IT BLUEPRINT DESIGN WITH TOGAF ADM FRAMEWORK FOR INFORMATION SYSTEM DEVELOPMENT

by E S Soegoto

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IT BLUEPRINT DESIGN WITH TOGAF ADM FRAMEWORK FOR INFORMATION SYSTEM DEVELOPMENT

RIZKY JUMANSYAH[1,*],
RANGGA SIDIK[2], EDDY SOERYANTO SOEGOTO[3]

[1,2]Departemen Sistem Informasi, Universitas Komputer Indonesia, Jl. Dipati Ukur 112-114 Bandung 40163, Jawa Barat, Indonesia
[3]Departemen Manajemen, Universitas Komputer Indonesia, Jl. Dipati Ukur 112-114 Bandung 40163, Jawa Barat, Indonesia
*Corresponding Author: rizky.jumansyah@email.unikom.ac.id

Abstract

National Unity and Political Agency of West Kutai Regency currently requires information and communication technology to support existing service process and utilize existing data and information. With the support and role of Information and Communication Technology (ICT), the public or interested parties can easily find or access the required data and information. This is where the role of the enterprise architecture is needed that supports the main business activities and supporting business activities carried out by the organization. The goal of enterprise architecture implementation is to match business and information technology for the organization's goals. Enterprise architecture implementation is inextricably linked to how an organization develops and constructs its enterprise architecture. Many frameworks can be used in designing an enterprise to support the running of the system in the enterprise. In this case, the framework that will be used in formulating and strategically planning information systems within the National Unity and Political Agency of West Kutai Regency is TOGAF (The Open Group Architecture Framework) with a focus on six architectural components consisting of Architecture Vision, Business Architecture, Information System Architecture, Technology Architecture, Opportunities and Solutions, and Migration Planning. TOGAF ADM can be used to create a technology blueprint for an enterprise, where the blueprint can be used and become a reference in developing an enterprise.

Keywords: Blueprint, Enterprise architecture, Information systems, TOGAF ADM 9.1

1. Introduction

The National and Political Unity Agency of West Kutai Regency (Kesbangpol) is a government agency located at the Government Office Complex of West Kutai Regency. National Unity and Political Agency of West Kutai Regency is tasked with the formulation of general policies, facilitation, monitor, coordination, evaluation, and report in the Secretariat Sector, National Vigilance Sector, Ideology and Nationality Concept Sector, Home Politics, Economic, Cultural, Religious, and Community Strength Sector. In addition, the Kesbangpol has the task of paying attention to the dynamics of the movement of society at this time, so the government can adjust its functions within the state. It was done to ensure that people can enjoy their rights and carry out their obligations comfortably and safely, which can be achieved by improving the system of the government. E-Government is one of the ways to achieve it.

Within the West Kutai Regency Government, it is necessary to implement E-Government at the internal level of government organizations to support effectiveness and efficiency in public services. One of the forms of E-Government that must be implemented is Government to Citizen or Government to Customer (G2C) where the delivery of public service information by the government to the public is already using information technology. Online Services can significantly reduce the total administrative, relation, and interaction costs incurred by the government and its stakeholders compared to manual services. In addition, there is a technology that can facilitate the government in creating a positive business climate by simplifying administrative stages (reducing bureaucracy process). Based on the results of direct observations, consisting of interviews and discussions conducted at the Kesbangpol of West Kutai Regency, it is known that the implementation of E-Government at the Kesbangpol is still at the preparation level and has not yet entered the emerging level or the lowest level. in the adoption of E-Government.

Concerning Presidential Instruction No. 3 of 2003 that E-Government is an effort to develop information technology-based governance that aims to improve the effectiveness and efficiency of public services. With the development of E-Government, it is possible to arrange management systems and work processes in the government environment through optimizing the use of information technology [1]. Research on the design of Enterprise Architecture has been done before, namely at the Universitas Muhammadiyah Maluku Utara [2]. STMIK Dharma Negara also designed Enterprise Architecture which provides information systems to assist in decision making [3]. Furthermore, modeling of Enterprise Architecture in an organization has also been carried out at SMK Muhammadiyah 2 Kuningan where enterprise architecture modeling was created which is used as an initial guide for planning the blueprint of information system design [4]. Based on previous research, it can be concluded that there is no research on enterprise architecture at the Kesbangpol of West Kutai Regency. This is one of the supporting factors for this research.

