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Designing of Enterprise Architecture for Vocational High School Information System Using TOGAF Architecture Development Method

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Abstract:
The purpose of this research is to design a blueprint that can be used to meet the needs of business functions the Vocational High School of XYZ. In this research, the method used to design Enterprise Architecture was The Open Group Architecture Framework Architecture Development Method (TOGAF ADM). The phases of TOGAF ADM applied in this design are the Preliminary Phase, Architecture Vision Phase, Business Architecture Phase, Information System Architecture Phase, and Technology Phase. The results of this research in the form of preliminary phase up to the technology phase from the TOGAF ADM that can be used for information system development in the Vocational High School of XYZ so that the next research is expected can meet all the TOGAF ADM phases.

Keywords: TOGAF, Information System, Enterprise Architecture

INTRODUCTION

The design of school information systems must be well planned and adapted to the needs of the organization. Good design will provide great benefits for the organization, both in terms of human resources, budget and organizational readiness in implementing the plan. Corporate Architecture Design by utilizing information technology is needed to improve the performance of every business process that occurs within a company or organization. In addition, the use of information technology is also used to support business activities in order to increase excellence and win the competition (Arifin, 2019).

Currently, the information system at XYZ vocational high school can be said to be part of a business process that is still done manually. So that will greatly affect the speed and reliability in the process of collecting, storing, searching and processing data and also the distribution of information to school management. The information system currently in use is still in the form of applications for certain jobs that are also not yet integrated, even various platforms and database types. To overcome this problem, a corporate architecture framework

is needed to meet the needs of school business processes. One method or framework that can be used to get a detailed picture in determining the architecture of a school's information system is The Open Group Architecture Framework (TOGAF). Regarding Governance, the TOGAF provides a holistic approach to stakeholder management. It is therefore suitable for overcoming challenges regarding joint decision and control rights (Mueller, *et al.*, 2013). TOGAF is a proven methodology and framework of Corporate Architecture used by world-leading organizations to improve business efficiency (The Open Group, 2020).

TOGAF is an enterprise architecture framework for planning, designing, building and managing IT infrastructure organization which provides a details method and set of supporting tools (Saepurrahman & Sumitra, 2019). The enterprise architecture development method is owned by the TOGAF framework called TOGAF ADM (Architectural Development Method). TOGAF ADM is the core of the TOGAF framework itself (Alit & Puspaningrum, 2018). The TOGAF ADM framework can provide the stages of the process used to incorporate modeling, it can also be used in designing the architectural design needed to build information systems in XYZ vocational high schools.

RESEARCH METHOD

The method used in designing enterprise architecture for vocational high schools is based on the TOGAF ADM literature study. The first step taken in this research method is through direct observation, collection of related documents and interviews with relevant stakeholders (Pratama & Sumitra, 2019; Azizi & Sumitra, 2019).

The next step that must be considered when implementing TOGAF ADM is defining preparation by identifying the architectural context to be developed. Next, determine the architectural strategy and determine the part of the architecture to be designed, starting from the Initial Phase, the Architectural Vision Phase, the Business Architecture Phase, the Information Systems Architecture Phase up to the Technology Phase. The method is illustrated in Figure 1.

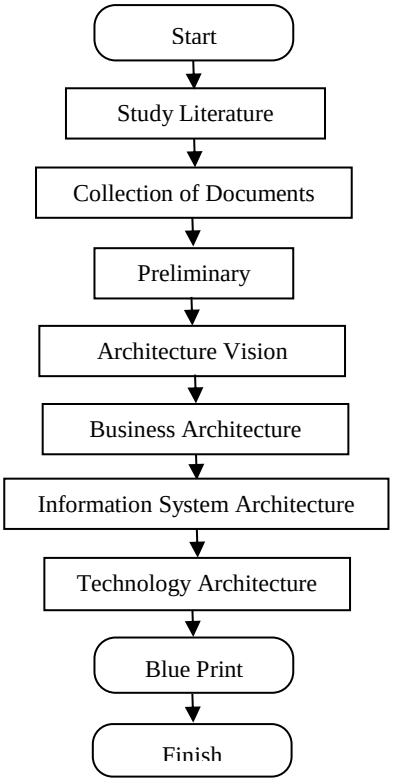

Figure 1. The illustration of the research method

RESULTS AND DISCUSSION

Based on the results of observations and interviews conducted at XYZ vocational high schools it was found that there is no Information System Architecture that can meet business needs so that access to information at the school becomes less effective. Therefore, it is necessary to design an information system that is effective, fast, and connected throughout the network. To determine this information system a work plan is needed for modeling the information system architecture.

