Proposed Implementation uses TOGAF ADM and ArchiMate - Enterprise Architecture in Retail Industry

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Abstract: As the growth rate of the retail industry in Indonesia continues to increase, leveraging information technology (IT) to support business operations has become increasingly crucial for achieving effectiveness and efficiency. Retail companies must manage interconnected business systems, such as inventory management, supply chain, e-commerce, and customer service. Without a clear architecture, integrating these systems becomes challenging, leading to operational inefficiencies, difficulties in decision-making, and an inability to respond quickly to market trends. A comprehensive Enterprise Architecture (EA) is therefore essential for managing all core processes within a company. Implementing EA using the TOGAF (The Open Group Architecture Framework) methodology is an optimal choice, as it is widely recognized and adopted. **Technology Architecture, Data Architecture, Application Architecture, and Business Architecture** are the four primary domains of TOGAF. Business Architecture improves cross-departmental integration and streamlines Business Process, while Application Architecture facilitates automation and optimizes application systems for more efficient operations. Data Architecture focuses on structured data management, ensuring accurate and accessible information for decision-making. Meanwhile, technology architecture provides a flexible and adaptable technological infrastructure that responds to business changes. By implementing Enterprise Architecture (EA) through TOGAF ADM, the retail industry can streamline Business Process, integrate various systems, adopt new technologies, and optimize the supply chain more effectively. This approach not only enhances operational efficiency but also strengthens competitiveness in the retail sector by fostering innovation and providing responsive services.

Keywords: Enterprise Architecture; Retail Industry; Business Architecture; ArchiMate; TOGAF ADM.

INTRODUCTION

The retail industry in Indonesia is currently undergoing rapid development and significant changes due to advancements in digital technology. **Figure 1**: The Real Sales Index (RSI) of Indonesia from January 2019 to April 2023 demonstrates fluctuations influenced by various domestic and global economic factors. During this period, the RSI reflects market dynamics including economic growth, changes in consumer purchasing power, and the impact of monetary and fiscal policies. The data shows consistent growth at the start of 2019, a significant decrease in 2020 due to the COVID-19 pandemic, and a slow rebound in 2021. Despite this recovery, inflation and global economic uncertainty continue to affect real sales trends, with notable fluctuations observed toward the end of 2022 and early 2023.
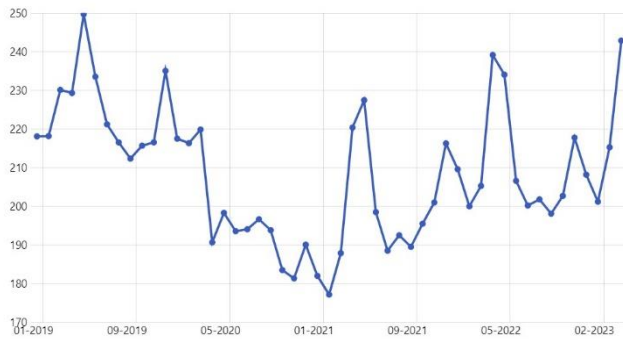
Figure. 1 Real Sales Index (RSI) of Indonesia (January 2019-April 2023). **Source: Bank Indonesia**
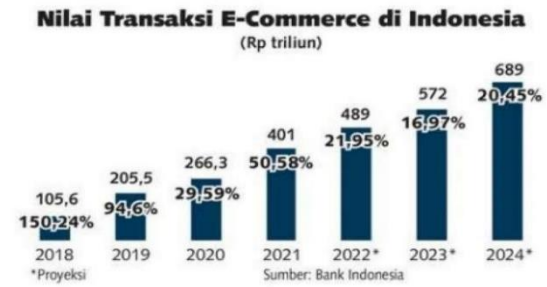

Figure. 2 Value of E-Commerce Transactions **Source: Bank Indonesia**

The growth of the retail industry in the digital era is marked by significant transformation driven by advanced technologies. E-commerce facilitates online shopping, enhancing transaction volumes and market reach. Big Data Technology assists companies in analyzing consumer behavior, improving marketing strategies, and enhancing customer experiences. Cloud computing provides flexibility in managing data and applications, enabling more efficient system integration. This is illustrated in **Figure 2**, which shows that e-commerce transactions in Indonesia have seen substantial growth over the past five years.

Yet, many retail companies struggle to integrate various Business Operations, data, technologies, and applications effectively. Previous studies have found that retail companies lacking Enterprise Architecture (EA) have a higher rate of failure in digitalization projects, failing to deliver the expected value. (Möhring et al., 2023). A key challenge is the absence of a structured EA implementation, which leads to operational inefficiencies and poor synchronization between business units. This makes it difficult for them to compete in a rapidly changing market. Regarding the retail sector, Enterprise Architecture (EA) is essential for optimizing operations and integrating various functions like inventory management and supply chain coordination. Implementing EA helps retail organizations gain better visibility into their processes, streamline workflows, and ensure that all departments work together towards common goals. This holistic strategy not only increases operational efficiency but also enables the development of creative business models to meet the demands of the digital era.

