Enterprise Architecture Design Using TOGAF ADM at Apotek Kimia Farma

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ARTICLE INFO	ABSTRACT
	Information technology is developing quite rapidly and has a significant impact in various aspects of business, including in the pharmaceutical industry. This research aims to design enterprise architecture at Apotek Kimia Farma. The method used in this research is TOGAF ADM (The Open Group Architecture Framework Architecture Development Method), which consists of several phases, namely preliminary phase, architecture vision, business architecture, information system architecture, technology architecture, opportunities and solutions, and migration planning. This research will produce a blueprint of enterprise architecture design that is in accordance with the needs and objectives of the Apotek Kimia Farma. This blueprint includes structured guidance on architecture components such as business architecture, information system architecture, and technology architecture. By having this blueprint, Apotek Kimia Farma can have clear guidelines in optimizing the use of information technology, increasing operational efficiency, and strengthening its competitive advantage in the pharmaceutical industry. The results of this research are expected to provide significant benefits to Apotek Kimia Farma and the pharmaceutical industry in general. A structured and integrated enterprise architecture design will help Apotek Kimia Farma in facing technological challenges and increasingly fierce competition.

1. INTRODUCTION

Pharmacies act as health care facilities that aim to improve public health. In addition, pharmacies are also places where pharmacist professionals carry out their pharmaceutical duties (Hartati & Sulasmono, 2007). In the ongoing era of globalization, competition among pharmacies, both domestic and those owned by owners from the ASEAN Economic Community (AEC) entering Indonesia, is increasingly unavoidable. In addition, regulations regarding the construction of pharmacies, high consumer demand for medicine, and the increasing number of pharmacists each year are also factors that trigger an increase in the number of pharmacies. As a result, pharmacy competition is becoming increasingly fierce to get as many customers as possible (Narendra et al., 2017).

Increased business competition in the pharmaceutical industry that is getting tighter and more complex demands an increase in the need for information and data. To overcome this, it is necessary to develop an integrated information system that can support business processes within the organization. The information system aims to provide quality data and information to reduce costs, increase productivity, facilitate data and information sharing, and improve customer service (Aswati et al., 2017).

One of the largest pharmacies in Indonesia with a vast network of branches is Apotek Kimia Farma. As a leading pharmacy, Kimia Farma has built a strong reputation in providing quality healthcare and

pharmaceutical services to the community. They have an established presence in various cities and regions across Indonesia, with branches strategically spread out.

In an effort to continuously evolve and innovate, Kimia Farma has also launched an online service that allows customers to order medicines and health products through a digital platform. This expands their accessibility and allows customers to make purchases easily, either through a direct visit to a branch or through an online platform. By being the largest pharmacy and having extensive branches, Kimia Farma continues to make efforts to maintain its commitment to provide quality pharmaceutical services and improve public health. In the competitive pharmaceutical industry, their strong presence and extensive branch network make Kimia Farma a major player that contributes significantly to the Indonesian people in fulfilling their pharmaceutical needs.

One of the ways that can help Kimia Farma in achieving business goals is Enterprise Architecture (EA). In the development of Enterprise Architecture (EA), it is important to adopt or develop an EA framework that is suitable for enterprise architecture. In the context of enterprise architecture (AE) design, there are several frameworks that can be used. Some of these include TOGAF (The Open Group Architecture Framework), Zachman Framework, and Enterprise Architecture Planning (EAP). The selection of an AE framework depends on the needs, context, and goals of the organisation. Each framework has its own advantages and disadvantages, and the right choice will depend on the complexity of the business, the operating environment, and the specific requirements of the organisation.

In the context of designing enterprise architecture at Apotek Kimia Farma, TOGAF (The Open Group Architecture Framework) is a superior choice than other frameworks. The enterprise architecture model using the TOGAF Architecture Development Method has the main objective of building agreement between business aspects and information technology in order to meet the needs of the organisation. TOGAF provides a structured and comprehensive framework for designing, developing, and managing enterprise architecture (Dewi et al., 2014). TOGAF has also become the main and trusted standard in the world of Enterprise Architecture, becoming a consistent reference for professionals in the field. This standard not only regulates the method of designing enterprise architecture, but also ensures consistency in communication between Enterprise Architecture professionals.

By using TOGAF, Apotek Kimia Farma can benefit from the experience and learning from other organisations in the pharmaceutical industry or other sectors that have successfully implemented TOGAF. Support from The Open Group also provides access to abundant resources and learning materials, making it easy to understand and implement TOGAF well. Overall, TOGAF provides a strong and comprehensive framework for designing an effective and adaptive enterprise architecture according to the needs of Apotek Kimia Farma.

