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Development of Enterprise Architecture in Improving the Efficiency of Hajj and Umrah Services of the Ministry of Religious Affairs of Lubuklinggau City with TOGAF

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Abstract

The Ministry of Religious Affairs of Lubuklinggau City organizes government affairs in Hajj and Umrah services. This research aims to design an enterprise architecture that can align the implementation of information systems with ongoing business activities, to improve the quality of hajj and umrah services at the Ministry of Religious Affairs of Lubuklinggau City. The method used in this study is the TOGAF Architecture Development Method (ADM), which consists of several phases: introduction, architectural vision, business architecture, data architecture, application architecture, technology architecture, and opportunities and solutions. The results of this study are in the form of an enterprise architecture blueprint that includes artifacts in the form of diagrams, catalogs, and matrices to describe existing conditions and proposed target conditions. In addition, this study produces a roadmap as a reference for implementing the architectural design that has been made. In conclusion, designing an enterprise architecture using TOGAF ADM can support the integration of information systems and business activities, thus potentially increasing the efficiency and effectiveness of hajj and umrah services at the Ministry of Religious Affairs of Lubuklinggau City.

Keywords: Enterprise Architecture; TOGAF ADM; Blueprint.

1. Introduction

The Open Group Architecture Framework Architecture Development Method, referred to as TOGAF-ADM, is a framework for enterprise architecture that provides methods for designing, planning, implementing, and managing enterprise information technology architecture. It is widely used in the industry and is considered the leading enterprise architecture standard (Gil-Garcia et al., 2018). TOGAF-ADM is based on a four-part architecture development method (ADM) that guides organizations through developing and maintaining enterprise architecture. TOGAF-ADM has been widely adopted by organizations worldwide and is considered the leading standard for enterprise architecture. It is widely used in both the public and private sectors and has been embraced by organizations of all sizes and industries. (Hinkelmann, et al, . 2016)

The main reason for using TOGAF (*The Open Group Architecture Framework*) in the development of *Enterprise Architecture* (EA) is that TOGAF facilitates effective communication between various stakeholders (management, technical teams, and end users) through well-defined guidelines and documentation, then TOGAF encourages interoperability standards between systems and applications, thus facilitating technology integration in various operational environments.

In this study, researchers prefer TOGAF EA compared to Zachman because TOGAF provides a step-by-step *roadmap* to achieve concrete results, while Zachman only helps in organizing information. In addition, TOGAF is more in-depth in bridging business needs with technology, making it suitable for organizations that want to leverage IT as a strategic *enabler*. TOGAF provides a practical and iterative approach that is more suitable for organizations that want to implement *enterprise architecture* effectively, not just documentation.

The benefits of the *framework* can help improve the organization's business strategy, increase the ability to market the latest innovations faster, have consistent information and business processes, be more secure, and reduce the risks and costs of implementing information systems (Puspitasari and Kamisutara, 2022). The purpose of the *framework* is to optimize integrated processes that support changes in business strategy (Al Qadr Saleh and Dewi, 2020) (Murungan and Shanti, 2021)

One form of information system implementation is online taxpayer registration. However, the application of this information system is not optimal, especially in the city of Lubuklinggau. The process of registering for Hajj through Haji Pintar still requires managing the requirements manually. For example, prospective pilgrims must travel back and forth to deposit and open hajj savings, from the Ministry of Religion to the BPS-BPIH bank to submit a Hajj Registration Letter

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(SPH). In addition, prospective pilgrims who do not have a birth certificate must first take care of it at the Population and Civil Registration Office (Dukcapil). In Lubuklinggau City, the management of Information and Technology (ICT) in the Ministry of Religious Affairs is handled by the information and public relations subsection.

