DESIGNING A DRUG DISTRIBUTION MANAGEMENT INFORMATION SYSTEM FOR PT TIGA A IN BANDUNG USING THE WATERFALL METHOD

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ABSTRACT

PT TIGA A, a pharmaceutical wholesaler located in Bandung, operates as a legal entity authorized to procure, store, and distribute medicines and pharmaceutical substances in large quantities, in compliance with statutory regulations. The company is committed to providing quality distribution services in line with Good Medicine Distribution Practices (CDOB). However, its current system for administration, operations, and reporting is manual, leading to inefficiencies and various operational shortcomings. This study aims to design a drug distribution management information system to address these issues using the Waterfall method. The research adopts a qualitative descriptive approach, with data collected through interviews, observation, documentation, and triangulation. The proposed system, named DOSIS (Drug Operations and Supply Information System), is designed to be both efficient and effective. Prior to the implementation of DOSIS, the average error rate in operations was 65%. After the introduction of the system, this rate decreased to 22%, demonstrating significant improvements in accuracy and efficiency. Future enhancements to DOSIS include transitioning the system to an online platform, integrating it with other operational functions to further minimize errors and streamline processes. The practical implementation of DOSIS is expected to increase productivity, optimize drug distribution management in accordance with the latest regulatory requirements, and enhance customer service. This will not only improve operational efficiency but also provide long-term benefits to PT TIGA A by ensuring compliance with regulatory standards and improving overall service quality.

Keyword: *DOSis, Waterfall, Pharmaceutical Wholesaler.*

1. INTRODUCTION

The World Health Organization (WHO) defines social determinants of health as the conditions in which people are born, grow, live, work, and age, as well as the broader social, economic, and political systems that influence daily life. These determinants include factors like economic policies, social norms, development strategies, and political frameworks that shape the health and well-being of individuals and communities. According to WHO, addressing these social determinants is crucial to improving health outcomes and ensuring equitable access to healthcare. The WHO underscores the importance of tackling the social factors that hinder people from receiving adequate care, as these barriers often exacerbate health disparities. One critical aspect of the healthcare system is drug distribution, which ensures the availability of essential medicines [1]. Efficient and equitable distribution of medications is a fundamental component of a well-functioning health system, as it directly impacts the ability of individuals to access life-saving treatments and maintain their health. By addressing both social determinants and improving key healthcare systems like drug distribution, the broader goal of enhancing global health equity can be achieved [2]. Health is defined as a state of well-being that encompasses physical, mental, spiritual, and social aspects, enabling individuals to live productive lives both socially and economically. In line with this, Law No. 36 of 2009, Article 1,

Paragraph 1 of the Indonesian legal framework, outlines the scope of pharmaceutical work. It includes the manufacture of pharmaceutical preparations, quality control, safety measures, procurement, storage, and the distribution of medicines. Additionally, it covers drug management, the provision of drug services based on doctors' prescriptions, drug information services, as well as the development of pharmaceuticals, medicinal ingredients, and traditional medicines [3]. This comprehensive approach emphasizes not only the technical aspects of drug production and distribution but also the critical role that pharmaceutical services play in ensuring public health and the proper use of medications.

The pharmaceutical industry refers to a business entity that is granted permission by the Minister of Health to engage in the production of drugs and medicinal ingredients. Drug manufacturing encompasses a comprehensive process that includes the procurement of raw and packaging materials, the production and packaging of the drugs, quality control, and quality assurance to ensure that the final product is ready for distribution. According to Minister of Health Regulation No. 1799 of 2010, the primary functions of the pharmaceutical industry include the production of drugs and medicinal ingredients, conducting education and training, as well as engaging in research and development activities. The main goal of this industry is twofold: first, to produce drugs that are safe and effective for therapeutic use, and second, to contribute to the economic development of a country by meeting the demand for essential medicines. The pharmaceutical industry plays a critical role in ensuring public health and supporting the healthcare infrastructure by providing necessary medicines that are both reliable and affordable.

The pharmaceutical industry is required to manufacture medicines in accordance with Good Manufacturing Practices (CPOB) regulations to ensure that the products meet their intended use and comply with the standards outlined in the distribution permit (registration) documents. This adherence ensures that the medicines produced do not pose any risks to consumers in terms of discomfort, inefficiency, or substandard quality. Following these guidelines is crucial in maintaining drug safety, efficacy, and quality, protecting public health, and ensuring that medicines are reliable and safe for their prescribed use [4].

