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Enterprise Architecture Design of Indonesian Engineers Association Using The Open Group Architecture Framework (TOGAF)

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KEYWORDS
enterprise architecture, TOGAF framework, TOGAF ADM, information architecture, technology architecture

ABSTRACT
The Indonesia Engineers Association has used Microsoft Dynamics Axapta (AX) enterprise resource planning (ERP) software as its operational support system. However, there are obstacles that are obstacles to completing business processes effectively by users, which have an impact on declining work performance and not achieving company targets. In addition, for the next 3 years, IT solutions are also needed to be able to support business development in the company. The implementation of Enterprise Architecture is expected to be the answer for the Indonesia Engineers Association in the next 3 years, so that the company can be more productive and develop as well as there is alignment between the business strategies owned by the company to optimize the use of information systems and information technology owned by the Indonesia Engineers Association. The basis for choosing using the TOGAF ADM method in designing Enterprise Architecture is that TOGAF ADM has a complete methodology, clear and structured stages, so that the design and specifications become easier and reduce the implementation risks faced by the Indonesia Engineers Association. This research is expected to provide insights for policymakers and enterprise architecture practitioners in selecting and implementing the framework that best suits the context and needs of their organizations. In addition, this study also provides recommendations to improve the efficiency and effectiveness of the implementation of enterprise architecture in the Indonesia Engineers Association.

INTRODUCTION

Technological developments occur very quickly, as evidenced by the increasing role of technology in various fields of life. A company without Information Technology (IT) is impossible to run effectively and efficiently, because information technology is one of the factors that determine a company in making business policies that will achieve maximum profits (Afarini & Hindarto, 2023). Therefore, a well-organized information technology infrastructure is needed. Information technology infrastructure is one of the information technology investments needed by companies in managing all information technology needs (Aji et al., 2023).

The Indonesia Engineers Association (PII) The Indonesia Engineers Association (PII) is a professional organization that accommodates Indonesia engineers to gather together. PII was established to strengthen the cooperation of engineers so that they can become a real force to build the Indonesia nation (Alhari & Fajrillah, 2022). Developing the competence of the engineering profession. PII develops science and technology-based engineering professional competencies. PII carries out the implementation of engineering in Indonesia, which is an engineering activity that uses expertise and expertise to increase added value and utility. PII helps formulate, establish, and implement policies in the field of advocacy and community service (Bernard, 2012).

In the digital era and global competition, PII needs to ensure that the information technology infrastructure and business processes used can support the organization's strategic goals. Enterprise Architecture (EA) is a design or blueprint of the company that is tailored to the needs of the company, by aligning the company's business direction with the IT direction. EA design plays a role (Darkel & Emanuel, 2023).

Also in building a business architecture, which is derived from the company's direction tactically into managerial targets outlined in the capability of the business, which will later be mapped into operational work standards. With the definition of business architecture, IT can define the form of support for business needs described in Information Architecture, Application Architecture and Infrastructure Technology Architecture (Girsang & Abimanyu, 2021). In the process of designing Enterprise Architecture, there are several stages of activities that must be carried out. The stage starts from collecting data about the actual condition of the company, through the Interview and Discussion process. Then it is continued with the analysis and depiction of architecture which is the hope in the future, through the Analysis and Design process which is then described in the Reference Arcihtecture.