However, the information and public relations subdivision itself does not have an *enterprise architecture* plan to support the development of ICT or *e-Government* which is the basis for policy and technical in building, developing, and implementing ICT at the Lubuklinggau City Office of the Ministry of Religious Affairs. System implementation in the Office of the Ministry of Religious Affairs of Lubuklinggau City has several processes that do not run according to applicable procedures. There are frequent errors in the index, errors in Hajj and Umrah data reports, and column errors when backing up data. Problems also exist in the process of entering Hajj and Umrah registration requirements which are still not integrated with the system. The information system also does not have system documentation such as a *blueprint* for *enterprise-scale* system development and maintenance.

Planning that can be used to describe the entire system that can help development, and help operational performance of the need for information flow between parts and systems. TOGAF-ADM is used as a method in the development of *enterprise architecture* as a form of planning so it is expected to be designed business architecture, information systems architecture, and technology architecture, based on the conditions of the Lubuklinggau City Office of the Ministry of Religion.

Research conducted by Putra and Sumitra (2022) develops existing information systems by designing service, planning, and reporting systems in the Identification Division of the Cimahi City Revenue Management Agency. The results of the analysis of the application of the TOGAF ADM method in the form of corporate architecture modeling provide direction in the development of future information systems in the field of identification of the Cimahi City Revenue Management Agency. Then another study by Andry, Sugian, Kartin, and Pranamya (2022) revealed that the role of *enterprise architecture planning* that can provide a *framework* as a reference for information system development is TOGAF (*The Open Group Architecture Framework*)-ADM. The research results are in the form of a blueprint for the company's enterprise architecture because it can provide a *framework* as a reference for developing information systems. However, there are still some things that must be improved and maintained to reduce errors when using this delivery service. System development with TOGAF-ADM was also carried out by Puspitasari and Kamisutara (2022), Perez-Castillo, et al, (2019), and Puspitasari and Kamisutara (2022) that *The Open Group Architecture Framework Architecture Development Method* (TOGAF-ADM) methodology produces information system designs for each business subunit with the main objective of improving performance in each sub-organization to produce relevant, accurate and timely information.

Other research on *enterprise architecture* is Sari and Manuputty (2018) about *enterprise architecture* planning using The TOGAF-ADM (*Architecture Development Method*) at the Salatiga City Health Office produces reference material in the development of information systems/information technology at the Salatiga City Health Office, and for further researchers can reach the implementation stage, application development can be applied to be able to help the performance of the business processes of the Salatiga City Health Office. From the above research, the TOGAF-ADM *framework* was chosen because it is considered capable of describing the required enterprise architecture design with detailed methods and *tools* to be implemented.

SISKOHAT is an IT unit within the Office of the Ministry of Religion of Lubuklinggau City, because the existing system is not running, the steps that need to be taken are to be developed using the TOGAF-ADM method. With the application of TOGAF-ADM and *enterprise architecture* as its object, it can be used for the development of information systems to determine the scope of the enterprise, methodological approach, business modeling, identification of organizational structure, business model, and *information resource catalog* and can define the type of technology architecture, data distribution to applications, network architecture schemes and distribution of technology foundation.

The formulation of the problem in this study is that TOGAF-ADM architecture modeling can help design application architecture to improve integration between existing applications in the Hajj and Umrah services of the Ministry of Religion of Lubuklinggau City and improve the performance of existing systems.

2. Theoretical Framework

Enterprise architecture framework serves as a tool for designing and developing *enterprise* architecture to classify complex information (Andry, et al., 2022)

2.1. Enterprise Architecture Planning (EAP)

It is an important strategic approach to develop *enterprise* architecture effectively. EAP has seven main components that are referenced in this development process. First, the *business architecture* describes the business processes, organizational strategies, and goals that underlie *enterprise* activities. This component is very important because it provides the foundation for all activities carried out in the organization.

