Designing IT Blue Print Academic System on Higher Education with Togaf

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ABSTRACT

STIE XYZ is one of the universities of economics that has not been optimal in the use of information technology. IT implementation is applied when there are urgent and sudden needs. So it is not planned carefully according to the development needs of this educational institution. Therefore many patchy applications are created. As the consequence, it affects the quality of service for all stake holder include students, lectures and all staffs. This study aims to provide solutions to existing problems by designing an output or blueprint that can be used as a foundation for the development of a better academic system in support of business process STIE XYZ. The blueprint is designed by using framework TOGAF and ADM framework. The solution is built by creating artifacts of each core architecture in TOGAF (business, data, application and technology architecture). This research focuses on new admissions services, study plan cards, lectures, study cards, graduation, and finance. The results show some recommendations to build based on each architecture.

1. Introduction

The development of information technology is increasingly fast, of course, can affect various aspects and elements, includes education sector. STIE XYZ is one of the universities that applies education in the field of economics. Currently this university does not use the information technology optimally. The non-optimal causes a variety of important problems. Some of new student registration processes are still manual. Desktop-based applications and the common constraints that students have to queue to register the courses and is validated manually by each student’s academic supervisor, which totally usually takes 10 minutes / student. The card exam which is the required document to take the exam has to be validated manually to the financial system. And many things which disruptive the teaching and learning process. In short, the use of information technology is still very minimal and affects the bad service for all stakeholders. However, there are several important things that encourage information technology needs in organizations, such as decision-making that is not based on information, available information is not relevant, existing information is not utilized by management, information is not timely, too much inaccurate information, the redundant data, and the existence of data that is not flexible.

During this time the university tried to solve problems one by one if they appeared. However this approach causes the system not being integrated. Therefore, solving with comprehensive system should be performed in this school. The restoration system is started blue print IT in this university which cover all of the system such as business architecture, data architecture, application architecture, technology architecture. The IT blueprint provides current and desired explanations and documentation, and will describe the basic architecture and target architecture so that it will create harmony between business strategy and information technology [1] [2] [3]. The main contribution of this research is to build IT blueprint in university XYZ to improve the quality system process using framework TOGAF

2. Related Work

Many frameworks are created by the different purpose. Some researchers uses the Zachman, TOGAF, FEA, and Gartner for design blueprint IT [4] [5]. Girsang et al use ITIL for improve system service on financial company [6] and software company [7], also uses COBIT for maturity in government office [8] and so forth. The method used in this study is the Open Group Architecture Framework (TOGAF), a framework developed by the Open Group Architecture that was first introduced in 1995, and used to develop enterprise architecture with detailed methods and tools to
implement it that distinguishes. Another enterprise architecture framework and the advantages of using the TOGAF Framework are because of its flexible and Open Source nature [9] [10] [11]. TOGAF has some advantages. TOGAF provides detailed methods on how to build, manage and implement architecture and enterprise information systems called the Architectural Development Method (ADM) [9]. Architectural Development Method (ADM) is a generic method that contains a series of activities used in modeling the development of corporate architecture. This method can also be used as a guide or tool for planning, designing, developing and implementing information system architectures for organizations [12] [13].

3. Research Method

The method used in this research uses TOGAF framework to create a blueprint design of academic system on STIE XYZ. Figure 1 shows the conceptual model of the research phase.

Explanation of the figure 1 concept model is describe as follows.
1. Formulation of research problems, which generate research questions about the problems studied.
2. Study the literature by studying various documents, theories or references related to the TOGAF framework. Study the literature either online or done through books, journals and previous research results.
3. Data collection is the stage of collecting data required both primary and secondary data.
4. Designing IT Blueprint is an activity to perform data processing to compose the vision of architecture, business architecture, information systems and technology as well as opportunities and solutions using TOGAF ADM framework.
5. Furthermore provide recommendations in the form of blueprint system design as a solution of some problems that exist in STIE XYZ.
6. And the last stage of research methodology in this study is the conclusion and suggestions from the research that has been done.

