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Enterprise Architecture for Higher Education Using Enterprise Architecture Planning Based Three Pillars of Higher Education

B Indrawan¹, I D Sumitra²

¹² Department of Postgraduate of Information System, Universitas Komputer Indonesia
² Department of Management Information, Universitas Komputer Indonesia

Email: ¹berny@labkom.unikom.ac.id

Abstract. This study aims to design and adapt IT infrastructure based on Enterprise Architecture Planning (EAP) at UNIKOM. The method used in this study was the Enterprise Architecture Planning (EAP) method; the EAP methodology serves as the basis for many modern EA methodologies. The results of this study can produce a blueprint that can align IT infrastructure and business processes by the Three Pillars of Higher Education. However, to improve the success factors of implementing EAP-Based Higher Education, full support from all levels of stakeholders is needed. Where technical and non-technical factors will influence the successful implementation of EAP. The goal is to design and adjust IT infrastructure based on Enterprise Architecture Planning (EAP) at UNIKOM. The framework in EAP consists of 4 stages, but only three stages are used namely Initiation Planning, Business Models, Current Systems and Technology, Data Architecture, Applications, and Technology. The conclusion from this study as applying EAP based on the Three Pillars of Higher Education can obtain a number of benefits such as better decision making and future business and IT alignment.

1. Introduction

Universitas Komputer Indonesia (UNIKOM) as a rapidly growing private university must be able to compete with other universities by running business processes that can support the improvement of the quality of education and service to the needs of their stakeholder. However, along with rapid growth and development of IT and business processes in UNIKOM, make the management of IT infrastructure face various problems and was unable to adapt and follow the change of business process and IT. It also makes the process of usage of IT infrastructure that has been running not aligned with business processes implemented by UNIKOM. So it needs a blueprint that aligns between business process and IT infrastructure. Diogo Ermida et al. did the research. Stated that Organizations with a significant level of complexity struggle for obtaining value from their IT infrastructure, aligning it with the strategic goals, and improving the communication between the business people and the IT people. Enterprise Architecture (EA) strives to provide a high-level overview of an organization while creating a framework around which to organize the documentation necessary to drive adoption and utilization of the EA plan and to better align technology resources throughout the organization [1][2].

Research conducted by Hatta et al.: stated that Enterprise Architecture Planning (EAP) could provide an overview or blueprint to organize the entire enterprise business processes, the information needed and supporting technologies. Where EAP consists of the definition of the current state, future mission vision & about business as well as technology and other ways to regulate complexity, the blueprint can be used as a basis for the integration strategy of governance system and IT, planning, implementation,
and overall IT utilization that covers all aspects of an organization. Based on types of research conducted about EAP, the researcher considers that the design of EAP is needed for compiling IT needs and align it with the needs of business processes run by UNIKOM [3][4].

Based on government regulations of the Republic of Indonesia Number 12, the year 2012 Article 1 Paragraph 9, higher education has a primary business goal namely conducting Education besides that, universities are also required to conduct research and community service activities. This regulation is also known as the Three Pillars of Higher Education as liability for the Higher Education. Based on these rules, the researcher assumes that the Three Pillars of Higher Education can be used as a success indicator of Higher Education. Therefore, to support efforts to improve service quality at UNIKOM, UNIKOM must have a business process that refers to the Three Pillars of Higher Education. Through this research, the researcher will make a design of EA using the EAP method to compile IT needs and align it with the needs of business processes by Three Pillars of Higher Education. The result of this research is to create a blueprint that can align IT infrastructure and business processes following the Three Pillars of Higher Education. The conclusion is the creation of a blueprint, the existence of the blueprint to facilitate UNIKOM to make decisions when running business processes that are following the Three Pillars of Higher Education [5].

2. Method

The method used in this research was a method of Enterprise Architecture Planning (EAP). In research [6] stated that the EAP methodology serves as the basis for many modern EA methodologies. Enterprise architecture (EA) is a logical organization for business processes and IT infrastructure related to the integration needs and standardization of an operating model. One central artifact of EA is EA models, which provide a holistic view of the organization and support EA’s stakeholder to create added value [7]. According to [8]: "EA provides a long-term view of the company's processes, systems, and technology so that each project can build capabilities - not only to meet urgent needs."

EAP is a method or guideline to develop information architecture. EAP is an architectural planning method which integrates business practices strategy with information stages and technology resource. In EAP, architecture defines data, application, and technology needed to support business organization [9][10]. EAP is a process in which multiple to-be architectures are constructed to transform the current architecture to a specific target architecture. It includes the modeling of different architectural scenarios and comparing them against each other [11]. In EA, the EAP contains the management and governance guidelines describing and documenting [12][13]: 1) The current or “as is” state of the enterprise, 2) The enterprise’s strategic business goals and objectives (strategic business plans), 3) The strategy for alignment of those strategic business plans and the organization’s IT capabilities, 4) The desired “to be” state of the organization, 5) The processes needed to handle strategic organizational transformation 6) The supporting, infrastructure, resources, applications, and systems to be developed, 7) An assessment of the risks to management for undertaking the effort. Consists of four stages of research flow but in this study, the researcher only uses three stages of flow, namely: 1) planning initiation, 2) business modeling, Current Systems & technology, 3) data architecture analysis, application architecture analysis, and technology architecture analysis. The stages of the EAP flow can be seen in Figure 1 [6]:
2.1. Research Framework

In this study, the research step refers to the methodology of EAP, where the EAP research step can be seen in the framework in Figure 2.

