

Enterprise Architecture Design at PT Perkebunan Kaltim Utama Using TOGAF ADM

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Abstract: Information systems and information technology have become indispensable in modern business operations, serving as critical tools for enhancing efficiency, streamlining processes, and supporting strategic decision-making. To ensure these technologies effectively meet organizational needs, enterprise architecture design plays a key role in aligning business goals with IT systems. This alignment not only improves operational efficiency but also lays the foundation for long-term organizational success. This study employs The Open Group Architecture Framework (TOGAF), focusing on its Architecture Development Method (ADM), to design an enterprise architecture tailored for PT Perkebunan Kaltim Utama. TOGAF ADM offers a structured, iterative approach to architecture development, encompassing phases from the initial planning stage to the final design and implementation analysis. Each phase is designed to integrate business processes with IT systems, enabling a cohesive and adaptive framework. PT Perkebunan Kaltim Utama, a company specializing in palm oil mill maintenance, faces significant operational challenges due to its reliance on manual processes and lack of integration. These inefficiencies hinder productivity and affect the company's ability to meet strategic goals. This research systematically identifies the functional and technological requirements for PT Perkebunan Kaltim Utama's business activities, laying the groundwork for an integrated solution. The proposed architecture design addresses these inefficiencies by providing a comprehensive blueprint for implementing a unified system. This system will not only enhance PT Perkebunan Kaltim Utama's operational performance but also support its strategic objectives, enabling the company to remain competitive and responsive to industry demands. By integrating TOGAF ADM into its processes, PT Perkebunan Kaltim Utama can ensure a more effective alignment of business and IT, paving the way for sustainable growth and improved decision-making capabilities.

Index Terms: Enterprise Architecture Design, Information Systems, TOGAF ADM, Integrated System Design

1. Introduction

Information systems, when aligned with enterprise architecture principles, support the integration of data and processes to manage complexity and enable efficient decision-making, particularly within the context of digital transformations in smart cities [1]. Modern businesses operate in dynamic and highly competitive environments, necessitating the development of integrated systems to enhance business processes, customer service, and productivity [2]. Although today's information systems largely depend on computerized platforms, significant challenges remain in optimizing business activities. Information technology plays a vital role in streamlining operations, supporting interorganizational cooperation, and facilitating digital transformation, particularly within sectors like infrastructure management [3]. Each organization operates under a distinct business management system guided by its unique vision, mission, objectives, and strategies [4]. Effective governance is achieved when data and information are cohesively integrated across an organization's functional areas [5].

Efficiency and effectiveness are essential for improving business operations. Rapid technological advancements have driven companies to digitize systems, including employee management, payroll, marketing, inventory, and production [6]. Integrated systems streamline operations for both organizations and their customers. PT Perkebunan Kaltim Utama, founded in February 2016, specializes in palm oil mill maintenance, offering mechanical services such as boiler repairs, pipeline installations, thresher maintenance, loading ramp repairs, and related tasks. The company also undertakes civil works, such as factory road repairs, storage tank foundation construction, and the development of bulking CPO facilities. Operating in Solo and Central Kalimantan, PT Perkebunan Kaltim Utama has extensive expertise in palm oil mill maintenance and construction projects. However, its use of information technology and systems remains suboptimal, with certain functions still manual and lacking integration. Addressing these deficiencies requires the design of an enterprise architecture. Enterprise architecture involves the systematic design, analysis, planning, and documentation of activities aimed at improving organizational performance through the effective use of technology [7].

The development of an enterprise architecture model necessitates a robust framework to manage complex systems and align business requirements with planned IT solutions. Several frameworks are widely employed for enterprise architecture, including the Zachman Framework, Federal Enterprise Architecture Framework (FEAF), Gartner Methodology, and The Open Group Architecture Framework (TOGAF). The Zachman Framework provides a structured organizational view across six perspectives—planner, owner, designer, builder, subcontractor, and functional—while addressing fundamental questions such as What, Where, When, Why, Who, and How [8,9]. The Federal Enterprise Architecture Framework (FEAF), designed for government systems, focuses on enhancing IT performance [10]. Gartner Methodology emphasizes strategic alignment over engineering design, involving stakeholders such as business owners, information specialists, and technology implementers [11,12].

TOGAF, developed by The Open Group since 1995, offers methodologies and tools for planning, designing, building, and managing enterprise architectures [13]. Despite its origins in the mid-1990s, TOGAF's foundational principles—such as the iterative Architecture Development Method (ADM)—remain applicable in addressing complex organizational challenges in the modern era. This enduring relevance ensures that organizations like PT Perkebunan Kaltim Utama can adopt TOGAF to create sustainable, scalable solutions for their unique operational needs [14]. For instance, Kanisius School applied TOGAF ADM to design an e-learning blueprint, addressing challenges such as manual attendance and counseling systems while improving integration across educational processes [15]. In Botswana, multiple-criteria decision-making (MCDM) methods were used to select EA frameworks, underscoring the importance of aligning organizational objectives with framework features [16].

The example of Netflix applying TOGAF ADM highlights the framework's flexibility and its ability to handle iterative, large-scale organizational changes. However, while the case demonstrates TOGAF's scalability, its direct relevance to PT Perkebunan Kaltim Utama's context as a palm oil mill maintenance provider is limited unless explicitly adapted to the industrial maintenance sector. To enhance its applicability, the methodologies Netflix employed should be tailored to address PT Perkebunan Kaltim Utama's challenges, such as improving operational workflows and system integration [17]. Similarly, STMIK Pontianak identified IT service gaps using TOGAF, recommending process reconstruction to optimize resources [18]. Dharmais Cancer Hospital utilized TOGAF to address misalignments between business and IT strategies, leading to actionable recommendations for operational and IT improvements [19].

Institutional pressures—regulative, normative, and cognitive—affect stakeholder behavior during enterprise architecture adoption, often creating conflicts that shape outcomes over time [20]. TOGAF has proven effective in government sectors, improving governance, integrating fragmented IT systems, and fostering inter-agency collaboration [21].