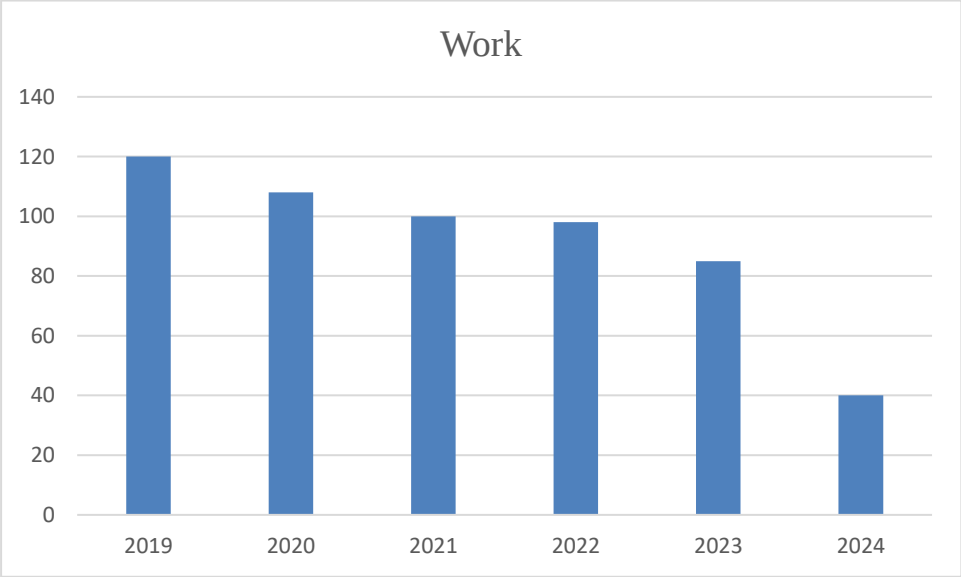

Figure 1 Employee Performance Graph

Based on graph 1 of employee performance in a period of 5 years starting from 2024 to 2019, Indonesian engineer companies began to implement Microsoft Dynamics Axapta (AX) enterprise resource planning (ERP) software, there are many obstacles (Hartawan et al., 2024). However, there are obstacles that occur, including unstable systems, bugs that often appear, data inconsistency, and other obstacles. This causes various obstacles to complete business processes effectively by users, which has an impact on declining work performance and not achieving company targets, therefore a company design model or blueprint is needed that is tailored to the company's needs, by aligning the company's business direction with IT direction (Liao & Wang, 2021).

Enterprise Architecture is used to plan and manage a large complex system. In the current e-business era, EA plays an important role for an organization or company, where with the existence of customer-oriented front-end applications and the need to connect to a number of back-end applications, EA itself has placed itself as a necessity to integrate between these services and applications (Mokone et al., 2019). According to The Open Group, Enterprise Architecture is an organization's blueprint to determine the direction of business, information and technology used so that the company or organization is able to achieve the mission and vision of the organization. EA can also be defined as a collection of principles, methods or models that can be used as a design to organize all enterprise business processes, information needed and supporting technologies which include hardware, software and networks in general, so that it is expected to have the ability to align the vision and mission of the company to carry out business (Surendro, 2009).

The description of the actual architecture of the company is poured into the Current Architecture process. Based on the results of the Reference Architecture and Current Architecture designs, validation is then carried out on the relevant users. Then it is continued with the Gap Analysis process to compare the difference between the current actual condition (Current) and the ideal condition later (Reference) (A. Setiawan & Yulianto, 2018). In the Activity Candidate and Dependency process, candidates for activities or projects that need to be carried out are determined to meet the existing gaps, so that Roadmap and Target Architecture planning can be made in an effort to meet the Reference Architeture design. The next process is the Governance Plan to determine the regulations that should be applied to the company and Team Competency as a reference for the competence of the team's abilities needed to meet the needs of the plan in the Roadmap that has been prepared (Sista et al., 2021).

The current architecture of the company that has been created will be confirmed and compared with the ideal architecture (Reference Architecture). The results of the comparison will be included in the gap analysis. Gap analysis will be a reference for improvements that need to be made by the company. For example, improvements to business processes, additional tools, and so on (Rakhman et al., 2019). The next stage after the Enterprise Architecture Design is completed is the implementation stage. The implementation process requires several preparations such as determining and planning the resources needed, calculating the estimated investment cost, and determining the amount of resources and technology needed. The use of cutting-edge technology will not run well without effective system support and human resources who have the capability to run these systems and technologies. Therefore, these three factors play a very important role (Satzinger et al., 2010).

Enterprise architecture planning is considered important because of its ability to capture information needs when the business environment changes. Given the importance of developing information systems in companies, PT Puma Logistic Indonesia needs to make an enterprise architecture plan. For this reason, in this study, an enterprise architecture planning using the TOGOF framework is proposed. TOGAF was chosen because it has the advantage of focusing on the Architecture Development Method (ADM) implementation cycle, more detailed, complete and open source (E. B. Setiawan, 2009).

According to Ismah et all (2024) TOGAF offers a more structured approach with clear phases, while FEAF tends to provide more general guidance. The TOGAF implementation process requires significant commitment and time, while FEAF may be faster to implement due to its more focused scope. can draw conclusions that the TOGAF method is a better and superior method than the FEAF method.

