Enterprise Architecture Characteristics in Context Enterprise Governance Base On COBIT 5 Framework

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Abstract
The existence of the enterprise architecture is an attempt of managing and planning over the evolution of information systems in the sphere of an enterprise with model-based. In developing the enterprise architecture, there are several tools definition of components in the system. This tool is known as enterprises architecture (EA) framework. In this paper, we present a method to build a model of enterprise architecture in accordance with the needs of the Organization by Understanding the characteristics of the EA framework such as Zachman, TOGAF, and FEAF. They are selected as the EA framework will be used to determine the characteristics of an EA because the framework is most widely used in corporate or Government. In COBIT 5 framework, there is a process associated with enterprise architecture it is APO03 Manage Enterprise Architecture. At this stage of the research, we describe the link between the characteristics of the EA with one process in COBIT 5 framework. The results contribute to give a recommendation how to design EA for organization based on the characteristic of EA in Context Enterprise Governance using COBIT 5 Framework.

Keywords: EA, characteristics, COBIT 5, framework.

1. Introduction

Each system is built has the potential to change the world into something better or even reverse can make the world full of millions of living creatures is so irregular. To optimize the potential of companies owned by each of these systems, we need to understand how the process happens inside with a look from a different point of view. Enterprise is an example of a system with its own complexity.

In an enterprise with the complexity of its business processes, planning an integrated information system and supporting to achieved business objectives is very important. If discussing about planning of integrated information system, enterprise architecture plays a role. In this case, the role of enterprise architecture is to create a picture of how the structure of the Organization, the Organization's business processes, applications, information systems and information technology infrastructure that supports [1].

The need to build an enterprise architecture for an organization according to IBM is as follows:

1. Enterprise Architecture has become the focus of medium and large companies (Enterprise) so that every employee understands the position where their role will effect of the Organization success

2. The need to build a simple system structure so every individual in the organization can look at the position that is right for them and how each activity they do contribute to the success of the Organization

3. The need to support the business model that has the ability to exceed the capabilities of the Organization so that IT can be used to navigate the complexity of enterprise systems

4. A knowledge to understand the system as well as deficiency needs the new system, the costs and the risks increase exponentially due to the changes

5. The large number of old system abandoned because it obsolete and has been gradually lowering the value of the business.

J Schekkerman in survey related trends in enterprise architecture 2005 getting results why EA is very important for an organization. The majority of respondents replied as decision support (16%), managing a portfolio of IT (14%), and became the introduction in manufacture of the roadmap for change (14%)
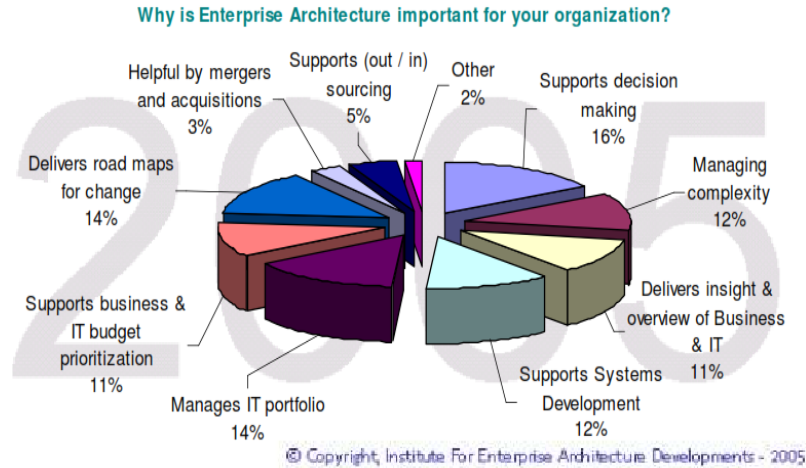

Figure 1. Importan of EA [2]