Distribution refers to a network of interdependent organizations involved in the process of delivering a product or service for consumption. It is a key component of marketing, aimed at facilitating the smooth transfer of goods and services from producers to consumers. The primary goal of distribution is to ensure that products are available in the right type, quantity, price, location, and time to meet consumer needs. A distributor acts as an intermediary between manufacturers and retailers or customers. After a product is manufactured, it is sent to the distributor, who then takes responsibility for selling and delivering it to retailers or directly to customers. This distribution process ensures that products are efficiently moved from the point of production to the point of sale, aligning supply with demand and making products accessible to end users.

Distribution facilities are required to maintain a comprehensive quality system that governs their responsibilities, processes, and risk management measures associated with distribution activities. This system ensures that the quality and integrity of drugs and/or drug ingredients, as well as the distribution chain, are preserved throughout the entire distribution process. All distribution activities must be clearly defined and systematically reviewed, with critical stages and significant transitions in the process being validated and fully documented. The quality system must incorporate quality risk management principles, which help in identifying, evaluating, and mitigating potential risks associated with distribution. Achieving the necessary quality standards is the responsibility of the person in charge of the distribution facility. It requires strong leadership, active participation, and a commitment to quality at all levels of the organization. This responsibility is further supported by management's commitment to ensuring that high standards are upheld in every aspect of the distribution process, thereby safeguarding the efficacy and safety of pharmaceutical products.

Distribution management within a company's internal organization is a crucial effort to regulate and oversee the planning aspects related to the availability and distribution of goods to consumers. Effective distribution management ensures that products are delivered to the right place, at the right time, and in the right quantity, which is essential for fulfilling customer demand efficiently. This management process is also vital to supporting the company's marketing efforts. Properly organized distribution not only facilitates the smooth flow of goods but also enhances the overall marketing strategy by ensuring that products are readily accessible to customers. Without well-structured and efficiently managed distribution systems, both the marketing and sales processes may face delays and disruptions, negatively impacting the company's ability to meet consumer expectations and achieve sales targets [5]. Thus, distribution management is key to the successful execution of marketing and sales activities.

Inventory management refers to systems used for overseeing and controlling a company's inventory. It involves determining how inventory items can be effectively classified, ensuring that accurate records are maintained, and managing stock levels to meet demand without over-investing in inventory. Proper inventory management is essential for maintaining a balance between minimizing costs and providing excellent customer service. In the service sector, inventory control is equally important, as operations managers worldwide recognize that efficient

inventory management is critical to the success of their businesses. On one side, reducing inventory can lower costs, but on the other, running out of stock can halt production and lead to dissatisfied customers. The main objective of inventory management is to find an optimal balance between inventory investment and customer service. Achieving this balance is crucial for maintaining smooth operations, ensuring product availability, and managing costs effectively. Without good inventory management, a company cannot successfully implement a low-cost strategy [6]. Pharmaceutical Wholesalers (PBF) are legally recognized entities authorized to procure, store, and distribute drugs and/or medicinal ingredients in large quantities, adhering to statutory regulations [7]. The operations of these companies are governed by specific technical instructions and standard operating procedures as outlined in Minister of Health Regulation Number 1148 of 2011. This regulation has been amended by various articles, including those in Minister of Health Regulation Number 30 of 2017, which details the amendments to Regulation Number 1148, as well as Minister of Health Regulation Number 34 of 2014, which further clarifies the regulations surrounding Pharmaceutical Wholesalers. These regulations ensure that PBFs operate within a framework designed to uphold the quality and safety of pharmaceutical products throughout the distribution process. Compliance with these guidelines is essential for maintaining public health standards and ensuring that medications are handled and distributed properly.