TOGAF is a framework that can be widely applied in various industries. It provides a flexible and extensible framework, which forms the basis for a common set of architecture deliverables and can be customised to specific needs (Suhartono, 2014). TOGAF has a primary focus on the deployment cycle and the business processes it executes. The key method used in TOGAF is the Architecture Development Method (ADM) which aims to develop an enterprise architecture that suits business needs. One of the advantages of TOGAF is that it is open source, so it is not associated with technology from a particular vendor.

ADM is a key element in TOGAF that provides specific guidance for the enterprise architecture development process (Agarina, 2015). Through ADM, companies can follow structured and clearly defined steps to design, implement, and manage an architecture that meets their business objectives. By using ADM, Apotek Kimia Farma can ensure that all important aspects of enterprise architecture development, including business needs, technical suitability, and interrelationships between architecture elements are comprehensively considered.

## 2.	METHOD

This research was conducted at Apotek Kimia Farma and used a qualitative approach to provide an accurate description of the actual situation. The method used in this research refers to the standard stages contained in TOGAF ADM. This research consists of one preparatory stage and eight stages that make up the architecture development cycle (Rachmaniah et al., 2011). This research focuses on designing enterprise architecture using TOGAF ADM, which involves stages from preliminary phase to migration planning. Figure 1 Framework illustrates the stages in this research.
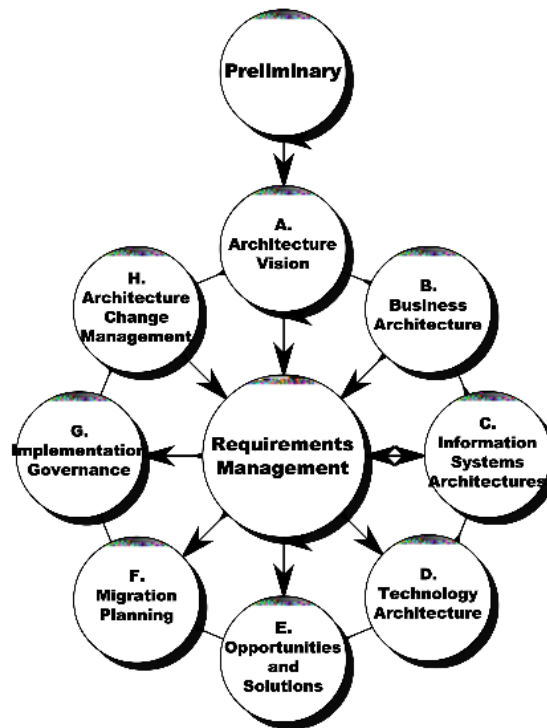

Figure 1. Framework

2.1.	*Preliminary Phase*: The inception stage of enterprise architecture is done so that the architecture modelling process can be well directed. At this stage, it is defined how the enterprise architecture will be created. The principles are intended to provide a guide to determine the structure and composition of enterprise architecture elements in the planning and implementation of enterprise architecture (Arifin, 2019).

2.2.	Stage A *Architecture Vision*: In the early stages of architecture design, an architecture vision is established that involves defining the scope of the project, as well as gaining permission to begin the architecture development process. This architecture vision becomes a clear foundation and is understood by all relevant parties to direct the design of enterprise architecture with the aim of achieving the desired results.

2.3.	Stage B *Business Architecture*: This phase aims to choose a point of view on architecture that is in accordance with the business processes at Apotek Kimia Farma. Development of a business architecture that supports the previously approved architecture vision.

2.4.	Stage C *Information System Architecture*: Defining the information system architecture in this stage includes data architecture and application architecture that will be used by Apotek Kimia Farma. Deliverables from the information system architecture stage are data architecture artifacts and application architecture.

2.5.	Stage D *Technology Architecture*: At the technology architecture development stage, the hardware and software technology needed to support the Apotek Kimia Farma information system is selected.

This technology selection aims to ensure an optimal infrastructure that meets the needs and goals of the organisation.

2.6. Stage E *Opportunities and Solutions*: This phase aims to evaluate the current architecture model and identify key projects that will be undertaken to implement the desired architecture. These projects can be classified as new development projects or revitalisation of existing systems.

2.7. Stage F *Migration and Planning*: Target to plan the process of switching the old system technology (existing 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.

