Analysis of Enterprise Architecture Design Using TOGAF Framework:

A Case Study at Archival Unit of Faculty of Agricultural Technology of Udayana University

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***Abstract* — The research aims to analyze the enterprise architecture design of the archival unit of the Faculty of Agricultural Technology of Udayana University. The method used in developing the enterprise architecture is TOGAF framework. The TOGAF framework includes the preliminary stage, architectural visions, business architecture, information system architecture, technology architecture, opportunities and solutions, migration planning, implementation governance and change management architecture. This paper only covers discussion up to the planning stage of migration. The research revealed that enterprise information systems can create an integrated information system. TOGAF ADM can generate an enterprise architecture design that will be applied in the archival unit of the Faculty of Agricultural Technology of Udayana University, and able to meet the needs of business processes and users of the archival unit of the said faculty. TOGAF ADM can produce an IT blueprint of the archival unit of the said faculty.**

***Keywords*— Archive, TOGAF, Enterprise Architecture**

I. INTRODUCTION

Information plays a very important role in various human activities. Various documents and media have been created for human convenience in storing, searching and disseminating information. These documents are better known as archives. An archive means a record of an occurrence or event. Archives have a high value in various events. In addition to being a collection of documents providing information, an archive also serves as a piece of evidence [1]. However, the nature of the existing archive management in the faculty being studied is still manual, and thus a blueprint is needed as a reference for the planning and application of Information Technology which refers to the university archival standards. In order to produce a good design of Information Technology architecture, it is necessary to have a framework. One of the frameworks of enterprise architecture designs is The Open Group Architecture Framework (TOGAF). TOGAF provides detailed methods on how to build, manage, and implement Enterprises Architecture (EA) and Information Systems [2]. The Architecture Development Method explains how to determine a company/organization architecture specifically based on its business needs. ADM is the result of the cooperation of architectural practitioners in the Open Group Architecture Forum.

II. REVIEW OF LITERATURE

A. Enterprise Information Systems

Enterprise Information System is a technology platform that can integrate all information from various divisions into a collection of logical information which enables a company to obtain the required information easily. The integration includes not only the use of LAN technology, but also the incorporation of the business system of each division. Enterprise Information System provides integrated and fast information, enabling secure access to the entire information system, accessible in multiple places, to help an organization to achieve its goals and improve the quality of its decision making. The information presented in the enterprise information system is comprehensive information, not the partial one. This type of information is very important for the company in making decisions. The overall activity of the system used to support the steps taken by the business seems to work, and thus the use of an enterprise system will improve its business intelligence [3].

B. Enterprise Architecture

Enterprise Architecture is a set of principles, methods, and models used in the design and realization of a corporate organizational structure, business systems, information systems and infrastructure. Enterprise Architecture Planning methodologies and models are a preliminary part of a key part of the knowledge of Enterprise Architecture that is still relevant and has much influenced the framework, methodology and best practices in the public and private sectors. [4]

C. Analysis and design of information systems at PT. X using the open group architecture framework (TOGAF)

This research resulted in an enterprise architecture design using TOGAF which provides an appropriate means in

developing an enterprise architecture design for companies, since TOGAF provides a flexible framework in designing enterprise architecture. The research also produced a design of marketing information system, production information system, inbound and outbound logistic information system, financial information system, accounting information system, warehousing information system, and human resource information system[5].

D. Enterprise Architecture Design Using TOGAF 9.0 Framework and Content Framework (A Case Study at Academic Administration Unit of Maranatha Christian University).

This research successfully applied the design of Enterprise Architecture using TOGAF 9.0 Framework and Content Framework in the case study conducted at the Academic Administration Unit of Maranatha Christian University, and produced an Enterprise Architecture Document which defines each component of design, and presents the methodology structure and the consistency of the perspectives. From the evaluation of the results of the Enterprise Architecture design, it can be concluded that the established design is appropriate and able to meet the needs of stakeholders of Maranatha Christian University [6].

E. Strategic planning of academic information systems using the open group architecture framework (TOGAF) with the architecture development methodology (ADM).

This research resulted in the model of enterprise architecture used to develop a strategic planning of an information system established in accordance with the business activity as well as the business needs and strategies. The enterprise architecture can be used as a guideline for managing information systems in terms of data and information processing so as to improve the business efficiency. The technology architecture is designed to provide network services that have represented the current situation and the future development [7]

Based on the above review of literature, it can be concluded that the TOGAF framework is a framework that can be used in designing enterprise architecture.

III. RESEARCH METHODOLOGY

A. TOGAF Framework

TOGAF is used to develop enterprise architecture with a detailed method and tools to implement it. This is what distinguishes the framework from other enterprise architecture frameworks, such as Zachman framework. One of the advantages of this TOGAF framework is that it is flexible, and it is also an open source. TOGAF provides a detailed method for building, managing and implementing enterprise architecture and information systems called Architecture Development Method (ADM) [3]. ADM is a generic method consisting of a set of activities used in modeling the enterprise architecture development. This method can also be used as a guideline or tool for planning, designing, developing and implementing information system architecture for organizations [9].