Pharmaceutical Wholesalers can be classified as distributors specializing in the distribution of pharmaceutical-related goods [8]. The wholesalers serve as facilities that provide and store a range of pharmaceutical supplies, including medicines, medicinal ingredients, and medical devices. These supplies are then distributed to various public health service facilities, such as pharmacies, hospitals, licensed drug stores, and other healthcare establishments. To ensure accountability and compliance with regulatory standards, Pharmaceutical Wholesalers are mandated to maintain comprehensive reports documenting every aspect of the procurement, storage, and distribution processes. This requirement enables PBFs to be accountable during inspections, ensuring that they adhere to the necessary regulations and maintain the integrity and safety of pharmaceutical supplies throughout the distribution chain.
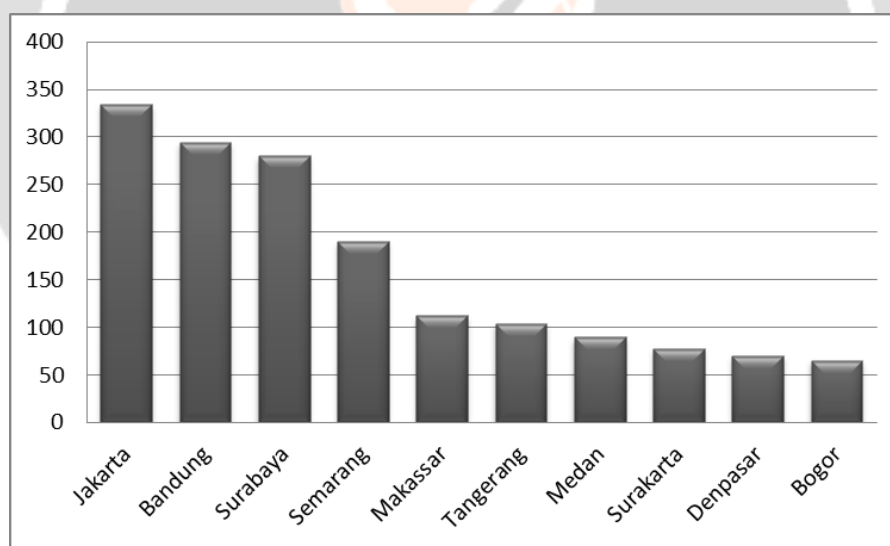
Fig-1: Certified Drug Wholesaler in Indonesia

Every medicinal substance or medicine distributed by Pharmaceutical Wholesalers must comply with Good Distribution Practices (GDP) to ensure safety and efficacy. Achieving this compliance necessitates the implementation of a robust management system that guarantees all operational processes function smoothly and meet established expectations. Effective management plays a critical role in facilitating the distribution and sales processes, resulting in productive outcomes. This is achieved through effective supervision, clear job descriptions, and structured operational processes that align with planned strategies. By adhering to these principles, potential issues arising during or after activities can be minimized. Management principles can be effectively applied to organize and integrate various daily activities, including those within PBFs. These efforts must be supported by competent human resources and adequate facilities and infrastructure to ensure quality service delivery. To realize quality distribution services that comply with GDP, a structured system of regulation or distribution management information is essential. Currently, there are 2,423 wholesalers across Indonesia that have obtained GDP

certification from the Food and Drug Inspection Agency, with 295 wholesalers located specifically in Bandung. This data underscores the growing commitment to maintaining high standards in the pharmaceutical distribution sector.

A Management Information System (MIS) is a vital component of a business's internal control framework, serving as a planning system that integrates the use of people, documents, technology, and procedures in accounting. Its primary purpose is to address various business challenges, including product costs, service efficiency, and overall business strategy. What distinguishes MIS from standard information systems is its analytical capability; MIS is specifically designed to evaluate and enhance other information systems employed in the organization's operational activities. Academically, the term often encompasses a range of information management methodologies aimed at automating processes or supporting human decision-making. This includes tools such as decision support systems, expert systems, and executive information systems. By providing structured information and analytical capabilities, MIS plays a crucial role in enabling managers to make informed decisions, optimize operations, and drive organizational success.

2. LITERATURE REVIEW

According to [9], a system is defined as "a group of elements that are integrated with the common purpose of achieving an objective." This definition emphasizes that a system comprises multiple interconnected components working together towards a shared goal. [10] further elaborates that the term "system" derives from the Latin and Greek words "Systema," meaning a set of parts or components that are systematically interconnected to form a cohesive whole. A system can also be understood as a collection of independent elements that interact to function as a unified entity. Systems are designed to manage processes or occurrences that are repetitive or routine in nature. They encapsulate real-world events and entities, including places, objects, and individuals. Ultimately, a system represents an assemblage of various parts that collaborate effectively to achieve specific objectives, highlighting the importance of interconnectivity and integration within any organizational or operational framework.

According to [11], a system is defined as "a series of two or more interconnected components that interact to achieve a goal." This definition highlights the relational aspect of systems, where multiple elements work together to fulfill a specific purpose. Most systems comprise smaller subsystems that contribute to the overall functionality of the larger system, demonstrating how various components collaborate to achieve collective objectives. [12] further elaborate on this concept by describing a system as "a set of interdependent elements that together achieve certain goals." They emphasize that a system must possess several key characteristics: organization, reciprocal relationships, integration, and a clearly defined main objective. These attributes underscore the importance of coherence and synergy among the elements within a system, ensuring that they work in harmony to attain the desired outcomes. Together, these definitions convey the complexity and interconnectedness inherent in systems, whether in organizational contexts or broader operational frameworks.