TOGAF (The Open Group Architecture Framework) is a framework which is one of the methods often used in a company or organization to help the company to develop the Enterprise Architecture owned by a company or organization. TOGAF functions to design, evaluate and build the right EA for a company, in this case the Indonesia Engineers Association

(PII). This TOGAF method is considered suitable for designing Enterprise Architecture in the Indonesia Engineers Association (PII). From the Enterprise Architecture design, it is expected to be able to provide improvements for the Indonesia Engineers Association (PII) in the next 3 years, so that the company can be more productive and develop as well as there is alignment between the business strategies owned by the company to optimize the use of information systems and information technology owned by the Indonesia Engineers Association (PII). The determination of the 3-year period is based on:

- Enterprise architecture is a strategic and long-term level, with a time range of 3 - 5 years (Sparx systems, 2016).
- In an IBM survey, 8 out of 10 CEOs said that their organization faces substantial changes over the next three years. These changes include social changes and corporate capabilities, business and IT convergence, and government policies (Jensen, 2011). So that the creation of enterprise architecture for the next 3 years is expected to still be relevant because it is expected that there will be no major changes in the social side and company capabilities, business and IT convergence, and government policies

As for the selection of the TOGAF method used in this study because this method has advantages over other methods, namely:

- The phases in architectural development, namely the Architecture Development Method (ADM), are carried out sequentially.
- It is open. Provides a collection of resources including guides, templates, background information to assist architects in using ADM.

With these privileges, the design and specifications become easier to implement, thereby minimizing the implementation risks faced by the Indonesia Engineers Association (PII).

The novelty of this research lies in its application of the TOGAF ADM (The Open Group Architecture Framework Architecture Development Method) in designing an Enterprise Architecture (EA) for the Indonesian Engineers Association (PII). This research uniquely tailors TOGAF ADM to address specific challenges faced by the PII, such as system instability and data inconsistency in their current use of Microsoft Dynamics Axapta (AX) for enterprise resource planning. By aligning the business and IT strategies, the study proposes a comprehensive EA design to improve productivity and efficiency over the next three years. Additionally, the research highlights how TOGAF ADM, with its structured methodology, can minimize implementation risks, offering a practical and adaptable solution for professional organizations like PII. This study also contributes to the discourse on EA by comparing the advantages of TOGAF ADM over other frameworks like FEAF, thus providing insights for policymakers and practitioners on choosing the most suitable framework for their specific organizational needs. The purpose of this study is to identify and compare the main elements of TOGAF AD.

The benefits of this research are multifaceted. First, it provides a practical framework for the Indonesian Engineers Association (PII) to align its business processes with IT strategies, leading to improved operational efficiency and productivity. By implementing the TOGAF ADM framework, PII can address existing challenges, such as system instability and data inconsistency, ensuring a more stable and efficient enterprise resource planning system. Second, this research offers insights for other organizations facing similar challenges, as it demonstrates how the structured phases of TOGAF ADM can minimize risks during the implementation of Enterprise Architecture. Third, the study contributes to the field of Enterprise Architecture by comparing TOGAF ADM with other frameworks like FEAF, helping policymakers and practitioners make informed decisions when selecting the most appropriate EA framework. Lastly, the research lays the groundwork for future studies on the application of Enterprise Architecture in professional organizations, specifically within the

engineering sector, and provides a blueprint for adapting EA to support long-term business development goals.

RESEARCH METHOD

The research approach used in this study is the analysis of the company's architectural framework, namely TOGAF ADM. This method was chosen to compare architectural approaches in the context of its use in companies.

This research will use a qualitative approach. Data will be collected through interviews, as well as through document analysis and related literature studies. The collected data will be analyzed using comparative analysis techniques. The initial stage of the research will involve a comprehensive literature study of the concept of Enterprise Architecture, especially the Government Enterprise Architecture Framework, the TOGAF framework. The literature study will form the theoretical foundation for this research.

Based on the understanding obtained from the study of the literature that became the theoretical framework, among others: Iterative cycle which includes the phases of Preliminary, Architecture Vision, Business Architecture, Information Systems Architectures, Technology Architecture, Opportunities and Solutions, Migration Planning, Implementation Governance, and Architecture Change Management.