Based on the problems above, this study aims to design an enterprise architecture in order to create a blueprint that can be used as a basis for the development and design of information systems and information technology in the Kesbangpol agency. The method used in this research is descriptive qualitative and the data collections method consists of interviews and observations. The enterprise architecture design was made with TOGAF ADM 9.1.

2. Methods

The method used in designing this information system Blueprint is TOGAF ADM, direct observation, and interviews with stakeholders. At the initial stage, direct observation was carried out and then continued by collecting documents related to research and conducted interviews with stakeholders. This research was conducted at the National Unity and Political (Kesbangpol) Agency of West Kutai Regency. The data were obtained from direct observations on each ongoing business process and interviews with stakeholders involved in business processes, it includes asking about the ongoing problems, architectural vision, business architecture, information system architecture, and technology architecture. It was done to ensure the enterprise architecture blueprint can be designed with reference to the framework used. The following is a visualization of the stages of the research carried out (See Fig. 1).

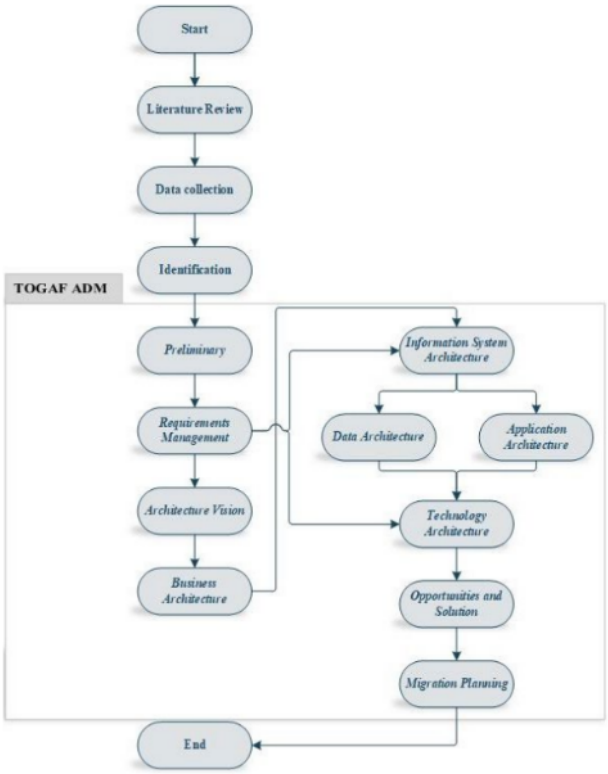

Fig. 1. Research stages.

3. Literature Review

3.1. Enterprise architecture

Enterprise architecture is a description of the mission of stakeholders, including information, functions/availability, organizational location, and performance parameters. How the organization uses the realization of the enterprise architecture, the organization should adopt a method or framework that can be used to develop the enterprise architecture. Therefore, using existing enterprise architecture methods, it is expected to be able to manage complex systems and to align the business and IT that will be invested [5].

3.2. TOGAF ADM

TOGAF is a sophisticated design methodology. Modeling is often done at four levels: business level, application level, data level, and technical level. Standardization, modularity, current goods, and established technology are all important in this process. Concerning DoD TAFIM, the TOGAF framework was established and developed in 1995. In 2016, TOGAF was claimed by 80 percent of the Fortune 50 corporations and 60 percent of the Fortune 500 organizations [6].

An important element of TOGAF is the Architecture Development Method (ADM), which explains the company's business processes in detail and determines the requirements of the enterprise architecture as needed. The TOGAF ADM development cycle is a logical methodology, consisting eight main development and maintenance stages, including the organization's business architecture, data architecture, application architecture, and technology architecture [6].

(i) The Preliminary Stage. This phase covers the processes that go into determining the scope of the TOGAF architecture and defining the company's organizational structure.