In this context, TOGAF (The Open Group Architecture Framework) is a framework used to design, manage, and develop Enterprise Architecture (EA) within a company. TOGAF consists of several main components, namely:(Aderiandra et al., 2024).

1. **Business Architecture**: Defining the main procedures, governance framework, and business strategy of the company.
2. **Data Architecture**: Identifying data structures, data standards, data quality, and data integrity.
3. **Application Architecture**: Describes how applications and the interactions between them support Business Process.
4. **Technology Architecture**: Describes the technology infrastructure, technology standards, and security measures to support system and application integration.

ArchiMate is visualization capabilities that facilitate the identification of problems and solutions efficiently. (Rizky & Fajar Firmansyah, 2017). By implementing Enterprise Architecture using the TOGAF framework and ArchiMate modeling, retail businesses can gain various benefits including:

1. **Enhanced Operational Effectiveness**: By understanding and optimizing business processes and technology infrastructure, companies can reduce operational costs and increase productivity (Batmetan et al., 2023).
2. **Flexibility and Scalability**: Enterprise Architecture allows companies to more easily adjust to market changes and business growth.
3. **Enhanced Service Quality**: With more efficient processes and integrated systems, companies can provide better services to customers.
4. **Better Decision Making**: Enterprise Architecture assists in IT resource decision-making across all levels of the organization, including executive, managerial, and staff levels (Bernard, 2006).

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The implementation of Enterprise Architecture (EA) in the retail sector still faces many challenges, despite its numerous benefits. EA implementation often fails due to decisions not based on accurate analysis and organizational needs, leading to a technology paradox. This occurs when the IT strategy is not aligned with the business strategy. Key factors for the successful and smooth implementation of Enterprise Architecture (EA) in the retail industry, several solutions can be applied: **In-Depth Needs Analysis**, **Strategy Alignment**, **Communication and Collaboration**, **Phased Approach**, **Evaluation and Adaptation**, **Training and Education**. By applying these solutions, retail companies can increase their chances of successful EA implementation and maximize the value derived from the project.

LITERATURE REVIEW

Enterprise Architecture (EA) aims to align business strategy with IT to ensure that the integration of systems and applications, as well as the technology used, functions effectively to support decision-making and improve operational efficiency based on the TOGAF ADM Framework. The retail sector benefits significantly from using the ADM technique for planning, developing, and implementing information systems and business architecture.(Amanda et al., 2023; Pramesti, 2021).

TOGAF divides enterprise architecture into four main domains. First, **Business Architecture** describes the Business Operations required to achieve organizational goals. Second, **Application Architecture** describes applications based on their design, their interaction with other applications, and their relationship to Business Process. Third, **Data Architecture** centers on the methods for organizing, managing, and accessing data within an organization, covering both its logical and physical structures. The fourth component is **Technology Architecture** focuses on the network infrastructure, hardware, and software that support applications and their interactions. (Prawira et al., 2023; N. C. Putri et al., 2023).

ArchiMate is a modeling tool that complements the TOGAF framework by offering a visual representation of enterprise architecture. The ArchiMate Core Framework encompasses three main aspects: **Active Structure**, **Behavior**, and **Passive Structure**. Active Structure consists of elements like business actors, Software Components, and devices. Behavior includes processes, functions, events, and services carried out by actors. Passive Structures refer to objects, typically information or Data Entity's, upon which behavior is executed. (Hindarto et al., 2021)

Businesses may make sure that their IT systems are in line with their aims and objectives by using Enterprise Architecture(EA). (Wedha et al., 2023)

Several papers will be compared as part of the literature evaluation in this research. **Enterprise Architecture Planning using TOGAF ADM in the Retail Industry**. (Andry et al., 2022). In this research, the visualization and diagrams have not yet used ArchiMate. **Enterprise Architecture Design at Toko Terus Sinar Using TOGAF ADM**. (Hardiani & Nur Afni, 2022). In this research, the integration between Technology Architecture, Data Architecture, Application Architecture, and Business Architecture is depicted separately. As a result, the data dependencies between layers are not clearly visible. **Yogya Group's Sales and Marketing Functions' Enterprise Architecture was designed using TOGAF ADM**. (Rizaldi et al., 2020). In the research, the visualization and diagrams have not yet used ArchiMate, and the depiction of Application Architecture and Data Architecture does not clearly show the data relationships between layers.

Previous research has not explored how **TOGAF ADM** and It is possible to adapted **ArchiMate** to satisfy the specific requirements of the ever-changing and varied retail sector. This study will illustrate Enterprise Architecture using **TOGAF ADM** in Retail Industry, starting from Phase A (Preliminary Phase) and continuing to Phase E (Opportunities and Solutions), with visualizations created using **ArchiMate**.