In the development of an enterprise architecture, it will be better and easier if organization follow a certain frame of mind. The frame is known by the term enterprise architecture (EA) framework. There are some enterprise architecture frameworks such as Zachman, the federal enterprise architecture framework (FEAF), and the open group architectural framework (TOGAF). Furthermore, according to the results of a survey conducted by IFEAD 2005 stated that the framework, some of the most widely used in corporate or Government other than the framework that made itself is Zachman (25%), TOGAF (11%), and FEAF (9%).
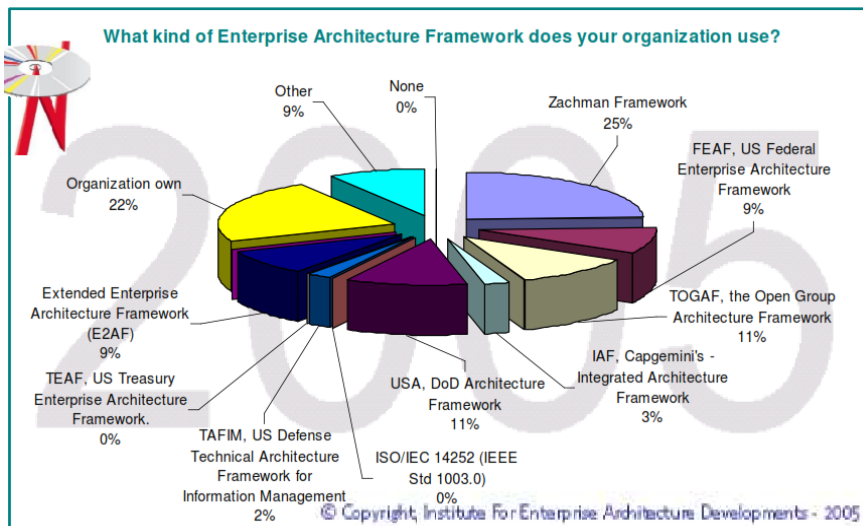

Figure 2. Enterprise Architecture Framework that Organization Use [2]

Enterprise Architecture Characteristics in Context Enterprise Governance… (Heru Nugroho)

The existence of a framework that provides a guide or an idea how should an enterprise architecture is built in an organization. This shows that in the world of information technology, the role of business became a very important part of remembering how alignment between IT and business. Zachman, TOGAF, FEAF and is some framework that can be used in developing the EA. Each framework has characteristics that indicate an excess or deficiency.

In this paper will be discussed about advantages and disadvantages framework which would then be compared to the one and the other is to gain it anything that becomes a characteristic of an enterprise architecture. By comparing multiple framework expected to be retrieved a pattern that would become a guide at the time of implementation of enterprise architecture modeling.

COBIT 5 is the latest edition of ISACA's globally accepted framework, providing an end-to-end business view of the governance of enterprise IT that reflects the central role of information and technology in creating value for enterprises. In COBIT 5, there is one process that discuss about enterprise architecture i.e. APO03 Manage Enterprise Architecture [3]. One of goal for this process is the architecture and standards are effective in supporting the enterprise. In this paper will be describe the link between the process and the characteristics of the EA.

The rest of this paper is organized as follows. Section 2 describes design science research methodology to describe principles, practices, and procedures applied to a specific branch of knowledge.. Section 3 describes related works of enterprise architecture characteristic. Section 4 describes the result and discussion about EA characteristic. Finally, we conclude our works in section 5.

2. Design Science Research Methodology

A methodology is "a system of principles, practices, and procedures applied to a specific branch of knowledge. Our research follows the Design Science Research Methodology (DSRM). There are six steps in the DSRM process, problem identification and motivation, definition of the objectives for a solution, design and development, demonstration, evaluation, and communication. On this paper will only do 3 early stages of DSRM [4].

    1. Problem identification and motivation.

Define the specific research problem and justify the value of a solution. A clear picture of the EA characteristics from Zachman, TOGAF, and FEAF and how the characteristic of EA in context of enterprise governance base on COBIT 5 framework

    2. Define the objectives for a solution.

Infer the objectives of a solution from the problem definition and knowledge of what is possible and feasible. Evaluation criteria of EA base one goal, input, and process and describe the process APO03 about goal, input, and output.

    3. Design and development.

Mapping the characteristic of EA with the process Manage Enterprise Architecture in COBIT 5 base on the goal, input, and output.