3. RESULTS AND DISCUSSION

3.1. *Preliminary Phase*

In the initial phase of TOGAF ADM, namely the preliminary phase, identification of the scope of the company that will be the object of research is carried out (Wikata et al., 2018). In the context of this research, business processes related to the system at Apotek Kimia Farma are identified using the value chain concept. Value chain is a concept that describes a series of activities carried out in an organisation to produce products or services. In the case of Apotek Kimia Farma, the identification of business processes related to the system is carried out by referring to the following value chain:
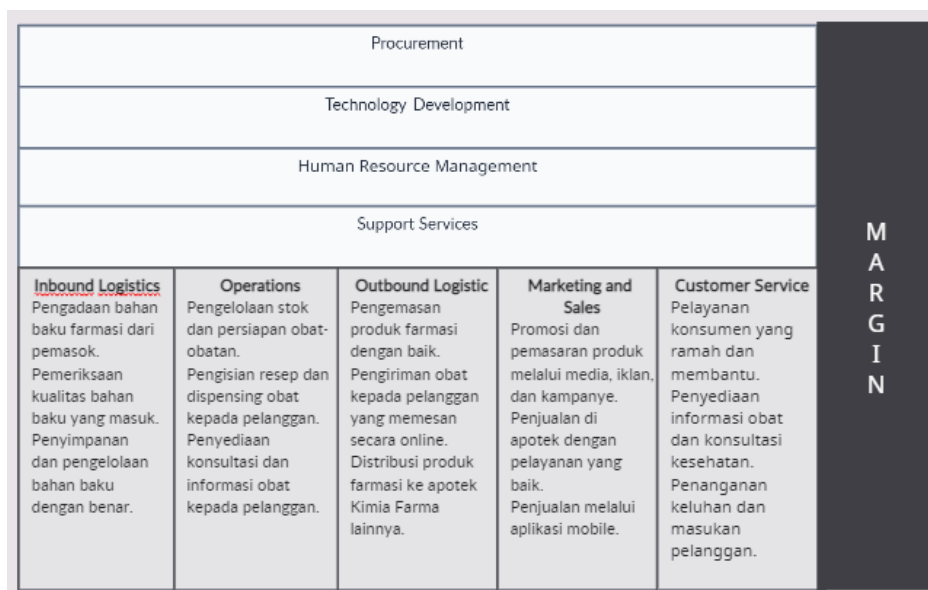
Figure 2. Value Chain of Kimia Farma Apotek

The purpose of identifying the value chain in the preliminary phase is to understand the existing business processes in the organisation and identify the added value generated by each activity in the value chain. By identifying the value chain, companies can understand more deeply how these activities are interconnected and contribute to creating value for customers and the organisation as a whole.

Through value chain identification, companies can recognise the core activities that provide competitive advantage and uniqueness in the market. In addition, it also helps companies identify the potential to improve operational efficiency and effectiveness, and find opportunities for innovation in business processes.

By understanding the value chain, companies can design more focused and targeted business strategies, allocate resources more efficiently, and optimise overall operational performance. Value chain identification also helps companies identify areas that may need to be improved or further developed, allowing for continuous improvement and sustainable business growth.

3.2. *Phase A: Architecture Vision*

Architecture Vision is the initial stage in TOGAF ADM which aims to unite views on the reasons behind designing enterprise architecture and to achieve the main objectives of the organisation. At this stage, Apotek Kimia Farma formulates an architectural vision that guides the development of information systems. This architectural vision includes long-term goals, values to be achieved, and organisational needs and expectations for the enterprise architecture design.

In the context of Apotek Kimia Farma, Architecture Vision is an important foundation in determining the scope of architectural planning that will be built on the object of research. Apotek Kimia Farma may want to expand the range of services and improve operational efficiency through an integrated information system. This architecture vision will help determine important aspects that must be considered in architectural design, such as user needs, integration with existing systems, and data security. By having a clear Architecture Vision, Apotek Kimia Farma can ensure that the enterprise architecture design is done with clear objectives and in accordance with the needs and expectations of the organisation.

3.2.1. Creating an integrated and innovative information system to efficiently support pharmacy operations and provide high quality services to customers. This architectural vision aims to become a leading pharmacy in providing health solutions to the community by combining cutting-edge technology, operational excellence, and commitment to customer satisfaction and providing convenience for customers in obtaining accurate product and service information, as well as increasing efficiency in drug stock management.

3.2.2. Enterprise Architecture at Apotek Kimia Farma consists of vision architecture, business architecture, information system architecture, technology architecture, opportunities and solutions, and migration planning.

3.2.3. Produce an enterprise architecture blueprint and IT roadmap for Apotek Kimia Farma using the TOGAF ADM framework.

3.3. *Phase B: Business Architecture*

The operational process at Apotek Kimia Farma can be illustrated through a Flow Map that describes the stages of each procedure in the system. This Flow Map includes various stages, such as drug search, drug ordering, stock management, prescription checking, payment, drug packaging, and drug delivery. Through this Flow Map, it can be seen how each stage is interconnected and contributes to running pharmacy operations efficiently and ensuring good service to customers.