Comparative analyses reveal TOGAF's flexibility and modularity, making it well-suited for large-scale cloud migrations and other complex IT initiatives [22]. In higher education and healthcare, TOGAF has been used to develop tailored business process models, improve IT performance, and align technology with organizational goals [23,24]. Its adaptability across industries highlights its potential to enhance strategic alignment and operational efficiency [25–30]. This research aims to integrate TOGAF ADM into PT Perkebunan Kaltim Utama's operations to foster greater agility, strategic coherence, and improved IT performance. Enterprise architecture is a critical tool for aligning business

strategies with information systems and enhancing operational efficiency through integrated and structured design. One approach commonly used in enterprise architecture design is TOGAF (The Open Group Architecture Framework), specifically its Architecture Development Method (ADM). While TOGAF ADM has proven to be flexible and effective in various organizational contexts, this manuscript heavily relies on the framework without providing adequate explanation for its selection.

While enterprise architecture frameworks like the Zachman Framework, FEAF, and Gartner Methodology are widely used across various industries, the selection of the right framework for PT Perkebunan Kaltim Utama required careful consideration of the company's unique operational needs. Each framework has distinct advantages; however, TOGAF ADM was selected due to its flexibility, scalability, and ability to handle complex, iterative processes. TOGAF ADM's phased approach facilitates continuous refinement, which is essential for aligning the company's evolving business goals and IT systems. For industries such as PT Perkebunan Kaltim Utama, which face constant changes in business processes and technology, TOGAF ADM provides the adaptability necessary for sustained improvement. In contrast, other frameworks like the Zachman Framework are more rigid in their structure, making them less suitable for environments that require frequent adjustments. Furthermore, FEAF is generally tailored for government sectors, limiting its relevance in private-sector companies. Therefore, TOGAF ADM's comprehensive and iterative approach was deemed the most suitable to ensure long-term strategic alignment and continuous enhancement of business operations at PT Perkebunan Kaltim Utama.

2. Research Methodology

2.1. TOGAF ADM

The methodology used in the preparation of this research contains a structured research flow so that it can be used as a clear guideline in solving problems from the research. The methodology used for problem solving in designing architecture in TOGAF is called the Architecture Development Method (ADM). The Architecture Development Method (ADM) from the TOGAF framework was selected for designing the enterprise architecture at PT Perkebunan Kaltim Utama. The selection of TOGAF ADM was based on its ability to support a structured yet flexible approach, which is crucial for the company's dynamic operational environment. TOGAF ADM offers an iterative, phased methodology that allows for continuous improvement, making it particularly suited for the ever-evolving business landscape at PT Perkebunan Kaltim Utama. This iterative nature ensures that the architecture remains adaptable to changing business processes and technology. Alternative frameworks such as the Zachman Framework, while highly structured, do not offer the same flexibility for frequent adjustments, making them less appropriate for PT Perkebunan Kaltim Utama's needs. Additionally, FEAF, which is oriented toward government agencies, may not be as applicable in the private-sector context of the company. Therefore, TOGAF ADM was chosen for its comprehensive and scalable framework that aligns closely with the company's objectives of strategic alignment and operational improvement.

Table 1. Comparison of Enterprise Architecture Frameworks for PT Perkebunan Kaltim Utama

Framework	Structure	Flexibility	Applicability	Industry Focus	Suitability for PT Perkebunan Kaltim Utama
TOGAF ADM	Structured and iterative with clear phases	High flexibility, allows for continuous refinement	Suitable for dynamic, evolving organizations like PT Perkebunan Kaltim Utama	Private sector, adaptable to various industries	Best suited due to its iterative and adaptive approach that supports continuous improvement and aligns with strategic goals
Zachman Framework	Highly structured and rigid	Low flexibility, static structure	Focuses on the comprehensive organizational structure, but lacks adaptability	Broad, used across many sectors	Less suitable for companies needing frequent adjustments or rapid changes in operations
FEAF	Structured with focus on governance and performance	Moderate flexibility, more rigid in structure	Primarily used for government agencies with a focus on regulatory alignment	Government and public sector	Not applicable due to its focus on government needs and regulatory constraints
Gartner Methodology	Strategic alignment-focused, less technical	Moderate flexibility, focused on high-level strategy	Suitable for aligning IT strategy with business goals, but lacks detailed guidance on architecture development	Private sector, high-level strategic planning	May not be detailed enough for operational adjustments and system integration needs at PT Perkebunan Kaltim Utama

This method is defined as an integrated process to develop an enterprise architecture. Fig 1 shows, the following provides an overview of the phases in TOGAF ADM and their application in this research preparation:

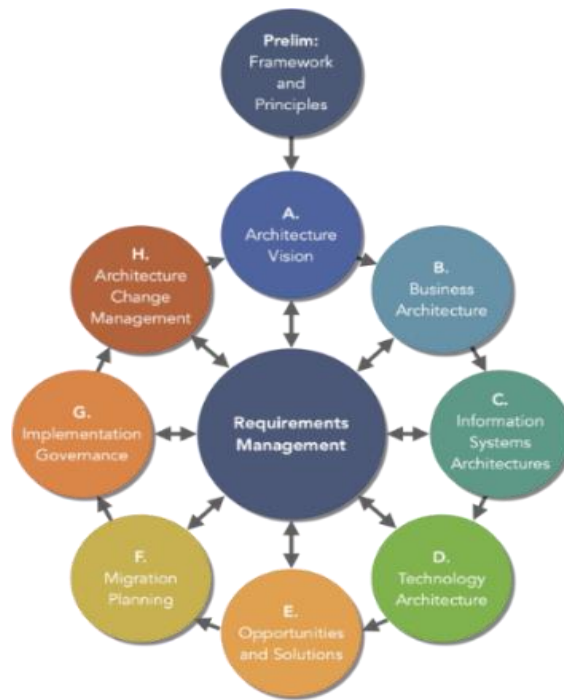


Fig. 1. Phases of TOGAF ADM

1. Preliminary

This phase is the initial preparation to achieve the direction of the business process towards the architectural model enterprise.

2. Requirement Management

The purpose of this phase is to determine the needs of enterprise architecture. To find out, this stage is carried out by the PIECES (*Performance, Information, Economic, Control, Efficiency, and Service*) analysis process and gap analysis. Gap analysis measures the difference between the actual and expected conditions [20].

3. Fase A: Architecture Vision

The architecture vision phase aims to define the company's vision, mission, goals, and strategies.

