*International Journal of Engineering & Technology*, 8 (1.9) (2019) 28-32

**International Journal of Engineering & Technology**

*Website: www.sciencepubco.com/index.php/IJET*

***Research paper***

# Quality of Integrated Information System Blueprint based on Enterprise Architecture Scorecard

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**Abstract**

Enterprise architecture development of information system in an organisation is very important for running its bussiness process. This research uses EAP (Enterprise Architecture Planning) metodology for planning enterprise architecture, and E2AF (Extended Enterprise Architecture Framework) for mapping and organizing the results of the design is already done. Then the resulf of its mapping is measured by a questionaire from Enterprise Architecture Scorecard by colecting EAP's documentations. The result of mapping between EAP into E2AF shows that EAP fillfull 3 (three) levels and 1 (one) level only for information system aspect in E2AF.The assessment process using EA Scorecard shows the percentage value of 71.875% of the documentation on mapping of EAP steps into E2AF. Overall, this research produced a blueprint for the development of an integrated information system in accordance with the business processes of Tri Dharma of University in UMS.

***Keywords***: *Integrated Information System, EAP, E2AF, EA Scorecard*

## 1. Introduction

Development of information system in an organization requires a good information system development planning in order to be aligned with business needs. Without planning, an organization tends to build or develop information system separately in each business unit, so it can cause piles of unintegrated datas. Therefore, it needs an integration process of information system for improving all of functions in enterprise and giving an added value for the enterprise.

UMS (Universitas Muhammadiyah Surakarta) as a college instantion that runs activities of Tri Dharma of University have used the implementation of information system for its business process, but each units of the organozation are using different information system, it causes pile of datas that make ineffectiveness of data management in the business. Therefore, this researchs is limited only for business function in scope of Tri Dharma of University that include teaching/education, research, and people service.

EAP (Enterprise Architecture Planning) methodology approach gives a knowledge in enterprise architecture development based on business and data support. The result of EAP metodology is a blueprint or high level model which contains of data, application, and technology architecture for enterprise needs that will be used for next information system implementation and planning.

This research uses E2AF (Extended Enterprise Architecture Framework) to map the results of enterprise architecture planning. E2AF has some advantages to clasify an architecture become some perspectives and categorizing enterprise architecture artefact, yet E2AF can be used for designing completeness of enterprise architecture very well.

The quality of planning results that had been done should be measured so that integrated information system planning can be accordance to strategy and purpose of enterprise, therefore needs a paramater that can show and how to measure it. This research uses the metodology of enterperise architecture which its assessment system is especially related to E2AF (Extended Enterprise Architecture Framework). By using Enterprise Architecture Scorecard, a college can consider its measurement target for the achievement of concrete steps that must be done to realize the objective of the college.

## 2. Research Aims

Goals of this research are:

1. Desaigning an enterprise architecture or blue print for Tri Dharma of University aspects according to bussiness process in UMS using EAP methodology.

2. Measuring planning results of mapping between EAP into E2AF.

Benefits of this reserch include :

1. Providing direction and control in the development of an integrated information system for UMS at the planning stage of development.

2. Becoming a guide and a reference in assisting the college in the process of developing a better and integrated information system in order to produce efficiently and effectively data.

3. It can be used by businesses in the field of higher education in documenting the data requirements in running business processes.

## 3. Literatures Review

### 3.1. Integrated Information System

Integrated information system is a technology platform that enables organizations / companies integrates and coordinates business processes owned (Sinambela, 2006). The characteristic of this system is the high level of integration to accommodate the needs of data or information that is integrated as well.

There are two spproaches in the integration of information system :

1. Total and homogeneous approach, is it runs the integration in all aspects of business with a standard framework and performed simultaneously in each field. Homogeneous component is expected to ease the process of integration. Disadvantages of this approach is the need of expensive and lengthy implementation time (depending on a company's IT capabilities).