METHOD

This research employs the Architecture Development Method (ADM) from The Open Group Architecture Framework (TOGAF) as a methodological approach to developing Enterprise Architecture (EA) within the retail industry.(Group, 2011). (See. **Figure 3**) This research employs the TOGAF ADM framework, which includes the **Preliminary Phase**: This phase includes several activities, starting with identifying stakeholders, establishing architecture principles, evaluating architecture maturity, and planning and forming an architecture team. **Architecture Vision**: The Architecture Vision phase encompasses several crucial activities, such as:(Prawira et al., 2023)

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- • Developing a clear vision for the company's architecture, including its goals and expected benefits
   - • Understanding the concerns of stakeholders
    - • Determining the scope of the architecture project
    - • Creating a broad overview of the proposed architecture
    - • Establishing a set of guidelines to steer the development of architecture

In the Architecture Vision phase, a clear architecture vision is developed, and stakeholder needs are analyzed to develop the initial architecture blueprint.

Business Architecture: refers to the structure and Business Operations that support the organization's strategic goals. This involves identifying and mapping core Business Operations, roles, functions, and interactions between various business units and systems. In this study, the core retail processes include Onsite Sales, E-Commerce Sales, Marketplace Sales, Rental of Marketing Promotion Tools (e.g., Billboards), and Rental of Commercial Areas. **Information System Architecture**: Application identification and data mapping are done to develop an integrated information system model. In the Information Systems Architecture phase for the retail industry, key activities involve:

- • Defining System Requirements
- • Designing System Components
- • Establishing Data Flows
- • Integrating Systems
- • Ensuring Scalability and Flexibility

Technology Architecture: This phase involves evaluating the existing technology infrastructure, designing the technology architecture, and setting technology standards. Finally, in the Opportunities and Solutions phase, opportunities for improvement and innovation are identified, followed by the development of feasible solutions and implementation planning. The methodology is designed to ensure
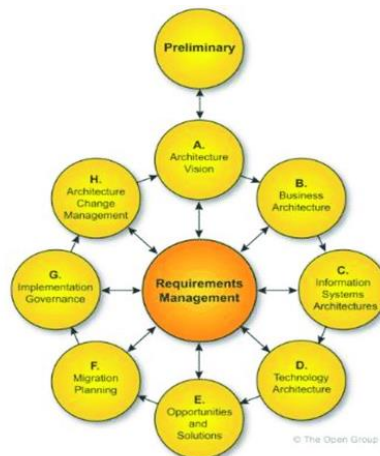
that the architecture developed aligns with the company's strategic business and technology goals.(Amanda et al., 2023).

Figure. 3 TOGAF – ADM Version 9.1
Source: The Open Group

RESULT

In this study, the researcher uses the TOGAF ADM framework to address key issues. The focus is placed on several phases, including the **Preliminary Phase**, **Architecture Vision**, and **Business Architecture**. Additionally, emphasis is given to **Information Systems Architecture** and **Technology Architecture**. This approach aims to provide a structured method for tackling challenges in the architecture process. The framework guides the development and alignment of business and IT strategies effectively.(A. W. Putri & Saepudin, 2024).

Preliminary Phase

The initial phase of TOGAF ADM readies the organization to implement the TOGAF framework in developing enterprise architecture. This phase includes establishing the architecture principles, determining the scope and approach, establishing the team and organizational structure, and identifying
*name of corresponding author

stakeholders and understanding their needs. In addition, this phase also includes selecting the framework, methodology, and supporting tools to be used, as well as developing a work plan that includes the schedule, budget, and resources needed. The goal is to ensure that all enterprise architecture development activities are in line with the organization's goals and are carried out in a structured and efficient manner.

Architecture Vision

A phase in which an overview of the architecture to be developed is established. The purpose of this phase is to align the vision of the architecture with the business objectives of the organization, ensure that all stakeholders have the same understanding, and determine the priorities and key needs to be met by the architecture.(SUSANTO, 2022). In addition, determining the scope of the architecture project and developing documents that will be used as guidelines for subsequent phases are also included in this phase. Show details in **Figure 4**. Business Model Canvas is a widely used tool in entrepreneurship for its ability to clearly outline the core elements of a business on a single canvas sheet. Its benefits include the ability to quickly adjust business models and observe how changes in one component impact other parts of the business.(Mamabolo, 2019)
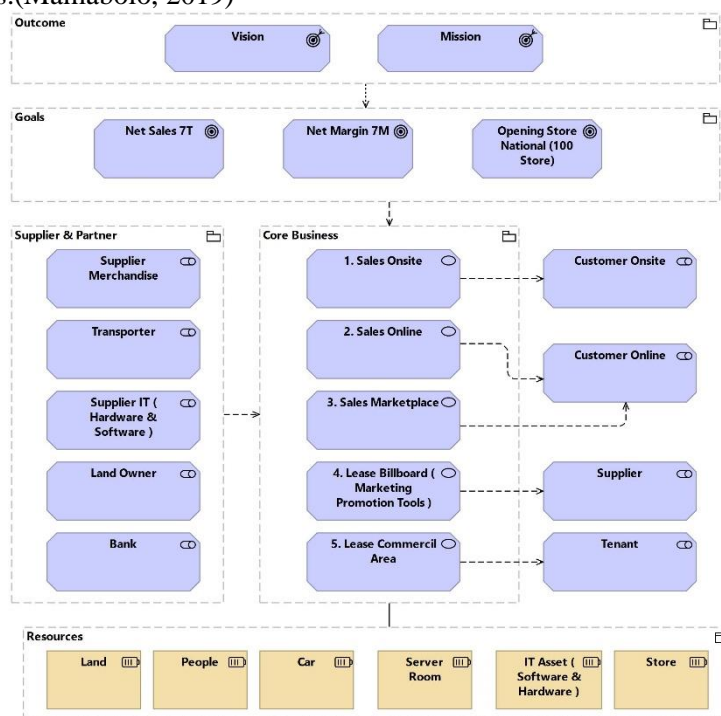