4. Fase B: Business Architecture

This phase contains business strategy, organization and information about the activities that exist in the company such as main and supporting activities. In addition, this phase aims to analyze the internal and external environment and the factors that affect business processes.

Value chain means a process used to understand and identify key activities and where value can be added in order to achieve competitive advantage [15].

In addition to the value chain, This phase also includes a discussion of the value chain, SWOT analysis, and use case diagrams. SWOT analysis contains the systematic identification of various factors that can maximize strengths as supporting internal factors and opportunities, and at the same time can minimize weaknesses and threats [17]. While a use case is a series of interactions between actors and systems to shape behavior in a relational diagram [18].

5. Fase C: Information System Architecture

In this phase, a design is carried out that discusses the design of information system architecture based on the needs of business architecture. The information system architecture phase is also defined as a stage where it will contain a description of the application system and its role in supporting business processes.

6. Fase D: Technology Architecture

The technology architecture phase defines technology that can support the management of data and applications needed by the company

3. Results and Discussion

In the process of designing an enterprise architecture, research begins by analyzing the company's needs. The following are the steps to analyze and solve problems in this study based on the TOGAF ADM method.

3.1 Preliminary

The determination of the company's scope is carried out as an initial stage in the development of enterprise architecture. This is done so that the research can focus on limitations that only cover the scope of the research. The scope of this research was carried out on one of the companies engaged in construction, namely PT Perkebunan Kaltim Utama.

3.2 Requirement Management

PIECES analysis is carried out to identify problems in a business process. This identification of time aims to determine the goals or objectives to be achieved in the development of enterprise architecture. Based on the results in the Table 2, the PIECES analysis, several weaknesses were found in business activities running at PT Perkebunan Kaltim Utama. These weaknesses often occur in business activities related to company data, such as the manual data input and storage process, which results in easy errors in the process.

Table 2. Analysis Pieces.

No	Parameter	Analyze Result
1	Performance Throughput	The process of each transaction takes a considerable amount of time because the transactions in each department are still separate. As a result, data and information integration must be done manually through file transfers between departments
2	Response Times	The creation of invoices takes a relatively long time because the data is still entered using Excel.
	Information Accuracy	Invoice data, receipts, and similar documents are still input and created manually in Excel on a repetitive basis, which greatly increases the possibility of data entry errors
	Relevancy	Purchase transactions information is still handwritten, which can lead to data loss
	Punctual	All information recording and documentation are still not using an integrated system, which results in relatively long processing times
3	Economic Cost	Data exchange between departments is still carried out using paper documents or external hard drives. The use of paper leads to waste, and with manual data exchange and reconciliation, the workload on employees increases significantly, further escalating the burden on them
4	Data Security Control	The overall report data, which is stored in paper and book documentation, is still considered insecure due to the possibility of manipulation, loss, tearing, or other physical damage
	Access Rights	Most of the data was stored in hardcopy form and was not kept in a secure, designated cabinet, which allowed easy access by anyone
5	Efficiency of Used Resources	When the required documents are in physical form, such as paper, it becomes difficult for employees to search for them, especially when discrepancies or calculation errors occur in the accounting department.
6	Service Quality and Quantity	Serving customers takes a relatively long time because it requires checking multiple departments, adding up the total bill, and then printing the invoice and receipt

Table 3 shoes, the Gap analysis aims to find out the running business architecture and find solutions in designing new information systems to achieve the company's targets. At PT Perkebunan Kaltim Utama still has several business processes that have not been integrated so that the target of the proposed architecture is made.

Table 3. Gap Analysis

Current Condition	Analysis	Target Architecture
The lack of an integrated information system results in data exchange and integration between departments being highly susceptible to errors, leading to potential discrepancies and inefficiencies	Designing an integrated information system that connects all departments or work units	An integrated information system has been implemented, making the coordination process much easier and more efficient
Data processing and storage have been carried out digitally; however, some reports are still being handled physically, which slows down data access and creates inefficiencies in the workflow	Strategic design of information system management	The processing time, data search, and access have become faster, with all information securely stored in the database
The data storage system is still physical and lacks security, which makes it vulnerable to threats.	The use of Management Information Systems (MIS)	The use of a Management Information Systems (MIS) for regulating authorization and authentication of data usage.

3.3 Architecture Vision

In this phase, a search was carried out related to the vision and mission as well as the goals and strategies of the company. The vision of PT Perkebunan Kaltim Utama is to increase the competitiveness of quality and work performance in the field of civil and mechanical construction in the Kalimantan region. In order to realize this vision, the company's name. The mission of the company is with the competence human resources, PT Perkebunan Kaltim Utama wants to raise the company's name to become a local company in Central Kalimantan, especially in East Kotawaringin Regency, which is no less competitive with other construction companies from the island of Java and the island of Sumatra.

Meanwhile, the company also has several strategies used in reaching the market and facing competition. Some of the strategies in question are as follows:

1. Providing a real price to the project owner, PT Perkebunan Kaltim Utama always provides the original price so that the project owner believes and can work together comfortably and in that way PT Perkebunan Kaltim Utama can maintain a relationship with the project owner.
2. Competing healthily, PT Perkebunan Kaltim Utama is never greedy in taking projects in one company, this is in order to maintain a healthy relationship between business rivals considering that the competition for contractors is very tight so that any method will be used to obtain the results they want.
3. Stay updated on upcoming projects.

3.4 Business Architecture

The business activities that are currently running in the company are described by the value chain which contains the main activities and supporting activities. As well as a value chain that contains an external analysis of the business environment. Value chain analysis is needed in a framework for identifying business needs for enterprise architecture design at PT Perkebunan Kaltim Utama. Fig 2 shows, the goal is to map the entire work process that occurs in the company.

