The Open Group Architecture Framework for Designing the Enterprise Architecture of ALIT

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Abstract. This research purpose is to analyze and developing business value also existing information system at Laboratory Unit of Telkom University Applied Science School. The method used is The Open Group Architecture Framework (TOGAF) with the Architecture Development Method (ADM). Among 8 phases of TOGAF ADM, it will be used 4 phases, start from Preliminary, Architecture Vision, Business Architecture, Information System Architecture, and last Technology Architecture. The result of this research is the blueprint contains an enterprise architecture for developing ALIT so that it can support the business processes that exist in the Laboratory Unit and furthermore in the future also achieve their strategic goals. This blueprint of enterprise architecture can be applied in the same unit that have similar business process, specially the unit that focused on laboratory and practicum. But in this research focused on laboratory unit at Telkom University. This research also concludes that using TOGAF ADM as a methodology tool can produce a design architectural models in general accordance to organization's vision and mission. The impact of this research is a solution to business processes problem, data loss, and unintegrated data during business activity. Especially the main problem is the manual processes implemented there and the information system that may not support it fully so impacted to its business process.

1. Introduction
Designing the enterprise architecture is needed before creating an information systems, specially at organizations and business units. The enterprise architecture itself is a single whole of principles, methods, and models that are used to design and form an organizational structure, business processes, information system, and infrastructure [1, 2]. TOGAF, one of the frameworks in enterprise architecture, is describing systematic processes of technological transformation from ideas and strategic requirements and into workable and documented products, systems or solutions [1, 3, 4, 5]. The core of TOGAF is the ADM that provides a specific picture of the architecture development process. It integrates the TOGAF elements described as well as other architectural assets available, to meet the business and IT needs of an organization [6, 7, 8, 9].

In Telkom University, the Laboratory Unit of SAS is the best laboratory management reference standard. It becomes a reference standard to the other 6 faculties. With the highest number of study programs and laboratories, also business processes and documentation are almost complete [10, 11]. Although with the best reference standard title, there are still problematic with document artifacts that are not integrated into every business process and there are some undocumented activities. Besides, the
business value has not been defined in detail, and business processes are not recorded. So it can be possible to reduce the points of audits and unit accreditation. To improve the work performance of the unit, it is necessary to analyze the problem and determine the appropriate business strategy. For this research, the scope will be limited to the main activities of the unit, excluding details per activity and process. The use of TOGAF because it excels in the completeness of process, reference model guidelines, vendor neutrality, information availability and time to value compared to other frameworks [12, 13, 6]. Apart from that, TOGAF also provides the process and steps in making the artifacts needed in enterprise architecture design. In the process, TOGAF allows users to run phases flexibly or does not have to be sequential and complete to suit the needs of the existing situation [7, 14, 15, 16]. Specifically, this research uses the method TOGAF Architecture Development Method (ADM) to analyze and design enterprise architecture of ALIT. ALIT (Aplikasi Laboratorium Ilmu Terapan) is a new proposed information systems that will be developed after the blueprint in this research produced.

This research proposed a blueprint for an information system designed based on enterprise architecture. With the design of the enterprise architecture this system can developed to be a support to managing practicum activity include its preparations, implementations, and evaluations. Also facilitated all process related to business processes properly.

2. Method

This research uses two research methods for data retrieval and analysis. Data retrieval is done by literature study, direct observation, and interviews with stakeholders. It included collecting documents according to each business process. For analysis of enterprise architecture used based on TOGAF especially ADM.

Observation is done directly to the research object to obtain documents related to its business processes. Stakeholders, head of the Laboratory Unit and Laboran, interviewed to get problems that occur there. Requirements of data and documents collected so it can be made a blueprint for enterprise architecture with reference to the framework of enterprise architecture in use today.

With the current condition of research object TOGAF ADM is suitable to be used, organization can arrange and map its business value and business processes clearly and precisely. Basically TOGAF has 8 phases and 1 preliminary phase as the starter. The phases are Preliminary, Architecture Vision, Business Architecture, Information System Architecture, Technology Architecture, Opportunities and Solutions, Migration Planning, Implementation Governance, and Architecture Change Management [3]. This research will using only 4 phases from Preliminary until Technology Architecture.