3.3.1. Drug Search

The medicine search feature is designed to make it easy for users to find the medicine they need. Users can enter various search criteria, such as drug name, category, brand, or symptoms of the disease they are experiencing. Thus, the app allows users to conduct a drug search that is specific and suits their needs.

After the user enters the search criteria, the application will perform a match with the drug database owned by Kimia Farma. The search results will be displayed in the form of a list of drugs that are relevant to the criteria entered by the user. With this feature, users can easily find the medicine they are looking for and obtain the required information about the medicine. This improves user experience and simplifies the process of searching for drugs at Apotek Kimia Farma online.
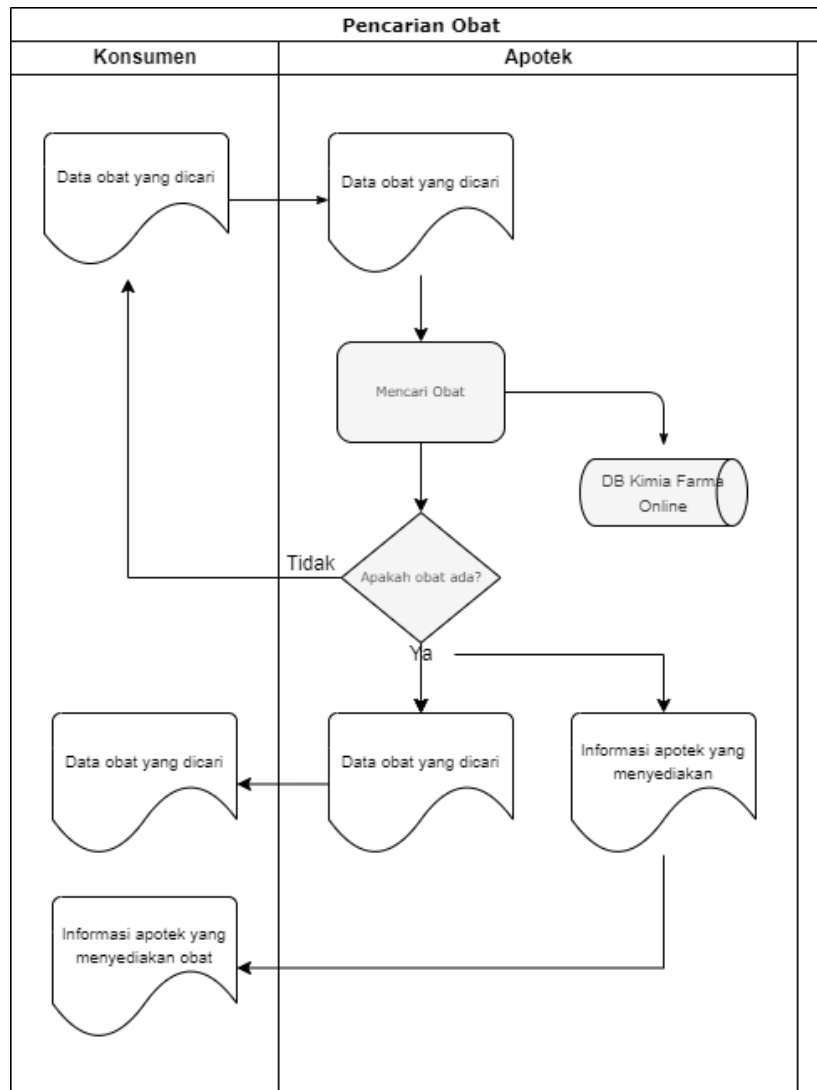
Figure 3. Medicine Search Flowchart

3.3.2. Medicine Ordering

Once users have found the medicine they want through the Apotek Kimia Farma website or app, they can start the medicine ordering process. First, users can add the medicine into the shopping cart and proceed to the payment process. At this stage, users will select an available payment method and enter the required payment information. In addition, the user is also required to enter a valid delivery address. Once all the information has been checked and confirmed, the user can finalise the order by sending a confirmation.