4. Results And Analysis

The scope of this study does not take all phases in TOGAF ADM, only Preliminary phase, Architecture Vision phase, Business Architecture phase, Information Architecture phase, Phase Technology Architecture, Opportunities and Solution phase will be discussed in this research. The steps of this study can be seen in Figure 2 of the following TOGAF ADM.

4.1. Preliminary Phase

Preliminary phase is the preparation step in the design of enterprise architecture. This stage defines the enterprise architecture to be created such as the determination of the
framework and methodology used, the scope of enterprise and the
general architectural principles used.

**Determination of Framework and Methodology.** In the design
of enterprise architecture, TOGAF ADM divides enterprise
architecture into 3 parts of business architecture, information
system architecture (consists data architecture and application
architecture), and technology architecture [14].

**Enterprise Scope.** The design of STIE XYZ blueprint refers to
several business activities including:

- a. **Academic Activities,** is the main activity in STIE XYZ
  including new admissions, filling of study plan cards, lecture
  process, process of study cards, graduation and alumni, and
  financial administration services
- b. **Non-Academic Activities,** including tax training, English
  training and computer training for students as well as a place
  for lecturers to update their knowledge.
- c. **Supporting Activities,** is a supporting activity on the
  implementation of academic and non academic activities.
  Supporting activities include human resources management,
  quality assurance, research and community service, facilities
  and infrastructure management, cooperation management.

**General Principles of Architecture.** The principles of general
architecture are the principles derived from the TOGAF
framework and confirmed at the management level to obtain
principles relevant to STIE XYZ. The STYLE XYZ architecture
principles are as follows [12]:

- a. **The Principle of Business Architecture** is the guarantee of
  business continuity and the system can keep running despite
  interruption, in this case demands the system to always
  operate so that the application and infrastructure must have
  high level of availability.
- b. **Architecture Principle Data**, data is a valuable asset for the
  enterprise and needs to be well managed, and can assist in
decision making process. Like any other asset, data must be
  well managed. Data management is needed to ensure that
  data location is known, data accuracy is reliable, and can be
  accessed easily, and data security must be protected from
  unauthorized access, in accordance with standardized
  processing and data security.
- c. **The Principles of Application Architecture** is that the
  application must be easy to use and can run on multiple
  platforms. Existing or established applications must have a
  common look and feel and take into account the ergonomic
  needs. Dependency on the platform will cause great loss and
effort to repair in case of failure.
- d. **Principle of Architecture Technology,** is the interoperability
  that hardware and software must conform to established
  standards and support interoperability for data, applications,
  and technology. In addition to interoperability, technology
  must also ensure the availability of systems and data so that
  it can serve the needs, and utilization of existing infrastructure
can be used optimally.

**4.2. Phase Architecture Vision**

The resulting vision architecture diagrams include
Stakeholder Map Matrix, Value Chain Diagram, Solution
Concept Diagram, with the following details [15].

**Stakeholder Map Matrix.** Table 1 shows the stakeholder matrix
from the observation and analysis of the organizational structure
of the task and authority of each section in STIE XYZ [15].

<table>
<thead>
<tr>
<th>Stakeholder</th>
<th>Involvement</th>
<th>Concerns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vice Chairman I</td>
<td>Have a high level of policy / direction related to vision and mission, and how to translate it into an effective business process and IT architecture and promote performance.</td>
<td>-Document -Related Policy</td>
</tr>
<tr>
<td>Study program</td>
<td>The main key in the management and preparation of lecture schedules, as well as until the release / graduation</td>
<td>-Document Policy of Study Program</td>
</tr>
<tr>
<td>Student Affairs and Academic Section (BAAK)</td>
<td>Assisting academic management and implementation, academic services.</td>
<td>- Academic calendar - Academic rules and policies</td>
</tr>
<tr>
<td>Academic Information System Section (SIAK)</td>
<td>Assisting the provision and management of information systems, databases and recapitulation</td>
<td>- Academic information systems, databases, data recaps and information</td>
</tr>
<tr>
<td>Finance Administration</td>
<td>The main key in the management of financial administration</td>
<td>- Financial documents - Financial policy</td>
</tr>
<tr>
<td>General and Household Administration Section</td>
<td>Assist the management of Finance administration and related management of facilities and infrastructure.</td>
<td>-Document of Adm. General -Facilities and infrastructure</td>
</tr>
</tbody>
</table>