3. Results and Discussion

There is no blueprint for designing enterprise information system not even the value business as the result of observations and interviews in Laboratory Unit which can supported its business process. Even with the current system used can not help it fully, regarding there was no value business or blueprint to follow, and it still has the scattered data both digital and manual. So in this research will concern on creating blueprint according to TOGAF ADM phases. The phases consist of Preliminary, Architecture Vision Phase, Business Architecture Phase, Information System Architecture Phase, and Technology Architecture Phase. It produced blueprints as a guideline for creating information system called ALIT. The following is a further result explanation of each phase.

3.1. Preliminary Phase

Before creating a design for enterprise architecture, preparation and initiation activities are needed to meet the business direction for the new enterprise architecture. The objectives of this phase are to determine the architecture capability desired by the organization and establish the architecture capability [17]. The principle catalogs defined for Laboratory Unit can be seen in Table 1. There are 4 architectural principles defined with each principle catalogs.
Table 1. Principle Catalogs of Laboratory Unit

| Architectural Principle       | Principle Catalogs                                      |
|-------------------------------|--------------------------------------------------------|
| Business Architecture         | Business continuity                                    |
|                               | Legal compliance                                       |
|                               | Service quality                                        |
| Data Architecture             | Data is an asset                                        |
|                               | Data security                                           |
|                               | Data accuracy                                           |
|                               | Data can be accessed and shared                         |
| Application Architecture      | Integration                                             |
|                               | Accessible                                              |
|                               | User-friendly                                           |
|                               | Support system                                          |
| Technology Architecture       | Interoperability                                        |
|                               | Technology security                                     |
|                               | Technology maintenance                                  |
|                               | Technology changes                                      |

3.2. Phase A, Architecture Vision
Previously there was no business value and activities scope writtenly described, so it must be made based on the result of observations of the organization’s current condition. Also, to identify the business goals and strategic drivers of the organization. It gives communication supports of the research by providing executive summary of the architectural definition version the same that socialized to stakeholders [5]. The scope of Laboratory Unit activities presented in the value chain chart. The result is grouping activities into 2 categories, there are main activities and supporting activities. The value chain of Laboratory Unit can be seen in Table 2.

Table 2. The Value Chain of Laboratory Unit

| Supporting Activities | Main Activities                     |
|-----------------------|-------------------------------------|
| Administration Management | Inbound | Processing | Outbound | Marketing & Sales | Services |
| Finance Management    | Practicum requests from study programs | - Recruitment of practicum assistant | - Evaluation of practicum | Practicum reports | Key taking |
| Facility Management   | Academic schedule                   | - Procurement of practicum needs    |                                      | Laboratory usage reports | Practicum schedule changes |
| HR Management         |                                      | - Implementation of practicum       |                                      |                                      | Handling problems |
|                       |                                      | - Monitoring of practicum           |                                      |                                      | Certificate and honorarium retrieval |
|                       |                                      |                                      |                                      |                                      |                                     |

3.3. Phase B, Business Architecture
It describes how the enterprise needs to operate and fulfill business goals, and respond to established strategic drivers in architecture vision. It provided the guidelines used for the development of the EA
Based on the result of the previous phase, the business architecture identified. The business architecture identification can be seen in Table 3, which consists of actors, business functions, and business processes.

