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Modeling an Enterprise Architecture of Final Project Management Based on National Research Standards for Higher Education in Indonesia

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ABSTRACT

In the era of industry 4.0, colleges and universities which are higher education institutions that can produce the intellectual assets, are required to innovate in researches. However, many higher education institutions have not yet properly managed the student research projects, while the government has provided guidelines for the research management in the national researche standards for higher education. Good quality researches require link and match with the needs of the industries. In this study, we design the model of enterprise architecture that can increase the effectiveness and efficiency of student final project management based on college research standards by using the methodology of The Open Group Framework Architecture Development Method (TOGAF ADM). The result shows that the application of architectural enterprise can create the research products that link and match with the needs of of the industries so it can encourage innovation in research from higher education institutions, specifically the student final projects.

Keywords: *Higher education, Student final project, Enterprise architecture, The Open Group Architecture Framework Architecture Development Method (TOGAF ADM)*

1. INTRODUCTION

In this industry 4.0 era, higher education institutions are demanded to be able to become research institutions that can contribute to the development of the country. Every year colleges and universities produce graduates, each of them should have competencies that are in accordance with the minimum standards of graduations. The final year students at higher education institutions are required to conduct research in the form of final projects or theses. The student's final projects and theses should be an reflection of the implications of the learning outcomes. But in fact there are many products from the student final projects and theses that cannot be implemented, this reflects the quality of research management in its intitutions, besides that there are also many students who do not finish their study on time because of several difficulties such as: determine the research topics, find the research objects, and others.

The government has provided research guidance to higher education institutions for the students. The guidelines are contained in the National Standards for Higher Education Researches, in which there are results standards, process standards, assessment standards, management standards, content standards, implementation standards, funding standards, and the last are the standards of facilities and infrastructure [1].

Looking at the problems faced by students and higher education institutions, they need an enterprise architecture model design that help create harmony between existing business processes, information technology with the needs of students and educational institutions. For this reason, in this study we will design an enterprise architecture modeling that can improve the efficiency and effectiveness of operational management of student final projects and theses. Enterprise architecture is a method used to compile elements of enterprise information systems in the form of a set of models and relationships between enterprise elements that can be used in planning, designing and realizing an enterprise structures, business processes, information systems and related infrastructure[2].

In this study, we used the Open Goup Architecture Framework Method (TOGAF ADM) approach or

methodology. to solve research problems. The TOGAF ADM allows individuals to choose, cut, adjust from the required process [3]. The TOGAF ADM establishes a set of methods and tools for developing a broad information technology architecture that enables the design, evaluation and implementation of architectures that are appropriate for the organization. The TOGAF supports the design of all types of architectural subsets, namely business architecture, application architecture, data architecture and technology [4].

2. METHOD

The methodology used to solve this research problem is to use the Open Goup Architecture Framework Architecture Development Method (TOGAF ADM), which is a framework for enterprise architecture that provides a comprehensive approach for designing, planning, implementing and managing enterprise information architectures[5].

Organizations that implement enterprise architecture will have standardization, namely a reference in making planning and procurement that will be more efficient, and make all members of the organization understand and know the needs based on the definition outlined in the enterprise architecture [6]. The TOGAF has a flexible and open source nature, provides detailed methods of building and managing and implementing an enterprise architecture and information system called the Architecture Development Method which is a generic that contains a set of activities used in modeling enterprise architecture development [2].

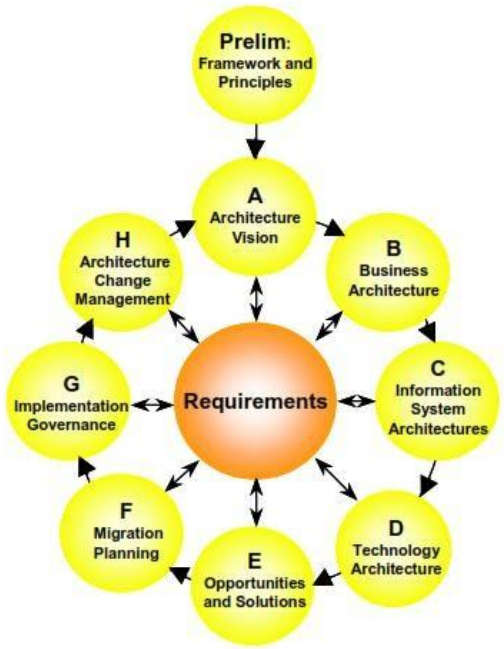

Figure 1. The TOGAF framework [7]