(ii) Architecture Vision (Phase A). In architectural design, this phase discusses the state of the company's IT infrastructure and defines stakeholders, vision, and goal.

(iii) Business Architecture Phase (Phase B). This phase discusses how the business architecture established in the architectural vision will be implemented in the creation of corporate business operations.

(iv) Information System Architecture (Phase C). This stage describes an independent information system that is created depending on the company's requirements.

(v) Technology Architecture (Phase D). This stage describes the technology and tools that are employed to aid the company's information technology deployment.

(vi) Opportunities and Solutions (Phase E). This step discusses the outcomes of the Blueprint's construction from Information System Architecture to Technology Architecture in order to identify gaps between the old and new systems.

(vii) Migration Planning Phase (Phase F). The risk and cost assessments are explained in this step.

3.3. Business process modeling notation (BPMN)

BPMN is a graphical notation for describing business process phases. The symbol

was created to help participants in various activities coordinate the sequence of procedures and information flow. BPMN is a business process modeling language that shows how to use business processes and their interactions to perform a task [7].

3.4. Value chain

A strategic technique for analysing a company's internal activities is value chain analysis. The value chain is used to identify the key activities and activity support in a company's business process that may be enhanced to gain a competitive advantage. In other words, the study exposes a competitive advantage or a company's shortcomings by looking at internal activity [8].

4. Results and Discussion

According to observations and interviews, it shows that at the National Unity and Political (Kesbangpol) Agency of West Kutai Regency has no blueprint for designing a corporate information system architecture. The enterprise architecture blueprint was designed using TOGAF ADM. The architectural design focuses on the Vision Architecture phase, the Business Architecture phase, the Information System Architecture phase, and the Technology Architecture phase [9]. This research is a blueprint of guidelines for creating information systems to support ongoing business processes. The following are the stages of TOGAF ADM:

4.1. Preliminary stage: Framework and principles

The preliminary stage is the initial stage of preparation for the Enterprise Architecture design. In this phase, the framework used to design and identify the resources in designing the Enterprise Architecture [10]. The resources needed to develop Enterprise Architecture at the National and Political Unity (Kesbangpol) Agency are the vision, mission, organizational structure, business strategy, IT strategy, goals, business processes, system conditions and IT. The Kesbangpol Agency has main activities and supporting activities which are described by Michael Porter's value chain which is shown in Fig. 2:

Fig. 2. Value chain of Kesbangpol agency.

4.2. Architecture vision

This stage defines the business environment and technology environment to get the architectural vision to be achieved [11]. The use of business scenarios is needed to

generate business needs by identifying problems that exist in the company, business and technology environment, involved actors, roles, as well as responsibilities [12]. The result of the business scenario is a solution to the existing problem and then adapted to the architectural principles applied in the previous step.

After the vision, mission, as well as goals and objectives of the organization are clearly defined, the next step is to assess the internal and external factors of the Kesbangpol Agency. SWOT analysis approach was done to see the complexity of the problems at the Kesbangpol Agency of West Kutai Regency as an institution and then used as consideration in producing various alternative information systems that are effective and efficient, and to be applied in the Kesbangpol of West Kutai Regency.

4.3. SWOT analysis on internal and external matters

The internal analysis includes an assessment of Strengths and Weaknesses. Meanwhile, the external analysis includes Opportunities and Threats [13]. In this case, the SWOT analysis was done to assess the factors that are owned where the factors that become advantages must be optimized for implementation while the factors that become weaknesses must be used as a reference for the better functioning of the Kesbangpol Agency in carrying out its main functions. Based on the results of internal and external analysis, several results related to existing Strengths, Weaknesses, Opportunities, and Threats have been obtained, the next step is to provide a SWOT description using a matrix where it explains how the strength strategy can affect the opportunities and threats, then how the weakness strategy can be overcome with opportunities and threats, the SWOT matrix is shown in Table 1.

Table 1. Matrix SWOT.