3. Related Work

The idea of enterprise characteristic was firstly proposed by A. Tang, et al., [5]. In [5], A comparative analysis of architecture frameworks is describe by table about characteristic of EA. A number of methodologies for implementing Enterprise Architecture (EA) have been proposed in the literature. Understanding methodologies' strengths and weaknesses play significant role in selecting appropriate methodology for each EA project is describe by Babak Darvish Rouhani, et al., in A Comparison Enterprise Architecture Implementation Methodologies [6]. Namkyu Lim, et al., [7] presented A Comparative Analysis of Enterprise Architecture Frameworks Based on EA Quality Attributes that provides the characteristics of the five EAFs using comparative analysis based on Enterprise Architecture Quality Attributes. Raouf Khayami in Qualitative characteristics of enterprise architecture discuss that Enterprise Architecture (EA) quality is a multi-dimensional content which is not easily distinguishable and measurable. To determine this content more exact, the qualitative models have been presented in which different aspects of this matter are investigated. This paper attempts to introduce mentioned about determine EA qualification and its qualitative characteristics more clearly [8].

3. Results and Analysis

To build a model of enterprise architecture with an understanding of the characteristics of the EA framework then we need to exploration characteristics of the Zachman, TOGAF, FEAF framework.
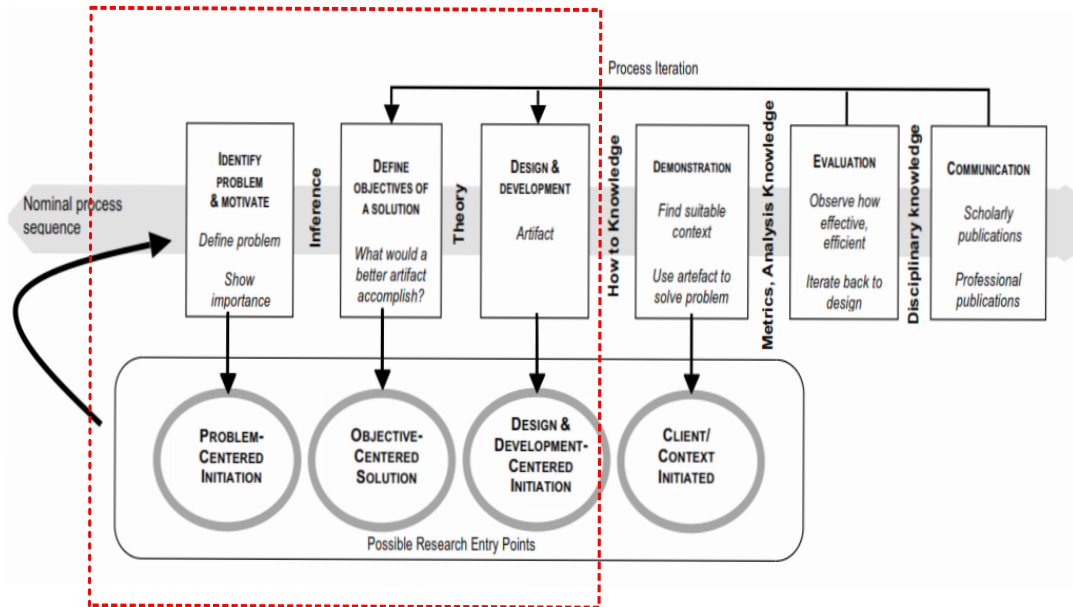

Figure 3. Design Science Research Methodology [4]

3.1. Zachman

Wartika and Supriana (2011), elaborated the characteristics of zachman Framework as enterprise architecture framework as follows [9]:

1. Is the framework of positioning
2. Has a background in manufacturing industry
3. delivered by category
4. Its use was very limited
5. The perspective view is less through
6. Is a tool for planning

Minoli (2008) explains the advantages of Zachman framework as follows [10]:

1. This Framework is very easy to understand, because it refers to the General Organization, and describes the tools and methodologies are independently

2. All components can be mapped to find the most suitable conditions with the Organization

3. The existence of a classification makes it possible to identify all over different parts of the IT infrastructure through different perspectives Shan and Hua in paper "*Architecture Methods and Frameworks Overview*" explains the advantages of the Zachman framework as can be seen in the following table [6].