Once the order is confirmed, Apotek Kimia Farma will process the order. The medicines that have been ordered will be safely packed by experts and ready to be delivered to the address that has been inputted by the user. Users only need to wait for the medicine to arrive at the address they have provided. To monitor the delivery status, Apotek Kimia Farma provides a tracking feature that allows users to track the position of the medicine in real-time. Thus, users can have clear visibility of the delivery process and the estimated time of arrival of the medicine they ordered.
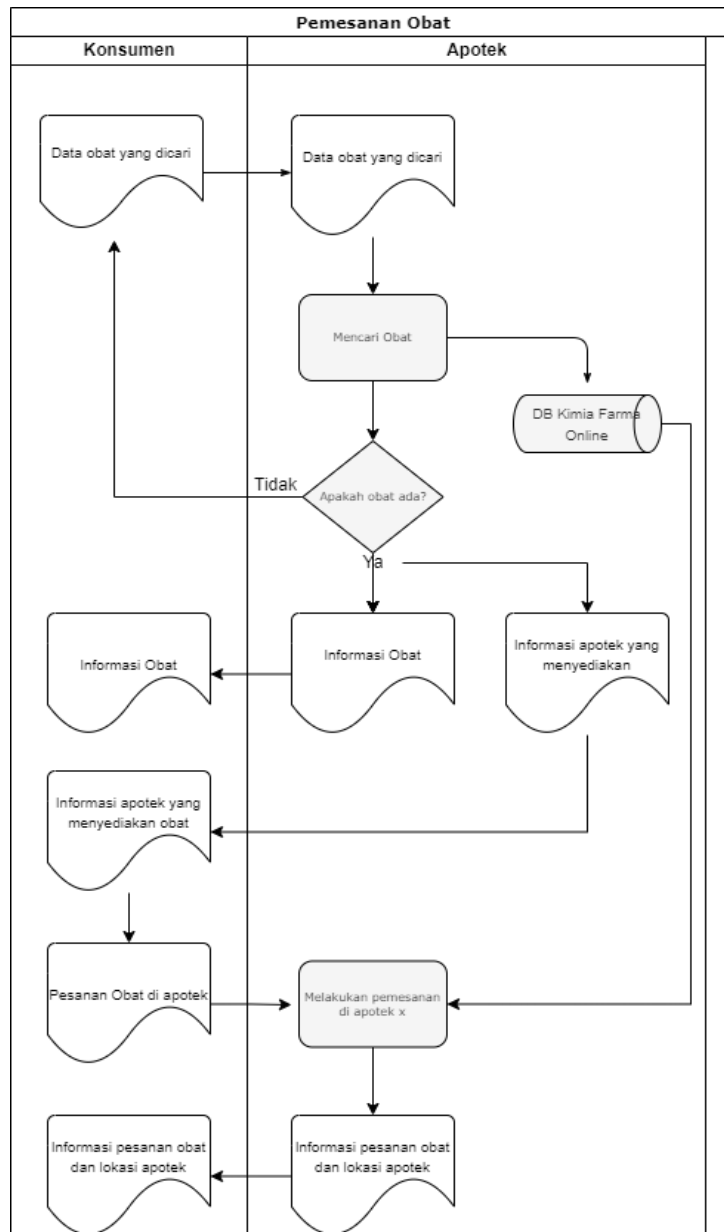
Gambar 4. Medicine Ordering Flowchart

3.4. *Phase C: Information System Architecture*

Information system architecture is divided into two main stages, namely data architecture and application architecture (Faddillah et al., 2019). The first stage, data architecture, deals with the design and management of data used in information systems. At this stage, attention is paid to data structures, databases, and data flows and interactions between various system components. The relationship between tables at Apotek Kimia Farma illustrates the data architecture as follows:

The first stage in the design of enterprise architecture, namely data architecture, focuses on the design and management of data used in the Apotek Kimia Farma information system. At this stage, attention is paid to the structure of the data used, the organisation of the database, and the flow and interaction of data between the various components of the system.

