Enterprise Architecture Design Using TOGAF ADM Framework (SME Case Study: Dormitory House)

Deny Deny, Angellita Herlian., Johanes Fernandes Andry

***Abstract*—XYZ is an SME which provides accommodation for university students and staffs. To improve the quality of service and the quality of company management, company need an information system to integrates the departments in the company. The driving factors of information system needs are the increasing number of residents and accuracy in the management of the company. Enterprise Architecture is used for determining architecture for the use of information in supporting the company's business. This research uses the TOGAF ADM Enterprise Architecture framework from the preliminary phase, requirement phase, architecture vision, business architecture, until information system architecture. Result of this research is the proposed TOGAF model that fits the process and business need of the XYZ Company.**

Keywords*— *Architecture Enterprise (EA), The Open Group Framework (TOGAF), Architecture Development Method (ADM)

I. Introduction

A dormitory defined as a room for several people to sleep in, especially in a school or other institution [1]. XYZ Company is an SME (Small Medium Enterprises) dormitory house which provides accommodation services for student and staffs of a university in North Jakarta. It has 614 rooms devided in 4 types of room facilities. Beside residential service, XYZ also has its own security team, laundry service, canteen, and deposit service for its residents.

To integrate all the residential services mentioned above and also operational management, company needs an integrated information system. The information system can be implemented in the company to support all data and information needed in all Management layers. An information system design can explain how to implement information system in company. Consequently, company can grow in-line with technology advancement and modern theory of information technology. Information system has to be designed carefully and must be implemented effectively and efficiently, therefore the design, execution, management and evaluation must be aligned with company needs and values [2].

Aligning management of information system and business is not an easy task. Some of the causes are: lack of understanding about information system advantages, lack of management support, dissent opinion about information system implementation, and inability to maximize information system use in achieving company goals. These problems resulting in company inability to take advantage of available business opportunities [3], especially after Covid-19 pandemic which force digitalization in many aspects of communication and business management.

Enterprise architecture of information system can answer this problem. An Enterprise Architecture is a management practice to maximize contribution of organization resources, IT investment, and development system activities to serve its performance goals [4]. It is architecture for designing enterprise system, and involves business process modeling and information characteristic [5]. Enterprise Architecture is an explanations about how an organization design a system to support its business needs and technologies to actualize visions and missions and to achieve organization goals and targets [6][7].

However, there is a question about whether Enterprise Architecture is too large to be applied on SME organizations, and could the benefits outweighs the costs. Research has been conducted to answer the question, with 84% of the participants answered “Yes” or “Yes, partially” [8]. Alm and Wißotzki in the same research also find out that TOGAF (The Open Group Architecture) ADM (Architecture Development Method) is very useful for SME while the TOGAF reference model is less useful.

Based on the research, while XYZ basically is an SME company, enterprise architecture TOGAF ADM will be used as information system design framework. TOGAF is frameworks which provide methods and tools to help production, receipt, use and maintenance of enterprise architecture [9]. Therefore, information system implementation can be aligned with XYZ organization business strategy.

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II. Research Methodology

This research used descriptive approach with case study on an SME, which is a dormitory house XYZ. In order to have more detail comprehension, qualitative method was used. Information collected by observation and deep interview with key person on XYZ [10].

TOGAF is a flexible and open source framework. It provides a detailed method for building, managing and implementing enterprise architecture and information systems called Architecture Development Method (ADM).

