

Strategic Planning of Information Technology Architecture in Schools Using The Open Group Architect Framework (TOGAF) Case Study: SMA Negeri 15 Bandar Lampung

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KEYWORDS

Enterprise Architecture;
TOGAF ADM; Information
System Architecture;
Migration Planning;
Operational Efficiency

ABSTRACT

This research aims to design an enterprise architecture at SMA Negeri 15 Bandar Lampung using the TOGAF ADM framework. This research involves several phases: Preliminary Phase, Architecture Vision, Business Architecture, Information System Architecture, and Opportunities and Solutions. In the Preliminary phase, the objectives and benefits of architectural development are determined to meet the needs of the school, including the new student enrollment system and network structure. The Architecture Vision phase describes the organization's profile, vision and mission, as well as the current state of architecture. Business Architecture analyzes key business processes using the value chain, including student admission, teaching and learning activities, and student release. Information System Architecture develops data and application architectures to support business vision and architecture. The Opportunities and Solutions phase identifies opportunities for information technology development to improve school operational efficiency. The results show that the implementation of TOGAF ADM can provide systematic and comprehensive guidance in designing enterprise architecture that suits the needs of schools.

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1. Introduction

The rapid development of technology today, especially information technology and information systems, has led to a significant change in the role of the organization's business processes and effectively affects the organization's efficiency. With the rapid development of information technology almost bringing a new era to the world faster than ever before, it is likely that this technological development will bring changes in many aspects of life parts. Information technology systems have undergone many changes, causing a change in the role of IT systems themselves, starting with their role in helping organizations become better and more efficient and efficient.

State High School (SMAN) 15 Bandar Lampung is one of the schools that utilizes SI/IT to support its operations. However, the use of SI/IT in these schools has not been integrated and is less efficient. There are several business processes at SMA Negeri 15 Bandar Lampung, including: (Dores et al., 2019) new student admission, academic administration, financial administration, human resource management, and laboratory management. The information system at SMA Negeri 15 Bandar Lampung is currently intended for certain groups, including students and teachers, as well as educators and related education staff, during teaching and learning activities at SMA Negeri 15 Bandar Lampung. However, related to the information system not only now but currently, in the future, the need for an information system must be taken into account will be more comprehensive and reliable so all school information systems can be centrally integrated both at the Education Office for the Provincial level and the Ministry of Education and Culture for the National level. The SI/IT architecture planning used to support the business process at the school has not been done correctly. Therefore, strategic planning is needed to design an architecture that can harmonize the organization's business processes with existing SI/IT developments.

3 reasons show the importance of strategic planning, namely 1) the availability of a framework basis, 2) providing ease in understanding the form of planning, and 3) this is the beginning for the understanding and activities of managers and organizations to be assessed. Several researchers have studied an organization's strategic planning to increase its productivity by applying SI/IT. According to reference (Fadli & Sa'adati, 2019), SI/IT planning requires a framework used in planning, designing, and managing SI/IT infrastructure known as enterprise architecture (EA) (Gunawan & Sutedia, 2018; Proenca & Borbinha, 2017). The term is among the ways that can realize a complete, logical picture of the organization, which includes the business architecture of the organization, the data architecture that will be used, the application architecture that will be built, and the technology architecture that will later support the running of the application. According to Prasetyo (2021) many alternative frameworks, such as Zachman Framework, EAP, EAS, BEAM, TOGAF ADM (Buckl et al., 2009; de Fatima Gusmao & Setyohadi, 2017; Palupi et al., 2018), GEAF, and others, can be used. However, it is necessary to select and determine the right and most suitable framework to be applied in making an SI/IT strategic planning model to support the running of the applications needed by SMA Negeri 15 Bandar Lampung.

In this case, it can be concluded that a framework or framework can be used to determine the scope of an information system architecture. framework or framework, TOGAF-ADM can be the right solution because TOGAF, in addition to a framework, can also provide process stages used in enterprise modeling and can also be used in designing architectural designs needed to build information systems at SMA Negeri 15 Bandar Lampung. The term is among the ways that can realize a complete, logical picture of the organization, which includes the business architecture of the organization, the data architecture that will be used, the application architecture that will be built, and the technology architecture that will later support the running of the application (Nirma & Sutedi, 2020).