The data obtained from literature studies and data collection will be analyzed in depth to conduct comparative analysis in identifying the principles, concepts, processes, and guidelines underlying each framework. This analysis helps in understanding the differences and similarities as well as the advantages and disadvantages of each architectural approach is also identified. As well as its contribution to the efficiency and quality of PII services.

RESULTS AND DISCUSSION

Requirements Management

Requirement management aims to determine process needs in designing *enterprise* architecture on PII.

Conditions of Information System Architecture

At this stage is to document and define the systems and technologies that are running in PII. has an information system that is used to process various related jobs. The information system used by PII schools is currently not integrated between one application and another. Give me this picture of the information system Figure 2.

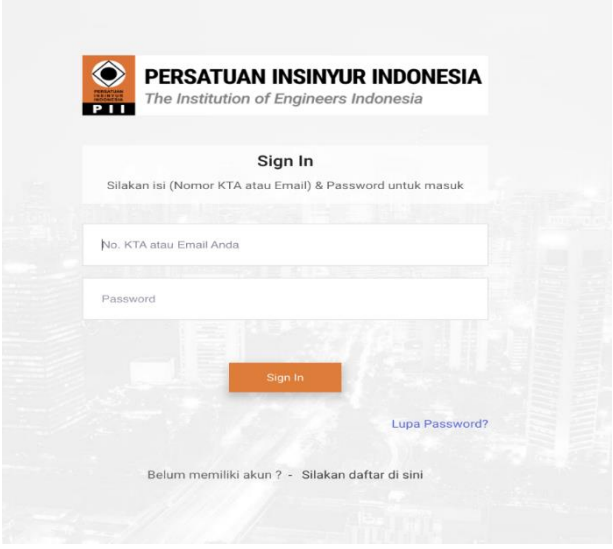

Figure 2
Information system

Network Infrastructure Architecture Conditions

Internet Services

Internet services use 2 *Internet Service Provider* (ISP) services, namely indihome with 6 10Mbps Broadband packages and 1 100Mbps Broadband package. Then the Melsa internet service is *a 50Mbps Broadband* package and has 1 *Internet Protocol* (IP) *Public Static.*

1. Network Topology

   The network topology used uses the *Star* topology or the star topology located in the PII office.

2. Server

   PII has *a VPS/Cloud* server that is used for *website servers* and *servers* for PII information system applications

Phase B: Business Architecture

This phase aims to choose a viewpoint on the architecture that is in accordance with the business process in PII where choosing the right technique or *tool* to describe the business architecture and its development targets. *The deliverable* of the *business architecture* stage is *a functional decomposition diagram* which is the target of the business architecture in the form of business function content.

Identify Business Scenarios

The definition of the business scenario obtained will be the *main resource* to be developed, the business scenario must include *core business, business process*, and *organization issues.*

1. Core business

   The main business that PII runs is to organize professional education for engineers and produce qualified graduates to be able to compete in the world of work.

2. Business process

   The business process in PII will be described in the *Value Chain Diagram* Based on the results of the analysis that has been carried out, here are some of the problems experienced by PII presented in Table 1

Table 1 Organization *Issue*

It	Activity	Problems	Indicators
1	Engineer Admissions	1. Engineer Registration is not yet effective and efficient	1. Health test results cannot be fast 2. During the interview, the selection of interviewers for prospective engineers was still relatively slow 3. Confirmation of payment of registration fees is still relatively slow
2	Information Systems	1. Socialization and training on the use of information systems that are not yet effective for their users	1. There are still many users who cannot and do not use the information system that has been provided.
		2. Limitations Technology-enabled infrastructure information	1. Difficulties for the adoption of new technologies

Problem Solutions

Based on the results of the analysis of the problems experienced by PII, the following Table 2 of the solutions proposed in overcoming problems in their activities:

Table 2 Activity Solutions

It	Activity	Problems	Solution
1	Admission of new Engineers	1. Engineer Registration is not yet effective and efficient	Developing a more effective and efficient information system
2	Informatio n Systems	1. Socialization and training on the use of information systems that have not been effective for its users	Increase training on the use of information systems, and manuals
		. 2. Limitations of information technology supporting infrastructure	Adding information technology infrastructure to support information systems Available

Business Architecture Design

In order to make it easier *for users* to understand the business architecture design, the design will be made in the form of *a use case diagram* to support the design of the business process