Figure. 4 Business Model Canvas

Business Architecture

In TOGAF ADM, the business architecture phase focuses on designing and documenting the business structure and processes of the organization. The purpose of this phase is to gain an understanding and definition of how the organization works, including the organizational structure, Business Operations, and information needs that support strategic goals. Business architecture describes how Business Operation's function, workflows are organized, and how different parts of the business interact to achieve goals (Gunawan et al., 2021). Organizations can ensure that the architecture they create matches their business needs and goals. Show detail in **Figure 5.** In this study, we use P.T XYZ as a case example, which has 5 core processes in its retail business, including: **Onsite Sales**, **E-Commerce Sales**, **Marketplace Sales**, **Rental of Marketing Promotion Tools (e.g., Billboards)**, and **Rental of Commercial Areas**. The flow processes for each core business will be illustrated using **ArchiMate** as a tool for designing, analyzing, and visualizing the Business Tier, Application Tier, and Technology Tier.
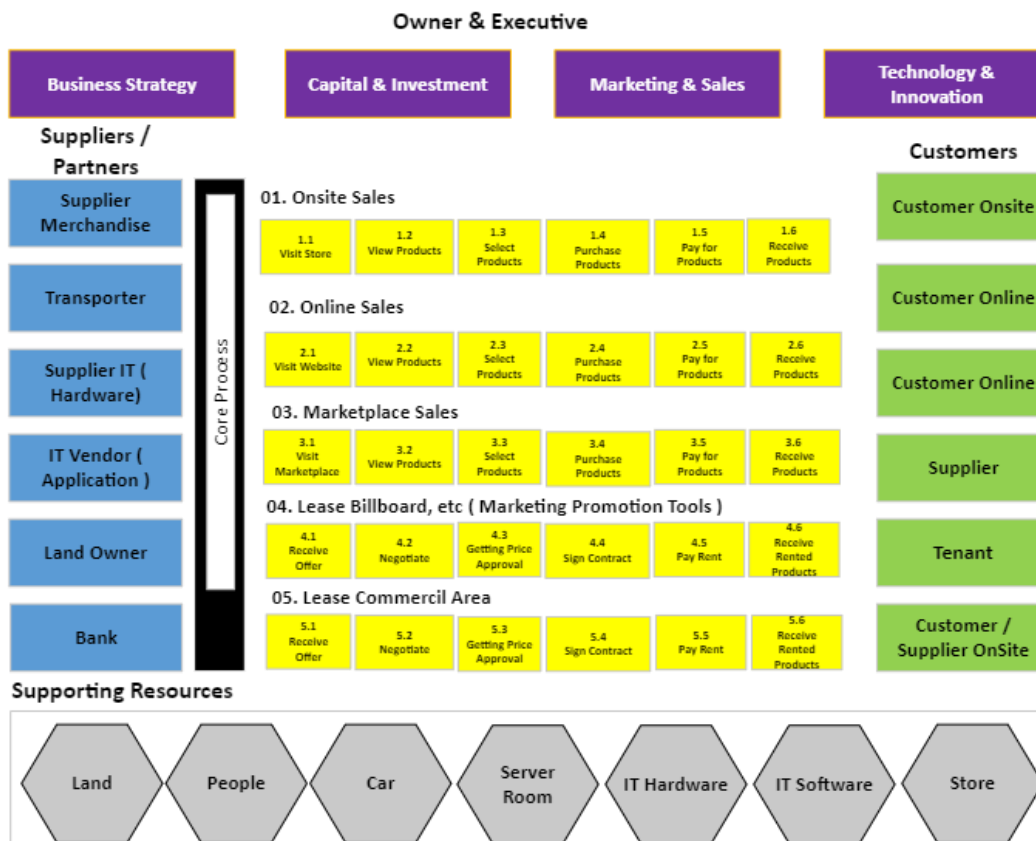
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Figure. 5 Business Architecture

Information System Architectures

In TOGAF ADM, the Information Systems Architecture phase focuses on designing and documenting the information systems architecture that supports the organization's business requirements. This phase includes two primary components: **Data Architecture**: Defines the organization's data structures and relationships, including data collection, storage, and management. Data schemas, models and related policies are included.(Vinardo et al., 2023). **Application Architecture:** Establishes the design and structure of application systems used in the organization, including how applications interact with each other and with other systems. It includes models, architecture, and application organization and integration. (Fikri et al., 2020). The purpose of **Information Systems Architecture** is to ensure that the information systems developed effectively support the Business Operations and strategic objectives of the organization in an integrated and consistent manner.