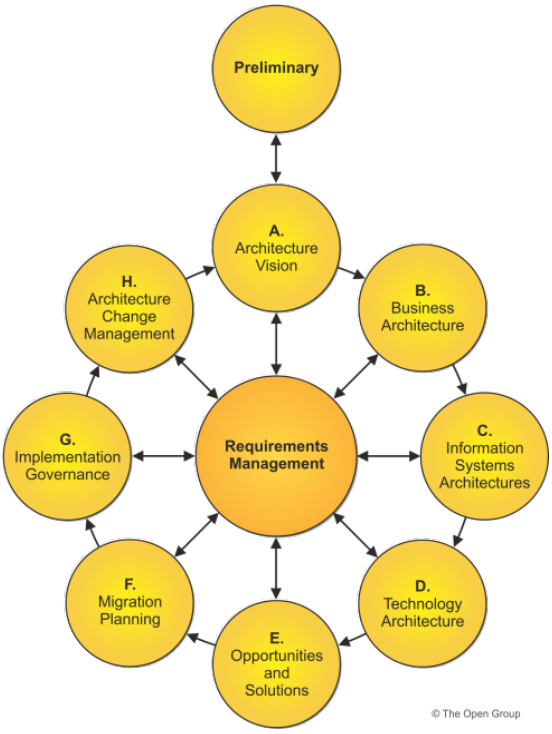

Fig. 1. Architecture Development Cycle [9]

TOGAF ADM identify architecture strategy and determine what architecture to be develop, that is business architecture, data architecture, application architecture and technology architecture. This research used five TOGAF methodology steps in the Architecture Development Cycle: [10]

1) *Preliminary Phase*. During this phase, design principles are defined as reference for architecture development and to identify 5W + 1H that will be described by using principles catalog.
2) *Requirement Management Phase*. The objective of this phase is to analyze and manage architecture requirements which will be used in all of the relevant ADM phases. In this phase, an analysis of the current system will be carried out. The analysis will be represented by flowchart and value chain [11]. Value chain provides framework to identify and inventory of business function areas. Value chain describe the way of seeing business as activity chain which change input into output with added value for customers.
3) *Phase A*: *Architecture Vision*. The objective of the architecture vision phase is to create unity paradigm about enterprise architecture importance in achieving corporate goals, which will be formulated in corporate strategy and to define scope of architecture that will be developed based on design principles and identification that has been defined at the preliminary phase.
4) *Phase B*: *Business Architecture*. This phase determines activity model whereby organization want to direct the course of the organization in the future on the organization point of view. It is represented by tree diagram.
5) *Phase C*: Information System Architecture. This phase will discuss data architecture and application architecture that will be used by the organization. The candidates of the application and all the data component will be identified, in which will produce necessary information for organization. This architecture will be represented by application portfolio catalog.

III. TOGAF Framework Implementation

A. Preliminary Phase

The principle catalog has been created to describe and explain each of principle in which will be implemented in XYZ company, which is:

1) Enterprise architecture design decision must be fit with objectives, decisions, needs, and corporate business process, as means to support corporate business process and to improve corporate services toward residents in dormitory.
2) Architecture being developed must be aligned with organization business strategy with the intention of minimizing the obstacles of the system.
3) Architecture being developed must become a safe architecture to overcome negative impacts of disaster and to resist from attack by malicious software, hacking and cracking.
4) Access to organization data must be protected from unauthorized party. The configuration of data security and confidentiality protection from unauthorized party must be provided by means of user-friendly applications. This will also help stakeholders to do data processing, facilitate data access and data sharing that will speed up service and decision making, improving process business effectiveness and resource efficiency.
5) Application architecture design must integrate different parts of the organization to ease data processing to improve service quality.
6) Architecture being developed must be technology-independent, multi-tier and component-based architecture. This way problem components can be replaced easily and upgrade modularly.

B. Requirement Management

XYZ business process described in Value Chain model as figure 2 shows. The figure shows primary activity and secondary in XYZ Company. The primary activities of XYZ are:

- Inbound logistic: asset management
- Operations: resident facilities management and general facilities management
- Outbound logistic: room allocation

- Marketing & sales: lodging offers
- Service: daily services and new resident admission