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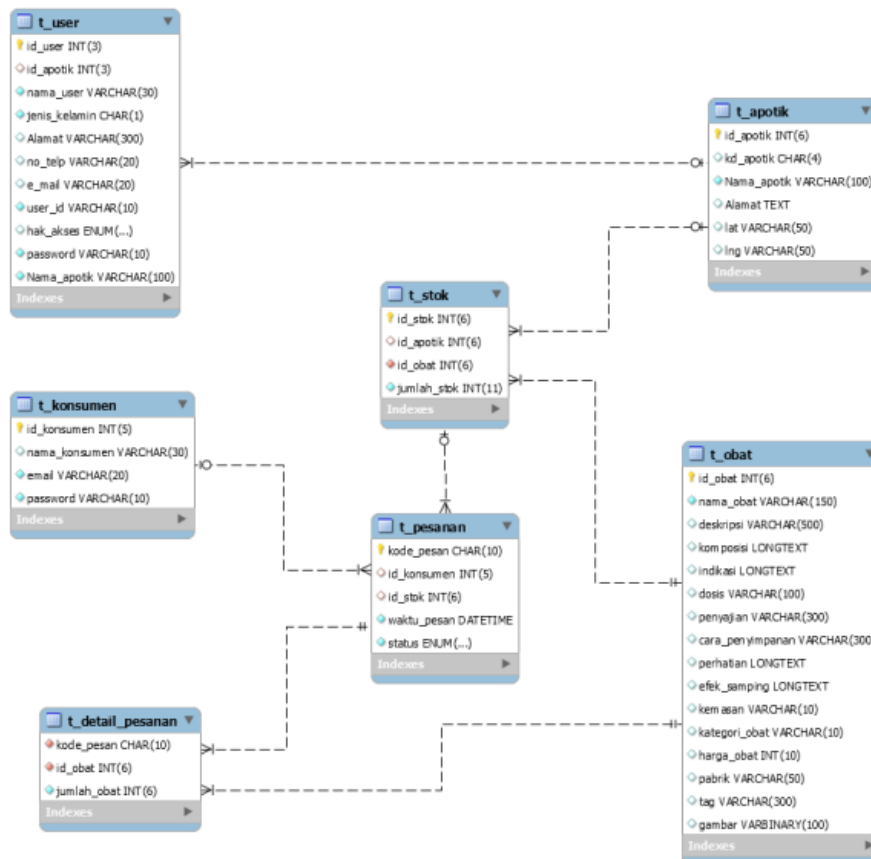

Figure 5. Entity Relation Diagram

The second stage in the design of enterprise architecture, namely application architecture, has a focus on the design and arrangement of applications used in the Apotek Kimia Farma information system. At this stage, the selection and configuration of application software in accordance with business needs is carried out. This involves identifying the application components and functionality required to support the operations of Apotek Kimia Farma.

The application architecture at Apotek Kimia Farma includes the flow of incoming data, data being processed, and outgoing data in the system. Incoming data includes information received by the application, such as drug orders from customers, payment data, and delivery information. This data is then processed through various application components that have been configured as needed. Once the process is complete, outgoing data in the form of order confirmations, payment invoices, and shipping information will be generated by the application and can be delivered to customers or related parties. By describing this data flow, the application architecture ensures integrity and efficiency in information management at Apotek Kimia Farma.
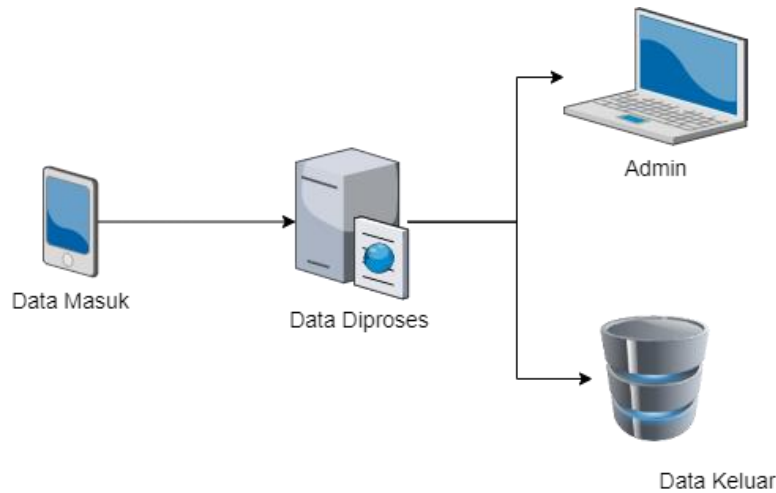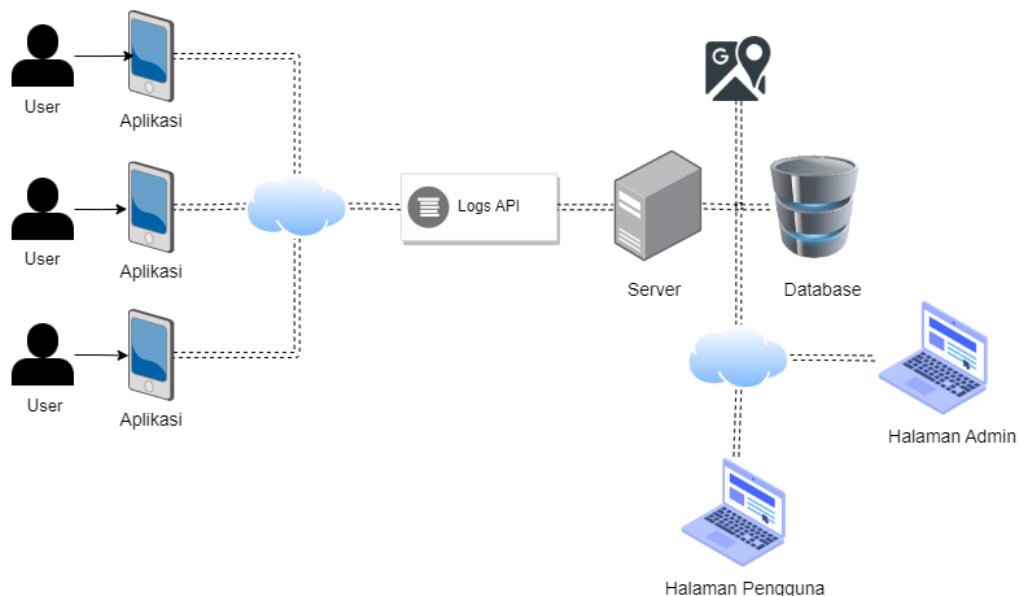
Figure 6. Application Architecture