Table 1. The Advantages and Disadvantages Zacman Framework

Advantages	Disadvantages
Is a planning tool	Has limited views
The spacious of reception area	Process oriented
Have a manufacturing background	Driven by data

3.2. TOGAF

Wartika and Supriana (2011), in his paper write down the characteristics of TOGAF Framework as follows [9]:

1. Development of EA methodologies
2. Use for Defense Background
3. Open standard because open source
4. Broad Acceptance
5. Comprehensive Perspective
6. As a tools for process or planning

According to the Raynard (2007) in a study of the purpose development and design of Enterprise Architecture Framework by Lusa et al [11], some of the advantages of TOGAF framework as follows:

1. IT operation owned by the company will be more efficient. This refers to the fact that there are lower costs for development, support, and maintenance of free software because of TOGAF used by any framework.

2. Risk to investment in the future increasingly declining due to a simpler it infrastructure using the TOGAF

3. Decisions relating to the procurement of the infrastructure is no longer so complex because information on the framework will be easily obtained.

Advantages and disadvantages TOGAF can be seen in the following table [12, 13].

Table 2. The Advantages and Disadvantages TOGAF Framework

Advantages	Disadvantages
Focus on a implementation cycle (ADM) and process	There is no standard template to the entire domain as in making block diagrams
There are many areas of technical architecture	There are no artifacts that can reuse
Resource base provides a lot of reference material	Do not discuss the tradeoff analysis
Development of EA methodology	It is the only Canal from engineering
Open structure	Do not include on your portfolio
Perspective covers the entire Organization (holistic)	

3.2. FEAF

FEAF is a mechanism within the Organization to manage the development and maintenance of architectural descriptions on the area to be a priority. The following is a characteristic of the FEAF Framework [5]:

1. Is an EA Reference Model
2. Have a background in planning the EA
3. Is the standard used by the Government of the United States
4. Showing an overall view perspective
5. Is a tool for planning and communication

Shan and Hua in paper "*Architecture Methods and Frameworks Overview*" explains the advantages and of the FEAF framework as can be seen in the following table [12].

Table 3. The Advantages and Disadvantages FEAF Framework

Advantages	Disadvantages
It is the reference of EA framework	Limited to U.S. Government
Have a background in planning the EA	Too common of Preparation
Perspective covers the entire Organization (holistic)	The blessed transformation model is less automatic
	Not a roadmap
	Not a methodology

Enterprise architecture framework each have a difference of one and more. In this case, there is no framework that best but there is a framework that is best suited for your organization. Each framework has strengths and weaknesses, as described in the previous section. The framework of the above will be evaluated using the criteria expressed by Antony Tang, Jun Han, dan Pin Chen in the paper "A Comparative Analysis of Architecture Frameworks". These criteria are grouped into three, namely, goal, inputs, and results [5].

1. Goal
The goal is the target desired by the organization. Some of the criteria from the goal is as follows:
- a. Architecture Definition and Understanding
- b. Architecture Process
- c. Architecture Evolution Support
- d. Architecture Analysis
- e. Architecture Models
- f. Design Tradeoffs
- g. Design Rationale
- h. Standardization
- i. Architecture Knowledge Base
- j. Architecture Verifiability

2. Input
Represents the data that is needed in building a model of architecture. Some of the criteria of the input is as follows:
- a. Business Drivers
- b. Technology Inputs
- c. Business Requirements
- d. Information System Environment
- e. Current Architecture
- f. Non Functional Requirements

3. Outcomes
The result of the architectural framework which can answer the purpose. Some of the criteria from the results as follows:
- a. Business Model
- b. System Model
- c. Information Model
- d. Computation Model
- e. Software Configuration Model
- f. Software Processing Model
- g. Implementation Model
- h. Platform
- i. Non-functional Requirements Design
- j. Transitional Design
- k. Design Rationale

As the results of the evaluation of Zachman, TOGAF, FEAF and framework for every criteria of goals, inputs and outcomes based on the results of the analysis of the comparison of enterprise architecture framework by the Tang, et al., (2004) then the mapping results can be seen in the following table.