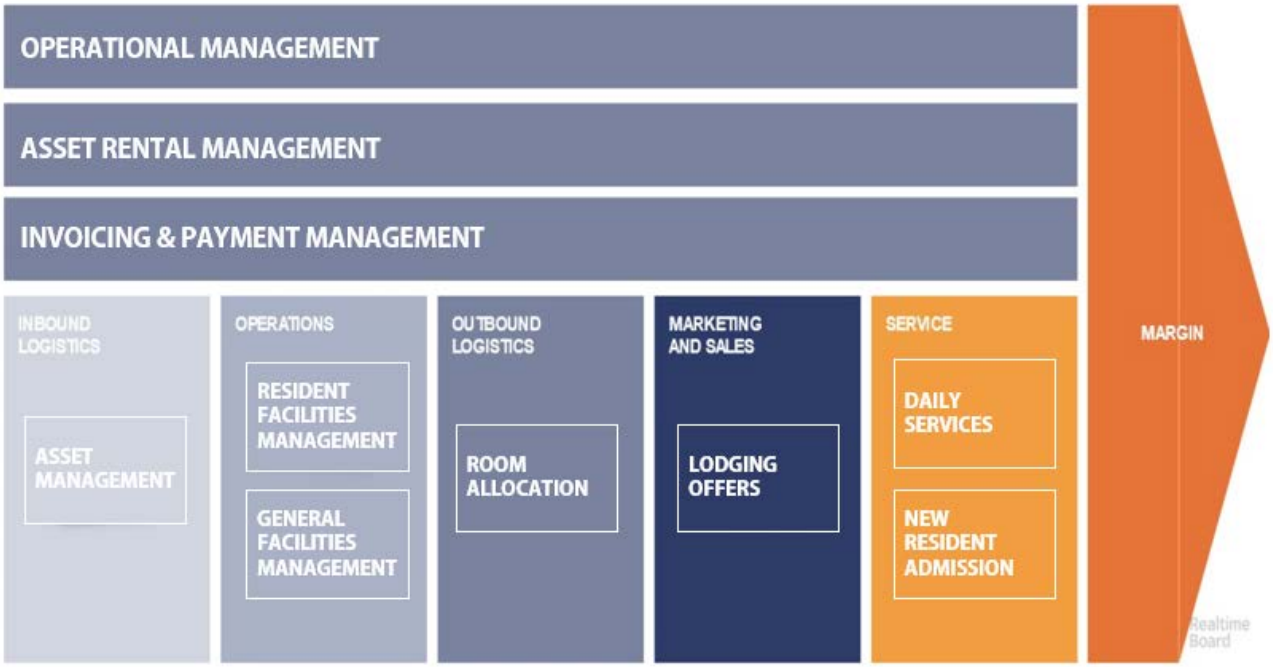

Fig. 2. XYZ's Value Chain

Explanations of the activities are:

- Asset management is the activities to manage company assets.
- General facilities management is the activities to manage general facilities such as student lounge, parking lots, lobby, and other general facilities.
- Resident facilities management is the activities to manage basic facilities for residents, which is lodging equipment (bed, chair, desk, etc.).
- Room allocation is the activities to prepare room for new residents by the general affair department.

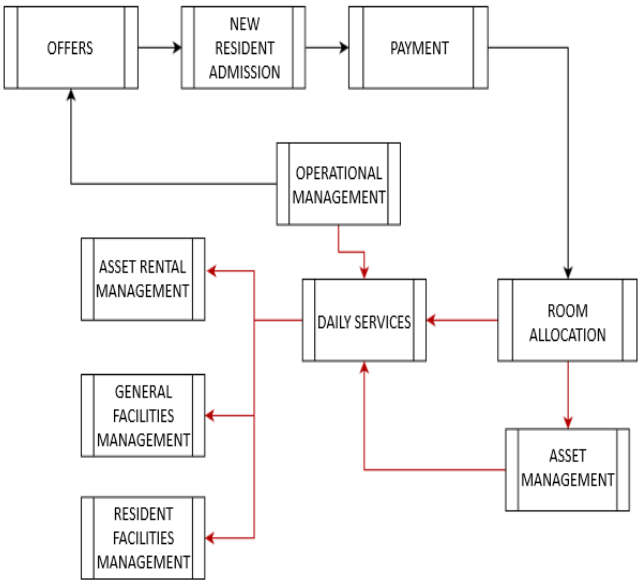

Fig. 3. Level 0 Current System Flowchart

- Lodging offers is the activities to promote and offer vacant room to students and university staffs.
- The offers are followed by the new resident admission which is handle admission of the new residents.
- Daily services are the activities that handle the daily needs of the residents such as receiving complaints about broken equipment or facilities problem.