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Furthermore, *information architecture* plays a role in managing data and information used in business processes. With good management, information can be accessed easily and used effectively to support decision-making. The third component is *application architecture*, which describes the applications or software systems used to support business processes. Appropriate and integrated applications can improve organizational efficiency and productivity. *Technology architecture* is the fourth component, which identifies the technology infrastructure that supports applications and information systems. A robust and reliable infrastructure is essential to ensure that applications and information systems can function properly. In addition, *architecture governance* serves to implement the *enterprise* architecture. With good governance, architecture development can be carried out in a planned and structured manner.

The sixth component is the *security architecture*, which provides protection mechanisms to ensure the security of data, applications, and technologies used. Security is a crucial aspect in today's digital age, where threats to data and information systems are increasing. Finally, *change* management plays a role in managing the changes required to keep the architecture relevant and in line with the dynamic needs of the organization. Effective change management ensures that the organization can adapt quickly to environmental changes and market demands. Taken together, these seven components are interrelated and support each other in the quest to develop an effective *enterprise* architecture. With a deep understanding of each component, organizations can design and implement the right strategies to achieve their business goals. EAP is not just a framework, but also a guide that helps organizations face challenges and take advantage of opportunities in an ever-changing world.

2.2. TOGAF ADM (Architecture Development Method) Framework

The cycle or stages in TOGAF ADM (*Architecture Development Method*) in research Puspitasari and Kamisutara (2022) consists of 9 stages can be shown in Figure 1.

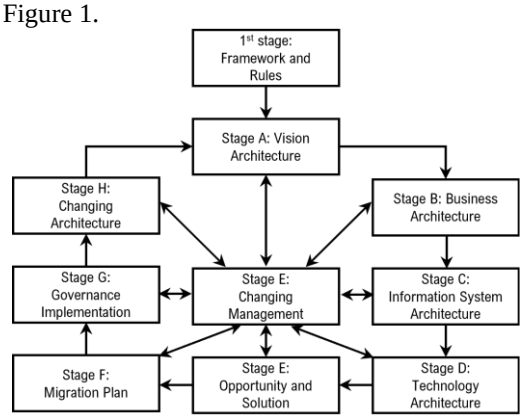

Figure 1. TOGAF Architecture Development Method

TOGAF ADM consists of an iterative cycle that includes several phases, each with specific goals and *outputs*.

a. Initial Phase
b. Phase A: Vision
c. Phase B: Architecture
d. Phase C: System Architecture
e. Phase D: Architecture
f. Phase E: Opportunities and Solutions
g. Phase F: Planning
h. Phase G: Management
i. Phase H: Architecture Change Management
j. Phase I: *Requirements Management*

3. Methods

The research method refers to the methodology and stages of *enterprise* architecture planning (EAP). For the stages of the TOGAF *Architecture Development Method* (ADM) used, namely vision architecture to create future *enterprise* architecture, business architecture which includes business processes and organizational functions, information architecture which includes data architecture and application architecture that supports business processes and technology architecture which includes alternative technologies used (Puspitasari and Kamisutara, 2022).

This research is a case study and the research method is descriptive analytical. Data collection techniques used interviews, observations, and distributing questionnaires to several respondents selected based on their abilities and relevance to their work. All respondents' answers can be justified (Putra and Sumitra, 2022). For performance measurement, the application uses the IT *balanced scorecard* method. The IT *balanced scorecard* method consists of an organizational contribution perspective, a user orientation perspective, an operational excellence perspective, and a future orientation perspective.