2.2. Value Chain Model

The analytical method in this study uses an analysis of the value chain model. Value Chain according to was introduced by Porter (1985), which consists of a series of activities that create and build a value that can produce an added value margin for the organization. The research conducted by Michael Porter produced a concept called the concept of Porter's value-added chain concept which aims to divide the main functions in the organization into two major groups, namely primary activities, and support activities. The identification of the primary activities and support activities of UNIKOM can be indicated using the value chain of Michael E. Porter, which looks like in Figure 3.
3. Results and Discussion

The EAP modeling flow stage is a step that should be done to create a blueprint that can align IT infrastructure and university business processes in accordance with the Three Pillars of Higher Education. The following are the results of research from each stage of the flow using the EAP method.

3.1. Planning Initiation

The initial stage of EAP is planning initiation; this stage aims to define the organization by describing the organization's vision and mission so that architecture development can be carried out following business goals. Determination of this vision and mission is needed as a guideline for determining various business strategies and determining strategies to regulate the IT infrastructure needed to support the vision and mission. In accordance with the existence of UNIKOM as a university, the indicators of the success of the vision and mission made by UNIKOM can be seen from the success in carrying out the Three Pillars of Higher Education. Therefore the decisions and determination of the business strategy that must be implemented by UNIKOM must refer to Vision, Mission and Three Pillars of Higher Education.

3.2. Business Model

The organizational structure in higher education is the main base for conducting business modeling. The organizational structure can show what parts and responsibilities will be handled by higher education. The relationship between one part and another part in a university are important and involved so that the determination of the structure of the Organization will be very decisive in business modeling step. In this study, business modeling that will be applied must refer to the Three Pillars of Higher Education, so that the main activities that must be carried out by UNIKOM namely Education, Research and Community Service. While the functions included in supporting activities are Three Pillars of Higher Education Support. The business modeling based Three Pillar of Higher Education that will be applied is described using a value chain that can be seen in Figure 4.
3.3. Main Functions of UNIKOM Hierarchy Chart

The main functions of the UNIKOM hierarchy chart focus on primary activities and supporting activity that can be seen in Figure 5.

![Figure 5: Main functions of UNIKOM Hierarchy Chart based on Three Pillars of Higher Education](image)

3.4. Current Systems & Technology

In this stage, the researcher trying to get to know the environment of architecture and technology system that has run or being used in the UNIKOM organizational environment by creating an architectural scheme that has been running in UNIKOM.
3.5. Data Architecture

The data architecture aims to identify and define the various types of significant data that support the business functions that have been defined in business modeling on the second stage. Based on the steps in EAP, the data architecture defines 3 (three) things, namely:
1. Register data entities by the business models of scope Three Pillar of Higher Education.
2. Create relationships between entities that were registered in the candidate.
3. Create relationship entity data with business functions that aim to describe the use of shared data made by some business functions as well as the representations of data that can be used in the process of data integration in SI/TI governance.

3.6. Application Architecture

The application architecture that will be identified is an application that serves to help manage data and support the main business functions of the organization. The process of defining the intended application is the definition of an application that functions to manage data and provide information for stakeholders who need it, where the application is used to support business functions based Three Pillars of Higher Education in the organization.

3.7. Technology Architecture

Analysis of the technology architecture is done to define technical requirements in processing data. The final result of this analysis aims to produce the technology needed by the application, starting from software, operating systems, security technology, network architecture, and the internet, this analysis serves to support the running of the application. This technology architecture analysis will compare planning and development between old technology and new technology so that it can place new technological infrastructure that will be needed to be implemented in the future.

Similar research was conducted by [14], the study using the Zachman framework method was carried out to make university governance, but the EAP design in this research only focused on process business on academic activities, there is no complete discussion about business processes based Three Pillars of Higher Education. Another research conducted by [15], where the research was carried out using the Zachman framework to create information systems for universities. In this research only found the main activity in the form of Three Pillars of Higher Education but no discussion why there is such activity.

Therefore, stage conducted in this research can produce a blueprint that can align IT Infrastructure and business processes by the Three Pillars of Higher Education. However, to improve the success factor of implementing Three Pillars of Higher Education-based EAP, full support from all levels of stakeholders is needed. Where technical and non-technical factors will affect the success of the implementation of EAP.

4. Conclusion

By applying enterprise architecture planning (EAP), the researcher can create a blueprint containing modeling on data, application, and technology architecture that can be used as a reference for improvement and development of information systems at UNIKOM. Blueprint design can align IT Infrastructure with business processes that are by the Three Pillars of Higher Education. The blueprint also to facilitate UNIKOM to prevents some data redundancies, information systems that had functional similarities and make better decisions about making rules.

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