TOGAF ADM is a flexible method that can identify various modeling techniques used in planning, as this method can be tailored to changes and needs in the designing process[8]. TOGAF ADM also states a clear vision and principle of how to develop enterprise architecture. The principle is used as a parameter in assessing the success of enterprise architecture development by organizations [10].

Figure 1 describes the TOGAF framework. The TOGAF framework includes the preliminary stage, architectural visions, business architecture, information system architecture, technology architecture, opportunities and solutions, migration planning, implementation governance and change management architecture. This paper only covers discussion up to the planning stage of migration.

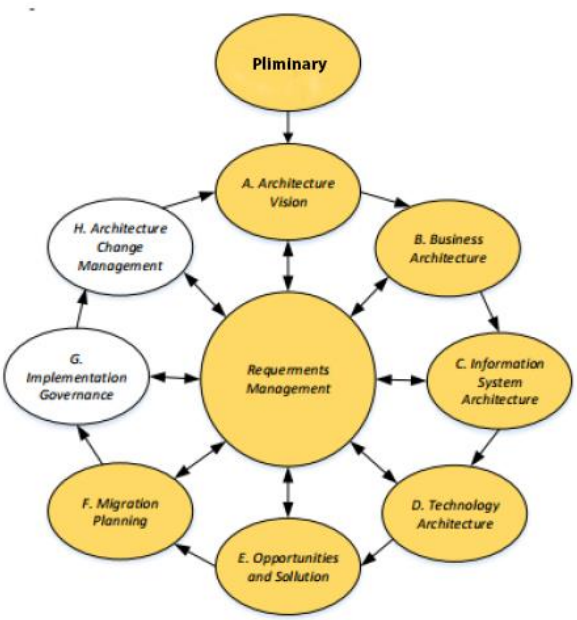

Figure 1. TOGAF Framework

B. Data collection

In order to obtain an overview of archive process management and technology policy used in supporting the archive administration process, it is necessary conduct data collection. The data were collected using the interview method, by interviewing the staff working at the archival unit. The interviews provided the baseline to obtain information on the business process, archive administration management activities, information system support and information technology required by the users in the faculty.

IV. TOGAF FRAMEWORK IMPLEMENTATION

A. Preliminary

This stage constitutes a preparatory phase and a beginning to define the framework and principles that aim to confirm the management commitment, the framework

determination and the methodological details that will be used in designing enterprise architecture.

In designing enterprise information systems, the initial step is to identify the business processes related to the main system in the Archival Unit of the Faculty of Agricultural Technology of Udayana University. There are two types of business process activities related to the information system in the Archival Unit of the said faculty, which are main and supporting activities. Table I presents the identification of business processes that occur in the faculty's archival system. In the preliminary stage of the process, there are two main activities along with the supporting activities.

TABLE I. IDENTIFICATION OF BUSINESS PROCESSES

Main Activities	Creation of Archives	The management of incoming files
		The management of outgoing files
	Maintenance of Archives	Archive filing
		File storage
	Use of Archives	File retrieving
		File collection
		File returning
	Destruction of archives	Destruction of archives
Supporting Activities	Archival Process Patterns	Inspecting process
		Indexing process
		Coding process
		Sorting process
	Classification of Access Rights	Classification
		Classification of access rights

B. Architecture Vision

This stage deals with the synergy in an architectural vision in the development of enterprise information systems. The vision includes description on the current business environment, business targets, perspective and techniques. The design of enterprise information system in the Archival Unit of the Faculty of Agricultural Technology includes architectural visions such as:

1) to create enterprise architecture in line with the needs of the end users;
2) to develop an expected design system which can be integrated with other existing systems;
3) to be able to provide a quick information in line with the existing business process;
4) to develop data sharing process among members of the academic community of Udayana University with ease

C. Business Architecture

Analysis of the existing business processes. At this stage, the business architecture defines the initial conditions, determines the business model or business activity desired in line with the business scenario. The design of enterprise information systems in the Archival Unit of the Faculty of Agricultural Technology includes business architecture.

TABLE II. BUSINESS ARCHITECTURE

The business process of archive reception	File acceptance process
	File recording process
	File distribution process
The business process of archive preparation	Concept-making process
	File signing process
	Numbering process
The business process of archive maintenance	Archive filing process
	File storage process
The business process of archive usage	Request-form filling process
	File searching process
	File-borrowing-form filling process
	File returning process
The business process of archive reduction	Archive destruction scheduling
The business process of archive classification	Archive inspecting process
	Archive indexing process
	Archive coding process
	Archive sorting process
The business process of access right classification	Classification
	Access right classification

Table II describes the existing business processes in the Archival Unit of the Faculty of Agricultural Technology. There are seven business processes in the Archival Unit of the Faculty of Agricultural Technology of Udayana University which include archive reception, archive preparation, archive maintenance, archive usage, archive reduction, archive classification, and access right classification.

