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Designing business architecture for machinery distribution company using the open group architecture framework method

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ABSTRACT

Machinery distribution company plays a crucial role in supporting various industries by providing the necessary machines and spare parts. This research focuses on the challenges faced by machine distribution companies in Jakarta, which have branches in Surabaya and Medan, Indonesia, especially in the management of warehouse data. The manual inspection process of stored goods for a long period of time results in operational inefficiencies and increased costs. To address this issue, this research proposes the application of enterprise architecture, specifically business architecture, using the open group architecture framework (TOGAF). This method to design optimal business processes that can improve productivity, reduce human errors, and enhance service quality. Through the analysis of current business processes and the planning of enterprise model interactions, this research identifies gaps in business architecture and designs business architecture to support the company's goals. The research results are expected to help companies improve operational efficiency and competitiveness in a constantly changing market.

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1. INTRODUCTION

Machinery distribution companies play a crucial role in supporting various industries by supplying essential machinery and spare parts [1]. Acting as intermediaries between manufacturers and end-users, these companies are responsible for ensuring the quality and timely delivery of products [2]. Their operations involve complex logistical and management components, including procurement, storage, and distribution [3]. Moreover, these businesses must adapt swiftly to market demand changes while maintaining strong relationships with stakeholders [4], [5]. A prominent example of such challenges is a machinery distribution company based in Jakarta, with additional branches in Surabaya and Medan, Indonesia. The company struggles with managing inventory data, especially regarding items stored in warehouses for extended periods or those that remain unsold [6]. This issue often necessitates manual inspections to assess item conditions, which are time-consuming and prone to human error. As a result, operational inefficiencies increase, leading to higher costs [7]. Furthermore, prolonged storage may result in item deterioration, causing unproductive inventory accumulation [8], [9]. This not only delays the introduction of new products aligned with current market needs but also leads to financial losses, reduced customer satisfaction, and damage to the company's reputation in the industry [10].

While the company employs some information systems/information technology (IS/IT) systems to support its operations, these systems are limited to specific divisions and lack full integration [11].

Consequently, the existing systems cannot effectively address inventory management challenges. Poor warehouse data management negatively impacts various operational aspects, including inventory planning and customer service [12]. Businesses without effective warehouse management systems may experience a 30% increase in operational costs and a 20% decline in customer satisfaction [13]. Therefore, it is imperative for the company to adopt strategies to enhance efficiency and address these challenges, particularly through enterprise architecture [14].

Enterprise architecture is a strategic approach that integrates business processes and technology within an organization to achieve its objectives [15]. It focuses on aligning hardware, software, and networks with the company's mission and goals to support business processes effectively [16]. The primary purpose of enterprise architecture is to create a roadmap for IT assets and business processes, alongside governance rules, to facilitate continuous evaluation of business strategies and their execution through IT [17]. This approach provides a comprehensive view of the organization's information systems and technology architecture, encompassing application systems, capabilities, IT infrastructure, and data [18]. Implementation of enterprise architecture enables organizations to adapt promptly to market changes, ensuring IT investments are aligned with business needs [19].

Among the various frameworks for enterprise architecture, the open group architecture framework (TOGAF) stands out as a widely used and effective methodology [20]. TOGAF provides a structured approach for designing, implementing, and managing enterprise architecture, ensuring consistency across stakeholders [21]. Previous studies [22], have examined enterprise architecture in public services, focusing on general business process design. However, these studies did not explicitly address its application to business architecture within machinery distribution companies, especially concerning integrated inventory management systems [23]. This study fills this research gap by employing the TOGAF framework to develop an enterprise architecture specifically tailored to the business architecture of machinery distribution companies. By addressing challenges related to warehouse data management, the proposed architecture seeks to enhance system integration, streamline workflows, and improve operational efficiency [24]. Through this approach, the company can align its IT investments with strategic goals, reduce costs, and maintain a competitive edge in the industry [25].

2. RESEARCH METHOD

The research method section will outline the author's methods employed in this research. The chosen technique is the TOGAF framework, with a specific emphasis on phase B, which pertains to business architecture [26]. The objective of this phase is to comprehend and articulate the operational procedures that take place within the organization. The framework selected in this study is for the analysis and development of an optimal business architecture [27]. Figure 1 depicts the research model.