**Value Chain Diagram.** One of the core architecture TOGAF is
business architecture. Value Chain is a good tool to see the
comprehensive program of one company. Taylor in his research
[16] uses the value chain to enhance quality the supply chain management (SCM). Porter (1985) described the value chain for buyer is a starting point for understanding what is valuable to a customer is a starting point for understanding what is valuable to a customer. It can be described as a series of actions a buyer (customers) [17]. The value chain is controlled by vision mission of a company and consists some program to achieve the target of vision mission. This diagram shows a series of main activities and activities that STIE XYZ undertakes to achieve the organization's vision and mission, shown in Figure 3 [18].

4.3. Business Architecture Phase

The resulting artifacts include functional decomposition diagrams, Business Interaction Matrix, Organization / Actor Catalog, and business process graphs described as follows [1]:

**Functional Decomposition Diagram.** Functional decomposition diagrams describe the organizational hierarchy based on the main activity, where each business function consists of smaller main operational activities. The functional decomposition diagram is shown in Figure 4 [18].

![Functional Decomposition Diagram](image)

**Business Interaction Matrix.** The purpose of this matrix is to describe the interaction relationships between organizations and business functions throughout the organization. Understanding the business interactions of an organization is important because it helps to know the value chains throughout the organization. Table 2 describes the Business Interaction Matrix [1].

**Business Process Diagrams.** At this stage, the analysis of business functions in STIE XYZ, with observations and interviews with the new student admissions department, academic and financial departments, is processed by using a notation of Business Process Modeling Notation (BPNN) [18]. The business processes modeled in this study include business processes in the new admission process, the process of filling out study plans cards and printing study results.

![Business Interaction Matrix](image)

Table 2: Business Interaction Matrix

<table>
<thead>
<tr>
<th>Organization/Actor</th>
<th>Interaction</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial Services</td>
<td>Financial Services</td>
<td>New Admissions Service, Study Card Service, Graduation Service</td>
</tr>
<tr>
<td>Study card service</td>
<td>Study Plan Card Service</td>
<td>Data of students who have passed the trial</td>
</tr>
<tr>
<td>Graduation Service</td>
<td>Graduation Service</td>
<td>Data of academic value of courses that have been taken</td>
</tr>
<tr>
<td>Lecture Service</td>
<td>Lecture Service</td>
<td>Data of student attendance data</td>
</tr>
<tr>
<td>Financial Administration</td>
<td>Financial Administration</td>
<td>Data of financial information of the new academic year</td>
</tr>
<tr>
<td>Student Finance Administration</td>
<td>Student Finance Administration</td>
<td>Data of KRS access who has re-registered</td>
</tr>
<tr>
<td>Employee Financial Administration</td>
<td>Employee Financial Administration</td>
<td>Data of student information is active, non active and leave</td>
</tr>
<tr>
<td>Publication of study result card</td>
<td>Publication of study result card</td>
<td>Data of student information that has been added</td>
</tr>
</tbody>
</table>

- New Student Admission Business Process, consisting of 8 business processes.
- The Study Results of Print Business Cards, consisting of 4 business processes.

Because of the limited space available, there is only one example of business process modeling manifested in every part of STIE XYZ from all business processes that have been successfully modeled as shown in Figure 5 of the new student admissions business process.

4.4. Information Architecture Phase

Information system architecture stage aims to look at information systems that have been applied in STIE XYZ and information systems expected to the fore. In the information...
system architecture there are two stages dianataranya data architecture and application architecture.