Internal Factors	Strengths	Weaknesses
	1. The main role of a very strategic institution in the development of national unity and integrity 2. Full support from the ranks of local government leaders in carrying out their duties and functions 3. Sufficient personnel quantity 4. Supporting facilities	1. Lack of planners and skills 2. The process of registering mass organizations, publishing research recommendations, and archiving documents is still done manually 3. The data is not database yet 4. The service process takes a long time 5. The information presented in the report is not accurate 6. Data security is not optimal, so anyone can open and change it 7. There is no multi-user access to procedures that involve multiple stakeholders 8. There is no special function to manage registration services for mass

		organizations, publishing research recommendations and archiving 9. Documents can be engineered
External Factors		
Opportunities	**S-O Strategy**	**W-O Strategy**
1. The need for fast, precise, and accurate information 2. Other local governments are also still doing the service process manually 3. There is an opportunity to improve the quality of HR 4. The Kesbangpol Agency can work by following technological developments 5. Having regulations and bureaucracy that are not so complicated	1. Creating an information system for registering mass organizations, publishing research recommendations, and computerized archiving 2. Utilizing a LAN network or the internet to create a multiuser information system improving services to the community in the field of The National and Political Unity Agency 3. Improving the quality of human resources to support service effectiveness	1. Improving the quality and competence of human resources and skilled workers more professionally. 2. Improving the quality of facilities and infrastructure and their management in order to support the improvement of the performance of institutions and employees. 3. Creating an information system for registration of mass organizations, publishing research recommendations, and archiving that can provide services automatically.
Threats	**S-T Strategy**	**W-T Strategy**
1. Demands for the quality of performance that must be improved and can be accounted for 2. Competition between employees 3. The number of competent human resources is very limited 4. Government 5. The development of information technology is growing rapidly	1. Provide training to employees so that they can carry out the process of registering mass organizations, publishing research recommendations, and archiving correctly 2. Synergize the increasingly rapid technological developments with available computer facilities, to form competent human resources in all fields 3. Giving tasks according to the ability of employees	1. Improving the effectiveness of performance implementation which is marked by an increase in the manual service system to become computerized 2. Improve the data security system to prevent the threat of damage, loss, virus attacks, and access from irresponsible users

4.4. Business architecture

Business Architecture develops business architecture objectives that describe how the organization's current business architecture then develops the existing architecture, the next step is to conduct a gap analysis to develop a strategy on how

to achieve business goals and achieve strategic goals that have been implemented [14]. The stages of the business architecture are as follows:

Identify the Current Business Process Flow

- Registration of Social Organizations/Social Institutions
  - Requirements document research
  - Field Research
  - Issuance of Registered Certificate

The business process of registering mass organizations at the Kesbangpol Agency currently does not utilize a special information system. This can be seen in Fig. 3.

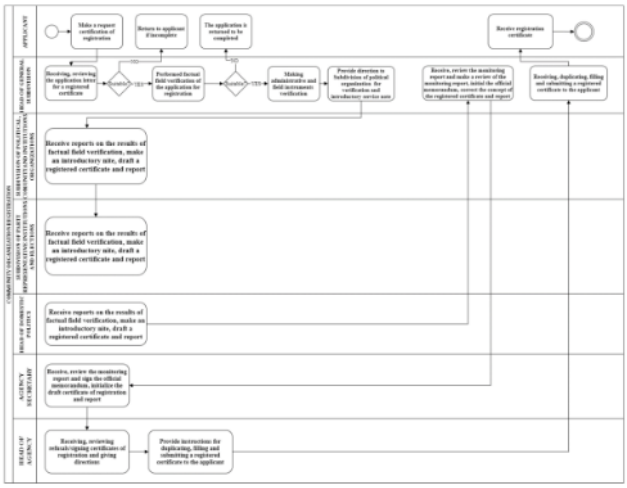

Fig. 3. BPMN Registration of social organizations/social institutions.

- Publishing Research Recommendations

  It is the same with the business process of registering mass organizations. The business process of publishing research recommendations at the Kesbangpol Agency currently also does not utilize the information system. This is shown in Fig. 4.