Table 4. The Mapping Zachman, FEAF, and TOGAF Framework

Framework EA Characterictic	Zachman	FEAF	TOGAF
Goal			
Architecture Definition and Understanding	Partial	Yes	Yes
Architecture Process	No	Yes	Yes
Architecture Evolution Support	No	Yes	Yes
Architecture Analysis	Yes	Yes	Yes
Architecture Models	Yes	Yes	Yes
Design Tradeoffs	Partial	Partial	Partial
Design Rationale	Partial	Partial	Yes
Standardization	No	Partial	Yes
Architecture Knowledge Base	No	Yes	Yes
Architecture Verifiability	No	No	Yes
Input			
Business Drivers	Partial	Yes	Yes
Technology Inputs	No	Yes	Yes
Business Requirements	Yes	Yes	Yes
Information System Environment	Partial	Yes	Yes
Current Architecture	Partial	Yes	Yes
Non Functional Requirements	Partial	Partial	Yes
Outcomes			
Business Model	Yes	Yes	Yes
System Model	Yes	Yes	Yes
Information Model	Yes	Yes	Yes
Computation Model	Yes	Yes	Yes
Software Configuration Model	No	No	Yes
Software Processing Model	Yes	Yes	Yes
Implementation Model	Partial	Partial	Yes
Platform	Yes	Yes	Yes
Non-functional Requirements Design	Partial	Yes	Yes
Transitional Design	No	Yes	Yes
Design Rationale	No	No	Partial

Table 4. The Mapping Analysis of Comparison Zachman, TOGAF, dan FEAF and APO03 Process in COBIT 5

Characteristic	Result analysis of comparison Zachman, TOGAF, dan FEAF	APO03 Process
Goal	• Architecture Analysis • Architecture Models	The architecture and standards are effective in supporting the enterprise
Input	Business Requirements	Identify the key stakeholder and their concern / objectives, and define the key enterprise requirement
Outcomes	• Business Model • System Model • Information Model • Computation Model • Software Processing Model • Platform	• Defined scope of architecture • Architecture principles • Baseline domain descriptions and architecture definition • Process architecture model • Information architecture model

4. Result

Based on the result analysis of comparison Zachman, TOGAF, dan FEAF as a enterprise architecture framework than we get a conclusion that can describe general EA characteristic with goal, input, and outcomes as follow

1. Goal
   a. Architecture Analysis
   b. Architecture Models
2. Input
   a. Business Requirements
3. Outcomes
   a. Business Model
   b. System Model
   c. Information Model
   d. Computation Model
   e. Software Processing Model

f.   Platform

In COBIT 5 framework, there is one process that discuss about enterprise architecture i.e. APO03 Manage Enterprise Architecture. One of goal for this process is the architecture and standards are effective in supporting the enterprise. Identify the key stakeholder and their concern/objectives, and define the key enterprise requirement to be addressed as well as the architecture views to be developed to satisfy the various stakeholder requirements is on of activities in this process. The output of this process is:

1. Defined scope of architecture
2. Architecture principles
3. Baseline domain descriptions and architecture definition
4. Process architecture model
5. Information architecture model

We can mapping the characteristic of EA base on the result analysis of comparison Zachman, TOGAF, dan FEAF as a enterprise architecture framework and EA in context Enterprise Governance in COBIT 5 framework which in this case represented by the process of Manage Enterprise Architecture.

5. Conclusion

Understanding the characteristics of the enterprise architecture framework such as Zachman, TOGAF, and FEAF will help organizations drawing up a model of EA. The results of the comparison of the three framework indicates that in building a framework need input like business requirements. Outcomes from development of EA is:

1. Business Model
2. System Model
3. Information Model
4. Computation Model
5. Software Processing Model
6. Platform

And the goal of EA for organization is create Architecture Analysis and Architecture Models.

In the COBIT framework 5, there is a process associated with enterprise architecture, APO03 Manage Enterprise Architecture. Base on the mapping, we can see that characteristic of EA in context of enterprise architecture in line with the goal, input and process in APO03 as a process in COBIT 5 framework. Base on the result, when organization is built an enterprise architecture, the APO03 can use as a references to khow the process, goal and outcomes with key management practice as the follow:

1. Develop the enterprise architecture vision;
2. Define reference architecture;
3. Select opportunities and solutions;
4. Define architecture implementation;
5. Provide enterprise architecture services.

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