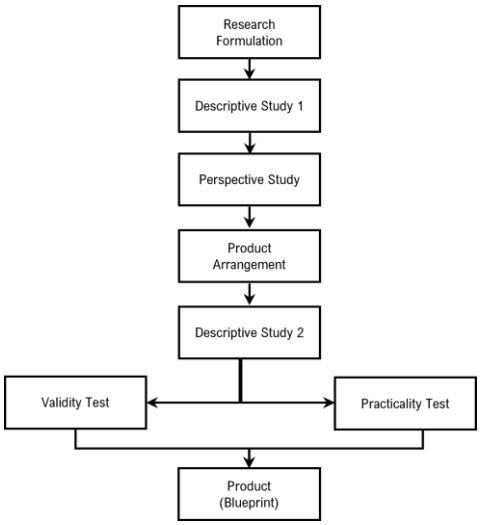

Figure 2. Research Procedure

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In Figure 2, this research begins with the identification of EA needs at the Ministry of Religion of Lubuklinggau City in Hajj and Umrah services. Then proceed with data collection, in the form of observations and interviews with position holders and also the information system that is running at the Ministry of Religion of Lubuklinggau City in Hajj and Umrah services. After that, the information system that is running is analyzed whether it is effective or not, namely with TOGAF ADM. Then, compare the current information system with the information system that has been developed with EA TOGAF ADM.

The validity test aims to ensure that the architecture developed using the TOGAF framework can produce an architectural solution that is true to the needs of the company, in this case, the Ministry of Religious Affairs of Lubuklinggau City. Some techniques that can be used to test the validity of the architecture include gap analysis testing, prototype testing, and integration testing with other systems in the company. The practicality test aims to ensure that the enterprise architecture developed using the TOGAF framework can be implemented effectively and efficiently. Some techniques that can be used to test the practicality of the architecture include load testing, integration testing, and reliability testing.

4. Results and Discussion

In this chapter, we will discuss the results of research using TOGAF ADM with six stages of the nine stages, namely the introduction phase, architecture vision, business architecture, information architecture, technology architecture, and opportunities and solutions. In this research, the data collected are the results of interviews, observations, and studies of organizational documents.

4.1 Results

4.1.1. Preliminary Phase

Identification of current business processes is done by interviewing relevant *stakeholders*. Existing business processes are divided into main activities and supporting activities. In the identification of business processes use Value chain diagram analysis. The results of the identification of business processes that run at this time can be seen in Figure 3:

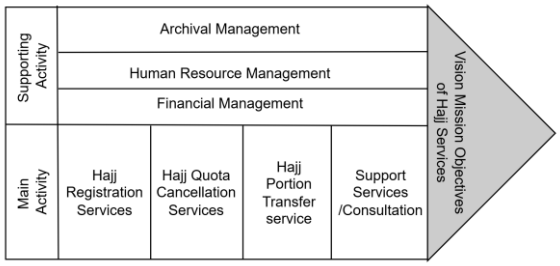

Figure 3. Value Chain Diagram

Based on Figure 3, it can be concluded that the *enterprise* environment is divided into two categories, namely main activities and supporting activities. The main activities include Hajj registration services, Hajj portion cancellation services, Hajj portion delegation services, and consultation services regarding Hajj and Umrah departures. The development that will be carried out by the PHU Division of the Ministry of Religion Lubuklinggau includes the procurement of equipment, software, hardware, and procedures in the transformation of archive management services, namely creating an archive database for data from 2012 onwards which is still in the form of files in the filing cabinet, using Microsoft Office Excel. HR management includes employee data collection, employee attendance, and employee payroll. In financial management, the funding structure comes from the government through the PKOH (Hajj operational financial management) fund.

Based on the analysis of ongoing business processes, it can be described in the *solution concept* diagram. Defining this solution concept is the result of interviews with relevant *stakeholders* and needs in the PHU field. In the *solution concept* diagram, it can be seen how applications are integrated, the data storage process, as well as system and network security. This diagram also displays the application of architectural principles, namely IT alignment with business, data security and confidentiality, and integration between applications. *The solution concept diagram* can be seen in Figure 4:

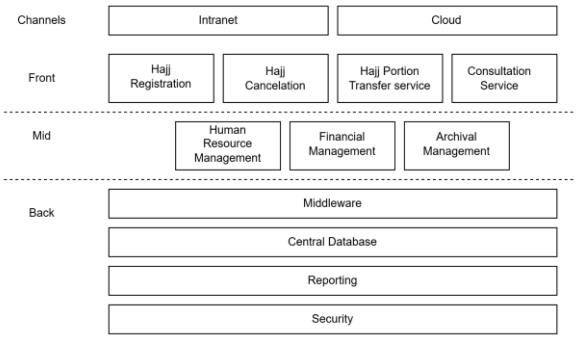

Figure 4. Solution Concept Diagram

4.1.2. Business Architecture

Business architecture is designed after architecture vision based on *value chain* analysis. At this stage, describing and defining the organization's current business architecture is carried out, then continued with the development of future business architecture, and analyzing *gaps* as a basis for developing strategies to achieve business goals.

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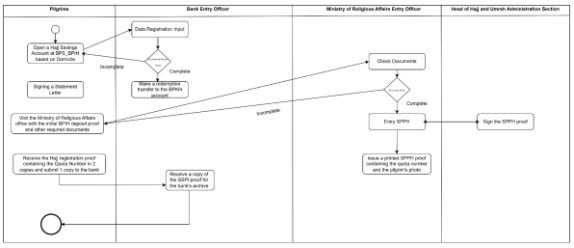

Figure 5: Current Business Process of the Hajj Registration Service Process

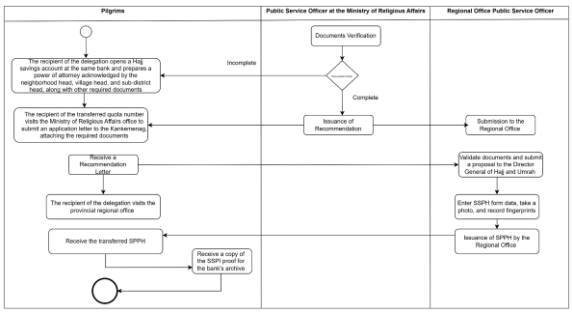

Figure 6: Current Business Process in the Hajj Portion Delegation Service Process

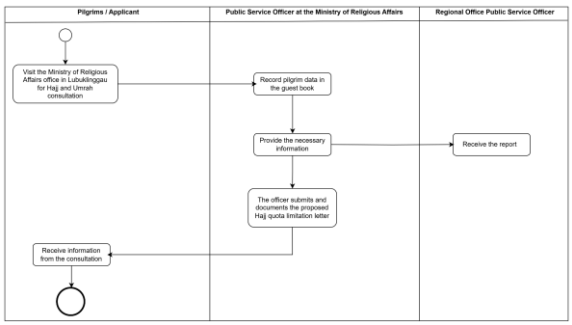

Figure 7. Current Business Process in the Consultation Service Process

4.1.3. Development

The development of the future business architecture is a strategic step to transform the current business architecture. Through in-depth analysis of the current business architecture and interviews and observations, steps that are considered processes that reduce the effectiveness and efficiency of the process will be removed and replaced with new digitized processes. The new processes created will make it easier for users and improve the quality of key business services.

Based on the results of the development of the current business architecture, a business architecture that does not yet have an application can be defined. The future business architecture will be described in BPMN notation:

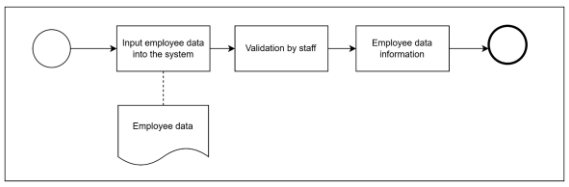

Figure 8. Future Business Processes in the Personnel Management Process

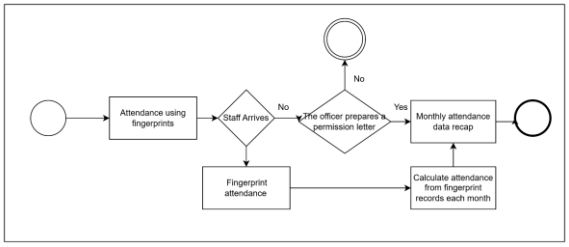

Figure 9. Future Business Process on Employee Attendance

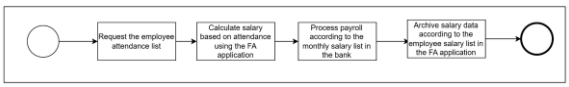

Figure 10. Future Business Process on Employee Payroll

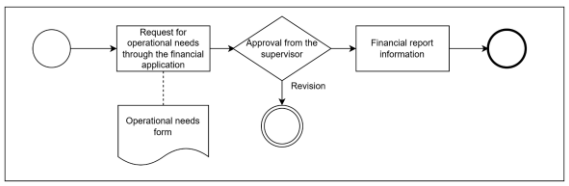

Figure 11. Future Business Processes in Financial Management

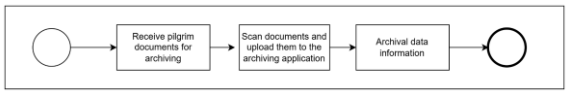

Figure 12. Future Business Processes in Archive Management

The *information system architecture* stage is the development of information systems that will be used by the organization which includes data architecture and application architecture. In data architecture planning, it is necessary to define data entities based on each business process that has been defined on the *value chain* diagram. The definition of data entities is focused on the development of future business architecture. The definition of data entities can be seen in Table 1:

Table 1. Data Entity Catalog

No.	Data entity	Logical data components
1	Employee	• Id_employee : int (PK) • Id_Jabatan : int (FK) • Employee name: varchar • Gender: char • no_telp : char • date_birth : date • place_birth : varchar

		• address: varchar • email: varchar
2	Congregation	• Id_Jamaah: int (PK) • Name_jamaah : varchar • Gender: char • no_telp : char • date_birth : date • place_birth : varchar • address: varchar • email: varchar • no_validation :char • no_portion : char
3	Position	• Position id: int (PK) • Position_name : varchar
4	Salary	• Id_wage: int (PK) • Position id: int (FK) • salary_pokok : float • allowance: float • taspen: float • piece_other : float • overtime: float
5	Archive	• Id_archive: int (PK) • Archive_name : int • Date_archive : date • Stock: int • type_archive : int
6	Leave	• Id_cuti: int (PK) • Leave_name : varchar
7	Attendance	• Id_absence: int (PK) • Id_employee : int (FK) • Date: date • Hour_in: time • Time: time • Overtime: int
8	Payroll	• Id_penggajian : int (PK) • Id_Employee : int (FK) • Month: date • Number_absence : int • Number of leave: int • Number of pieces: float • Number_loose : float • Amount_tunjangan : float • salary_pokok : float • amount_salary : float

At the *technology architecture* stage, the activities carried out are designing and developing the desired technology architecture. The first step is to compile technology proposals based on the current architectural conditions obtained from observations and interviews with *stakeholders* in the PHU section. Information about the *hardware* and *software* used can be seen in Table 2:

Table 2: Current Hardware and Software

No.	Hardware	Software	Description
1	PC (Personal Computer)	OS: Windows	There are 3 PCs CS Section: 1 Finance Section: 1 Siskohat Section: 1
2	14" Laptop	OS: Windows	There is 1 laptop for the PHU Section Head
3	UPS	-	There is 1 UPS (for siskohat PC)
4	Internet Bandwidth	-	10 Mbps Unlimited Capacity

In Figure 13, the network infrastructure diagram will depict the environmental design and location of the technology to be implemented in the PHU section:

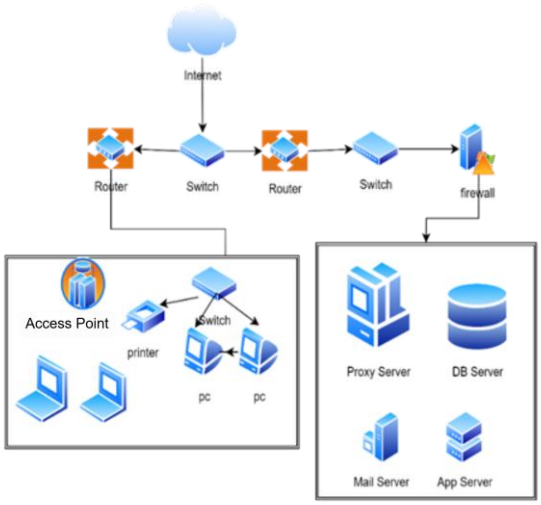

Figure 13. Blueprint Diagram of Network Infrastructure

The next step is to analyze the gap between the current technology architecture and the expected conditions, more details can be seen in Table 3:

Table 3. Current Technology Architecture

Category	Findings
Technology improvements	Bandwidth capacity needs to be increased because it is still insufficient to support the speed of data processing.
Technology creation	Unavailability of hardware and software in each part of the organization as in the technology portfolio catalog.

After conducting a gap analysis, the next step is to prioritize technology changes to achieve the desired technology architecture, as shown in Table 4:

Table 4. Desired Architecture

Category	Findings
Technology creation	Unavailability of hardware and software in each part of the organization as in the technology portfolio catalog.
Technology improvements	Bandwidth capacity needs to be increased because it is still insufficient to support the speed of data processing.

Based on the *gap* analysis previously described, the constraints and business solutions from the condition of the business architecture of the PHU section of the Lubuklinggau City Ministry of Religious Affairs are described in Table 5:

Table 5. Business Architecture Condition of the PHU Section

Category	Findings	Solution

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People	• Staff sometimes still do work that is not their main tasks and functions, so that certain parts are less focused on their work. • There are no employees who are experts in the IT field (to supervise and control information technology systems in the organization).	• Conduct employee recruitment in areas that are still short of employees • Create the main tasks and functions of each position
Process	Business processes are not effective and efficient	Perform business process improvement by business process architecture planning using elimination, integration, simplification, and automation.
Tools	Some processes have not been automated	Creation of *tools* for easy automation of business processes
information	There is no integration of information between sections	Performed information integration process and created information flow documents related to *enterprise* architecture.

Based on the *gap* analysis previously described, the constraints and solutions to the condition of the data architecture in the PHU section of the Lubuklinggau City Ministry of Religious Affairs are described in Table 6:

Table 6. PHU Data Architecture Condition

Category	Findings	Solution
Data not yet available	There are no data entities available to support business processes contained in several activities such as financial management activities, HR/personnel management, and archive management.	Creation of all data in each business function of the organization and reassessment of data needs in each section.

Based on the *gap* analysis previously described, the constraints and solutions of the application architecture conditions in the PHU section of the Lubuklinggau City Ministry of Religious Affairs are described in Table 7:

Table 7. The Architecture Condition of the PHU Application

Category	Application Name	Current condition	Solution
New Apps	*Financial Accounting* *HR Administration* e-Archive	Application not yet available	Perform the required application creation

Based on the *gap* analysis previously described, the constraints and solutions to the condition of technology architecture in the PHU section of the Ministry of Religion of Lubuklinggau City are described in Table 8:

Table 8. PHU Technology Architecture Condition

Category	Findings	Solution
Technology improvements	*Bandwidth* capacity needs to be increased because it is still insufficient to support the speed of data processing and transactions.	*Upgrading bandwidth* capacity so that the organization's needs for internet capacity can be met
Technology creation	Unavailability of hardware and software in each part of the organization as in the *technology portfolio catalog.*	Procurement of hardware by the needs of the developed software

4.2. Discussion

Validating the results of research on the *TOGAF Architecture Development Method* (ADM) for the Development of *Enterprise* Architecture for Hajj and Umrah Services at the Ministry of Religious Affairs of Lubuklinggau City has been carried out by researchers systematically to ensure its reliability, relevance, and applicability, with steps namely:

a. The data used is complete, valid, and according to *stakeholder* needs.
b. The system *prototype* was successfully tested and had a positive impact on service performance.
c. Each phase of TOGAF ADM has been applied correctly and consistently.
d. There is support from experts, *stakeholders*, and trial results that show the success of the system.
e. The resulting solution can be adapted for future needs.