- Archive Management

  Archive management is divided into two, namely incoming and outgoing letters. In the current incoming mail procedure, there are two groups of letters, namely personal letters and official letters. The personal letters do not need to be verified by functional officials and are only scheduled and then forwarded to the recipient of the letter, while the outgoing letters are divided into two

groups, namely general outgoing letters and field outgoing letters. There are differences in the verification process for the procedures for the two groups of outgoing letters. The business process of managing archives at the Kesbangpol Agency of West Kutai Regency as shown in Fig. 5.

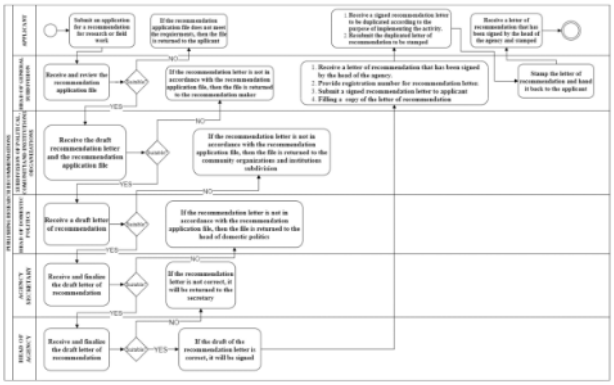

Fig. 4. BPMN issuing research recommendations.

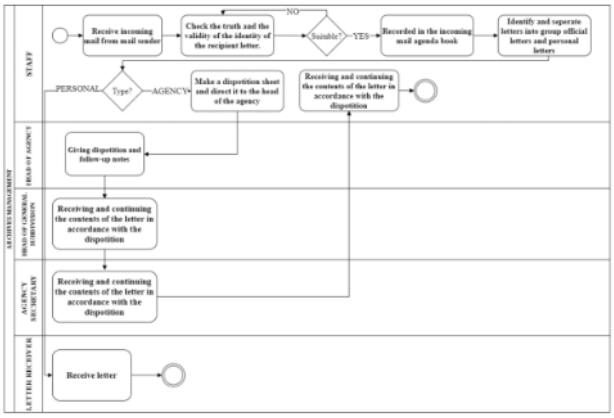

Fig. 5. BPMN archive management.

4.5. Information system architecture

This phase emphasizes how the information system architecture was built which includes the data architecture and application architecture that is used by the organization [15].

4.5.1. Application architecture

At this stage, the application architecture is designed to define the main information system/applications needed to manage data and manage business functions in existing business processes [16]. These applications are related to the business processes that have been analysed. Use case diagrams will be used for application architecture design, there are three use case diagram designs at the application architecture stage, namely use case diagrams for registration of community organizations, use case diagrams for research recommendations and use case diagrams for archiving (See Figs. 6-8).

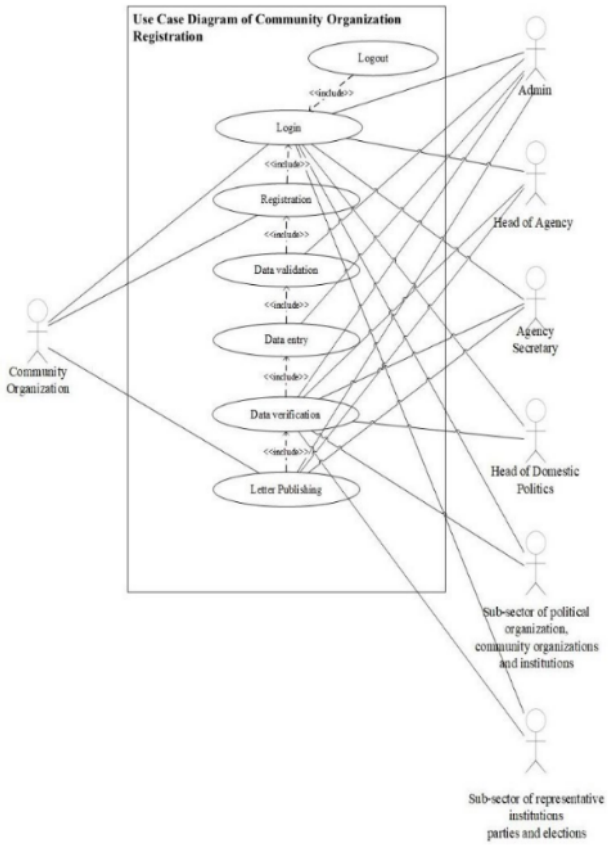

Fig. 6. Use case diagram of community organization registration.