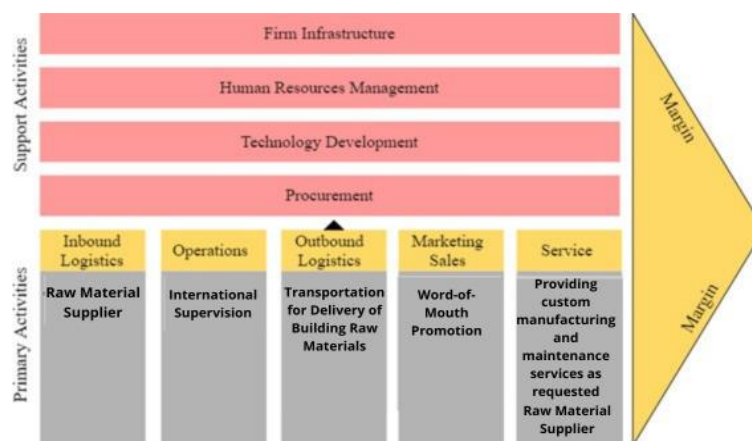


Fig. 2. Value Chain Internal

As shown in the image above where some supporting activities and main activities that run in the company are mentioned. In supporting activities, the activities include parts that will support business processes such as the firm infrastructure part which contains general management, planning, finance, accounting and quality management activities. In the human resource management section which contains activities related to employee development, providing training, recruiting new employees, implementing the collection, management, storage, maintenance of employee data and preparing and proposing employee promotions.

The recruitment process at PT Perkebunan Kaltim Utama itself is carried out by the commissioner and president director. Then in technology development, activities carried out to support companies are related to the management and processing of information and protect the company's knowledge base. Furthermore, it is in the procurement or management of facilities and infrastructure which is in charge of carrying out procurement, data collection, purchase, utilization and maintenance of facilities and infrastructure owned by the company. As for the external value chain, here it explains how the influence of organizations outside the company in their cooperation helps the company's internal business activities.

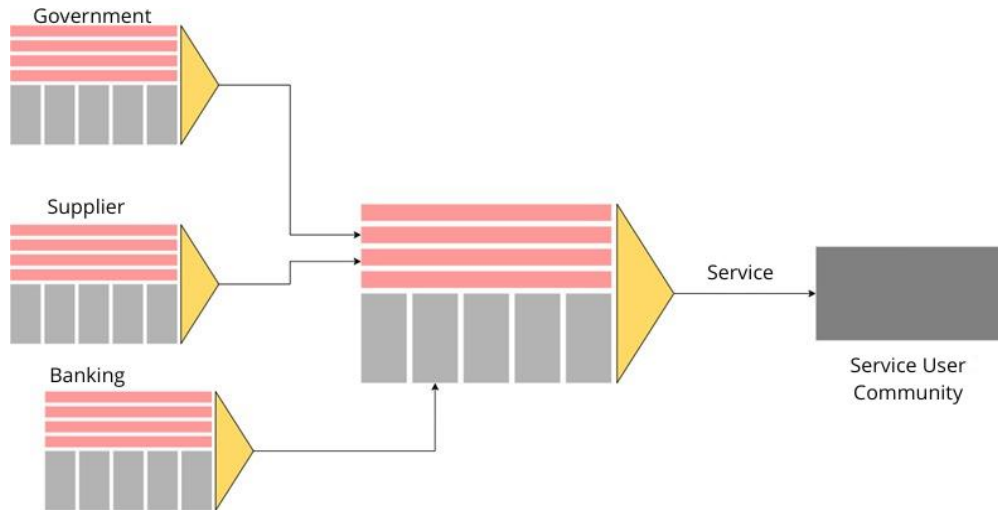


Fig. 3. External Value Chain

In addition, an analysis of several strengths, weaknesses, opportunities, and threats that affect business processes is also carried out. Table 4 shows the results of the SWOT analysis that has been carried out on the company. From the internal side in terms of strength, the company is considered superior in competent human resources and prioritizes trust in project owners by providing genuine price information in every collaboration carried out. Meanwhile, the company's weaknesses include systems that have not been integrated so that in some business activities they are still running ineffectively and efficiently. Apart from the internal side, SWOT analysis is also carried out on the external side, namely for the opportunities that the company has, there are technological advances used so that it can maximize business processes and promotions. Another opportunity is related to the company's location in Kalimantan where there are many oil palm plantations so as to increase the needs of clients in accordance with the services offered by the company. Meanwhile, the company also has threats from competitors of other companies in the same field, especially companies that are superior in the use of technology.

Table 4. SWOT Analysis

Internal		External	
Strength	Weakness	Opportunities	Threats
Having skilled human resources in their respective fields, who are also capable of utilizing information technology effectively to enhance the company's competitiveness and drive business growth	The information system was not yet integrated, making it vulnerable to errors during data exchange between different departments or business processes within the system	Utilizing the opportunities presented by advancements in information technology, communication technology, and information systems to maximize the use of technology in business processes and promotional activities, thereby enhancing overall efficiency and outreach	Many other companies were also operating in the same field, creating a highly competitive market
Consistently offering fair and transparent pricing to build trust with project owners, ensuring a comfortable working relationship, and maintaining long-term partnerships with clients	Some reports were still processed manually in physical form, which caused slower data access and delays in the overall workflow	The abundance of oil palm plantations has increased the demand from clients to utilize the services offered by the company, thereby driving business growth and expanding opportunities	The competing companies used more advanced technology, gaining a competitive edge in the market

Use case diagrams are created with the aim of displaying an overview of a user's interaction with the system in accordance with their respective access rights. In this study, the interaction covers three business processes ranging from purchasing, human resources, and finance. The use cases for each business process in this study have been illustrated in Fig. 4, 5 and 6. There are three main components in a use case diagram, namely the system, actors, and use cases. Actors represent people or devices that will interact with the system they are built on. While the use case describes each function built within the system so that it is easy for users to understand.

Fig 4 shows, the Use Case Diagram for the Purchasing process at PT Perkebunan Kaltim Utama. This diagram shows the interactions between actors and the purchasing system, illustrating how users interact with it to achieve specific goals.

1. Actors Involved:

- Purchaser: The primary user who initiates purchasing requests and interacts with the system to place orders.
- Supplier: Represents external entities that provide goods or services. The supplier receives orders and confirms delivery.
- Inventory Manager: Responsible for overseeing stock levels and ensuring that purchases align with inventory needs.

2. Use Case:

- Create purchase order: This use case describes the process where the purchaser generates a new purchase order within the system, detailing the items needed, quantities, and supplier information.
- Approve purchase order: After creation, the purchase order may require approval from a designated authority within PT Perkebunan Kaltim Utama before it is finalized.
- Receive goods once the order is confirmed by the supplier, this use case captures the steps involved in receiving and verifying the goods against the purchase order.
- Update Inventory: This use case reflects how inventory levels are updated automatically in the system once goods are received, ensuring accurate stock management.