The old system in the Ministry of Religious Affairs Lubuklinggau experienced several problems, such as manual processes in archives and Hajj services, incompatibility of information between sections, and human resource performance constraints. Information technology had not been focused on in the budget and there were deficiencies in data security management

and system integration. Inefficient business processes slowed down services and posed a risk of data corruption. After the implementation of TOGAF ADM, there was an improvement through six main stages: *Preliminary, Architecture Vision, Business Architecture, Information System Architecture, Technology Architecture, and Opportunities & Solutions*. In TOGAF, the integrated system includes technology, data, and applications, overcoming previous problems with manual process elimination, archive digitization, and information integration. Technological changes such as increasing *bandwidth*, procuring new devices, and implementing personnel and financial applications, improved efficiency and security.

TOGAF also brought a new approach to people management, with clearer assignments and training to improve adaptability to new systems. *Enterprise* architecture principles were applied, such as data security, integration between applications, and alignment of technology with the business. *Gap analysis* helped in designing a *roadmap* to achieve change targets with a focus on automation and simplification of business processes. The use of technology and data that is more structured with TOGAF helps organizations to identify obstacles and solutions faster, and improve the quality of Hajj services. The separation of business processes into *the Front Office* and *Back Office* clarified roles within the organization and ensured the main services remained focused on Hajj registration, cancellation, and portion assignment. Changes in technology architecture provided a blueprint that showed network connectivity and the fulfillment of hardware and software requirements for each section. TOGAF provides a *framework* that facilitates incremental technology updates, ensuring the organization can adapt to changing needs and regulations.

Enterprise architecture is a master plan that integrates various aspects of the organization, including business planning, goals, vision, mission, and governance principles to improve business efficiency through information management and information technology strategies (Silaen and Mastan, 2021). Its advantage lies in its ability to make each department understand and support each other in achieving organizational goals (Perez-Castillo, et al., 2019). *Enterprise* architecture frameworks, such as *The Open Group Architecture Framework* (TOGAF), serve as tools for designing and developing architectures to classify complex information (Andry, et al., 2022). TOGAF uses the *Architecture Development Method* (ADM) methodology which includes several stages to develop and maintain the organization's architecture technically. ADM is an interactive cycle, enabling new decisions to be made to determine the scope, level of detail, objectives, and time targets (Laia et al., 2022).

The TOGAF *framework* can help overcome organizational problems, such as the lack of community data collection archives, by providing direction to optimally utilize technology and information systems to improve performance (Angeline and Fibriani, 2021). Planning using TOGAF ADM can produce an *enterprise* architecture *blueprint* that includes business functions, data entities, application modules, and hardware and software procurement (Sofyana, 2017). With proper implementation, TOGAF can optimize organizational functions, align enterprise systems with business strategies, and model comprehensive alignment between business and information technology (Puspitasari and Kamisutara, 2022).

5. Conclusion

The implementation of TOGAF ADM in Kemenag Lubuklinggau successfully overcame various problems in the old system that were still manual and inefficient. TOGAF ADM is implemented through six main stages, integrating technology, data, and applications, overcoming problems with the elimination of manual processes, digitizing archives, and integrating information between sections. The problems of time-consuming archival processes and Hajj services, information incompatibility between sections, HR performance constraints, and lack of focus on information technology in the budget were overcome. Weaknesses in data security and system integration, which slowed down services and increased the risk of data corruption, were also addressed. The new technology architecture provides a *blueprint* for network connectivity and the fulfillment of hardware and software needs in each section.

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