We used the TOGAF architectural framework ADM (figure 1) in doing this research. As seen on figure 2, the preliminary stage is done by preparing the organization for the success of the project architecture. In the architecture vision stage, scope is determined and the expectations for the TOGAF project are straightened, and then the vision of the architecture is compiled and subsequently, the business context is validated and finally, the architecture works. The business architecture stage is carried out by developing business architecture, developing baselines and target architectures and analyzing existing gaps. The information system architecture phase is carried out by developing an information system architecture, developing baselines and targets and conducting gap analysis. The technology architecture stage is carried out by developing a technology architecture, developing a baseline and conducting gap analysis. Opportunities and solution stages are carried out in the initial implementation of planning and identifying major implementation projects. The migration and planning phase are carried out by cost, benefit and risk analysis, developing details of implementation and migration plans. The implementation governance phase is monitored for implementation, and ensures the project is in line with the architecture. The last stage is architecture change management which carried out continuously by monitoring and ensuring that the architecture which is built truly meets the needs of the organization [8].

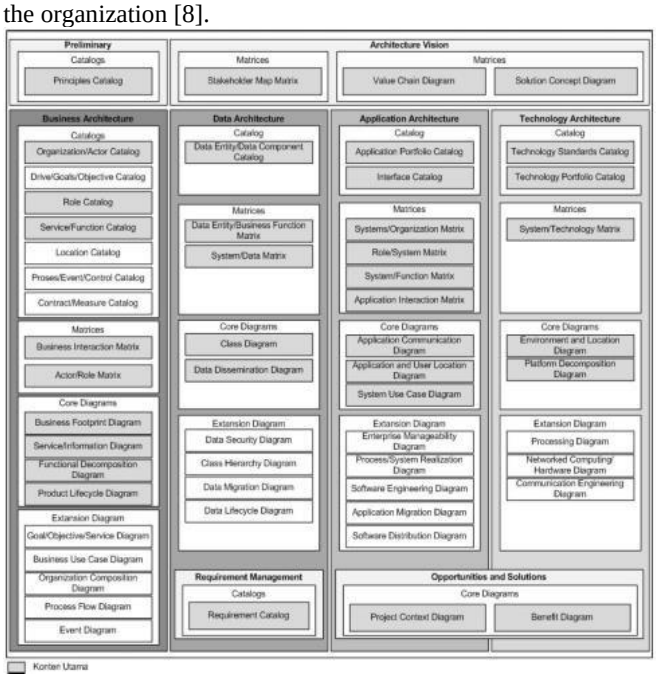

Figure 2. Model of enterprise architecture design using the TOGAF ADM [9]

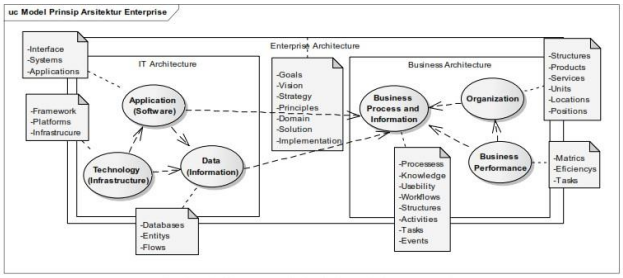

Figure 3. Components of enterprise architecture [9]

3. RESULTS AND DISCUSSION

The following is the architecture development of the final project management of the students who have adopted the TOGAF ADM based on the National Standards of Higher Education Research:

3.1. The Architecture Vision

The architecture vision is the process of creating uniformity of views on the importance of enterprise architecture to achieve the objectives of management of student final projects based on the National Standards of Higher Education Research, so that at these stage strategies are drawn up and determine the scope of student final project management architecture. To establish the architectural vision of the management of these student final projects, we conducted data collections that are related to the ideal management of student final assignments in accordance with the National Standards for Research in Higher Education. From the results of data collection, a vision of architecture and strategies to achieve it are established. The results of the architecture vision set the goal of the final project management to produce products that can be utilized throughout the business sectors and produce researchers who are competent in their fields. The strategies used to achieve these objectives are:

1. Start a discussion group forum that helps students find a very recent research topics and supports knowledge management from lecturers, alumni, students and the industrial / business world.
2. Build online mentoring management that can help students and supervisors to communicate or collaborate.
3. Build administrative management in terms of registering student final projects.
4. Establish management of student final projects assessment.