2. Phased approach, it is started by running the integration of bottom and utilize existing information systems. Information systems are assembled following the pattern of integration and future information needs. In this integration process takes a long time and consistent so as not to fail, and require specific strategies (including non-technical political will of the leadership). Costs incurred by this approach is relatively cheaper.

### 3.2. Enteprise Architecture Planning (EAP)

Enterprise Architecture Planning (EAP) methodology is an approach made by Steven H. Spewak (1992) to build the enterprise architecture based on the data and bussinesssupport. According to Steven H Spewak, the use of the term in the EAP architecture consists of a data, application and technology architecture.

Enterprise Architecture Planning (EAP) has seven (7) major components which show stages to determine and plan the implementation of information systems architecture. The seven main components are grouped into four (4) layers (Spewak, 1992) and can be seen in Figure 1.

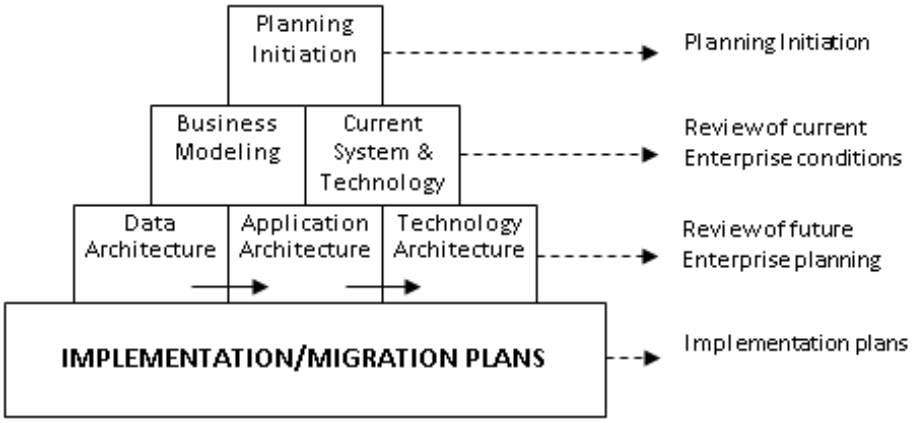


**Fig. 1.** Components and Layers of EAP

### 3.3. Extended Enterprise Architecture Scorecard (E2AF)

Extended Enterprise Architecture Framework (E2AF) is built and developed by Schkkerman (2006) from the Institure For Enterprise Architecture Developments (IFEAD) in 2006. E2AF has reached version 1.4. E2AF have three (3) main elements include (Dewi, et al, 2012):

1. Construction element

2. Function element

3. Style element that reflect the culture, values, norms and rules of the organization.

Grouping topics of concern in E2AF divided into:

1. Contextual Level (Rev) is the context and scope of the company.

2. Environmental levels (With Who) describe the business relationship and flow of information.

3. Conceptual level (What) illustrates the need.

4. Logical level (How) describe the ideal solutions.

5. Physical level (With what) describe the products and engineering solutions physically.

6. Transformation level (When) describe the impact of a solution to the company.

While the 4 (four) rows in E2AF areas represent different aspects in enterperise which include:

1. Business or Organization,

2. Information,

3. Information Systems,

4. Infrastruture Technology,

The advantages of E2AF is able to ensure the enterprise designer to take full advantage of the alignment between business and IT architecture to integrate all the results into one, which is comprised of architectural design related business, information, information systems, security, infrastructure, and governance aspects. (Dewi, et al, 2012).

### 3.4. Enterprise Architecture Scorecard

Enterprise Architecture (EA) Scorecard is an approach that is used to measure the quality based on the results of enterprise architecture planning which is developed by Schekkerman (2006) from the Institure For Enterprise Architecture Developments (IFEAD). EA Scorecard methodology relating to aspects of the E2AF areas and levels of abstraction based on the facts during the process of enterprise architecture in which all elements are handled and described which depends on the purpose and objective enterprise. Based on these elements, EA Scorecard method was developed to get an overview and insight of the topics status that is discussed related to the quality of the EA scope. These elements include business, information, information systems, and technology infrastructure.