D. Information System Architecture

This stage deals with the types of applications needed to manage data and support the existing business processes. There is further emphasis on how information system architecture activities develop. At this stage, what is meant by information system architecture includes data architecture and application architecture that will be used by the organization. Data architecture focuses more on how the data is used to meet the needs of business functions, business processes, and services, as well as the identification and classification of the existing data in the process.

TABLE III. DATA ARCHITECHTURE

Student admission data	Student evaluation data	Scholarships data	Academic information data
Data on file sender administration	Data on file-borrower registration	Data on archival lending	User login data
Student registration data	Data of graduates	Data on student organizations	Data on Job Market and Further Education
Data on student status	Data on lecturers	Data on student activities	Health insurance data
Data on lectures	Educational supporting data	Research data	Student Dormitory Data
Curriculum data	Alumni data	Community Service Data	Student Development/

			Training Data
Study program data	Organizational structure chart data	Higher Education Statistics Data	Student Activity Facility Data

Table III presents the data needed to build an enterprise information system. The data is stored in a database and will also be integrated with the existing data. Meanwhile, the application architecture puts more emphasis on the requirements of the application planned using the Application Portfolio Catalog, and focuses on the application model to be designed.

TABLE IV. APPLICATION ARCHITECTURE

File receiving system	Registration system
	Data input system
	Distribution system
Archive filing system	Archive filing system
	Archive signing system
Archive lending system	Borrower registration system
	File search system
	Return-form print system
Archive reduction system	Schedule system of archive destruction
Archive classification system	Archive classification system
Archive access rights system	Classification system of access right to archives

Table IV describes the systems needed to build an enterprise information system in the Archival Unit of Faculty of Agricultural Technology of Udayana University. This architecture is built based on the needs of business functions.

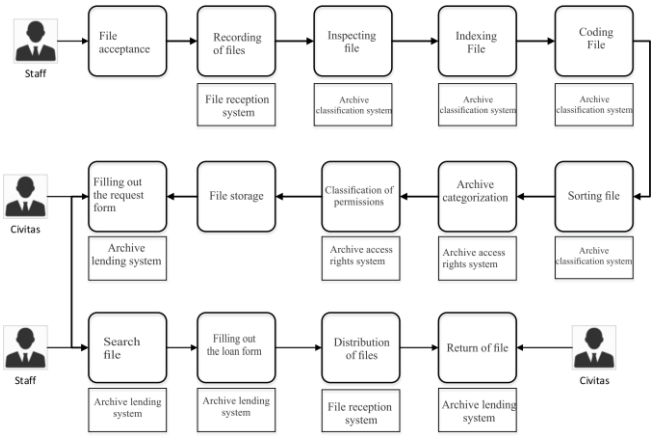

Figure 2. Scheme of Information System Application.

Figure 2 illustrates the scheme of receiving, filing and borrowing archives at the Archival Unit of Faculty of Agricultural Technology of Udayana University.

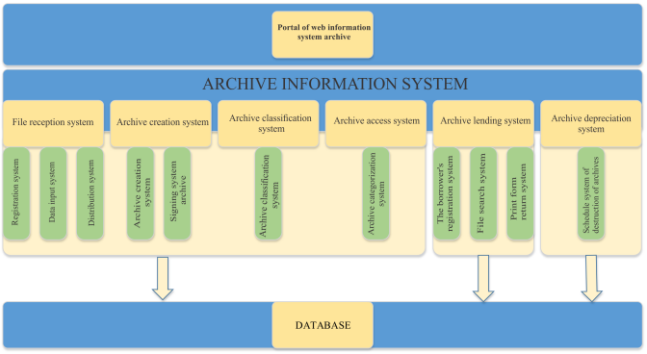

Figure 3. Scheme of the proposed Information System for the Archival Unit of Faculty of Agricultural Technology of Udayana University.

Figure 3 illustrates the proposed archive information system that will be designed and applied in the Archival Unit of Faculty of Agricultural Technology of Udayana University.

E. Technology Architecture

Building a desired technological architecture is started with determining the type of technology required using Technology Portfolio Catalog which includes software and hardware. The required alternatives of technology are also taken into consideration at this stage. It also involves the use of Environment and Location Diagrams, Network Computing Diagrams, and more.