There three supporting activities: operational management, asset rental management and invoicing and payment management.

Below is the explanation of the secondary activities:

- Operational management is the activities to manage overall daily operation in the dormitory.
- Asset rental management is the activities to manage rental of dormitory assets, and also general facilities rental for partners or any third-party outsider who need to use the facilities.
- Invoicing and payment management are activities that handle the payment of the residents.

Current running system is described in Fig. 3 Level 0 Flowchart that depicts the flow of the activities. In the figure, black arrows represent one-way relationship while red arrows represent two ways relationship.

C. Phase A: Architecture Vision

Primary activities and secondary activities that described in value chain Fig 2 were analyzed and new organization structure are suggested based on the value chain. In the current organization structure, the organization did not have department or sub-department focusing on enterprise

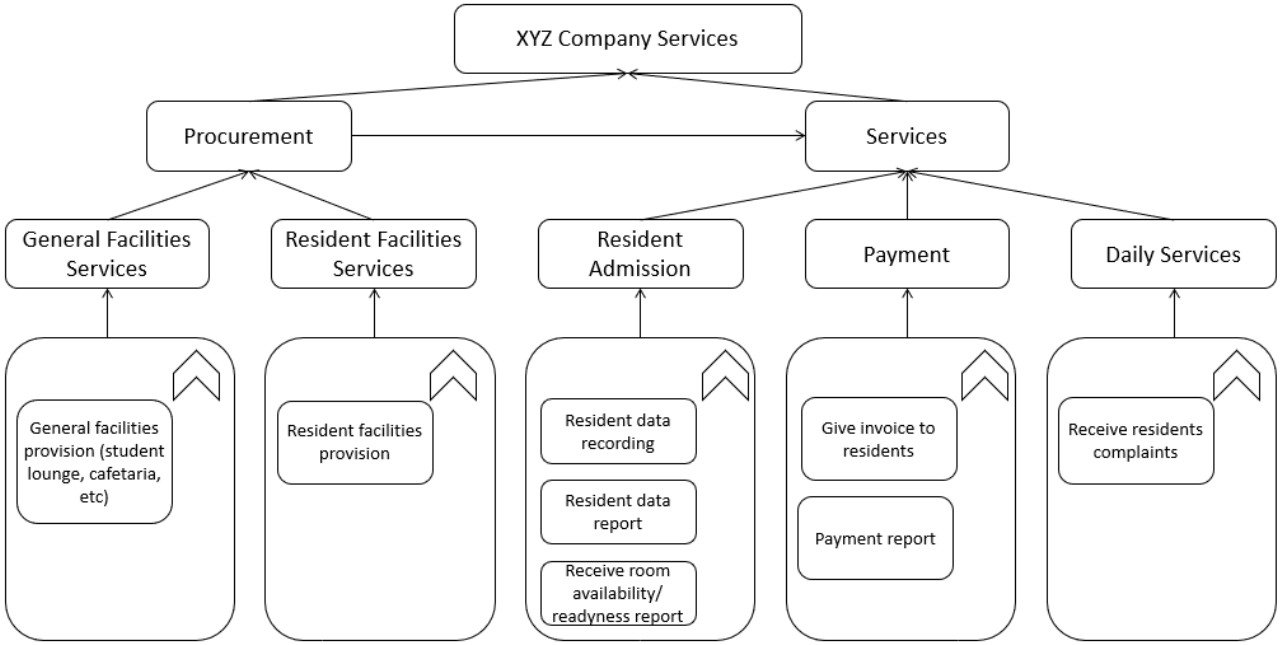

Fig. 5. Tree Diagram XYZ Company Services

Architecture implementation, therefore IT personnel are suggested to be part of the operational management to handle the implementation. Suggested new organization structure is described in Fig 4.