## 4. Research Metodology

The steps flow of the research process combines information system design evaluation method of Hevner (2004) with the method of Enterprise Architecture Planning (EAP) of Spewak (1992), which the results of research design is incorporated into the framework E2AF and measured using EA Scorecard of Schekkerman (2004). The flow of the study include:

1. Observational stage

2. Analytical stage

3. Experiment stage

4. Testing stage

5. Testing stage

### 4.1. Relationship of Metodologies

This study uses multiple approaches and methodologies include EAP (Enterprise Architecture Planning), E2AF (Extended Enterprise Architekture Framework), and Enterprise Architecture Scorecard. The relationship between these methodologies in this study can be seen in figure 2.

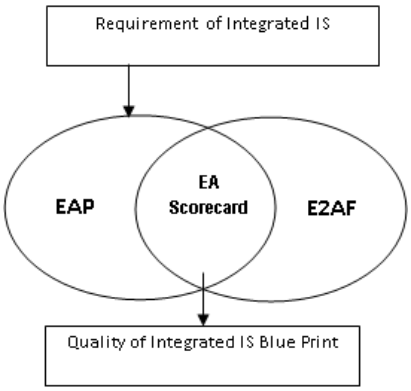


**Fig. 2:** Relationship of methodologies

Explanation of methodological relationship in Figure 2 is started from the need to plan an integrated information system for business processes Tri Dharma of University in UMS, then the collected needs are carried out enterprise architecture planning process using EAP. Planning results in the form of documents are then mapped into E2AF's elements.

Then the scope of EAP into E2AF is assessed by using EA Scorecard based on collected documentations and knowledges during planning process. The last results of the assessment process is quality of blue print that will be used as a guide in the development of integrated information system.

### 4.1. EAP into E2AF Mapping

Mapping for getting scope of EAP into E2AF is done before running enterprise architecture planning. In the mapping process of planning results must relates the steps in EAP to bussiness aspects in E2AF. The result of the relation produces a chart which depicts the scope of EAP's steps into E2AF. The scope will be used for mapping every collected document which are produced during planning process. Mapping result of EAP into E2AF mapping can be seen in table 1.

**Table** 1: EAP into E2AF Mapping

| | Why? | With Who? | What? | How? | With what? | When? |
|---|---|---|---|---|---|---|
| **Bussiness** | Mission and vission, strategy, organisation structure | | Bussiness function | | System support for each area | |
| **Information** | Data flow of Bussiness process | | Data architecture | | Location for data distribution | |
| **Information System** | Condition of current IS | | Application architecture | | Integrated IS architecture | Influence and implementation roadmap |
| **Technology Infrastructure** | Condition of current IT | | Technology architecture | | Technology platform | |

Table 1 shows that the mapping is only filled 4 (four) levels, these are the contextual level (why), conceptual level (what), physical level (with what), and transformation level (when) only for information systems element, so the process of counting only will involve the filled elements. While the levels are not filled will be considered as NA (Not Applicable) because not all aspects or needs in E2AF are not done in the process of designing the enterprise architecture in EAPmethodology. These results will influence the results of the quality assessment in the next step.

## 5. Enterprise Architecture Planning

Enterprise Architecture planning process at UMS is run based on steps of EAP metodology in figure 1.

### 5.1. Planning Initiation

Planning initiation phase includes defining the scope of the enterprise by collecting the rules of the organization, defining the vision and mission of the organization, as well as everything that leads into the enterprise / organization associated with the development of information systems.

In this phase describes the scope of business processes that will be addressed in the planning process of enterprise architecture, namely Tri Dharma of University which includes teaching, research, and people service. As well as the process of defining the vision, mission, and goals in UMS

### 5.2. Review of Current Enterprise Condition

This layer provides the basics in defining the architecture for the future (to be) and long-term migration. In this layer there are two stages include:

1.Business Processes Modeling

2.Current Systems and Technology

### 5.3. Review of Future Enterprise Condition

This layer designs architecture needs that will be used by UMS in the development of integrated information systems. The architectures in this phase include:

1.Data Architecture

The design of the data architecture produces a list of data entitycandidates, relationships among data entities (ERD or Entity Relationship Diagram), and the relationship of data with business functions.