The research process will consist of three main phases:

i) Preliminary phase involves the preparatory and first activities required to effectively guide the business processes in the developed enterprise architecture design.
ii) Phase A, known as the architecture vision, which marks the starting phase of architecture creation. This involves establishing spatial boundaries, identifying relevant parties involved, developing the overall design plan, and obtaining the required authorizations.
iii) Phase B, known as business architecture, focuses on building the business structure to support the approved design plan.

- Current business process analysis: provides an in-depth overview of the operational procedures within a machinery distribution company.
- Enterprise model interaction planning: delineates the schedule for implementation, incorporating a suggested application roadmap with objectives set for the short, medium, and long term.
- Business architecture gap analysis: disparities were identified between current methodologies and the proposed business processes, revealing areas of inefficiency and the need for technology integration.
- Business architecture design: elucidates the designing of business processes within the machinery distribution company to attain the company's objectives, by integrating applications such as driver scheduling, leave management, employee performance reporting, employee payroll, and warehouse maintenance.

These findings demonstrate that the proposed enterprise architecture, grounded in TOGAF, correlates with improved operational efficiency and aligns business processes with organizational objectives. The roadmap and gap analysis further highlight areas requiring immediate attention and provide a clear pathway for achieving sustained improvements.

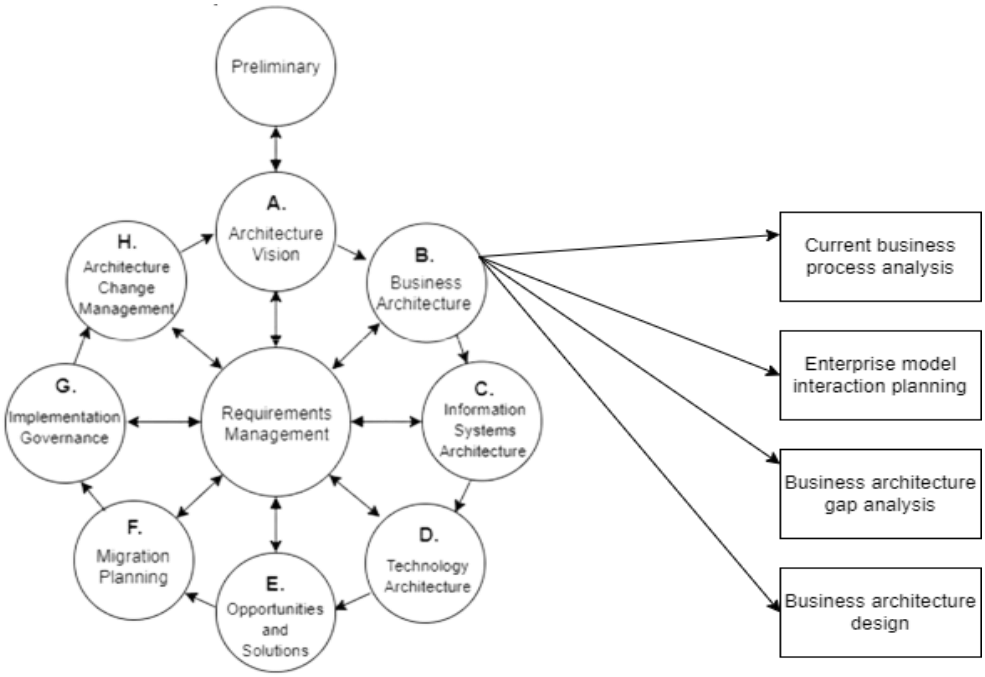

Figure 1. Research model [28]

3. RESULTS AND DISCUSSION

The results and discussion section will address four key topics, beginning with the current business process analysis. This will be followed by an examination of enterprise model interaction planning. Next, a business architecture gap analysis will be conducted. Finally, the section will address business architecture design.

3.1. Current business process analysis

The current business process analysis entails a thorough assessment of a company's operational procedures in terms of their efficiency, effectiveness, and accuracy [29]. This analysis involves identifying workflows, mapping processes, and measuring performance to pinpoint areas requiring improvement. Furthermore, it utilizes data and key performance indicators to evaluate the success of the processes and to determine the most effective optimization steps [22]. The objective is to enhance productivity, reduce operational costs, and maintain high-quality service or products, enabling the company to swiftly adapt to market changes and meet customer demands [17]. Figure 2 depicts the current business process analysis.