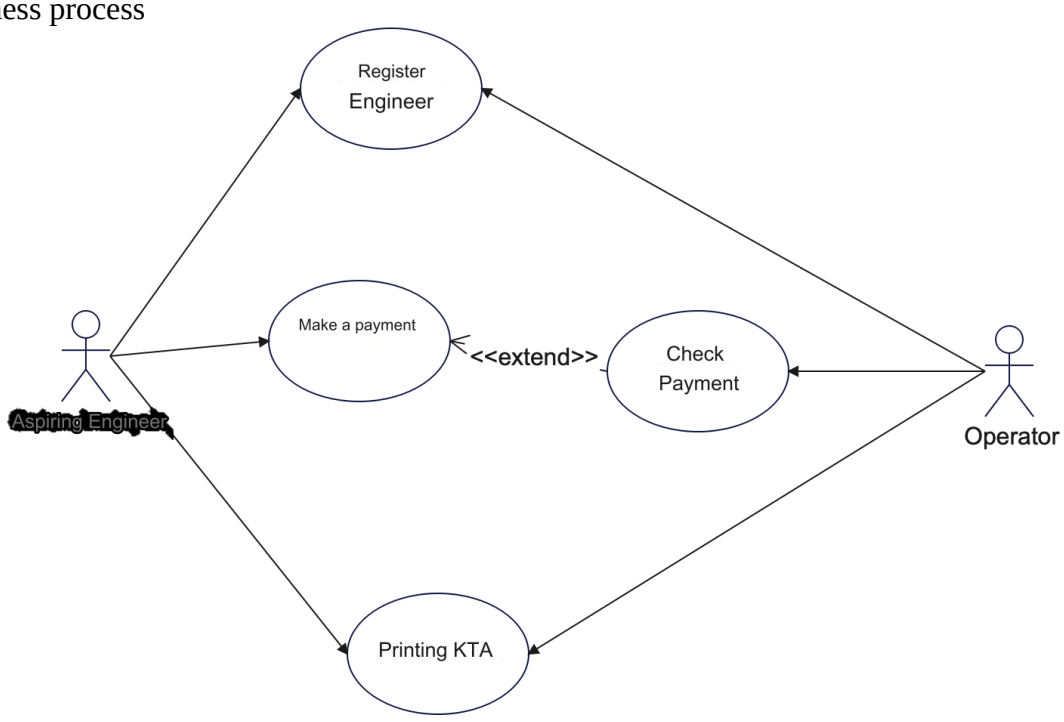

Figure 3 Business Architecture Design

In Figure 3, you can see how the business process in the Engineer admission system is. The operator opens any study program where registration is opened, then prospective

new engineers who register can register as Engineers, after the prospective Engineer registers they must pay the registration fee confirmed by the finance department, then prospective students take the admission selection test and wait for the results of the decision, after being declared passed, the prospective Engineer will get an Engineer KTA number.

Phase C: Information System Architecture

The definition of information system architecture in this stage includes data architecture and application architecture that will be used by PII. The *deliverables* of the *information system architecture stage* are the artifacts of data architecture and application architecture.

Data Architecture

In this phase, a data architecture design is carried out based on the results of this data architecture research, describing the entire data used in designing an enterprise architecture using a class diagram tool. Figure 4 shows how the table relationships in the *database* will be developed. *The database* developed includes all applications that are integrated into one to facilitate system development.