This modeling will produce a framework that can be used as a reference in designing information systems architecture. In this study, the framework used to design information system architecture is to use the TOGAF ADM framework. The phases of TOGAF ADM applied in this design are the Preliminary Phase, Architecture Vision Phase, Business Architecture Phase, Information System Architecture Phase, and Technology Phase.

A. Preliminary Phase

The preliminary phase is the initial stage of preparation for the design of information systems architecture. This stage defines how the information system architecture is created (Pratama & Sumitra, 2019). The purpose of this stage is to confirm how management is committed, determine the framework and how the methodological details will be used in designing the company's architecture (Murpratiwi, *et al.*, 2016; Nama & Kurniawan, 2017; Ariawan, *et al.*, 2017).

Management support is one factor in the success of making information systems architecture. In this case, as the main person in charge of organizing education in the XYZ Vocational High School is the Principal, who has a strong desire to apply information technology in organizing education. While the framework used in this study is the TOGAF ADM which is used to determine how the information system architecture is built, maintained and implemented.

B. Architecture Vision Phase

The architectural vision phase aims to find out the architectural design that is made in accordance with the vision, mission and organizational goals in XYZ vocational high school (Pratama & Sumitra, 2019). Architectural vision can be determined based on the company's current conditions and the company's mission.

C. Business Architecture Phase

The business architecture phase illustrates the current organizational architecture and develops it with strategies to achieve business goals in the future by conceptualizing business solutions using information systems based on the current conditions in XYZ vocational high school (Pratama & Sumitra, 2019).

Identification of the scope of the company's architecture is done to understand the main functions associated with existing business processes in XYZ vocational high schools (Ariawan, *et al.*, 2017). There are two types of business process activities related to information systems in XYZ vocational high schools, namely business processes which are the main activities and supporting activities. The activity defines the business area described in what can be seen in Figure 2.

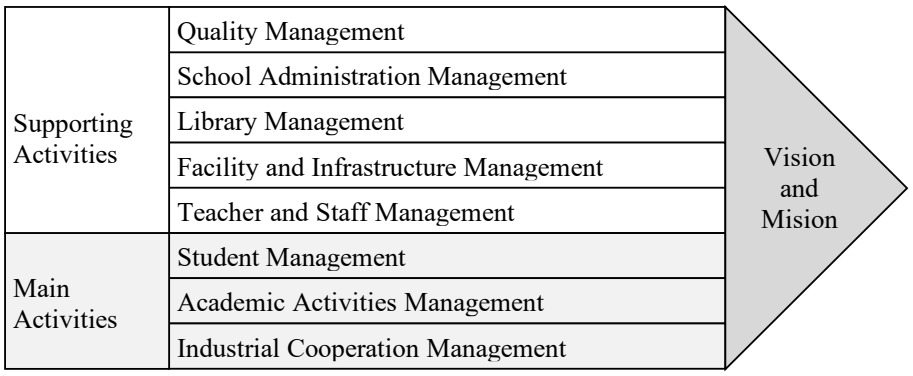

Figure 2. Value Chain of Business Process in Vocational High School XYZ

The current architectural business conditions can be seen in Table I.