The current business process in the machinery distribution company is as follows: i) The warehouse administrator requests the procurement of items and submits the request to the purchasing division. The warehouse administrator identifies the need for a particular item and makes a procurement request which is then submitted to the purchasing division; ii) The purchasing division receives these requests and forwards them to the import division. After receiving the request from the warehouse administrator, the purchasing division forwards it to the import division to process the procurement of items; iii) The import division contacts suppliers to obtain the necessary items. The import division is responsible for contacting the relevant suppliers to ensure the availability and purchase of the required items; iv) Suppliers send invoices to the finance division. After ensuring the availability of the items, the supplier sends the billing invoice to the company's finance division to process the payment; v) The finance division handles payments to the suppliers. The finance division then processes and finalizes payments to suppliers in accordance with the invoices received; vi) Suppliers deliver the items to the import division. Once the payment is finalized, the supplier delivers the ordered items to the company's import division; vii) The import division receives the items and notifies the warehouse administrator. Once the items are received, the import division informs the warehouse administrator about the arrival of the items; viii) The warehouse administrator checks for driver availability; if unavailable, the process is complete; if available, the warehouse administrator creates a waybill for the driver; ix) The driver collects the items and delivers them to the company warehouse. The assigned driver then picks up the items from the import division and delivers them to the company's warehouse; x) After the items arrive at the company's warehouse, the warehouse technicians unload and inspect the items to ensure that the items are in good condition and in accordance with the order.

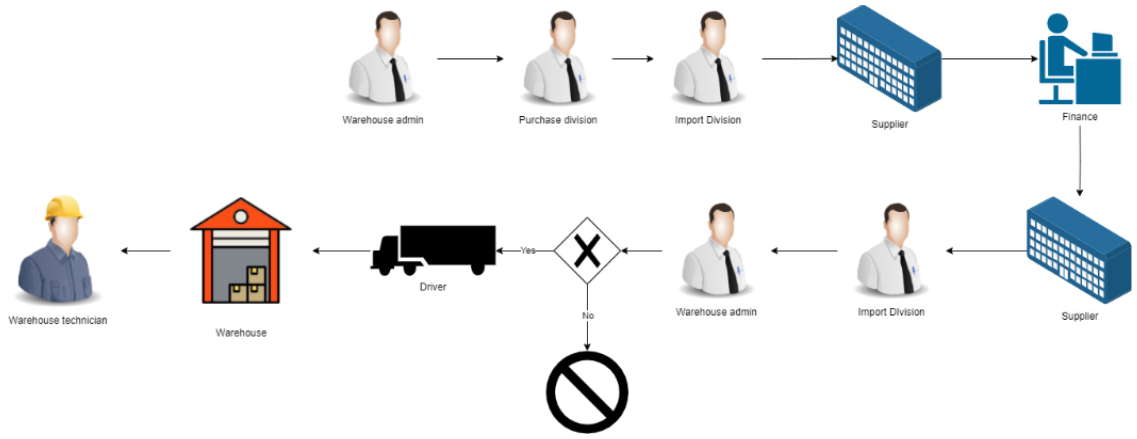

Figure 2. Current business process

3.2. Enterprise model interaction planning

The enterprise model interaction planning section will outline the suggested approach for execution, which is divided into three objectives: short, medium, and long-term [30]. The short-term phase will be marked by a concentration on attaining immediate and swift outcomes, typically within a few months. The medium-term phase spans one to two years and is dedicated to the development and improvement of increasingly complex applications. The long-term phase, on the other hand, involves strategic efforts planned for more than two years, with the aim of achieving the company's vision and mission. There are several proposed applications, such as driver scheduling, employee performance reports, leave requests, warehouse maintenance, and employee payroll. In the short term will be proposed warehouse maintenance applications. In the medium term, employee payroll applications and driver scheduling applications will be proposed. In the long term, employee performance reporting applications and leave request applications will be proposed.

The unfulfilled information technology requirements of the machinery distribution company determine the selection of these applications in supporting business process operations, as seen in Figure 1. Through the assessment of the existing operational needs and business protocols, it is anticipated that the chosen application will offer the correct solution. The proposed solutions are anticipated to enhance productivity and operational performance, hence assisting firms in achieving their business objectives more effectively. Applications are anticipated to enhance workability, reduce human error, and enhance the quality of services offered to clients. Moreover, by practically utilizing information technology, enterprises can exhibit enhanced adaptability in response to market changes and adapt to industry trends, thereby promoting long-term growth and durability [31].

3.3. Business architecture gap analysis

The business architecture gap analysis section will analyze the gap in the business architecture, which involves evaluating the differences between the current business architecture and the desired or ideal architecture [32]. This analysis identifies areas that need improvement and develops strategies to address those deficiencies. Table 1 presents a comprehensive representation of the gap analysis, highlighting the discrepancies in business processes and information.