Enterprise Architecture (EA) is seen as a logical, comprehensive, and holistic approach to simultaneously defining, designing, and implementing systems and system components. In the implementation of EA, it is necessary to adopt methods/frameworks that can be used as an example

for complex system management. According to Prasetyo (2021), many alternative frameworks, such as Zachman Framework, EAP, EAS, BEAM, TOGAF ADM, GEAF, and others, can be used, many alternative frameworks can be used, such as Zachman Framework, EAP, EAS, BEAM, TOGAF ADM, GEAF, and others. However, it is necessary to select and determine the right and most suitable framework to be applied in making an SI/IT strategic planning model to support the running of the applications needed by SMA Negeri 15 Bandar Lampung.

Infrastructure reduction is carried out by limiting the scope consisting of the initial six phases of TOGAF ADM, which include preliminary, architecture vision, business architecture, information systems architectures, technology architecture, opportunities, and solutions. The output of this research is in the form of a Blueprint for Strategic Planning of Information Technology Architecture at SMA Negeri 15 Bandar Lampung in the development of information technology (IT) that can be used by SMA Negeri 15 Bandar Lampung as a guideline in the implementation of its IT development (Soares & Styohady, 2014).

The discussion in this study is limited to the following scope: Analyze the overall business needs of the general business by aligning the school's strategy. Developing a valid architectural concept for information systems meets the needs of everyone involved in the school. It has a value-added benefit for the school as a blueprint for developing information systems.

2. Materials and Methods

This research involves several stages of data collection using observation and interviews. The stages of the research carried out include: a) Planning: Planning and conducting research, including problem identification and literature studies. b) Data Collection: Collecting data through literature studies, observations, and interviews. c) Analysis: Conducting Value Chain analysis and Gap Analysis. d) Architecture Design: Designing SI/IT architecture using the TOGAF framework and ADM methods from the Preliminary Phase to Migration and Planning (Matheus Edward et al., 2014).

Data Collection Stage

The data collection stage in this study aims to meet the data needs needed to achieve the research objectives. The stages of data collection include:

a. Data Collection Techniques:

1. Observation: Direct observation of the SI/IT system at SMA Negeri 15 Bandar Lampung, including its utilization and related data collection.
2. Interview: Direct questions to principals and teachers about SI/IT at SMA Negeri 15 Bandar Lampung.

b. Primary Data and Secondary Data:

1. Primary Data: Direct data from the SMA Negeri 15 Bandar Lampung research object and interview results.
2. Secondary Data: Data from books, e-books, scientific journals, and internet sources relevant to the research topic.

c. Data Processing Stage: Data is processed from SMA Negeri 15 Bandar Lampung, including the Organizational Structure and stakeholder duties for SI/IT design.

Analysis Stage

This stage involves design analysis using TOGAF ADM as an architectural framework. The stages include: Value Chain Framework Analysis: The author analyzes the current conditions related to SI/IT at SMA Negeri 15 Bandar Lampung using primary data from interviews and related documents. Gap Analysis: After analyzing the current state of SI/IT, a Gap Analysis compares the current SI/IT architecture with the planned target architecture (Kurniawan & Suhardi, 2013; Osadhani et al., 2019).

3. Result and Discussion

This chapter contains the analysis carried out in SMA Negeri 15 Bandar Lampung for enterprise architecture (EA) design by applying TOGAF ADM. The process comprises the preliminary phase, phase requirement management, architecture vision, phase business architecture, information system architecture, technology architecture, and opportunities and solutions (Rukoyah et al., 2019).

Preliminary Phase

In this phase, determine the goals and benefits of building an architecture enterprise according to the school's needs **Framework Togaf**; this is done so that there are no mistakes in designing architecture that does not meet the needs, and then an initial review is carried out at the school first (Agarina, 2015). As a result of the initial review conducted at SMA Negeri 15 Bandar Lampung, there are several essential points; the following are ones that will be designed from the important points:

- 1) Redesigning the registration system for new SMA Negeri 15 Bandar Lampung students.
- 2) Merancang arsitektur aplikasi yang dapat melakukan pertukaran informasi yang berupa media publikasi mulai dari pengumuman sekolah dan berita terbaru di sekolah jauh lebih mudah diperoleh.
- 3) Improving the Academic Information System at SMA Negeri 15 Bandar Lampung.
- 4) Designing a network structure (LAN) and utilizing the school's local server in SMA Negeri 15 Bandar Lampung to make it easier for students, teachers, and employees to connect to the Internet and local networks more easily and quickly to obtain information related to the school.
- 5) Storing data securely because all student, teacher, and employee data is stored in the database.