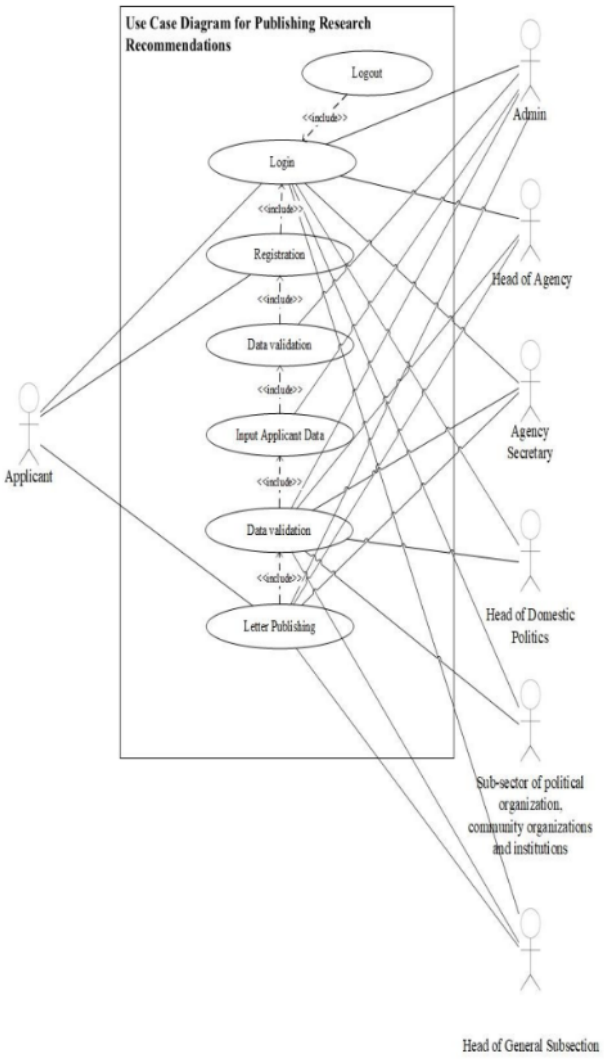

Fig. 7. Use case diagram for publishing research recommendations.

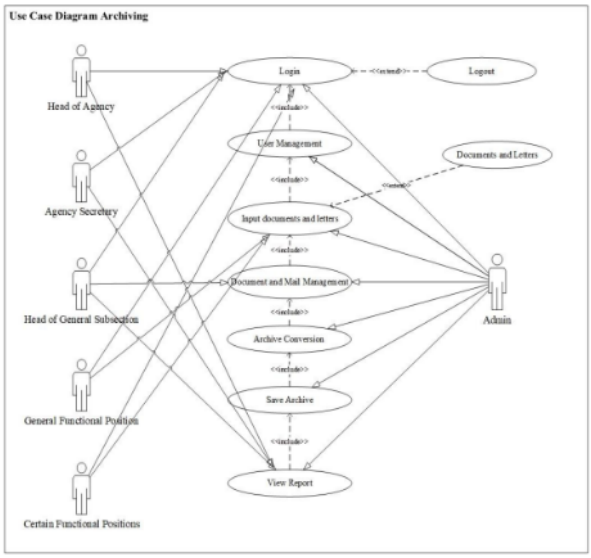

Fig. 8. Use case diagram archiving mail.

4.5.2. Data Architecture

At the data architecture stage, the stakeholders of the Kesbangpol need to have integrated and centralized data from various work units. It aimed to improve coordination and synchronization of business processes and so that information can be conveyed in a timely, accurate and relevant manner [14]. After the data is integrated, it is hoped that timely, accurate, and relevant information will be created.