3. System Boundaries:

The diagram delineates the boundaries of the purchasing system, indicating what functionalities are included within it and how actors interact with these functionalities.

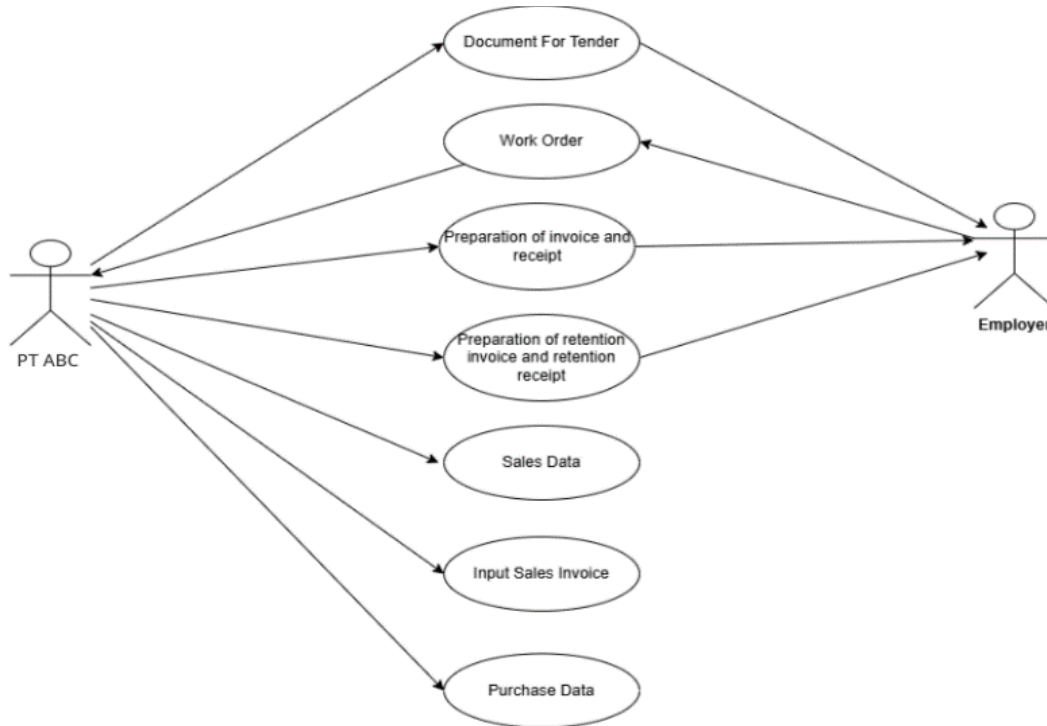


Fig. 4. Use Case Diagram Purchasing

Fig 5 shows The Use Case Diagram for Human Resources (HR) at PT Perkebunan Kaltim Utama visually represents the interactions between various actors and the HR system, illustrating how users engage with the system to manage human resource functions effectively.

1. Actors Involved:

- HR Manager: The primary user responsible for overseeing all HR activities, including recruitment, employee management, and compliance with labor regulations.
- Employee: Represents the staff members who interact with the HR system for various purposes, such as submitting leave requests, accessing personal information, and participating in performance evaluations.
- Recruiter: A specialized role focused on sourcing and hiring new employees. The recruiter interacts with the system to post job openings and manage applications.
- Payroll Administrator: Responsible for managing payroll processes, including salary calculations and disbursements.

2. Use Case:

- Manage Employee Records: This use case involves maintaining up-to-date employee information within the HR system, including personal details, job titles, and performance records.
- Recruit Employees: This use case outlines the steps involved in posting job vacancies, reviewing applications, conducting interviews, and selecting candidates.
- Process Payroll: This use case captures the procedures for calculating employee salaries, managing deductions, and issuing payments on time.
- Handle Leave Requests: This use case describes how employees can submit requests for leave through the HR system and how these requests are reviewed and approved by the HR manager.
- Conduct Performance Evaluations: This use case involves managing the performance review process, allowing managers to evaluate employee performance and provide feedback.

3. System Boundaries:

The diagram defines the boundaries of the HR system, indicating which functionalities are included and how actors interact with these functionalities.