Once the framework is ready, the next step is to determine the principles that will be used to describe the principles that will be used in the design of the enterprise architecture as follows

Phase An Architecture Vision

This stage's content explains architecture's needs, including the organizational profile, description of vision and mission, organizational goals, and ongoing architectural conditions.

Phase B: Business Architecture

This phase includes business processes using value chains and relationship matrices in business processes with organizations. The main activities include new student admissions, teaching and learning activities, and student release. The value chain is used to define business areas.

SMA Negeri 15 Bandar Lampung already has networks connecting the internet between labs, classrooms, offices, and business managers (Ibrahim & Nurpulaela, 2016). To create this architecture development system, several additions and changes are needed in this network to facilitate data exchange starting from local and non-local data. The following network design is presented in Figure 2.

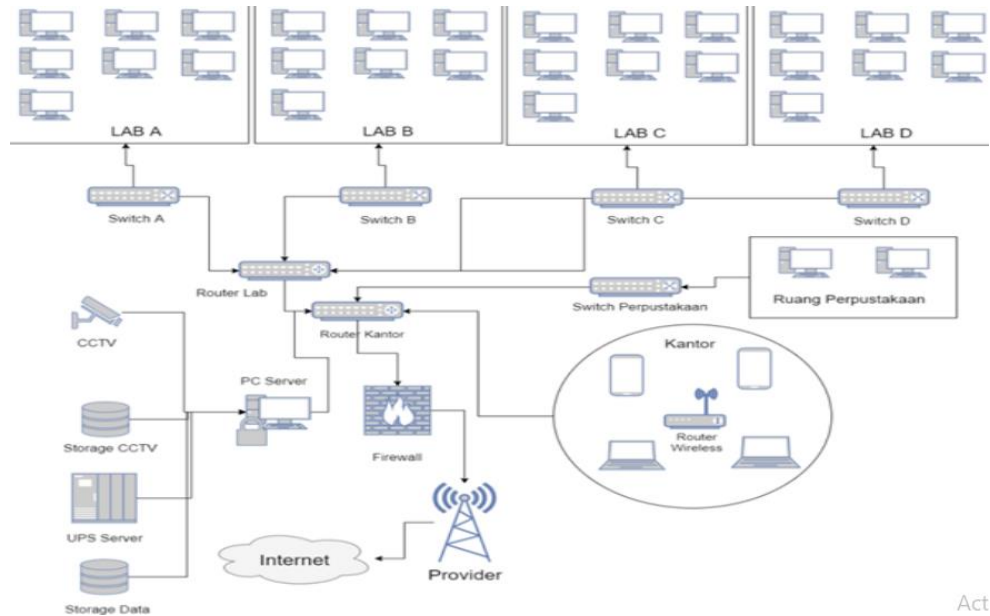


Figure 2 Network Design of SMA 15 Bandar Lampung

2. Software Proposed

Several software applications support the design of the architecture.

Table 1 Software Proposals

Category	Software
OS	Windows Server 2008/2012
Web Server	Apache Web Server
Web Browser	Internet Edge, Google Chrome and Mozilla Firefox
Database Manager Server	MySQL
Website Development	Visual Studio Code
Text Manager	Microsoft Office Word 2018
Data manager	Microsoft Office Excel 2018

3. Hardware Proposed

Server computers should be used in a cool room to reduce the possibility of overheating because they must be turned on for a long time. Table 2 presents the following proposed hardware specifications.

Table 2 Proposed Hardware

Hardware	Specifications
Server	Acer
Processor	Intel Xeon E2124 (Xeon Processor)
Memory	8 GB DDR4
Database Manager Server	MySQL
Storage	1 Terrabyte (Raid 0) SATA 7200RPM 1 Terrabyte (Raid 1) SATA 7200 RPM
Input Device	Mouse and Keyboard
Output Device	Monitor

4. Gap Analysis

Based on the comparison of the data above, both existing and also proposed to be made between software, hardware, and information systems, the gap analysis can be displayed

Table 3 Gap Analysis

Application Proposal	New Student Admission Information System	Sistem Informasi Kegiatan Belajar Mengajar	Student Release Information System	Student Information Systems	Personnel Information System	Letter and Archive Administration Information System	Financial Information System	Infrastructure Information System	Infrastructure Information System
Attendance information system	C								
Assessment information system		U							
Library Information System									R
SPP Payment Information System							U		
School Application Information System				U	U	U	U	U	

Phase F: Migration Planning

Migration planning has the goal of planning the migration process or switching from the old system to the new system so that the implementation of the information system to be built is directed and runs well (Yolanda et al., 2023). This migration process is through an implementation roadmap plan. The following are the results of Migration planning.