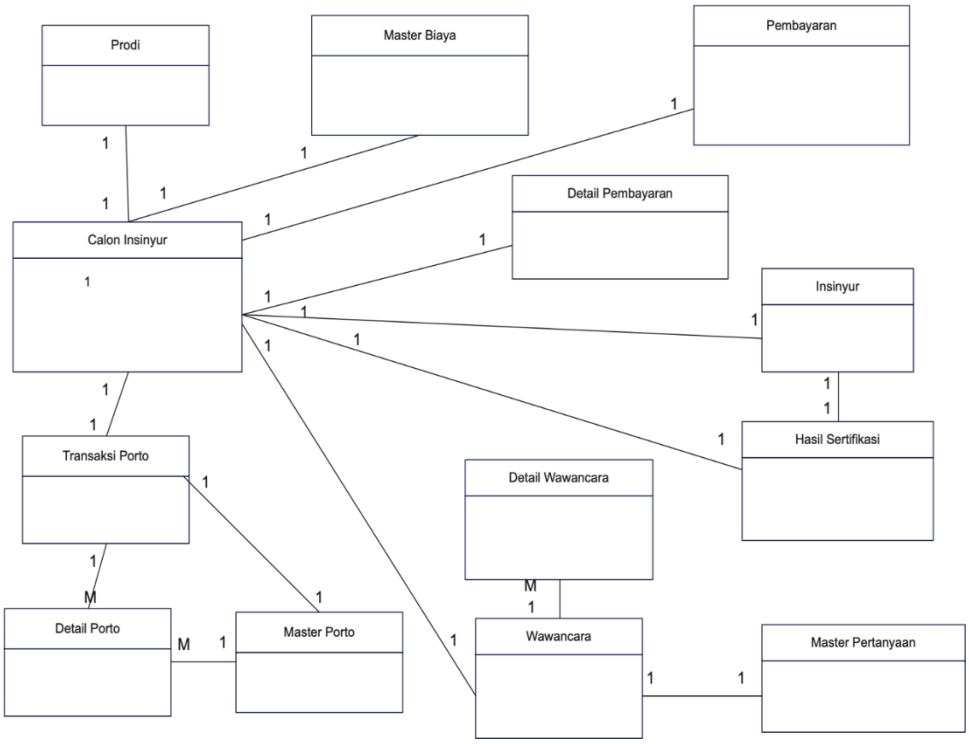

Figure 4 Business Architecture Design

It can be seen in Figure 4 that the data architecture in the academic support process information system requires 13 classes, the following are the details of the explanations of the classes presented in Table 3:

Table 3 Description of Data Architecture Class

It	Class Name	Explanation	Application
1	Aspiring Engineer	This is the table used for master aspiring Engineers	Axapta
2	Study Program	This is the table used for Masters of Study Programs	Axapta
3	MasterCost	This is the table used For account master name billing or payment name	Axapta
4	MasterPorto	This is the table used for master portfolio types.	Axapta

5	MasterInquiry	This is the table used for the master question.	Axapta
6	Interview	This is the table used to save the Interview Results	Axapta
7	Payment	It is a table used to store payment transactions for new Engineer registration, and tuition payments Student	Axapta
8	TransactionsPorto	It is a table used to store the transactions of the Portfolio of prospective Engineers	Axapta
9	DetailPorto	It is a table used to store transaction details of the Portfolio of prospective Engineers	Axapta
10	DetailInterview	It is a table used to store the details of prospective Engineer interview transactions	Axapta
11	Payment Details	It is a table used to store the details of payment transactions for prospective Engineers	Axapta
12	Certification Results	It is a list of the results of the decision Selection of New Engineer Admissions	Axapta
13	Engineer	This is the table used for Master Engineers	Axapta

Phase D: Technology Architecture

At this stage, the principles of technology architecture needed to support the use of information technology infrastructure are identified. The deliverable of the *technology architecture* stage is The result of the identification of these principles includes hardware, software, and communication devices that are adapted to the PII technology architecture presented in Table 4 below

Table 4 Description of Technology Architecture Device

Kind	Device	Description
Hardware	Computer *Server*	Server Computers Used for *Servers* Information Systems and *Databases*
	Computer Data *Center*	Data *Center* Computers Used for Centralized storage media
	Computer User	The computer that will be used for the users in PII
Software	OS	Windows Server 2019 operating system Standard used for *information system server* computers, Ubuntu Server Linux operating system used for data center computers and Ubuntu Desktop Linux operating system used For User Computers
	Software Supporter	Common supporting software includes: Web Browser, Antivirus, Office. Then software for *servers* includes: Web Server and PHP which Use it to build information systems
Communication Devices	Network	Wireless Access Point (AP), Register Jack (RJ) 45, Switch Hub, Mikrotik Router, Internet Service Provider (ISP)
	Phone/Mobile	Phone IP

Technology *Platform* Comparison

This stage aims to define and identify the technology needed. Definition and identification of technology architecture includes defining technology *platforms*, determining technology *platforms*, connecting business functions with technology *platforms*, and connecting applications with technology *platforms*.