Technology Architecture

Technology Architecture outlines the technology platforms that underpin the functioning of the information systems architecture. This diagram includes all the infrastructure platforms needed to support the information systems. It provides an overview of the company's technology platforms. Technology Architecture ensures that all technical components function effectively and are well-integrated. As a result, organizations can manage and maintain their technology infrastructure efficiently. However, many retail companies struggle to effectively integrate Business Operations, applications, data, and technologies in the digital era.(Andry et al., 2022).

Table 1. List of ArchiMate Components for Core Business Onsite Sales

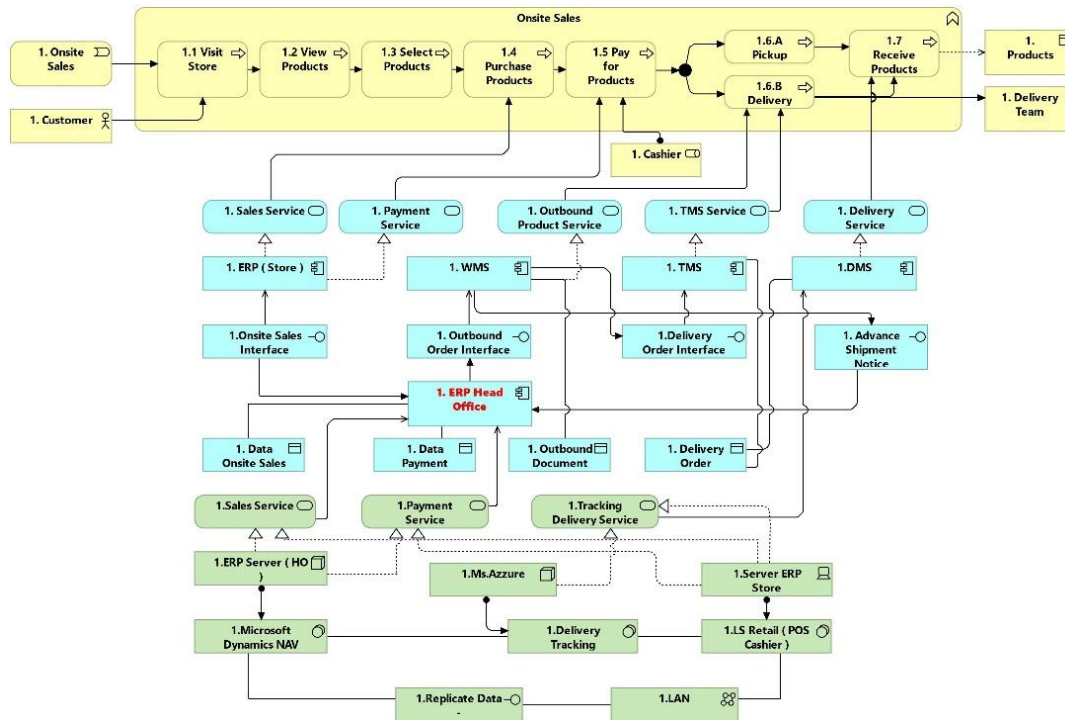| Element	Type	Layer
ERP (Store)	Software Component	Application Tier
ERP Head Office	Software Component	Application Tier
Transport Management	Software Component	Application Tier
Warehouse Management	Software Component	Application Tier
Delivery Management	Software Component	Application Tier
Advance Shipment Notice Interface	Application Interface	Application Tier
Outbound Order Interface	Application Interface	Application Tier
Delivery Order Interface	Application Interface	Application Tier
Onsite Sales Interface	Application Interface	Application Tier
Delivery Service	Application Service	Application Tier
Outbound Product Service	Application Service	Application Tier
Payment Service	Application Service	Application Tier
Sales Service	Application Service	Application Tier
Transport Management	Application Service	Application Tier
Data Onsite Sales	Data Object	Application Tier
Data Payment	Data Object	Application Tier
Delivery Order	Data Object	Application Tier
Outbound Document	Data Object	Application Tier
Customer	Business Actor	Business Tier
Delivery Team	Business Actor	Business Tier
Onsite Sales	Business Event	Business Tier
Onsite Sales	Business Function	Business Tier
Products	Business Object	Business Tier
1.1 Visit Store	Business Flow	Business Tier
1.2 View Products	Business Flow	Business Tier
1.3 Select Products	Business Flow	Business Tier
1.4 Purchase Products	Business Flow	Business Tier
1.5 Pay for Products	Business Flow	Business Tier
1.6.A Pickup Products	Business Flow	Business Tier
1.6.B Delivery Products	Business Flow	Business Tier
1.7 Receive Products	Business Flow	Business Tier
Cashier	Business Role	Business Tier
LAN	Communication	Technology Tier
Server ERP Store	Device	Technology Tier
ERP Server (HO)	Node	Technology Tier
Ms. Azzure	Node	Technology Tier
Delivery Tracking	System Software	Technology Tier
LS Retail (POS Cashier)	System Software	Technology Tier
Microsoft Dynamics NAV	System Software	Technology Tier
Replicate Data -	Technology Interface	Technology Tier
Payment Service	Infrastructure Service	Technology Tier
Sales Service	Infrastructure Service	Technology Tier
Tracking Delivery Service	Infrastructure Service	Technology Tier