3.5. *Phase D: Technology Architecture*

The Technology Architecture stage in information system development involves mapping application components consisting of hardware, software, and networks. The main purpose of this stage is to design and build a technology architecture that will be the basis for system implementation (Wikata et al., 2018).

At this stage, planning and design is done to select the right hardware, such as servers, client computers, network devices, as well as the necessary infrastructure. In addition, software selection, including operating systems, databases, and other supporting applications are also part of this stage. In addition to hardware and software components, the Technology Architecture stage also considers the network design needed to support the information system, one of which is the network topology.

By mapping the application components and designing the technology architecture at this stage, the organisation can have a solid foundation to proceed to the information system implementation stage by ensuring that the right technology infrastructure is in place to properly support the operationalisation of the system. The technology architecture of Apotek Kimia Farma is as follows:

Figure 7. Technology Architecture

3.5.1. Mobile device users send data requests to the server through the application programming interface (API). The data request can be a request for drug information, information on the location of the nearest pharmacy branch, or other requests.

3.5.2. The server receives a data request from the user and identifies the type of request submitted. This is done to ensure that the request will be processed by the right component in the system.

3.5.3. If the request is related to location, the server will forward the data request to the Google Place server. This aims to obtain information related to the location of the nearest pharmacy branch according to the user's request.

3.5.4. If the request relates to text data, the server will retrieve the data directly from the available databases. Such data may include drug product information, drug description, or other relevant data.

3.5.5. Once the server receives the requested data, it will be sent back to the user in JSON format. The JSON format allows the data to be processed easily on the user's mobile device.

3.5.6. The web system admin and users can also send data requests to the server via the internet network. These requests can be requests for report data, inventory data, or other requests related to pharmacy operations.

3.5.7. The server receives data requests from the admin web system and users, then retrieves the requested data from the available database. The data can be financial report data, drug inventory data, or other data needed for management and decision making.

3.5.8. The server sends the requested data to the admin and user computers via the internet network. The data is sent in a form that matches the request, so that admins and users can easily access and process the data.

3.6. *Phase E: Opportunities and Solutions*

Opportunities and Solutions is a stage in architecture design that involves planning and identifying opportunities in business processes arising from the previous stage. The purpose of this stage is to design the implementation plan needed to achieve the objectives of the architecture design (Wikata et al., 2018). In this research, there are 2 projects that will be realised in the design of enterprise architecture. Information regarding the definition of these projects can be found in the following table.

Table 1. Project Catalog

Project	Sub Project	Service	Application
Development of Kimia Farma Mobile	Addition of medicine consumption reminder feature.	User Experience	Kimia Farma Mobile
	Addition of real-time drug delivery location tracking feature.		
	Development of Kimia Farma Mobile which can be accessed through the website.	Accessibility Through Multiple Platforms	
Technology infrastructure development	Increased RAM capacity	-	-

3.7. *Phase F: Migration Planning*

Migration planning is an important stage in enterprise architecture design that involves planning and synchronising the movement of systems with the organisation as a whole. The purpose of this stage is to manage and implement changes to the organisation's portfolio. In the context of Apotek Kimia Farma, this stage involves planning and scheduling projects that will be implemented in the next few quarters.

Table 2, the Architecture Roadmap, is a document that shows the planned implementation of projects scheduled in quarterly time estimates. This table provides a clear picture of the sequence and

schedule for implementing the architecture solutions that have been designed. Through this Roadmap, Apotek Kimia Farma can clearly see the projects that will be implemented, including infrastructure updates, and application development. The Roadmap plays an important role in setting priorities and managing resources so that the implementation is in line with the organisation's plans and objectives.