Table 5 *Technology* Platform

Kind	Now			Proposal			
	Device	**sum**	**Information**	**Device**	**sum**	**Information**	**Reason**
Hardware	1. Computer (PC) Intel XEON i7 3.40GHz HDD 2 Tb RAM 8Gb	**1**	1 Unit in IT (Server)	Intel XEON i7 3.40GHz HDD 4 Tb RAM 32Gb	**1**	1 Unit in IT (Server)	*The i7 processor* is still can be optimized, part in PC devices still working fine. Update Done on RAM and HDD becomes 32Gb and 4Tb
	1. Computer (PC) Intel Pentium 4 HDD 500GB RAM 4Gb	**10**	Work unit	1. Computer (PC) Intel Core i5 3.40GHz HDD 500GB RAM 8Gb	**10**	Work unit	Update Done at RAM BECOMES 8GB and Processor Update from pentium 4 to core i5

Current Network Infrastructure

In Figure 5, it can be seen that the network connection is centralized so that the network can be managed easily.

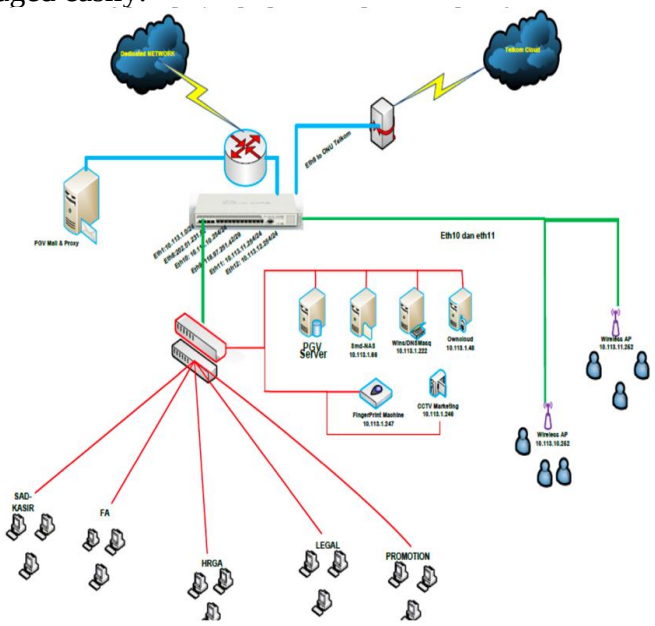

Figure 5 Network Infrastructure

Phase E: *Opportunities & Solutions*

The *Opportunities & Solutions phase* aims to evaluate and select the way the architecture is implemented as well as the gap analysis between the previous phases. The result of this phase is a solution pattern derived from the architectural principles that have been established in the *preliminary phase.*

Gap Analysis

Gap analysis is used to describe what components should be retained or removed from a running system and to describe what components should be replaced, updated and added with new components from the proposed architecture.

Table 6 *Gap Analysis* of Information System Architecture

Exiting Future	**AXAPTA**
Application Registration	*Add*
PortoFolio Upload Application	*Add*
KTA Print Application	*Add*
Interview Application	*Add*
Payment Apps	*Add*

Table 7 Analysis *Gap* Technology Architecture

Future ***Exiting***	Windows Server 2019 Standard	Linux Ubuntu Server	Linux Ubuntu Desktop	Phone/ Mobile	Wireless Access Point	Web Server	PHP	ISP
Computer Server	*Replace*					*Retain*	*Retain*	
Computer User			*Replace*					
Wireless Access Point					*Replace*			
ISP								*Update*
New				*Add*				

Phase F: Migration Planning

The migration planning stage is a target to plan the process of transitioning the technology from *the old system* to the new system (*future system*). In this phase, the order of implementation of each information system application will be described according to its priority.

Application Roadmap

Table 8 *Application* Roadmap

Phase	**App Name**	**Information**
1	Application Registration	PII Information System, Implemented in 2019
	Portfolio Upload Application	
2	Interview Application	PII Information System, Implemented in 2020
	KTA Print Application	
3	Payment Apps	PII Information System, Implemented in 2021

We can see that the *Roadmap* is sorted based on the needs of business activities in PII starting from the registration of prospective engineers to the payment to become an engineer.

