliver architecture visions, comparing the current architecture as baseline. The goal is to articulate an Architecture Vision that enables the business goals, responds to the strategic drivers, conforms to the principles, and addresses the stakeholder concerns and objectives. In lament terms, this phase is the planning phase where future or desired architecture is envisioned. The main subjects that drives the business strategies detected here are: (1) Stakeholders-within own enterprise, across enterprise wide; (2) Standards & Regulations; (3) Business Profit Return. Hence, the initial architecture planning has to include and address these factors. The output of this phase is the input for the next phase in the ADM. Apparently according to top level management, it is agreed that they organization could benefit a lot by improving the current enterprise architecture, to enhance alignments between business and technical architecture. However they do not find it necessary at the moment, the company is deemed to have performed well with existing practice.

## **7.2 Business Architecture**

In practical terms, the Business Architecture is also often necessary as a means of demonstrating the business value of subsequent Technical Architecture work to key stakeholders, and the return on investment to those stakeholders from supporting and participating in the subsequent work. The extent of the work in Phase B will depend to a large extent on the enterprise environment. The business objectives outlined are: (1) To ensure customer satisfaction (decrease in customer complaints) ; (2) To ensure zero observation for audit; (3) To ensure on-time production/ delivery for products and (4) To increase company's annual yield. Looking at "scope", Business Architectures can be used for supply chains, networked organizations, individual enterprises, business units, departments, etc. Regarding the dimension "level of detail", Business Architectures can appear in various levels of detail. The level of detail is mainly tied to the scope of the architecture, the smaller the scope the more detailed the Business Architecture usually is. An Enterprise Business Architecture generally contains less detail than a Business Architecture of one its departments. A set of business architectures for a certain organization, can contain a top-level Business Architecture completed with more detailed sub Business Architectures for its Business Units and so forth. In today's practice however, Business Architectures are usually very high level structures with little detail.

The organization does not have any formal documentation of their Business Architecture models. Therefore, according to the adapted framework, here is where it should be addressed. Should the organization wish to change their business process, it is in this phase that they determine the target business architecture that they wish to achieve, and compare it to existing business architecture. Having properly documented

architecture models enables the management to see the areas of business processes that needs to be changed. However they do have an organizational chart, stating all the departments, which in this phase is known as business units, and they do have Standard Operating Procedures (SOP) which states the standard procedure that should be followed for processes which involves product quality. This SOP can be used to create the organizations Business Architecture model.

## **7.3 Information Systems Architecture**

The objective here is to define the major kinds of application system necessary to process the data and support the business. It is important to note that this effort is not concerned with applications systems design. The goal is to define what kinds of application systems are relevant to the enterprise, and what those applications need to do in order to manage data and to present information to the human and computer actors in the enterprise. Here the main application system used to the business function is the MRP System which handles the product inventory tracking, shipment processes, purchasing processes, customer order, and other business related processes. Other application systems are such as Access based systems which aids in invoice issuing, manufacturing order issuing, and product data entry. So far, the top level management finds that existing applications are able to support their business needs, although there may be room for improvement.

## **7.4 Technology Architecture**

The objective of this phase is to identify the existing technology, convert the description of the existing system into services terminology using the organization's Foundation Architecture (e.g., the TOGAF Foundation Architecture's TRM). This study does not include this phase as part of it's analysis. Therefore there are no deliverables from this phase.

## **7.5 Architecture Views**

Architecture views are representations of the overall architecture that are meaningful to one or more stakeholders in the system, to enable them to verify that the system will address their concern and pictures clearly the groups of people involved in each view. The view encompasses the Business Architecture View, data Architecture View, Applications Architecture View, and Technology Architecture View.

The planners and business management group applied to this case study is the top level management group. Across the matrix this group seemed to involve only in the business architecture area. This is probably due to their knowledge and job function that limits their knowledge only to business area. Database designer or administrator and system engineer group, and software engineer applied to this case is the programmer and the information technology assistant. They seem to be more involved all across the whole views. The knowledge and

information of all of the architecture views are important to these people, whereas the last group inclusive of managers of various other business units is not involved in any of the views.

## **8.0 CONCLUSION AND FUTURE WORKS**

This study reveals the only EA that the organization practices is business planning. Focusing on the Business Architecture domain, the top level management found it difficult to explain their business scenario, without any reference to documentations such as business architecture models, therefore improvement to be done on such area is difficult to be envisioned.. Such documentation will enable the management to have a clearer vision of the whole business processes, and this should make developing target business process easier. They agreed that by implementing the Open Group Architecture Framework will enable them to perform enhancements in a more structured manner. This study also reveals that the organization overlooked the fact that IT planning is important to ensure that the company's IT practice conforms to the required standards and regulations of the enterprise. Therefore, future work can be focused on the Technology, Data and Applications architecture, to help the organization in aligning it's Business and IT strategy better.

Based on the Open Group Architecture Framework these business principles are outlined:

- Maximize Benefit to the Enterprise
- Information Management is a teamwork
- Robust Business Continuity
- Compliance with Standards & Regulations
- IT Responsibility
- Protection of Intellectual Property

These business principles can be used as a guideline to define and develop their business strategies, and business architecture. It is highly recommended that future studies should look more into other architecture domains, namely the Data Architecture, Application Architecture and the Technology Architecture.

## **REFERENCES**

Madsen, H. (2007). *Framing National Enterprise Architecture: Enterprise Architecture in Government*. Retrieved April 30, 2007, from [http://www.eagov.com/archives/2006/12/framing\\_nationa.html](http://www.eagov.com/archives/2006/12/framing_nationa.html)

Schekkerman, J. (2004). *How to Survive in the Jungle of Enterprise Architecture Frameworks*. Victoria, B.C.: Trafford Publishing.

Sessions, R. (2006). *A Better Path to Enterprise Architectures*. Retrieved April 30, 2007, from <http://msdn2.microsoft.com/en-us/library/aa479371.aspx>

Sweden, E. (2006). *Transforming Government through Change Management: The Role of State CIO*. Retrieved April 30, 2007, from <http://www.egov.vic.gov.au>