In the organization chart diagram Fig 4, there is IT Support sub-department that will support the whole information technology in the company. Consequently, problems in information technology area can be solved in short time.

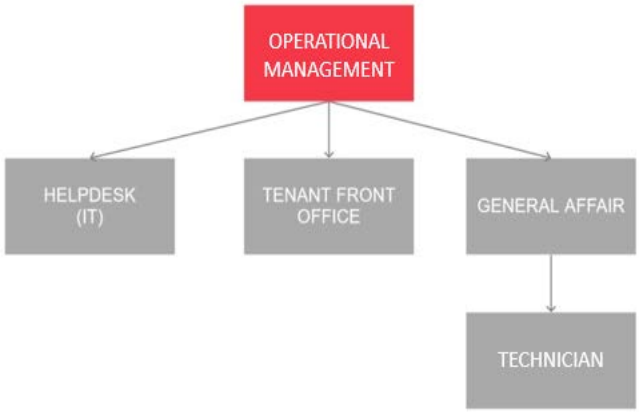

Fig. 4. Suggested Organization Structure

D.Phase B: Business Architecture

Business process mapping, business functions and business services are presented by tree diagram in Fig. 5.

As Fig. 5 described, the enterprise has two type of services: procurement and services. Procurement has several business processes, which is general facilities provision and resident facilities provision. In Services, there are resident admission, payment and daily services.

E. Phase C: Information System Architecture

There are six application architecture needed by XYZ company, which is resident portal, rental application (for residents and outsiders), payment application, inventory application, asset management and digital recording application, and tenant front office application. The details as follow:

1) XYZ dormitory house website will be designed as portal website. This portal objective are to provide information about historical payment records and payment confirmation, electricity and water used records, to make reporting room issues easier and can be reported anytime. The data can be accessed by General Affairs and Tenant Office department to accelerate complaints handling and also provide more accurate and complete historical records. The application data also can be used by other application to provide more integrated system.
2) Rental application will be integrated with portal website. The rental application will cover residents and third-party rental of general facilities and equipment's. The functions are designed as follows: rental management staff can view the facilities current and historical condition and rental payment, rent period, and facilities locations.
3) Payment application will be designed to maintain data accuracy and make payment data recording easier. This application will help dormitory staff to calculate the correct payment nominal amount for each resident every month. The application will also be integrated with other application, such as dormitory portal.
4) Inventory application will be designed to be integrated with historical room condition data, provide help for stock data and to help management decision on when and how much stock item must be purchased.
5) Asset management and electronic recording application will be designed to complete these objectives: Routinely record and provide report about room status, asset condition (such as lift, carpet, sofa, etc.), and electricity and water meter records of all rooms and the whole

dormitory, which must be integrated with other applications.

6) Tenant front office application will be designed to integrate with dormitory portal, to provide data about keys availability, laundry vouchers, and status of the package sent to residents. Detail information in the area will be provided to minimize false recording and information while improving service.

IV. Conclusions and Suggestions

While XYZ as SME has simple business process and manual data management, still TOGAF ADM can analyzed and provide a simple enterprise architecture whereby can give benefit to organization such as improving service in term of fastness, data accuracy, improving efficiency and effectivity to its business process. Before implementation of enterprise architecture, an evaluation will be needed to create adaptation strategy from current system to the new integrated system.

We suggest implementing the suggested system gradually based on company needs and budget availability. In order to have successful implementation of the information system, it must be supported by the whole departments in all levels of management. The design, development and implementation of the information system also have to be properly communicated and explained to the stakeholder affected.

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