2.Application Architecture

The design of the application architecture produces a list of application candidates and application definition, applications relationships with business functions, and analysis of the impact on existing applications (legacy systems)

3.Technology Architecture

The design of technology architecture generates technology principles to be used / proposed, and conceptual.

### 5.4. Implementation Planning

In the phase is preparing a recomendation for implementation planning based on designed architectures to produce an information system. EAP approach suggested that the order of application is done by using a relationship matrix applications and data entities. The steps of implementation planning phase includes :

1.Determining the order of application developmentpriority.

2.Creating approximate of implementation (time estimation, human resource estimation, and cost estimation)

3.Creating the conclusion of planning

## 6. Enterprise Architecture Assessment

The study produced a blueprint of the results of the design process using EAP methodology that is mapped into E2AF. The quality of mapping results are then assessed using a questionnaire instrument of EA scorecard that has been specifically linked to aspects of E2AF.

The measuring process is done by answering the questions in the questionnaire were based on the status of the goals and objectives assessed on enterprise architecture. Each question on each element of area (business, information, information systems, technology infrastructure) should be assessed.

The answer on each question based on the collected knowledge and documentation of the enterprise architecture design process. If a step in the EAP have the knowledge but not documented, this means maintenance of the results of planning can not be done and that knowledge can not be assigned or transferred to another person.

While the counting process is done by calculating the value of the overall value at every level of the topic. Each level has a number of sub-total level, then the entire sub-total summed to obtain the total value of each element in the business. The sum of each level of sub-total and total quality rating reflects the overall level of enterprise architecture planning results are measured from the completeness of the documentation on the steps enterprise architecture planning process that has been done.

It should be noted that the assessment will be carried out only on cells filled by the results of planning, whereas the Not Applicable cells will not be involved in the counting process because it is not included in the results of enterprise architecture planning.

From the results of the assessment at each sub-level aspects of the business and using Scorecard EA questionnaire, obtained counting every aspect and detail levels as in table 2.

**Table** 2. Values Calculating of EAP Using EA Scorecard

| Element / Level | Business | Information | Information System | Technology Infrastructure |
|---|---|---|---|---|
| Contextual Level(Why?) | 12 | 12 | 12 | 10 |
| Conceptual Level (What?) | 6 | 8 | 6 | 6 |
| Physical Level(With what?) | 6 | 12 | 12 | 11 |
| Tranformation Level(When?) | | | 10 | |
| Total Score | 24 | 32 | 40 | 27 |
| Element % | 60 | 80 | 80 | 67,5 |
| Average % | 71,875 | | | |

From the values calculating process about quality of EAP into E2AF on table 2 can be conclude as follows :

1. The average percentage of all quality elements of the business is 71.875%, This is because only 4 levels were assessed and measured based on the results of the EAP mapping into E2AF.

2. There are many aspects that have not been documented in the implementation of enterprise architecture planning, it also reduces the value of each element.

## 7. Conclusion

Enterprise architecture planning processes using the EAP methodology and A2AF (Extended Enterprise Architecture Framework) as a framework for organizing the results of the EAP, and then measured the quality of the EAP using EA Scorecard. The overall yield some conclusions as follows:

1. This study produces an enterprise architecture blueprint for the development of an integrated information system in the Tri Dharma of University aspect in UMS (University of Muhammadiyah Surakarta), which is a blueprint showing the data, applications, and technology architecture required to run enterprise business processes.

2. Measurement of the quality of the EAP mapped into E2AF has been done with the overall result is 71.875%, from the collected documentation during the planning process of the enterprise architecture takes place.

3. The mapping of EAP into E2AF only fills4 (four) levels in E2AF (Extended Enterprise Architecture Framework), these are contextual level (Why), conceptual level (What), physical level (With What), and transformation level (When) only for information systemselements.

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