4.6. Technology architecture

Consideration and determination of technology that will be used to support data processing through information system applications are also important in the efficiency and effectiveness of operational processing at the Kesbangpol Agency of West Kutai Regency. At this stage, the modeling of the technology architecture includes database modeling, data center technology modeling, and network infrastructure modeling. The purpose of this technology architecture modeling is to support the processing of the designed information system.

4.6.1. Technology architectural design

By referring to the current state of infrastructure at the Kesbangpol Agency of Kutai Barat Regency, a new information technology architecture can be proposed which is modelled in Fig. 9.

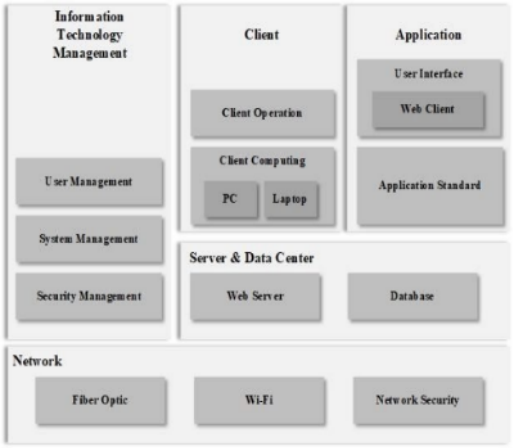

Fig. 9. Information technology infrastructure architecture.

4.6.2. Database technology design

The modeling of the Database Management System (DBMS) in the Kesbangpol Agency of West Kutai Regency is standardized using Microsoft's product, namely SQL Server.

4.6.3. Software technology design

The software that will be proposed at the Kesbangpol Agency of West Kutai Regency is described in Table 2.

Table 2. Proposed software specifications.

Software	Specification
Operating System	Windows Server 2019
Web Server	Apache
Web Browser	Mozilla Firefox, Google chrome
DBMS	SQL Server
Coding	PHP
Word Processing	Microsoft Word
Spreadsheet	Microsoft Excel
Presentation	Microsoft Power Point

4.6.4. Hardware technology design

Based on these considerations, Table 3 describes the proposed computer specifications that can be applied to the Kesbangpol Agency of West Kutai Regency.

Table 3. Proposed computer specifications.

Hardware	Specification
Processor	Intel Core I3 3,2 GHz
Expansion slot	PCI Express, PCI
RAM	8 GB
Network connection	10/100/1000 Mbps
Video type	Dedicated 512 MB
Hard drive	128 GB
Optical drive	DVD RW/Adapter
Keyboard type	USB
Mouse	USB optical mouse
Interface	Serial port parallel port, USB port audio
Monitor	LCD 14" 1024x768

4.6.5. Computer network infrastructure design

The network technology modeling proposed at the Kesbangpol Agency of West Kutai Regency is based on TCP-IP to improve computer network services that are more reliable and faster. The proposal of this network technology is modelled in Fig. 10.

In the description of the computer network architecture of the Kesbangpol Agency shown in Fig. 10, it consists of:

- Internet for planning the development of Information System at the Kesbangpol Agency in the future which is online with the proposed network capacity of 3 Mbps as an initial stage.
- Router as a local network connection modulator to the internet.
- Proxy with Mikrotik is used so that traffic to the Internet can be reduced and browsing for the Web can be accelerated.
- SWITCH HUB to deploy to the local network.
- VPN Gateway to provide network access to staff working in other places or at the same place.
- IPS (Intrusion Prevention System) to secure the network from intruders
- A firewall to separate the network from the public Internet network
- Wireless for internet user network access
- Server and External Storage to manage applications and other interrelated programs.
- HUB to share to administrator and client
- Printer for printing documents related to system
- Head of Agency as user/supervisor of system management activities
- All stakeholders starting from the 1st floor to the 2nd floor as network users.

Some of the developments that will be carried out on this architecture include:

- Network capacity increased to 3 Mbps.
- Wireless network access, (wireless (Wi-Fi) for client computers behind a firewall using the IEEE 802.11g standard which is secured with WPA-PSK and MAC address filtering. For guest access, it is exempted but limited to Internet access only.
- Several additional tools for security and that support IT infrastructure architecture that did not exist in the previous architecture.