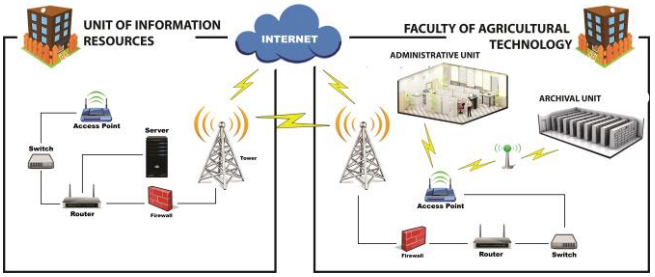

Figure 4. Chart of EA Network Architecture

Figure 4 illustrates a network architecture to connect one computer to another. There is a server used to save enterprise databases and enterprise information systems. In addition, there is a connection from the central unit to the archival unit.

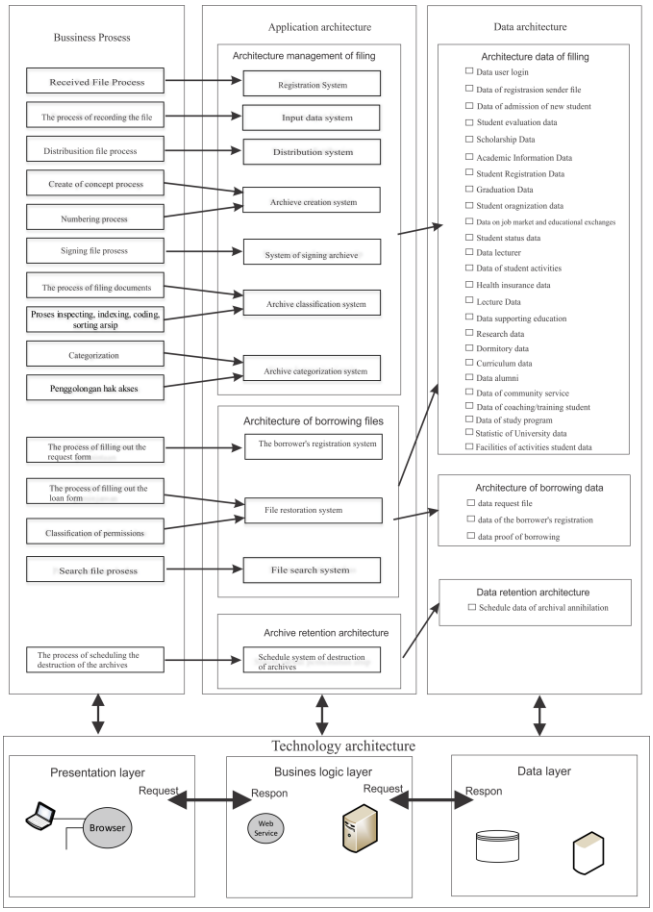

Figure 5. Enterprise Architecture Blueprint

Figure 5 illustrates the IT blueprint of the enterprise architecture. The blueprint covers business processes, data architecture classifications, and approved application architecture classifications.

F. Opportunities and Solution

This stage deals with the development of a business architecture design, Information System architecture design and technology architecture design having been proposed in the previous framework, followed by proposed solutions.

The proposed opportunity and solution is to design an information system to be applied in the Archival Unit of Faculty of Agricultural Technology of Udayana University and develop the application and provide necessary infrastructure. In order to support the implementation, here are several strategies that must be considered to minimize the risk of failure. They are as follows:

1. Develop the human resources
2. Reduce risk during the development and implementation of the system by:
   a. documenting the complete and structured information system;
   b. implementing an information system developed in parallel with some existing applications;
   c. providing training for the users of the application;
   d. disseminating information to all stakeholders including students.

G. Migration Planning

At this stage, the transition process from the old system to the new system is planned so as to ensure a well-directed and smooth application of the established information system. This migration process involves project priorities determination, resource determination, and steps taken to minimize the risk due to any possible changes. The migration planning refers to the process of migration or transition from the current system to the new system so that the application of information systems become more effective and efficient. The following constitutes the steps taken to perform migration planning.

1) considering the importance of business processes;
2) viewing the sequence of system implementation in the information system architecture;
3) building an application based on the existing business processes;
4) integrating data on the existing databases; and
5) Inputting new data that does not exist in the database.

V. CONCLUSIONS

The conclusions of the study on the development of enterprise architecture design at the Archival Unit of Faculty of Agricultural Technology of Udayana University, are as follows:

1. Through the enterprise information system, an integrated information system can be created.
2. TOGAF ADM can generate an enterprise architecture design that will be properly implemented in the Archival Unit of Faculty of Agricultural Technology of Udayana University and able to meet the needs of business processes and users of the Archival Unit of Faculty of Agricultural Technology of Udayana University.
3. TOGAF ADM can generate an IT blueprint of the Archival Unit of Faculty of Agricultural Technology of Udayana University.
4. The result of the mapping using the TOGAF framework revealed that there are four main systems and two supporting systems

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