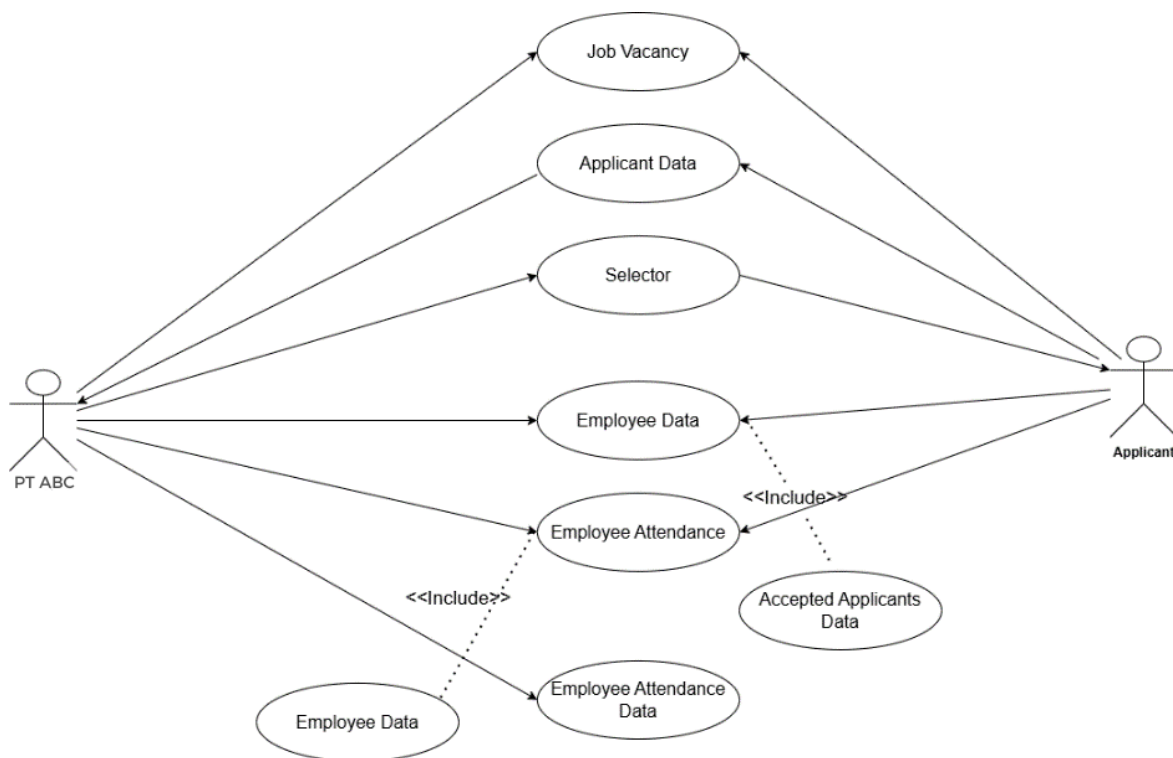


Fig. 5. Use Case Human Resources Diagram

Fig 6 shows, The Use Case Diagram for Financial processes at PT Perkebunan Kaltim Utama visually represents the interactions between various actors and the financial system, illustrating how users engage with the system to manage financial operations effectively.

1. Actors Involved:

- Finance Manager: The primary user responsible for overseeing all financial activities, including budgeting, forecasting, and financial reporting.
- Accountant: Handles day-to-day financial transactions, maintains financial records, and prepares financial statements.
- Auditor: An external or internal party that reviews financial records and processes to ensure compliance and accuracy.
- Supplier: Represents external entities that provide goods or services and interacts with the financial system for invoicing and payment processing.

2. Use Case:

- Manage Budgets: This use case involves creating, modifying, and monitoring budgets within the financial system to ensure that spending aligns with organizational goals.

- b) Process Invoices: This use case outlines the steps involved in receiving, verifying, and processing invoices from suppliers for payment.
- c) Generate Financial Reports: This use case describes the steps for generating financial reports, including profit and loss statements, balance sheets, and cash flow reports.
- d) Conduct Audits: This use case describes how auditors access the financial system to review records and ensure compliance with accounting standards and regulations.
- e) Manage Payments: This use case reflects how payments are processed to suppliers and other entities, ensuring timely disbursement of funds.

3. System Boundaries:

The diagram defines the boundaries of the financial system, indicating which functionalities are included and how actors interact with these functionalities.

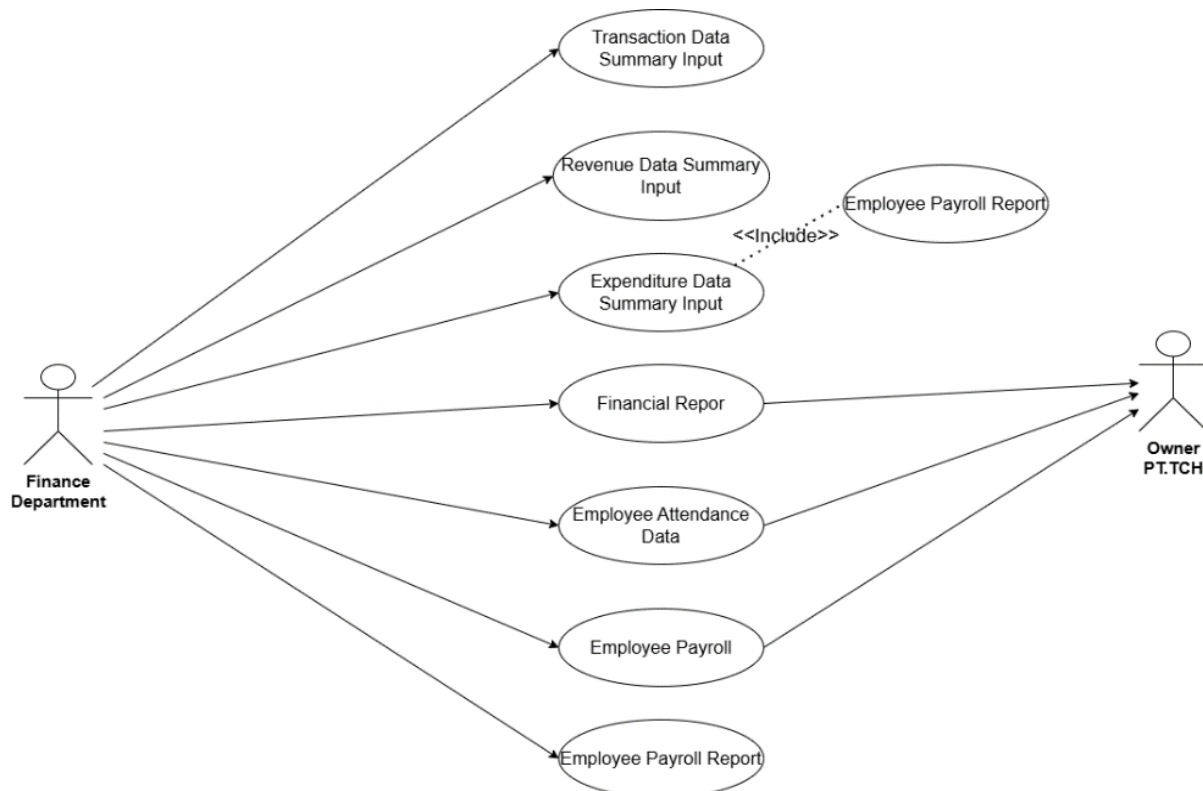


Fig. 6. Use Case Financial Diagram

3.5 Information System Architecture

There are two stages in information system architecture, specifically data architecture and application architecture. Application architecture describes the applications needed to support every business activity, while data architecture contains data or information that is also needed for every business activity.

Table 5 shows the essential business and data entities for PT Perkebunan Kaltim Utama's enterprise architecture. It includes entities for key business functions such as Purchasing (Sales, Purchase, Product, Inventory, and Supplier Entities), Human Resources (Recruitment, Employee, Position, Attendance, and Department Entities), and Finance (Revenue, Expenditure, and Payroll Entities). These entities will structure the data necessary for the company's business processes, ensuring that information is organized to support operational efficiency and system integration. The identification of these entities is a critical step in designing the architecture and selecting the appropriate applications to manage and process them.