Minimizing Migration Risks

In the implementation of the information system, it is hoped that the risks due to the implementation of the new system will be minimized. To minimize these risks, here are some

things that must be done:

1) Testing each application that will be implemented into the system to be built.
2) Provide documentation complete information about the information system that is built so that if there is an error it can be easily traced.
3) The implementation of the information system is carried out in parallel with several applications that already exist today.
4) Conduct training and socialization for all *PII* stakeholders

CONCLUSION

In an era where information technology is becoming increasingly important for governments to improve efficiency and transparency, the implementation of Enterprise Architecture (EA) frameworks such as TOGAF ADM is crucial. Comparative analysis research shows that TOGAF ADM offers a clear structure and high flexibility, allowing for rapid adaptation to technological changes and business needs. The framework also supports integration with the latest technologies such as AI, cloud computing, and IoT. In contrast, the SPBE architecture is more focused on the integration of public services and electronic-based government administration, with an emphasis on interoperability between institutions and measurement of public service performance. Although SPBE provides standardization in services, there is still a need for increased flexibility to accommodate new technological innovations. These two architectures, although different in focus, contribute to improved efficiency and performance, with TOGAF ADM more oriented towards standardizing business processes and resource usage, while SPBE Architecture focuses on improving bureaucratic efficiency.

REFERENCES

Afarini, N., & Hindarto, D. (2023). The Proposed Implementation of Enterprise Architecture in E-Government Development and Services. *International Journal Software Engineering and Computer Science (IJSECS)*, *3*(3), 219–229.

Aji, R. P., Putranto, B. D., & Pritama, A. D. (2023). Implementasi Fremework TOGAF ADM untuk Perancangan Arsitektur Enterprise pada Desa XYZ. *Jurnal Ilmiah IT CIDA*, *9*(2), 97–106.

Alhari, M. I., & Fajrillah, A. A. N. (2022). Enterprise Architecture: A Strategy to Achieve e-Government Dimension of Smart Village Using TOGAF ADM 9.2. *JOIV: International Journal on Informatics Visualization*, *6*(2–2), 540–545.

Bernard, S. A. (2012). *An introduction to enterprise architecture*. AuthorHouse.

Darkel, Y. B. M., & Emanuel, A. W. R. (2023). Perancangan Arsitektur Enterprise Dengan TOGAF ADM dan ITIL V3 Tahap IT Service Design (Studi Kasus: Universitas Nusa Nipa). *Techno. Com*, *22*(2), 373–387.

Girsang, A. S., & Abimanyu, A. (2021). Development of an Enterprise Architecture for Healthcare using TOGAF ADM. *Emerging Science Journal*, *5*(3), 305–321.

Hartawan, C. A., Ismah, A. Z., Kholisoh, E., Mulyanah, M., Hasugian, R. A., & Idrus, A. (2024). Menentukan Metode Terbaik Implementasi Enterprise Architecture: Analisis Perbandingan Metode TOGAF dan FEAF. *INTECH (Informatika dan Teknologi)*, *5*(1), 16–21.

Liao, M.-H., & Wang, C.-T. (2021). Using enterprise architecture to integrate lean manufacturing, digitalization, and sustainability: A lean enterprise case study in the chemical industry. *Sustainability*, *13*(9), 4851.

Mokone, C. B., Eyitayo, O. T., & Masizana, A. (2019). Decision support process for selection of an optimal enterprise architecture framework for e-government implementation. *Journal of E-Government Studies and Best Practices*, *19*, 1–4.

Rakhman, R. A., Anggraini, N., Legowo, N., & Kaburuan, E. (2019). A design of government enterprise architecture framework based on G-cloud services. *Int. J. Sci. Technol. Res*, *8*(9), 1692–1700.

Satzinger, J. B., Jackson, R. B., & Burd, S. D. (2010). System Analysis and Design with the Unified Process. *USA: Course Technology, Cengage Learning*.

Setiawan, A., & Yulianto, E. (2018). E-government interoperability and integration architecture modeling using TOGAF framework based on Service Oriented Architecture. *The Asian Journal of Technology Management*, *11*(1), 26–45.

Setiawan, E. B. (2009). Pemilihan EA framework. *Seminar Nasional Aplikasi Teknologi Informasi (SNATI)*.

Sista, D. N. A., Candiasa, I. M., & Gunadi, I. G. A. (2021). Perancangan Arsitektur Enterprise Sistem Informasi Menggunakan Togaf Adm Di Sma Negeri 1 Singaraja. *JST (Jurnal Sains dan Teknologi)*, *10*(2), 316–328.

Surendro, K. (2009). Pengembangan rencana induk sistem informasi. *Bandung: Informatika*.