Table 1. Business architecture gap analysis

Business process	Description
Driver scheduling	Driver scheduling to streamline the process of arranging driver shifts, facilitating convenient access for drivers to their assigned schedules.
Leave request	Leave request simplifies the procedure for employees seeking to request time off from work.
Employee performance reports	Employee performance reports simplify the assessment of employee performance, providing business owners with a report on the operational capabilities of their workforce.
Employee payroll	Employee payroll facilitates the finance division procedures in disbursing company staff salaries.
Warehouse maintenance	Warehouse maintenance streamlines the tasks of warehouse technicians in assessing the condition of warehouse inventory, and determining its market viability or need for repairs.

3.4. Business architecture design

The business architecture design section will outline the proposed business architecture design. The process begins with identifying the existing issues within the machine distribution company, followed by an analysis of the company's current business processes. Subsequently, the business functions within the company are identified and mapped. An analysis is then performed to identify the gaps between the current and proposed business processes. The final stage involves designing the new business architecture. In the previous section, specifically the current business process analysis, it was identified that the company's business processes include several manual procedures and lack supporting applications. To enhance these business processes, the following applications are proposed driver scheduling application to streamline driver schedules, a leave application to facilitate employees in applying for leave, an employee performance reporting application to assist with employee evaluations, an employee payroll application to simplify the payroll process, and warehouse maintenance application to improve the management of warehouse items. Figure 3 depicts the proposed business architecture design for a machinery distribution company.

Figure 3 depicts a proposed business architecture design that is based on the current business processes of a machinery distribution company. The process is as outlined: i) The warehouse administrator submits a procurement request to the purchasing division. When the inventory in the warehouse starts to run low or there is a new need, the warehouse administrator sends a procurement request to the purchasing division to start the procurement process; ii) The purchasing division receives the request and forwards it to the import division. Upon receiving the request from the warehouse administrator, the purchasing division evaluates the requirement and forwards it to the import division for further processing; iii) The import division contacts the supplier to acquire the necessary items. The import division is responsible for contacting existing suppliers or looking for new suppliers to obtain items in accordance with the request; iv) The supplier submits an invoice to the finance division. After agreeing to provide the items, the supplier sends an invoice to the company's finance division for the payment process; v) The finance division pays the invoice and sends a payment report to the supplier. The finance division processes the payment of the invoice and sends a payment report to the supplier as confirmation that payment has been made; vi) The supplier delivers the items to the import division. After receiving confirmation of payment, the supplier delivers the ordered items to the company's import division; vii) The import division receives the items from the supplier. The import division inspects and receives the items sent by the suppliers, ensuring that the items conform to the order; viii) The import division arranges for a driver to collect the items using a driver's scheduling app. Once the items are received, the import division organizes a schedule for the driver to pick up the items using a special application for driver scheduling; ix) The driver receives the information from the application and retrieves the items. The driver receives the schedule information and pick-up details from the app, then heads to the location to pick up the items; x) The items are transported to the company's warehouse. After being picked up by the driver, the items are transported to the company's warehouse for storage and further processing; xi) Upon arrival at the warehouse, the warehouse technician takes receipt of the items. Arriving at the warehouse, the warehouse technician is responsible for receiving and inspecting incoming goods; xii) The warehouse technician performs the tasks of unloading, inspecting, and documenting the condition of commodities using the warehouse maintenance application. Warehouse technicians unload the items, perform quality checks, and document the condition of the items using the warehouse maintenance application; xiii) Employees submit work reports to the general division using the employee performance reports application. Employees create their work reports and send them to the general division through the employee performance report application; xiv) The general division receives the reports and notifies the finance division to expedite salary distribution through the employee payroll application. The general division receives work reports from employees and informs the finance division to perform the payroll process using the payroll application; xv) Employees utilize the leave request application to inform the general division of their request for leave. Employees who wish to apply for leave use a special application to submit leave requests to the general division; and xvi) The general division handles the processing of leave requests and communicates the responses to the employees. The general division processes leave requests from employees and communicate the results to the employees concerned.