The results of the identification of data and application architecture, a matrix is created that will describe the relationship of each candidate. Table 6 shows the Application Entity Candidate List, which outlines the applications needed to manage the data entities identified in the previous table. For the Purchasing function, the candidate applications include Product Data Application, Sales Application, Purchase Application, and Supplier Application. The Human Resources function will be supported by applications like Employee Data Application, Recruitment Application, and Attendance Application. For Finance, the applications include Financial Management Application, Revenue Management Application, Expenditure Management Application, and Payroll Management Application. These applications are designed to interact with the corresponding data entities, facilitating efficient data processing, storage, and management across business functions.

Table 5. Data Entity Candidate List

Business Entities	No	Data Entities
Purchasing	1.	Sales Entity
	2.	Purchase Entity
	3.	Product Entity
	4.	Inventory Entity
	5.	Supplier Entity
Human Resources	1.	Recruitment Entity
	2.	Employee Entity
	3.	Position Entity
	4.	Attendance Entity
	5.	Department Entity
Finance	1.	Revenue Entity
	2.	Expenditure Entity
	3.	Payroll Entity

Table 6. Application Entity Candidate List

No	Business Function	Analysis	No	Target Architecture
1	Purchasing	Purchase Information System	1.1	Product Data Application
			1.2	Sales Application
			1.3	Purchase Application
			1.4	Supplier Application
2	Human Resources	Human Resource Information System (HRIS)	2.1	Employee Data Application
			2.2	Recruitment Application
			2.3	Attendance Application
			3.1	Financial Management Application
3	Finance	Financial Information System	3.2	Revenue Management Application
			3.3	Expenditure Management Application
			3.4	Payroll Management Application

Table 7 shows the Matrix of Application Relations with Data Entities, which provides a detailed overview of how each application interacts with the data entities identified in earlier tables. This matrix helps establish the connections between business functions and the data they manage, ensuring that each data entity is effectively linked to the corresponding application for proper data handling. The relationships are categorized as Create, Reference, or Update, indicating how the applications interact with the data entities.

The Purchasing System interacts with several applications, including the Product Data Application, Sales Application, and Purchase Application. The matrix shows that the Product Data Application creates and references product-related data entities, while the Purchase Application updates purchase-related entities and references data like supplier information. Similarly, the Human Resources System manages data through applications such as Employee Data Application, Recruitment Application, and Attendance Tracking Application, all of which create, reference, and update employee, recruitment, and attendance records.

In the Finance System, applications like the Financial Management Application, Revenue Management Application, Expenditure Management Application, and Payroll Management Application interact with financial data entities, ensuring that entities such as revenue, expenditure, and payroll are continuously updated and referenced. The matrix makes it clear which data entities are affected by each application and whether the interaction involves creating new records, referencing existing data, or updating current entries.

This matrix is crucial for understanding how the various applications and data entities are interconnected within the enterprise architecture. By clearly defining these relationships, it helps ensure seamless integration of business processes, supports efficient data management, and enables the flow of information across different functional areas within PT Perkebunan Kaltim Utama. The matrix also provides valuable insights into how data is handled at each stage of the process, helping to identify potential gaps or inefficiencies in the data management system.

Table 7. Matrix of Application Relations with Data Entities

		Sales Management Entity	Buyer Entity	Product Inventory Entity	Stock Management Entity	Supplier Entity	Hiring Entity	Workforce Entity	Job Role Entity	Attendance Entity	Division Entity	Income Management Entity	Expense Management Entity	Payroll Management Entity
Purchasing System	Product Data Application	C		R	C									
	Sales Management Application	C		R	C									
	Purchase Management Application		C	R	C									
	Employee Information Application		R		R	C								
Human Resources (HR) System	Employee Data Management Application						C	C		C				
	Recruitment Application													
	Attendance Tracking Application							R		C				
Finance System	Financial Management Application											C	C	R
	Revenue Management Application											C		
	Expense Management Application											C		C
	Payroll Application								R	R				

The relationship is also depicted in the form of an E-R (Entity Relationship) diagram in Fig. 7 which contains the relationship between each data entity. The Entity Relations diagram illustrates how each existing entity is interconnected with each system. The Entity-Relationship (E-R) Diagram for PT Perkebunan Kaltim Utama illustrates the relationships between various entities within the organization's database system, providing a visual representation of how data is structured and interconnected.

1. Entities Involved:

- Employee: Represents the staff members of PT Perkebunan Kaltim Utama, containing attributes such as Employee ID, Name, Position, and Contact Information.
- Department: Represents different departments within the organization, with attributes like Department ID, Department Name, and Location.
- Project: Represents projects undertaken by the company, including attributes such as Project ID, Project Name, Start Date, and End Date.
- Supplier: Represents external entities that supply goods or services to PT Perkebunan Kaltim Utama, with attributes like Supplier ID, Supplier Name, and Contact Information.

2. Relationships:

- Works In: This relationship connects the Employee entity to the Department entity, indicating which department each employee belongs to. It may include cardinality indicating that an employee works in one department but a department can have multiple employees.
- Assigned To: This relationship links the Employee entity to the Project entity, showing which employees are assigned to which projects. This relationship can indicate that an employee can work on multiple projects while a project can have multiple employees assigned to it.
- Supplies: This relationship connects the Supplier entity to the Project entity, indicating which suppliers provide goods or services for specific projects. It may show that a supplier can supply multiple projects while each project can have multiple suppliers.

3. Attributes:

Each entity in the diagram has specific attributes that provide detailed information about them. For example:

- The Employee entity may include attributes like Hire Date and Salary.
- The Project entity may include attributes like Budget and Status.

This E-R Diagram serves as a crucial tool for understanding the data structure at PT Perkebunan Kaltim Utama. It helps stakeholders visualize how different entities interact within the organization's database system, facilitating better communication among team members during the design and implementation phases of enterprise architecture. By clearly defining entities and their relationships, it supports effective data management and retrieval processes essential for business operations.