Figure 5: Business Process of New Student Admission

Architecture Currently. To find out the current data architecture and application architecture needs to identify the data requirement for STIE XYZ business activity and application inventory through interview and inventory result then stored in Information Resource Catalog (IRC) which contains description of application, manager and user of application. Here Matrix application that shows the quality of application services in STIE XYZ. It is used to identify non-functional requirements, this matrix is denoted by CRUD. CRUD consists of four roles: Create, Read, Update, Delete. Application Matrix can be seen in table 3 [21].

Target Architecture. The target archetype is done by creating a concept model through the class diagram of the data that has been identified in the previous stage, the data entity is a class on the class diagram [22].

4.5. Phase of technology architecture.
The technology architecture stage is the stage in documenting the basic organization of information technology systems that include hardware, software, and communication technology, and identification of current technology and the creation of target architectures needed by STIE XYZ [23].

Current Architecture. Hardware identification includes 50 computer program units, 9 laptop units, 7 multifunction copier units, 4 inkjet printer units, 2 laserjet printer units, 3 switch units, 1 router unit, 3 access point units, 1 scanner unit, 1 network attach unit storage (NAS), 6 units of external hard drives. While identification for existing software is a Windows-based operating system, for database management there are Microsoft Excel, Microsoft Access and DBMS / DBF, and general-purpose applications.

Table 3: Application Matrix

<table>
<thead>
<tr>
<th>Modul e</th>
<th>DB-Entity</th>
<th>New Admissions</th>
<th>Data of Prospective Students</th>
<th>Lecture Service</th>
<th>Card Services</th>
<th>Graduation Service</th>
<th>Financial Administration on Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campus Information</td>
<td>CR UD</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td></td>
</tr>
<tr>
<td>Data of Prospective Students</td>
<td>CR UD</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student Data</td>
<td>CRUD</td>
<td>RU D</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lecturer Data</td>
<td>CRUD</td>
<td>RU D</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Data</td>
<td>CRUD</td>
<td>R</td>
<td>RU</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Course Values Data</td>
<td>CRUD</td>
<td>R</td>
<td>RU</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Graduate Data</td>
<td>CCR UD</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Financial Data</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>R</td>
<td>CRUD</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Target Architecture. This stage is the mapping phase between the systems used with the proposed technology. The purpose of this mapping is to see the relationship between recommended applications and the architecture used. Figure 6 shows that component interchange and user interfaces will be mapped to web portals in the application landscape, data management components will be mapped to the DBMS in the application landscape, Location & Directory components will be mapped to profile management users in landscape applications, business applications will be mapped to systems found in the application landscape [24].
This stage describes the location where the application is implemented and identifies the technology and application where the business interaction occurs. This diagram also shows the location of the environment for applications and data to support STIE XYZ business activities. Here figure 7 Environments and Location Diagram in STIE XYZ.

3.6 Opportunities and Solution

his stage aims to perform gap analysis that occurs between the current condition and the target conditions of information system architecture and technology architecture. The result of this stage is the application that needs to be integrated the module (partially replaced), replaced (replaced), the application needs to be added function (upgrade). Application analysis gap can be seen in table 4.

Table 4: Application Gap Analysis

<table>
<thead>
<tr>
<th>Target Application</th>
<th>Current Application</th>
<th>PMB SIPTI</th>
<th>Academic SIPTI</th>
<th>Finance SIPTI</th>
<th>Payroll Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Admissions System</td>
<td>R</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Academic Information System</td>
<td>U</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Financial Information System</td>
<td></td>
<td>U</td>
<td>R</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. Conclusion

Based on the results and discussion, it can be concluded from this study that: 1) this study focuses on modeling corporate architecture in business activities at STIE XYZ in the scope of business modeling, information and technology; 2) Some latest information technology architecture in STIE XYZ can still be used but need to improve to optimize academic system services. 3) blueprint design using TOGAF ADM has been able to provide integrated information technology and recommendations to optimize services at STIE XYZ which focuses on new student admission services, study plan cards, lectures, study cards, graduation, and finance.

In order for the design of this IT Blueprint to be implemented properly, it is deemed necessary to develop human resources for managing information technology at STIE XYZ.

References