1. Implementation Roadmap Plan

Table 4 Implementation Roadmap Plan

Group Information Systems	Stages of Information System Development				
	Phase I	Phase II	Phase III	Phase IV	Phase V
New Student Admission Information System System Information System Infrastructure Financial Information System					
Teaching and Learning Activity Information System					
Student Information Systems					
Personnel Information System					
Library Information System Letter and Archive Administration Information System					

According to the information system the implementation roadmap plan above can be described from the information system part that is derived with applications according to the needs at SMA Negeri 15 Bandar Lampung. The following are the applications that align with SMA Negeri 15 Bandar Lampung's needs.

Table 5 Application Requirements for SMA Negeri 15 Bandar Lampung.

No	Group System	Application package	Code Application System	Stages of Information System Development
1	Teaching and Learning Activity Information System (SIKBM)	Class Determination Application	AS_2.1	Phase I
		Subject Determination Application	AS_2.2	
		Spatial Determination Application	AS_2.3	
		Teaching Management Application	AS_2.4	
		KBM Scheduling Application	AS_2.5	
		Laboratory Use Applications	AS_2.6	
		Application for Assignment of Classroom Teachers	AS_2.7	
		Value Inputting Applications	AS_2.8	
		Value Processing Applications	AS_2.9	
		Print Value Applications	AS_2.10	
		Remedial Management Applications	AS_2.11	
		Consolidation Management Application	AS_2.12	
2	Student Information	Student Data Management	AS_3.1	
		Student Attendance App	AS_3.2	

No	Group System	Application package	Code Application System	Stages of Information System Development
	System (SIKSS)	Student Activity Recording Application	AS_3.3	Phase II
		Student Personality Recording Application	AS_3.4	
		Student Violation Recording Application	AS_3.5	
		Achievement Recording Application	AS_3.6	
		Student Mutation Application	AS_3.7	
		Graduate Recording Application	AS_3.8	
3	Personnel Information System (SIKEP)	Employee Data Management Application	AS_4.1	Phase III
		Employee Attendance Application	AS_4.2	
		Employee Performance Assessment Application	AS_4.3	
		Employee Performance Evaluation Application	AS_4.4	
		Honor and Salary Calculation Application	AS_4.5	
		Promotion Application	AS_4.6	
		Employee Mutation Application	AS_4.7	
4	Library Information System (SIPUS)	Administrative Logging Applications	AS_8.1 AS_8.2	Phase IV
		Library Usage Logging Applications		
5	Letter and Archive Administration Information System (SIASA)	Mail Management Application	AS_5.1	
		Archive Management Applications	AS_5.2	
6	System Admission Information New Students (SIPSB)	New Student Registration Application	AS_1.1	Phase V
		Application for Exam Selection Implementation	AS_1.2	
		Application for Announcement of Selection Results	AS_1.3	
		Re-Registration Application	AS_1.4	
7	Financial Information System	School Fee Input Application	AS_6.1	
		School Budget Preparation Application	AS_6.2	

No	Group System	Application package	Code Application System	Stages of Information System Development
		Budget Evaluation Application	AS_6.3	
8	Infrastructure Information System	Inventory App	AS_7.1	
		Infrastructure Procurement Application	AS_7.2	
		Infrastructure Supervision Application	AS_7.3	

4. Conclusion

The conclusion of this study, from the stage of designing the architecture of the information system to the results of determining the framework used using TOGAF ADM, are as follows. a) The Information System Architecture at SMA Negeri 15 Bandar Lampung has been well integrated; this is illustrated by the value chain, including the process of accepting new students, financial systems, infrastructure facilities, library systems, teaching and learning activities, student release of personnel systems, letter administration, and archives. b) The TOGAF ADM system architecture that was successfully submitted as a design consisted of 38 data entities and 41 application candidates that could be developed to support the learning process in SMA Negeri 15 Bandar Lampung.

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