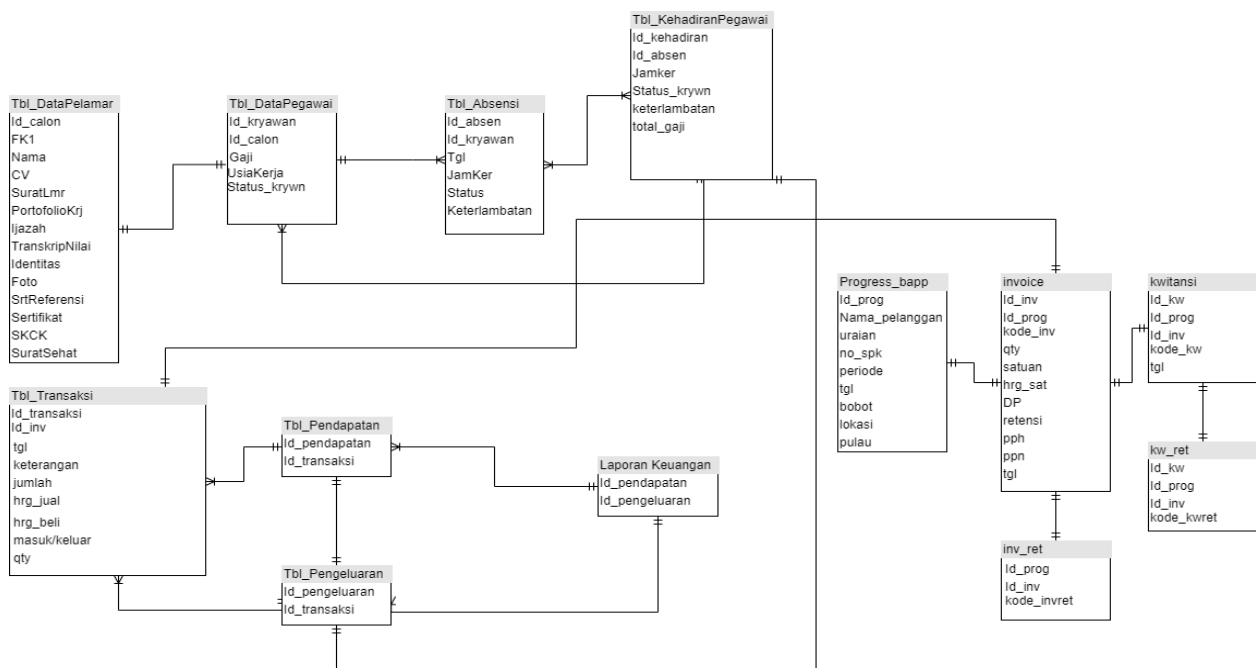


Fig. 7. E-R Diagram

3.6 Technology Architecture

The identification of the technology needed in the company is explained at this stage by making a proposed technology platform that is created. The proposal is listed in the portfolio of future applications in Table 8 which contains a list of applications submitted or recommended as input to be applied to PT Perkebunan Kaltim Utama .

Table 8. Future Application Portfolio

Code	Strategic	Code	High Potential
2.1	Employee Data Application	2.2	Recruitment Application
2.3	Attendance Application		
1.1	Product Data Application		
Code	Key Operational	Code	Support
3.1	Financial Management Application	3.2	Revenue Management Application
3.4	Payroll Application	3.3	Expenditure Management Application
1.2	Sales Application		
1.3	Purchase Application		

In the *purchasing* information system, the application candidates contained in it as mentioned in Table 9 are described as the information system used for the transaction process. Then for the human resource information system, the application candidate is used as an information system that will help in employee management. Meanwhile, the financial information system includes applications that help financial management.

Table 9. Comparison with a Running System

No	System Information	Application Module Candidate	Description
1	Purchasing System	Product Data Application Sales Management Application Purchase Management Application Employee Information Application	Done manually
2	Human Resources (HR) System	Employee Data Management Application Recruitment Application Attendance Tracking Application	Done manually Not available yet Done manually
3	Finance System	Financial Management Application Revenue Management Application Expense Management Application Payroll Application	Done manually

According to the comparison of the running system as mentioned in Fig 8, it is known that in some parts there are still many business processes that have not been integrated with the system. Starting from business processes that are done manually to those that do not have a system available at all. Based on the results of the analysis that has been carried out, the following Service Oriented Architecture (SOA) is made which shows an integrated system model that aims to explain the process more specifically regarding the service use of the system.

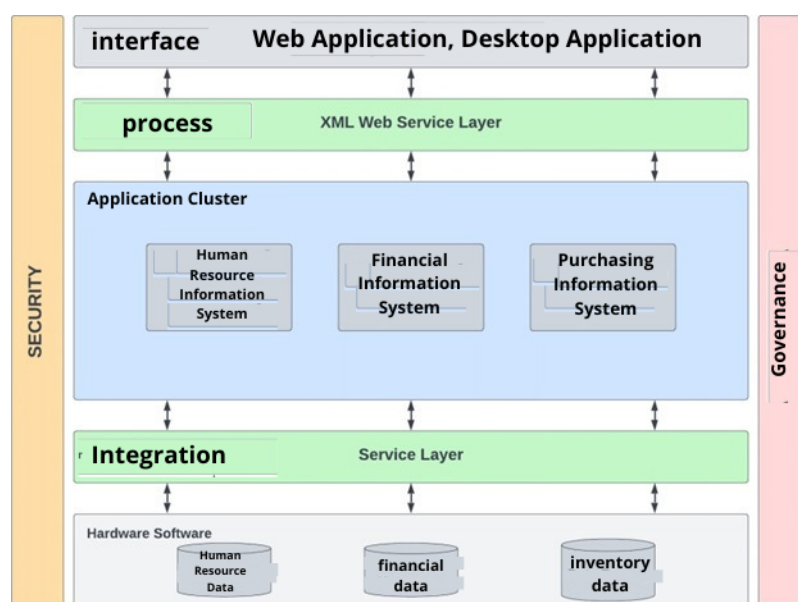


Fig. 8. Service Oriented Architecture (SOA)

4. Conclusion

According to the purpose of this study, the design of enterprise architecture ends in the *technology architecture* phase because the next phases include the implementation process of the design that has been designed. Therefore, based on the phases in the design and development of enterprise architecture at PT Perkebunan Kaltim Utama uses TOGAF ADM, obtained the results of the analysis of system needs in the company. From the results of the analysis, an enterprise architecture design was obtained that can be used by the company as a guideline for system development that will help its business activities. The proposed design relates to three parts within the company, especially for purchasing, human resources, and finance due to the lack of an integrated system for business activities in these parts.

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