Table I. Analysis of Business Architecture Gaps

Number	Current Business Architecture	Proposed Solution	Future Business Architecture Targets
1	In carrying out its activities have not utilized the existing SI and IT optimally.	Design Information Systems to support all business processes and designing IT applications in business processes	Having applications that help business processes and has an IT Architecture design
2	Do not Have Standard Operating Procedures for IT activities	Designing Standard Operating Procedures in IT management	Have Standard Operating Procedures and monitor any changes in IT management work procedures

D. Information System Architecture Phase

This information system architecture phase focuses more on how information system architecture is built and developed. Management requirements in the information system architecture phase are divided into 2 parts, namely data architecture and application architecture (Nama & Kurniawan, 2017).

E. Data Architecture

Existing data architecture must be able to be made centrally so that any available data can be managed quickly and efficiently so as to improve collaboration and coordination for each of the relevant sections (Azizi & Sumitra, 2019). The data architecture phase focuses more on how data is used for the needs of business functions, processes, and services, as well as the identification and classification of the existing data in the process (Murpratiwi, *et al.,* 2016; Ariawan, *et al.,* 2017). In managing data architecture an integrated data source is needed. With integrated data, it is expected that the information presented is true and accurate. The business process at XYZ Vocational High School consists of main activities and supporting activities. Candidates of data entities for the main activities needed to support business processes in XYZ Vocational High School can be described in Table 2.

Table 2. Candidates of Data Entity for The Main Activities

Number	Main Business Process	Business Process Entity	Candidates of Data Entity
1.	Student Management	New Student Admission	List of New Student List of Registered School Registration Implementation Entrance Examination Students accepted
		Problematic Student Handling	Student Complaints Problematic Student Recapitulation Counseling Recommendations Case Handling
		Extracurricular Activities	List of Extracurricular List of Extracurricular Participants List of extracurricular trainers Implementation of Extracurricular Activities
		Home Visit Service	Request a home visit Home Visit Report
		Counseling Guidance Service	Types of Counseling Services Counseling Activity Plan Counseling Implementation Report
2	Academic Activities Management	Teaching and Learning Activities	Lesson List Teacher List Class List Studen List Syllabus List Lesson plan Distribution of Teaching Tasks Student Attendance List Teacher Attendance List Learning Schedule Learning Implementation Report
		Evaluation of Learning Outcomes	Exam Schedule Daily Assessment Mid Semester Assessment Final Semester Assessment Report Value
3.	Industrial Cooperation Management	School Promotion	Promotion Location List School Promotion Schedule School Promotion Report

Number	Main Business Process	Business Process Entity	Candidates of Data Entity
		Job Training	Job Training Industries
			Job Training Students
			List of Cooperation
			Job Training Requests
			Job Training Advisors
			Job Training Report
			Job Training Assessment
		Alumni Distribution	Workplace Industries List
			Alumni List
			Alumni Recruitment Activities
			Alumni Placement Activities
			Alumni Search Activities

Candidates of data entities for the supporting activities needed to support business processes in XYZ Vocational High School can be described in Table 3.

Table 3. Candidates of Data Entity for The Supporting Activities

Number	Supporting Business Process	Business Process Entity	Candidates of Data Entities
1.	Quality Management	Document Control	Issuance of Documents
			Document handover
			Revisions of documents
			Master List of Documents
			Withdrawal of Documents
			Internal Documents
			External Documents
		Archive Control	Master List of Archives
			Borrowing of Archives
			Annihilation of Archives
		Internal Audit	Internal Auditor List
			Internal Audit Schedule
			Internal Audit Report
			Internal Audit Findings
		Corrective action	Internal Audit Findings Report
			Corrective action
			Recapitulation of Corrective action
2	Facility and Infrastructure Management	Procurement of goods and services	The need for goods and services
			Proposed of goods and services
			Supplier of goods and services
			Purchase of goods and services
			Receipt of goods and services
			Storage of goods and services
		Maintenance of Facilities and Infrastructure	Tool Inventory
			Maintenance Program
			Maintenance Activities