Drawing from the various definitions of systems discussed, a system can be conceptualized as a collection of interconnected components that collaborate to achieve specific goals. Another perspective highlights that a system comprises elements along with three primary functions: input, processing, and output. This leads to a broader understanding that a system is essentially an organized set of elements or variables that interact and depend on one another. Systems are specifically designed to enhance information processing and operational efficiency. Once a system has been developed, it is introduced and implemented within the user organization. The success of this implementation is largely determined by user acceptance; if the system is utilized effectively by its users, it can be deemed a success. Conversely, if users reject the system, it may be classified as a failure. This underscores the importance of user engagement and adaptability in the successful implementation of any system within an organization.

According to [13], a system is defined by several key characteristics or properties, which include:

1. Components: A system is made up of various interconnected elements that work together to achieve specific objectives.
2. System Boundaries: These define the limits of the system, indicating what is included within the system and what lies outside it.
3. External Environment: This refers to the surrounding factors or conditions that may influence the system's operation but are not part of the system itself.
4. Interfaces: These are the points of interaction between the system and its environment or between different components of the system.
5. Input: This encompasses the resources, data, or materials that enter the system for processing.
6. Processing: This is the transformation of input into a usable form, where the system operates on the input to produce output.

7. Output: The results or products generated by the system after processing the input.
8. Targets or Goals: Every system is designed with specific objectives or goals it aims to achieve.
9. Control: This refers to the mechanisms or processes in place to guide the system's operation and ensure it meets its objectives.
10. Feedback: Feedback mechanisms allow the system to assess its performance and make necessary adjustments based on the output or external conditions.

These characteristics collectively define what constitutes a system and are crucial for understanding how systems function and interact with their environments.

Information can be understood as data that has been processed into a more useful and meaningful format for the recipient. According to [14], the source of information is data, which consists of real facts and figures that describe actual events and entities. Events are occurrences that take place at specific points in time, providing context and relevance to the data being analyzed. In essence, while data represents raw facts, information arises when this data is organized and interpreted to convey significance and facilitate understanding. This transformation enhances the utility of the data, making it valuable for decision-making and various applications across different fields.

According to [15], information is defined as data that has been processed into a form that holds significance for the recipient and possesses tangible value that can influence current or future decisions. This definition underscores the transformative nature of data, highlighting that the mere collection of facts and figures is insufficient; they must be processed and contextualized to be useful. By converting data into meaningful information, organizations and individuals can make informed decisions, enhancing their ability to respond to challenges and opportunities effectively. The emphasis on the practical value of information illustrates its crucial role in decision-making processes across various domains, ensuring that the information utilized is relevant and actionable.

From this definition, information can be characterized as a quantity of data that has undergone processing through specific data processing procedures to evaluate its accuracy and usability based on particular needs. The characteristics of this information include:

1. Accuracy: Information must be truthful and reliable, ensuring that it reflects reality without errors or distortions.
2. Relevance: The information should be pertinent to the user's needs and context, providing value in decision-making processes.
3. Timeliness: Information must be available when needed, allowing for prompt decisions and actions. Outdated information may lose its relevance.
4. Completeness: Information should encompass all necessary data to provide a full understanding of the context or situation, preventing misinterpretations.
5. Clarity: The information should be presented clearly and understandably, making it accessible to the intended audience without ambiguity.
6. Consistency: Information should be consistent across various datasets and time periods, ensuring that users can rely on it for comparative analyses.
7. Usability: Information must be structured in a way that allows users to easily interpret and utilize it, facilitating effective decision-making.

By ensuring that information possesses these characteristics, organizations can enhance the effectiveness of their decision-making processes and overall operations.

The quantity of information received can exhibit varying characteristics, which are often influenced by several factors, including the source of the information, its format and type, and the specific purpose for which it is sought. These characteristics may include:

1. Source Credibility: The reliability and authority of the source play a significant role in determining the quality of information. Information from reputable sources tends to be more trustworthy.
2. Format: Information can be presented in various formats, such as textual, visual, auditory, or digital. Each format may affect how the information is perceived and understood.
3. Type of Information: Information can be categorized as qualitative or quantitative, descriptive or analytical, among others. The type affects how it can be used in decision-making and analysis.
4. Relevance to the Inquiry: The specific needs of the user or the context of the inquiry will dictate what constitutes useful information. Information that aligns with the user's objectives will be prioritized.
5. Timeliness: The recency of the information can affect its relevance and applicability, particularly in rapidly changing fields.
6. Complexity: Information can vary in complexity, from simple facts to intricate analyses. Users may require different levels of detail depending on their needs.

7. Volume: The sheer amount of information available can impact how it is processed and understood. Too much information can lead to analysis paralysis, while too little may not provide sufficient context.