Tabel 2. Architecture Roadmap

Quarterly 1	Quarterly 2	Quarterly 3	Quarterly 4
Adding server RAM capacity			
	Addition of medicine consumption reminder feature.		
	Development of Kimia Farma Mobile which can be accessed through the website.		
			Addition of real-time drug delivery location tracking feature.

4. CONCLUSIONS

This research was conducted at Apotek Kimia Farma, with the intention of implementing an enterprise architecture plan using TOGAF ADM, covering all stages from initial preparation to migration planning. Based on the research findings, several proposals for development were made, including the development of Kimia Farma Mobile which can be accessed via the web, the addition of a drug consumption reminder feature, and a real-time drug delivery location tracking feature. With the proposed development, it is expected that Kimia Farma will provide a better experience to users, increasing comfort, trust, and compliance with drug use. In addition, this application assists Apotek Kimia Farma in their efforts to improve operational efficiency and provide more optimised services to their customers. In addition, in the context of technology architecture, it is proposed to increase RAM capacity with the aim of faster application performance so that it can handle a larger user load. This research resulted in an enterprise architecture blueprint and an IT roadmap for Apotek Kimia Farma.

REFERENCE

Agarina, M. (2015). Pemanfaatan Framework TOGAF Untuk Perencanaan Sistem Informasi Manajemen Aset dan Logistik di IBI Darmajaya Lampung (Studi kasus: IBI Darmajaya Bandar Lampung). Jurnal Informatika, 175-187. https://jurnal.darmajaya.ac.id/index.php/JurnalInformatika/article/view/599/pdf.

Arifin, D. (2019). Perancangan Arsitektur Enterprise Menggunakan Togaf Adm Di Sekolah Tinggi Ilmu Kesehatan Dharma Husada Bandung (STIKESDHB). *Masters thesis, Universitas Komputer Indonesia*. https://elibrary.unikom.ac.id/id/eprint/2580/

Aswati, S., Firmansyah, A. U., Ramdhan, W., & Suhendra. (2017). Analisis dan Perancangan Sistem Informasi Data Siswa Pada Sekolah Menengah Kejuruan (SMK) PGRI 8 Medan dengan Zachman Framework. Jurnal SISFO : Inspirasi Profesional Sistem Informasi, 309-318. https://doi.org/10.24089/j.sisfo.2017.05.004

Faddillah, U., Syamsiah, N. O., & Purwandani, I. (2019). Pemodelan Enterprise Arsitektur Sistem Informasi Penjualan Obat Menggunakan Kerangka TOGAF ADM. Indonesian Journal on Software Engineering, 114-122. https://doi.org/10.31294/ijse.v5i1.5871

Hartati, Y. S., & Sulasmono. (2007). Apotek: Ulasan Beserta Naskah Peraturan Perundang-Undangan Terkait Apotek Termasuk Naskah dan Ulasan Permenkes tentang Apotek Rakyat. Yogyakarta: Universitas Sanata Dharma.

Narendra, M. P., Skarayadi, O., Duda, M., & Adirestuti, P. (2017). Analisis Tingkat Kepuasan Pelanggan Terhadap Pelayanan Di Apotek Kimia Farma Gatot Subroto Bandung. *Kartika: Jurnal Ilmiah Farmasi*, *5*(1), 31-37.

Dewi, P., Komala, I., Kusrini, K., & Al Fatta, H. (2014). Analisis Dan Perancangan Sistem Informasi Perpustakaan Stkip Hamzanwadi Selong Dengan Menggunakan Togaf Adm. *Data Manajemen dan Teknologi Informasi*, *15*(4), 90749.

Rachmaniah, M., Adrianto, H. A., & Aziz, A. (2011). Rancang Bangun Sistem Informasi Manajemen Kepegawaian dengan Metode the Open Group Architecture Framework (TOGAF). Jurnal Ilmu Pertanian Indonesia, 164-172. https://www.journal.ipb.ac.id/index.php/JIPI/article/view/6605

Suhartono, B. (2014). TOGAF, Salah satu Metodologi dalam pembuatan IT Blue Print. Retrieved from Bambang Suhartono Blog: https://bambangsuhartono.wordpress.com/2014/02/26/togaf-salah-satu-metodologi-dalam-pembuatan-it-blue-print/

Wikata, E. R., Setiawan, N. Y., & Mursityo, Y. T. (2018). Perencanaan Sistem Penjualan Menggunakan Togaf Architecture Development Method (TOGAF-ADM) Studi Pada PT. Millennium Pharmacon International Tbk Cabang Malang. Jurnal Pengembangan Teknologi Informasi dan Ilmu Komputer, 2589-2598.