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Figure. 6 Layer View – Onsite Sales (Archi Mate Model)

Table 2. List of ArchiMate Components for Core Business Online Sales

Element	Type	Layer
Delivery Management System	Software Component	Application Tier
E-Commerce	Software Component	Application Tier
ERP (HO)	Software Component	Application Tier
Transport Management System	Software Component	Application Tier
Warehouse Management System	Software Component	Application Tier
Advance Shipment Notice (ASN)	Software Interface	Application Tier
Delivery Order Interface	Software Interface	Application Tier
Outbound Order Interface	Software Interface	Application Tier
Sales Transaction Interface	Software Interface	Application Tier
Delivery Service	Application Service	Application Tier
Outbound Product Service	Application Service	Application Tier
Payment Service	Application Service	Application Tier
Sales Service	Application Service	Application Tier
TMS Service	Application Service	Application Tier
Data Online Sales	Data Entity	Application Tier
Data Payment	Data Entity	Application Tier
Delivery Order	Data Entity	Application Tier
Outbound Document	Data Entity	Application Tier
Customer	Business Actor	Business Tier
Online Sales	Business Event	Business Tier
Online Sales	Business Function	Business Tier
Products	Business Object	Business Tier
2.1 Visit Website	Business Operation	Business Tier

*name of corresponding author

| 2.2 View Products	Business Operation	Business Tier
2.3 Select Products	Business Operation	Business Tier
2.4. Purchase Products	Business Operation	Business Tier
2.5. Pay for Products	Business Operation	Business Tier
2.6. Receive Products	Business Operation	Business Tier
Ms. Azzure	Node	Technology Tier
ERP Server (HO)	Node	Technology Tier
Delivery Tracking	System Software	Technology Tier
NAV (HO)	System Software	Technology Tier
Payment Service	Infrastructure Service	Technology Tier
Sales Service	Infrastructure Service	Technology Tier
Tracking Delivery	Infrastructure Service	Technology Tier
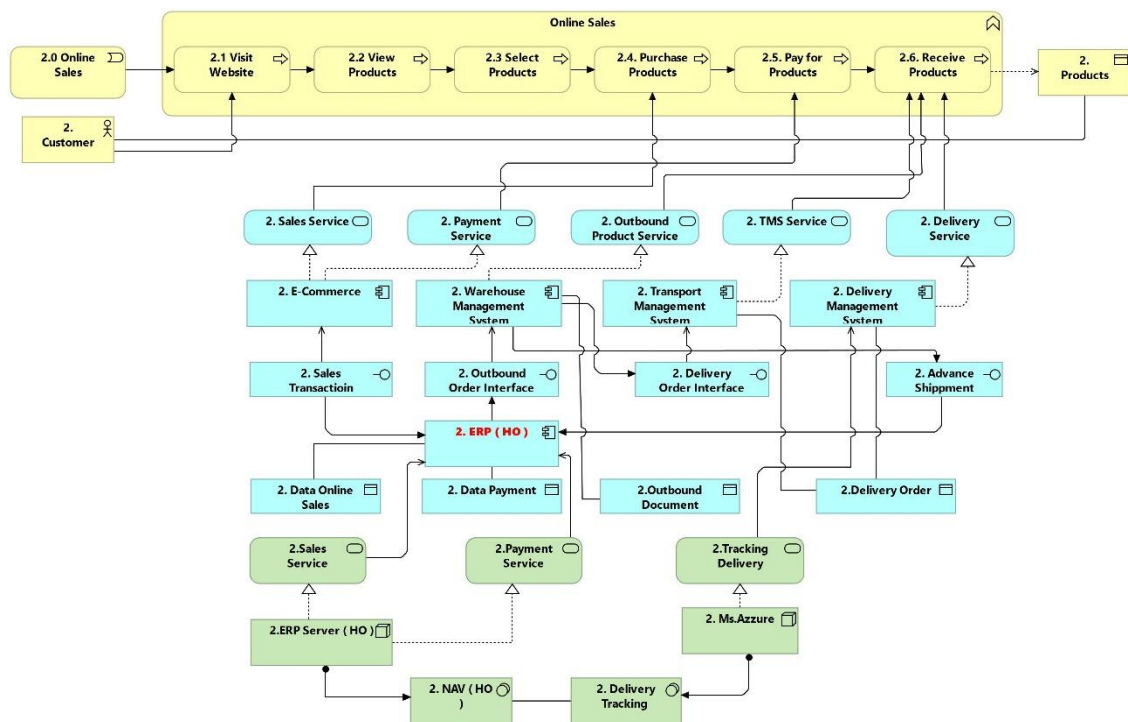
Figure. 7 Layer View – Online Sales (Archi Mate Model)