By recognizing these varying characteristics, users can better assess the information they receive and determine its applicability to their specific needs and objectives. This understanding is crucial for effective decision-making and information management.

The demand for information has significantly increased in recent years, driven by advancements in science and technology. However, it is essential to emphasize that the need for information should not be assessed solely based on the quantity produced but rather on its quality. Here are some key points to consider regarding this shift in focus:

1. Quality Over Quantity: In an era of information overload, the relevance, accuracy, and reliability of information have become paramount. High-quality information enables better decision-making and fosters innovation, while excessive amounts of low-quality information can lead to confusion and misinformation.
2. Impact of Technology: Technological advancements, such as artificial intelligence and data analytics, allow for the processing and analysis of vast amounts of data, making it possible to extract meaningful insights. This emphasizes the importance of not just collecting data but also interpreting it effectively to derive valuable conclusions.
3. Critical Thinking: With the proliferation of information, the ability to critically evaluate sources and discern the quality of information has become increasingly vital. Users must develop skills to assess credibility, relevance, and bias in the information they consume.
4. Customization and Personalization: As information needs vary among individuals and organizations, the ability to tailor information to specific requirements is essential. High-quality information should meet the unique needs of its audience, facilitating informed decision-making.
5. Reliability and Trust: In a world where misinformation can spread rapidly, the trustworthiness of information sources is crucial. High-quality information stems from reputable sources and is verified through rigorous methods.
6. Sustainability of Knowledge: Quality information contributes to the sustainability of knowledge within organizations and societies. It fosters continuous learning and development, enabling individuals and organizations to adapt to changing environments effectively.

In summary, while the volume of information may continue to rise, the emphasis on the quality of that information is what will ultimately determine its value and utility in today's rapidly evolving landscape. Prioritizing quality ensures that information can be effectively utilized to support informed decision-making and drive progress.

According to [16], the quality of information is defined as the characteristics, attributes, or properties of an information product that enhance its value for users. This definition emphasizes that high-quality information is not merely about the data itself but also about how well it meets the needs and expectations of its users. Here are some key aspects to consider regarding the quality of information based on this definition:

1. Relevance: Information must be pertinent to the user's needs and context. High-quality information is relevant to the decision-making processes, addressing specific questions or problems faced by users.
2. Accuracy: The information should be correct and free from errors. Accurate information builds trust and confidence among users, ensuring that decisions are based on reliable data.
3. Completeness: High-quality information should provide all necessary data required for effective decision-making. Incomplete information can lead to misunderstandings or incorrect conclusions.
4. Timeliness: Information must be available when needed. Timely information ensures that users can act quickly and make informed decisions based on the most current data.
5. Understandability: The information should be presented clearly and concisely, making it easy for users to comprehend. High-quality information is accessible and understandable, allowing users to grasp its meaning without unnecessary complexity.
6. Consistency: Information should be consistent over time and across different sources. Consistency enhances credibility and allows users to compare and validate information more effectively.
7. Security: Protecting information from unauthorized access or alterations is crucial. High-quality information is secure, ensuring that users can trust its integrity and confidentiality.
8. Value: Ultimately, the quality of information is determined by the value it provides to its users. High-quality information supports better decision-making, improves operational efficiency, and enhances overall effectiveness in various contexts.

In summary, the quality of information, as described by [16], hinges on its ability to meet the specific needs of users. By focusing on these key attributes, organizations can enhance the quality of their information products, leading to improved decision-making and better outcomes.

Based on the definitions provided, information quality can be understood as the degree to which the output produced by an information system meets the needs and expectations of its users. The assessment of information quality is crucial, as it directly impacts decision-making processes and overall organizational effectiveness. There are four fundamental dimensions of information quality that management should consider, as they significantly contribute to the value of the information. Relevance refers to the degree to which the information is pertinent to the user's specific needs or context. Relevant information directly addresses the questions or issues at hand, ensuring that users can make informed decisions based on the data provided. Accuracy pertains to the correctness and precision of the information. High-quality information should be free from errors and reflect true values or conditions. Accurate information builds trust among users and minimizes the risk of making decisions based on faulty data. Timeliness involves the availability of information when it is needed. For information to be useful, it must be delivered at the right moment, enabling users to act promptly based on current data. Outdated or delayed information can lead to missed opportunities or ineffective responses. Completeness refers to the extent to which the information provides all necessary details required for comprehensive understanding and decision-making. Incomplete information can lead to misunderstandings or inadequate assessments, hindering effective action. In conclusion, these four dimensions—relevance, accuracy, timeliness, and completeness—are essential for ensuring high information quality. By prioritizing these attributes, organizations can enhance the value of their information outputs, leading to improved decision-making, increased efficiency, and better overall performance.