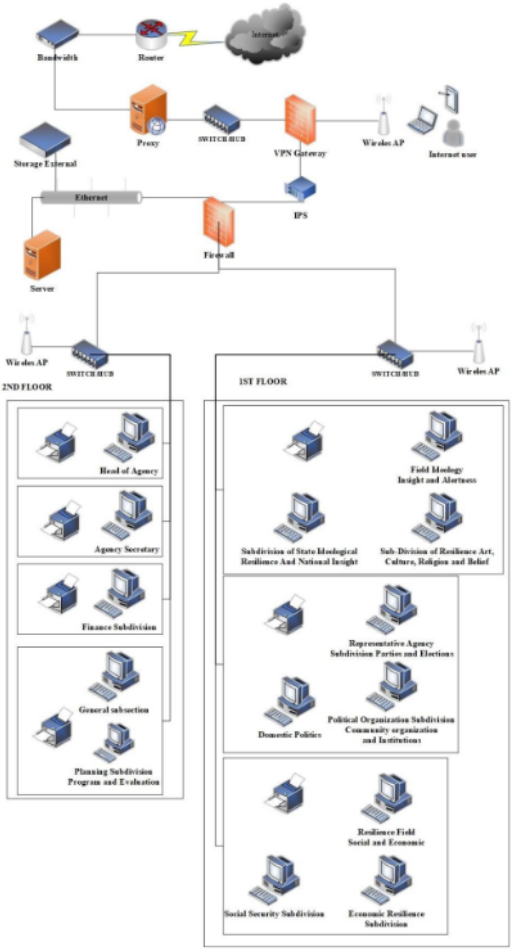

Fig. 10. Computer network architecture modeling.

4.7. Initial design

After completing the stages of the vision architecture to the technology architecture, the initial design will then be carried out to describe how the proposed application will look like, the following is the initial design of the application to be implemented (see Figs.11-13). This study is in line with previous reports [17-26].

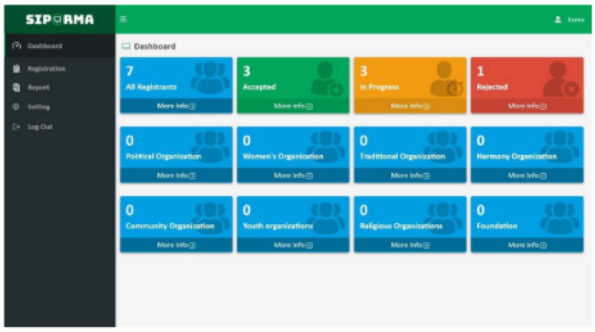

Fig. 11. Initial design of community organization registration application.

Fig. 12. Initial design of publishing research recommendations application.

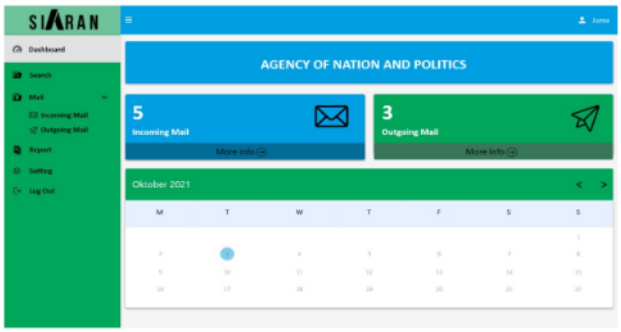

Fig. 13. Initial design of archiving mail application.

5. Conclusion

The design of enterprise architecture using TOGAF ADM at the National and Political Unity (Kesbangpol) Agency can be carried out in accordance with ongoing documents and processes and is able to produce blueprints so that it can support ongoing business processes. Business Architecture and Information System Architecture are planned in order to maximize the use of information technology using automation systems using applications that are integrated into each subsection. Also, the network architecture has been developed, which helps in the development of the existing information system architecture. Information system integration uses the TOGAF framework to align activity strategy and information technology strategy. The implementation of enterprise architecture design is carried out in order to create a Blueprint as a basis for the design and development of information technology.

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