Table 3. List of ArchiMate Components for Core Business Lease Sales

Element	Type	Layer
ERP (Store)	Software Component	Application Tier
ERP Head Office	Software Component	Application Tier
TMS	Software Component	Application Tier
WMS	Software Component	Application Tier
DMS	Software Component	Application Tier
Advance Shipment Notice Interface	Software Interface	Application Tier
Outbound Order Interface	Software Interface	Application Tier
Delivery Order Interface	Software Interface	Application Tier
Onsite Sales Interface	Software Interface	Application Tier
Delivery Service	Application Function	Application Tier
Outbound Product Service	Application Function	Application Tier
Payment Service	Application Function	Application Tier

*name of corresponding author

| Sales Service	Application Function	Application Tier
TMS Service	Application Function	Application Tier
Data Onsite Sales	Data Entity	Application Tier
Data Payment	Data Entity	Application Tier
Delivery Order	Data Entity	Application Tier
Outbound Document	Data Entity	Application Tier
Customer	Business Actor	Business Tier
Delivery Team	Business Actor	Business Tier
Onsite Sales	Business Event	Business Tier
Onsite Sales	Business Function	Business Tier
Products	Business Object	Business Tier
1.1 Visit Store	Business Operation	Business Tier
1.2 View Products	Business Operation	Business Tier
1.3 Select Products	Business Operation	Business Tier
1.4 Purchase Products	Business Operation	Business Tier
1.5 Pay for Products	Business Operation	Business Tier
1.6.A Pickup Products	Business Operation	Business Tier
1.6.B Delivery Products	Business Operation	Business Tier
1.7 Receive Products	Business Operation	Business Tier
Cashier	Business Role	Business Tier
LAN	Communication Network	Technology Tier
Server ERP Store	Device	Technology Tier
ERP Server (HO)	Node	Technology Tier
Ms. Azzure	Node	Technology Tier
Delivery Tracking	System Software	Technology Tier
LS Retail (POS Cashier)	System Software	Technology Tier
Microsoft Dynamics NAV	System Software	Technology Tier
Replicate Data - Synchronization	Technology Interface	Technology Tier
Payment Service	Infrastructure Service	Technology Tier
Sales Service	Infrastructure Service	Technology Tier
Tracking Delivery Service	Infrastructure Service	Technology Tier
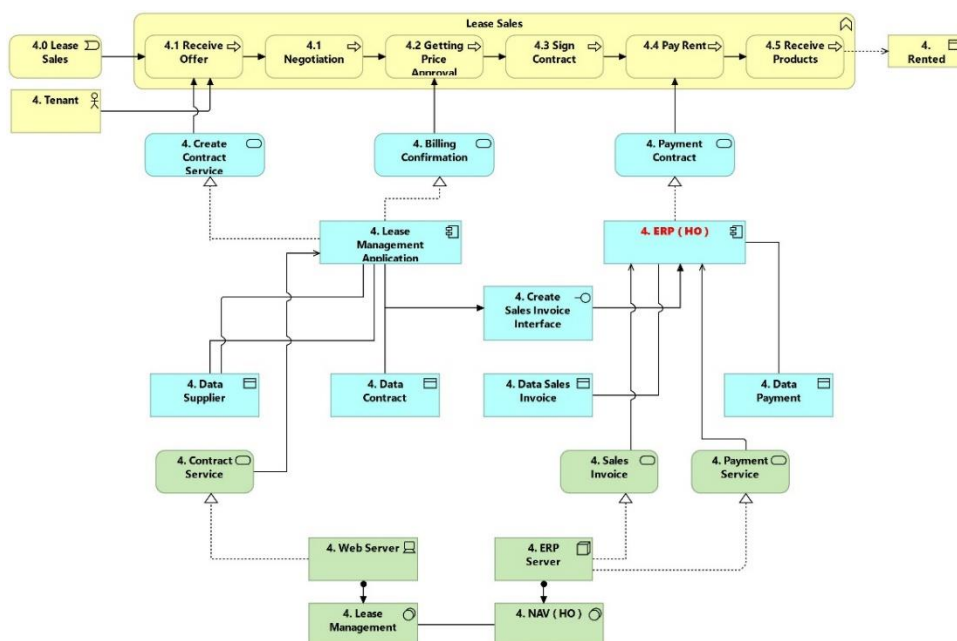
Figure. 8 Layer View – Lease Sales (Archi Mate Model)

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Opportunities and Solutions

In the context of Enterprise Architecture (EA) for the retail sector, **"Opportunities and Solutions"** focus on ways to enhance operational efficiency, customer experience, and company competitiveness. Here are some opportunities and solutions that can be implemented in the retail industry.