Efforts to obtain information require a transformation process that converts raw data into meaningful insights. This transformation involves several steps, beginning with the collection of input resources, such as data from various sources. Once collected, these inputs undergo processing, which may include organizing, analyzing, and interpreting the data. Through this process, the raw data is transformed into output resources—valuable information that can be utilized for decision-making, strategic planning, and other organizational purposes. This structured approach ensures that the information produced is not only relevant and accurate but also actionable, thereby enhancing its overall utility for users. Ultimately, the goal is to ensure that the information generated serves its intended purpose effectively, facilitating informed decisions and fostering improved outcomes within the organization.

Based on the various opinions presented, it can be concluded that the quality of information serves as a critical measure of how well specific requirements, specifications, and expectations have been met in the processes of collecting and storing data, facts, messages, opinions, and comments. High-quality information enables individuals to understand the external circumstances surrounding their situation, which in turn informs their decision-making processes. When the quality of information is ensured, it allows for a clearer understanding of the context in which decisions are made, enhancing the effectiveness of those decisions. Consequently, the emphasis on information quality is essential for facilitating informed choices that positively impact both individual and organizational outcomes.

[10] propose that information systems are composed of several components, referred to as building blocks. These include input blocks, model blocks, output blocks, technology blocks, database blocks, and control blocks. Each of these six blocks interacts with one another, collectively functioning as a cohesive unit to achieve specific objectives. The input blocks serve as the initial stage, where data is gathered for processing. The model blocks analyze and manipulate this data according to predefined criteria, while the output blocks present the results in a usable format. Technology blocks provide the necessary hardware and software support, and database blocks store the information for retrieval and further analysis. Finally, control blocks monitor the system's performance and ensure that it operates within established parameters. Together, these components work in synergy to enhance the efficiency and effectiveness of information systems.

According to [17], a management information system (MIS) is a computer-based system designed to provide relevant information to multiple users with similar needs. This information can be presented in various formats, including periodic reports, special reports, and outputs generated from existing information simulations. Typically, the users of an MIS belong to a formal organizational entity, agency, or sub-unit. The information generated by the system plays a crucial role for managers and other staff members as they rely on it to make informed decisions and address problems effectively. By streamlining access to pertinent data, an MIS enhances decision-making processes and organizational efficiency.

According to [17], a management information system (MIS) is an integrated system designed to provide information that supports the operational activities, management, and decision-making functions of an organization. This system generates output results by utilizing various inputs and processing techniques to achieve specific objectives within management activities. By streamlining the flow of information, an MIS enables organizations to enhance their operational efficiency, make informed decisions, and effectively manage resources. Through its comprehensive approach, the MIS plays a pivotal role in facilitating communication and coordination across different levels of the organization.

In conclusion, the primary purpose of establishing a management information system (MIS) is to ensure that an organization possesses a reliable system for processing data into valuable information. This information aids in making informed management decisions, whether they pertain to routine operations or strategic planning. Essentially, an MIS serves as a vital tool for organizational managers, providing them with the necessary data and insights related to the execution of organizational tasks. By facilitating access to timely and relevant information, an MIS enhances decision-making processes and contributes to the overall effectiveness and efficiency of the organization.

A management information system (MIS) can be described as a comprehensive network of data processing procedures that are developed and integrated within an organization to provide timely and relevant data to management. This system is designed to supply both internal and external data whenever needed, thereby serving as a critical foundation for decision-making aimed at achieving organizational goals. MIS encompasses a variety of information systems, one of which is the distribution information system. The effectiveness of a distribution system plays a crucial role in facilitating the smooth flow of goods or services from producers to consumers. A key element in this process is the selection of the appropriate distribution channel. According to [18], a distribution channel consists of a group of interdependent organizations that collaborate to make a product or service available for use or consumption by end-users or business clients. Effective management of these distribution channels is essential, as it impacts everything from logistics to customer satisfaction. By utilizing an efficient distribution information system within the broader framework of MIS, organizations can optimize their distribution strategies, enhance their supply chain efficiency, and ultimately achieve their business objectives more effectively.

Distribution plays a vital role in marketing, as it encompasses the activities aimed at expediting and facilitating the delivery of goods and services from producers to consumers. This process ensures that products are used in accordance with consumer needs. Essentially, distribution involves moving products through the supply chain, connecting suppliers with consumers. Effective distribution is crucial for companies because it directly impacts supply chain costs and the ability to meet consumer demands. A well-structured distribution network can help achieve various supply chain objectives, ranging from minimizing costs to providing a quick response to consumer requests. According to [19], having the right distribution strategy is key to optimizing the overall efficiency and effectiveness of the supply chain, ultimately benefiting both the company and its customers. By aligning distribution activities with market demands, organizations can enhance customer satisfaction and drive business growth.