Table 3. The Business Architecture of Laboratory Unit

| Actor                        | Business Function                                      | Business Process                                                                 |
|------------------------------|--------------------------------------------------------|----------------------------------------------------------------------------------|
| Head of Laboratory Unit Affairs | Supervision, direction, making standard procedure of the unit’s activity | - Developing unit’s roadmap and making decisions of unstructured problems          |
|                              |                                                        | - Create standard procedures and work instructions to be applied in the unit       |
|                              |                                                        | - Approval unit’s activity, quarterly expenses, and letter’s submission            |
| Administration staff         | Administration management                              | - Create an official memo and outgoing letter for unit’s urgency                   |
|                              |                                                        | - Data collection of practicum requests from study programs                       |
|                              |                                                        | - Data collection and generate practicum schedule in laboratory                   |
|                              |                                                        | - Create assignment letter for practicum assistant, laboratory’s name and regulation |
|                              |                                                        | - Create practicum implementation reports                                         |
|                              |                                                        | - Create certification of practicum assistant                                    |
| Financial staff              | Finance management                                     | - Data collection of practicum expenses each semester and year                    |
|                              |                                                        | - Practicum assistant honorarium management                                      |
|                              |                                                        | - Data collection of device’s pricelist from vendor                               |
| Asset management staff       | Facility management                                    | - Data collection of all facilities                                               |
|                              |                                                        | - Procurement and inventory of facilities                                          |
|                              |                                                        | - Calculate the depreciation of each facility                                     |
| HR staff                     | HR management                                          | - Recruit and selection of practicum assistant                                   |
|                              |                                                        | - Create and data collection of practicum assistant’s work agreements            |
|                              |                                                        | - Design and implement the development program for internal                      |
|                              |                                                        | - Conduct publications in the mass media and social media                         |
| Laboran                      | Laboratory management                                  | - Maintenance of laboratory’s equipment and devices                               |
|                              |                                                        | - Record the laboratory’s devices usage and status                                |
| Laboran                      | Monitoring and controlling of practicum                | - Complete the K3 laboratory                                                     |
|                              |                                                        | - Prepare practicum needs                                                       |
|                              |                                                        | - Handle all problems when practicum implementation                              |

3.4. Phase C, Information System Architecture

It consists of data architecture and application architecture, which focused on the identification and determination of the application and data that support the business architecture [17]. The result of data
architecture identification can be seen in Table 4. It shows the data requirements of business functions and business processes. It also describes the method of Create, Read, Update, and Delete (CRUD) which used in each business function and entity.

Table 4. Data Entity Based on Business Function

| Business Function                                      | Data Entity                                                                 |
|-------------------------------------------------------|-----------------------------------------------------------------------------|
| Administration                                        | Procedures                                                                 |
| Practicum Request                                     | R                                                                           |
| Practicum Assistant                                   | R                                                                           |
| Practicum Schedule                                    | R                                                                           |
| Assignment Letter                                     | U                                                                           |
| Finance                                               | U                                                                           |
| Practicum Expenses                                    | R                                                                           |
| Honorarium                                            | D                                                                           |
| Devices Pricelist                                     | D                                                                           |
| Facility                                               | D                                                                           |
| Depreciation                                          | D                                                                           |
| HR                                                    | D                                                                           |
| Laboran                                               | D                                                                           |
| Laboratory                                            | D                                                                           |
| Problems & Solutions                                  | D                                                                           |

The result of application architecture can be seen in Table 5. Here the application will be made into an application module, part of the information system. Including defined application needed to optimize business processes [14].

Table 5. Application Requirement Based on Business Function

| Business Function                                      | Requirements                                                                 |
|-------------------------------------------------------|-------------------------------------------------------------------------------|
| Supervision, direction, making standard procedure of the unit’s activity | Supervision application module to support stakeholder take decision          |
Administration management Focus on all administrations needs include create documents and save it, also front office services

Finance management Manage finance activity and the report

Facility management Manage all data and needs about laboratory facilities and assets on it

HR management Manage all data about human resources in Laboratory Unit, include recruitment of resources

Laboratory management Manage all data of laboratory

Monitoring and controlling of practicum Manage all data of practicums include its preparations, implementations, and evaluations

3.5. Phase D, Technology Architecture
It aims to provide a determination and decide on technology would be implemented as supporting data processing through information system application [12]. The technology architecture designed to support business strategy. The result of technology architecture identification can be seen in Figure 1.

![Figure 1. Technology Architecture Designed](image)

4. Conclusion
Based on the result above, it can be concluded that the implementation of TOGAF ADM can result in planning in the form of technology design and application list that fits the organization’s needs. It produces architecture blueprint included the application modules and entities needed for the development of ALIT now and the future. The result of this research identified can optimize the main activity even support activity at the Laboratory Unit. The architecture designs made are recommended for all Laboratory Unit at Telkom University. This blueprint can be use to make an information system that fully support its ongoing business process.

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