1. **System and Process Integration**

   Opportunity: Offline and Online promotions often differ, leading customers to prefer in-store shopping.

   Solution: Improve promotion systems to ensure that offline promotions are also available online. collaborate with third-party vendors to develop middleware for seamless integration.

2. **Data and Analytics Utilization**

   Opportunity: Use customer data to understand shopping behavior, identify trends, and make better data-driven decisions.

   Solution: Deploy Business Intelligence (BI) systems and predictive analytics to examine large datasets and deliver tailored customer recommendations.

3. **Enhancing the efficiency of the supply chain**

   Opportunity: Improve the delivery process to address customer complaints about delivery delays.

   Solution: Implement an integrated supply chain management system and utilize technologies such as more accurate inventory management systems and real-time shipment tracking. This includes using ERP software integrated with Warehouse Management Systems (WMS) to enhance visibility and efficiency in the shipping process. Furthermore, implementing IoT technology to track shipment status can accelerate the process, minimize issues that may cause customer complaints, and enhance customer satisfaction.

4. **Digitalization and Automation**

   Opportunity: Reduce operational costs and increase productivity through automation and digital processes.

   Solution: Apply robotic process automation (RPA) for administrative tasks and use integrated e-commerce platforms with backend systems.

Implementing Enterprise Architecture (EA) provides significant benefits for the retail industry in Indonesia by enhancing operational efficiency and competitiveness. By applying the TOGAF methodology, retail companies can streamline Business Process, integrate various systems such as inventory management, supply chain, e-commerce, and customer service, and effectively adopt new technologies. EA ensures that data is managed systematically, and that accurate information is available for decision-making. However, challenges include the complexity of designing and implementing an architecture that meets specific company needs and aligning all business units and existing technologies. Additionally, changes in technological infrastructure and integrated management require substantial time and resources to overcome resistance to change and ensure successful implementation.

DISCUSSIONS

The adoption of Enterprise Architecture (EA) in the retail industry represents a strategic initiative aimed at aligning business processes with technological advancements to enhance operational efficiency and competitiveness. This discussion leverages **SWOT** (**Strengths, Weaknesses, Opportunities, and Threats)** analysis to elucidate the significance of Enterprise Architecture in this sector (Mulyanto & Rosiyadi, 2018; Zainuri & Budi Setiadi, 2023)

See details in **Figure 9**.

Strengths	Weakness
Enhancing operational efficiency through better system and process integration	Requires a significant initial investment in terms of time, cost, and human resources.
Enhancing decision-making capabilities with more accurate and integrated data	Resistance to change from employees and management who are accustomed to the old system
Enabling scalability and flexibility to accommodate business growth and market changes	Complexity in implementing and integrating existing systems
Reducing long-term operational costs through resource optimization and elimination of system redundancies	
Opportunities	**Threats**
improve customer experience through personalization and more responsive service	Higher data security and privacy risks with increased integration of systems and data
Supporting digital transformation and technological innovation that can provide a competitive advantage	Change in regulations and policies that could impact operations and the implementation of systems
New opportunities exist for more in-depth data analysis and the development of more effective business strategies	Dependence on vendors or technology service providers that may result in risks if service disruptions or changes occur
Enable better cooperation with business partners through better system integration	

Figure. 9 SWOT Analysis

CONCLUSION

The implementation of Enterprise Architecture (EA) is crucial for the retail industry as it aligns Business Process with technological advancements. EA provides a structured framework for system and process integration, which enhances operational efficiency and data consistency. By adopting EA, retail companies can better manage customer information, improve customer experiences, and leverage advanced technologies to enhance inventory management and demand forecasting. This helps businesses remain competitive in a rapidly evolving market. The conclusion summarizes the insights gained from the results and highlights areas for further research. It also covers the benefits and applications of the research, limitations, and recommendations. However, successful Enterprise Architecture (EA) implementation requires careful planning and effective change management to address high initial costs, integration challenges, and employee resistance, ensuring a smooth transition from old systems to new architecture. Despite these challenges, with adequate support and commitment to the change process, implementing Enterprise Architecture (EA) through TOGAF ADM provides significant benefits. It enables the retail industry to streamline Business Process, integrate various systems, adopt new technologies, and optimize the supply chain more effectively, thereby improving operational efficiency and strengthening competitiveness by fostering innovation and providing responsive services.

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