The integration of proposed applications, such as driver scheduling, leave, employee performance reporting, employee payroll, and warehouse maintenance, significantly improves efficiency in machinery distribution business processes by automating tasks previously handled manually. This aligns with findings by [33], highlighting that effective warehouse management systems can reduce operational costs by 30% and increase customer satisfaction by 20%. Additional benefits include enhanced interdepartmental coordination. However, the study's limitations include a lack of real-world testing and detailed analysis of data processing improvements and error reduction. Future research should validate these solutions for larger or more complex businesses, explore their long-term impact on sustainability and market adaptability, and develop methods to evaluate real-time application performance for continuous optimization.

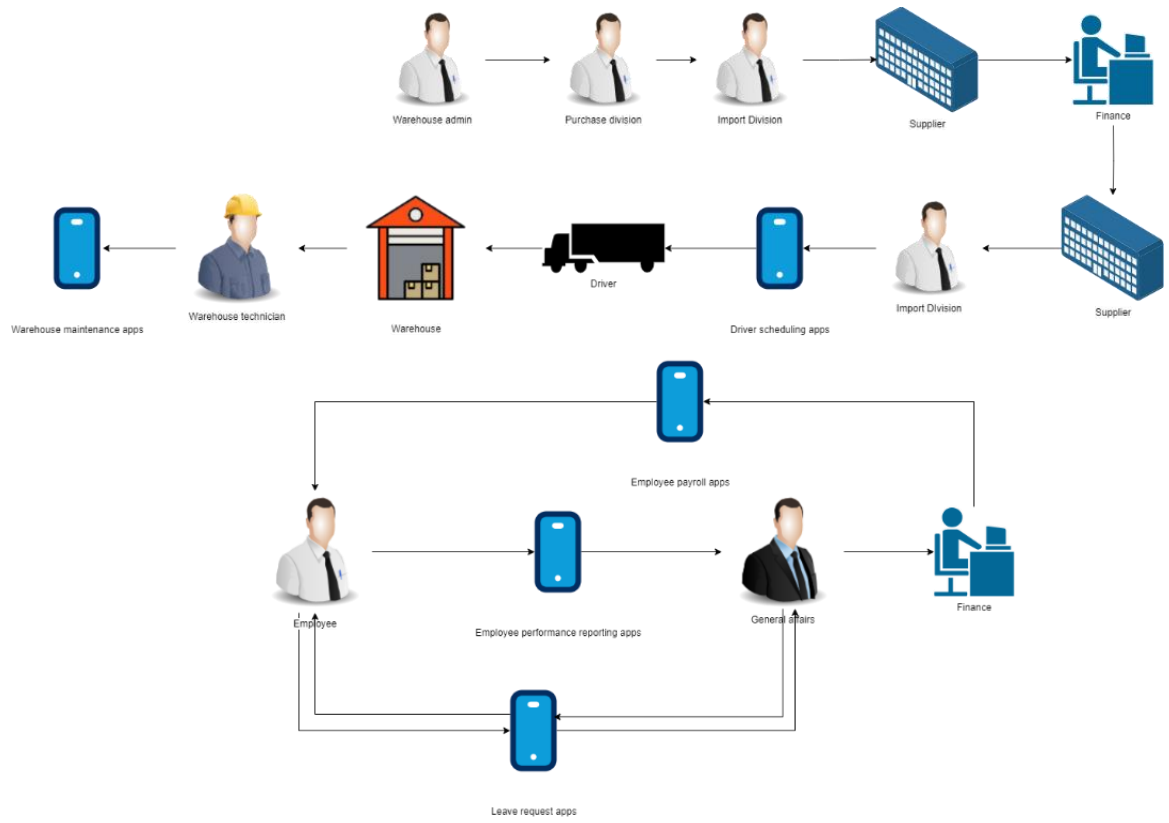

Figure 3. Proposed business architecture design

4. CONCLUSION

Recent observations reveal that the business processes of the machinery distribution company have integrated IS/IT; however, its application has not been fully optimized to support operational activities, particularly in warehouse data management. Our findings provide definitive evidence that addressing this limitation requires the development of an enterprise architecture tailored to the company's needs. This research proposes a design using the TOGAF framework, focusing on business architecture, which results in a blueprint comprising five key applications: driver scheduling application, employee payroll application, employee performance reporting application, warehouse maintenance application, and leave application. Unlike previous research on public guest services for universities, this study emphasizes the selection of reference models, viewpoints, and tools, the development of baseline and target business architecture descriptions, and thorough gap analysis. These contributions offer a structured enterprise architecture model that aligns with the company's goals, vision, and mission, effectively guiding business architecture development to meet operational and strategic needs.

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