3.2. The Business Architecture

We defined the initial conditions of the business architecture, then determined the business model or the desired business activity based on a business scenario. To do that, researchers use a tool to model the business architecture which is UML (Unified modeling language). The following is the business management of the student final projects management:

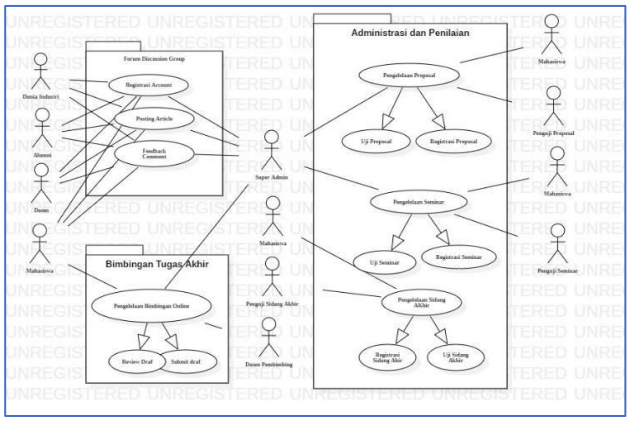

Figure 4. The business architecture for student final project management

3.3. The Information System Architecture

At this stage, we emphasized the development of information system architecture. The development is done by defining information system architecture, namely in the form of data architecture and application architecture that will be used in the student final project management. The technique used in defining this information system architecture is by using class diagrams.

Whereas, the application architecture focuses on the design of the application and was planned by using the Application Portfolio Catalog. The techniques used include Application Communication Diagrams, Application and User Location Diagrams, and others.

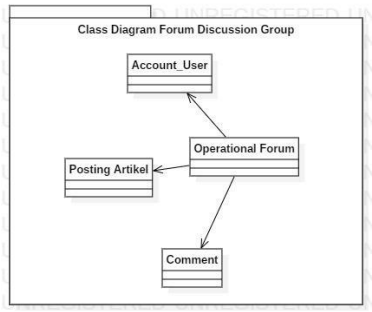

Figure 5. The Application architecture for member registration of focus discussion group

3.4. The Technology Architecture

At this stage we built a technology architecture that is tailored to the needs by using the Technology Portfolio Catalog in which it describes software and hardware and the relationship between them in supporting the management of student final projects. The techniques used include Environment and Location Diagrams, Network Computing Diagrams, and others.

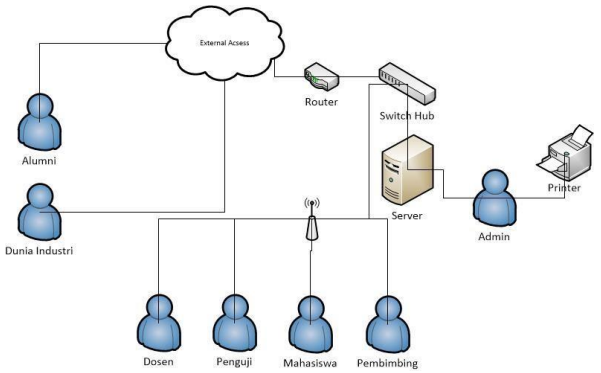

Figure 6. The Network architecture

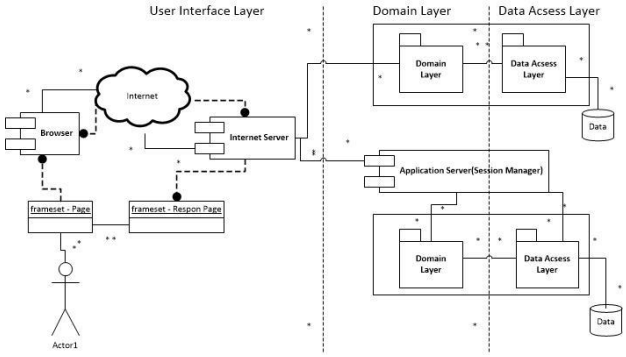

Figure 7. The Technology achitecture for internet technology

3.5. Oportunities and Solutions

At this stage, enterprise architecture includes business architecture, data architecture, application architecture and technology architecture so that it becomes the basis for higher education institutions management to choose and determine the architecture to be implemented. At this stage the design is modeled with the Project Context Diagram technique and Benefit Diagram.

3.6. Migration Planning

At this stage we conducted an assessment to plan the migration process. To model this stage, an assessment matrix is made, so that the main priorities and supporters are obtained.

3.7. Implementation Governance

At this stage, recommendations were made for implementing implementation governance. The governance includes management organization governance, student's final project, information technology governance, and architectural governance.

3.8. The Architecture Change Management

We determined the management of architecture from the management of the student final projects of who are doing the supervision and determining the next step of improvement.

4. CONCLUSION

The application of the TOGAF ADM framework in the management of student final projects can produce enterprise architecture that can be implemented so as to align the management needs of higher education institutions with information technology. With this final project management enterprise architecture, higher education institutions can describe business architecture, information systems and technology so that they can provide guidance or standardization of final project management students which can meet the National Standards of Research in Higher Education.

Enterprise architecture management of the student final projects can be implemented in higher education institutions such as colleges and universities with the availability from stakeholders, namely alumni, lecturers, students, industries and the managements to use the application. For that, before applying this enterprise architecture, the management must be able to properly socialize the vision of the enterprise architecture that is built.

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