According to [20], efficient distribution channels significantly impact a company's logistics costs by minimizing distribution expenses and enhancing customer satisfaction. Factors such as faster delivery times and high-quality customer service are critical components of an effective distribution strategy. When companies streamline their distribution processes, they not only reduce costs but also improve their ability to meet customer expectations. This connection highlights the importance of optimizing distribution channels to achieve a balance between cost efficiency and service quality, ultimately fostering a positive relationship with customers. Ensuring timely deliveries and responsive customer service can lead to higher levels of satisfaction and loyalty, which are essential for a company's long-term success in a competitive market.

From the definitions provided, it can be concluded that distribution is the process of delivering goods or services from producers to consumers at the appropriate time and location. This process not only ensures that products are available when and where they are needed but also creates value through utility—specifically, time utility, place utility, and the transfer of property rights. Time utility refers to making goods available at the right moment, while place utility involves providing products at convenient locations for consumers. The transfer of property rights ensures that ownership is passed from producers to consumers effectively. Together, these elements highlight the crucial role of distribution in facilitating commerce and meeting customer needs.

The distribution of pharmaceutical preparations involves the careful handling and delivery of both drugs and medicinal ingredients, ensuring that all quality requirements are met throughout the process. This distribution process begins from the moment the pharmaceutical preparation is manufactured by the factory or pharmaceutical wholesaler and continues until the products reach various outlets, including wholesalers' branches, hospital pharmacy installations, clinics, pharmacies, and community health centers for patient use. The primary goal of this distribution is to provide the appropriate pharmaceutical supplies in the right types and quantities to service units. Furthermore, the distribution of medications must prioritize safety, effectiveness, and efficiency. This includes ensuring that the correct medicine is administered to each patient at the appropriate dose, at the designated time, and in the prescribed manner of use. By adhering to these standards, the pharmaceutical distribution process helps ensure optimal patient care and health outcomes.

The distribution of medicines must be executed with utmost care by the factory or pharmaceutical wholesaler following the principles of GMDM. This approach aims to ensure the quality of medicines throughout the entire distribution process, adhering to the necessary requirements for their intended use, as outlined in Minister of Health

Regulation No. 1148. The principles of GMDM encompass various aspects of the distribution chain, including procurement, storage, and the distribution process itself. Additionally, these principles address the proper handling of returned medicines and medicinal substances to maintain their quality and safety. Compliance with these standards is crucial to ensure that pharmaceutical products are delivered effectively and meet regulatory requirements, thereby safeguarding public health. This is further reinforced by BPOM Regulation No. 6, which emphasizes the importance of quality control in the pharmaceutical distribution chain.

Information serves as the driving force behind the distribution management cycle, playing a critical role in ensuring that the distribution system operates efficiently. Without reliable information, the effectiveness of the distribution system diminishes significantly. Distribution managers are tasked with collecting detailed information on every activity within the distribution cycle and analyzing this data to inform future actions. To facilitate this process, distribution management is often supported by a Drug Distribution Management Information System, commonly referred to as DOSIS. This system can operate in both paper-based and electronic formats, enabling the recording and reporting of drug distribution activities. DOSIS aggregates data from various levels of distribution management within a large pharmaceutical company, allowing for comprehensive analysis, validation, and visualization of critical information. A well-functioning DOSIS provides decision-makers throughout the supply chain with accurate and timely data. This includes essential insights such as drug availability, stock reductions and adjustments, usage patterns, demand forecasts, delivery statuses, and information regarding drug assets. By leveraging this information, organizations can enhance their distribution strategies, optimize inventory management, and ultimately ensure a reliable supply of pharmaceuticals to meet consumer needs.

Effective distribution management relies on three crucial pieces of information. First, it involves maintaining up-to-date records of drug stock levels at each level of health services. This ensures that healthcare facilities have the necessary medications on hand to meet patient needs without interruption. Second, understanding the average usage of drugs within a specific period is essential for forecasting future needs and ensuring adequate stock levels. This information helps in planning purchases and managing inventory effectively. Third, tracking adjustments made to drug stock due to factors other than usage, such as expiration, damage, or theft, is important. Additionally, adjustments may occur when there are returns of goods to the pharmaceutical wholesaler. This aspect of management ensures that records are accurate and reflective of the actual stock on hand. With the integration of electronic information systems, these processes can be automated, allowing for real-time updates and streamlined management of drug distribution. This automation enhances efficiency, reduces the potential for errors, and ensures that decision-makers have access to reliable data for effective distribution management.