Number	Supporting Business Process	Business Process Entity	Candidates of Data Entities
			Tool damage report
			Tool repair report
		Tool Borrowing	Request for Equipment Loans
			Equipment Loan Activity
		Information Technology Management	Hardware List
			Software List
			IT usage activities
3	Library Management	Book Management	Book List
			Library Managers
			Library Activities
		Book Lending	List of Borrowers
			Book Loan Data
			Book Return Data
4	School Administration Management	Issuance of Incoming Mail	Incoming mail agenda
			Incoming Mail Expedition Book
		Issuance of Outgoing Letters	Outgoing Mail Agenda
			Outgoing Mail Expedition Book
		Financial Management	Type of payment
			Payment Card
			Financial Income Data
			Financial Expenditures Data
			Financial Statements
5.	Teacher and Staff Management	Staff Performance Assessment	School staff
			Job Description of Staff
			Staff Attendance
			Staff Performance Assessment
		Teacher Performance Assessment	Teacher List
			Job Description of Teacher
			Teacher Attendance
			Teacher Performance Assessment

F. Application Architecture

Management needs in application architecture are management requires applications that support information systems to run optimally and also online (Azizi & Sumitra, 2019). The application architecture places more emphasis on the requirements of the planned application using the Application Portfolio Catalog and focuses on the application model to be designed (Ariawan, *et al.,* 2017). The use of information systems applications online is expected to be accessed anytime and anywhere. In addition to applications that are online, management wants dynamic applications. With this dynamic application, it is expected that the information presented is accurate, timely, and up to date.

Based on the analysis of business processes in XYZ Vocational High Schools, it is necessary to propose applications that can be applied to support existing business processes. Proposed Application Plans to be implemented can be seen in Table 4.

Table 4. Proposed of Application Plan

Number	Business Process	Application Plan	Application Code
1.	Student Management	New Student Admission	APL. 1.1
		Problematic Student Handling	APL. 1.2
		Extracurricular Activities	APL. 1.3
		Home Visit Service	APL. 1.4
		Counseling Guidance Service	APL. 1.5
2	Academic Activities Management	Teaching and Learning Activities	APL. 2.1
		Evaluation of Learning Outcomes	APL. 2.2
3	Industrial Cooperation Management	School Promotion	APL. 3.1
		Job Training	APL. 3.2
		Alumni Distribution	APL. 3.3
4.	Quality Management	Document and Archive Control	APL. 4.1
		Internal Audit and Corrective action	APL. 4.2
5	Facility and Infrastructure Management	Procurement of goods and services	APL. 5.1
		Maintenance of Facilities and Infrastructure	APL. 5.2
		Tool Borrowing	APL. 5.3
		Information Technology Management	APL. 5.4
6	Library Management	Book Lending Management	APL. 6.1
7	School Administration Management	Issuance of Incoming and Outgoing Mail	APL. 7.1
		Financial Management	APL. 7.1
8.	Teacher and Staff Management	Assessment of Teacher and Staff Performance	APL. 8.1

G. Technology Architecture Phase

Architectural technology is focused on building the required architectural technology. Management hopes that existing technology can be optimized for the development and use of the system (Azizi & Sumitra, 2019). In this phase, the need for technology to process data is defined, namely by determining the technology candidates that will be used to produce technology choices based on existing technology (Nama & Kurniawan, 2017). Building a technology architecture begins by determining how the type of technology is needed by using the Technology Portfolio Catalog which includes software and hardware (Ariawan, *et al.*, 2017). Management will support the addition of technological equipment in accordance with the needs for the construction of information systems architecture so that later it can run optimally and in the long run can be further developed due to the development of new information technology. Management also wants infrastructure rejuvenation on a regular basis in accordance with the needs of the XYZ Vocational High School.

CONCLUSION

Based on the results of research in applying the TOGAF ADM framework, the conclusion obtained is that corporate architecture planning using TOGAF ADM can be used to

support business processes in XYZ Vocational High Schools in accordance with documents and processes that are running and can produce a blueprint for creating information systems. The results of this research in the form of preliminary phase up to the technology phase from the TOGAF ADM that can be used for information system development in the Vocational High School of XYZ so that the next research is expected can meet all the TOGAF ADM phases. To develop business processes in XYZ vocational high schools requires commitment and support from stakeholders.

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