3. METHOD

The research employs a descriptive qualitative approach, utilizing both primary and secondary data sources. Primary data is gathered directly through interviews with respondents about drug distribution, while secondary data is obtained from various sources that provide relevant information on the topic. The informants selected for this study are individuals directly involved in the drug distribution process at PT Tiga A, including employees from the administration, document department, and warehouse staff.

Criteria for choosing research informants include their direct involvement in the distribution system, knowledge of the related events or issues, effective communication skills, and their ability to articulate the impact of these events or problems. In-depth interviews are conducted three times at different intervals to clarify and reinforce the data gathered in the field.

The purposive sampling technique is utilized to select informants based on predetermined criteria aligned with the research objectives. This technique ensures that the selected participants possess the necessary knowledge and experience relevant to the study. To provide a comprehensive understanding of the findings, the collected data will be analyzed descriptively, allowing for a detailed exploration of the drug distribution processes and challenges faced by the organization.

4. RESULTS AND DISCUSSION

The objective of the Management Information System is to address various business challenges, including service delivery, product costs, and overall business strategies. This system is designed to analyze and support other information systems in carrying out the organization's operational activities effectively. A key commitment of the company is to enhance service quality continually while addressing increases in drug prices in the market. To achieve this, the company focuses on fostering effective and efficient partnerships with the pharmaceutical industry.

This strategy enables the organization to maintain or even lower product prices without compromising quality. The waterfall method has been selected for the development process because it provides structured control over each phase. This sequential approach minimizes the likelihood of errors, ensuring that each stage of development is thoroughly completed before moving on to the next. This meticulous process is essential for achieving the desired outcomes and maintaining the integrity of the system.

The Distribution Management System is a comprehensive software tool designed to streamline various aspects of distribution management, including processing sales orders, managing purchases, overseeing inventory, handling financial accounting, and generating reports required by national regulators. Unlike traditional methods where documents were processed manually, this system automates and integrates these functions, significantly enhancing the efficiency and effectiveness of the distribution management process. One of the primary advantages of implementing this system is its ability to minimize errors and mistakes across different departments. The system maintains a detailed record of all actions taken within its framework, allowing for accountability by tracking who entered specific data. Additionally, it provides a clear documentation trail for every handover between sections, ensuring that all transactions are well recorded. This level of transparency not only aids in identifying potential errors but also improves overall operational reliability.

Proper dispensing and distribution of medications is essential for ensuring the safety and effectiveness of treatment. The primary objective of a drug distribution management information system is to streamline the drug distribution process in line with established good distribution guidelines while optimizing the availability of drug stocks. Additionally, these systems provide substantial benefits for pharmaceutical professionals by enhancing the quality and safety of drugs and minimizing errors throughout the distribution process. Utilizing a drug distribution management information system offers significant advantages, such as improving drug safety and quality, increasing operational efficiency in distribution service settings, and enabling the monitoring of the safety and quality of distributed drugs. These systems help minimize errors in drug distribution and optimize inventory management. The implementation of such a system is expected to enhance the efficiency and quality of pharmaceutical services, ultimately improving patient safety during treatment. Furthermore, this system facilitates convenient and accurate access to drug and supply information for pharmacy and healthcare professionals. It also aids government monitoring of drug distribution data and promotes error reduction and distribution efficiency through timely notifications. Overall, the drug distribution management information system plays a crucial role in enhancing the pharmaceutical supply chain's effectiveness and reliability.

PT TIGA A is a pharmaceutical distribution company based in Bandung, founded in 1972 with the mission of providing comprehensive distribution services for pharmaceutical preparations throughout Indonesia, adhering to the latest laws and regulations. However, the company currently operates without a modern Drug Distribution Management Information System, relying instead on a semi-manual system that presents numerous challenges. One significant issue is the manual invoice creation process, which requires employees to write down customer names, drug names, expiration dates, batch numbers, drug prices, and tax numbers. This manual approach not only increases the likelihood of data errors but also leads to repeated invoice generation. Such inefficiencies hinder the distribution of medicines to customers, resulting in subpar service from PT TIGA A. Additionally, there are delays in reporting, both internally (such as sales turnover, purchases, storage, stock cards, and returns) and externally to relevant authorities. Specifically, the company struggles to submit timely Quarterly Reports to the Indonesian Ministry of Health and drug reports to the Indonesian POM Agency due to the lack of an automated application system. These shortcomings highlight the urgent need for PT TIGA A to adopt a more efficient digital distribution management system to enhance accuracy, streamline operations, and improve overall service quality.

The waterfall method, often referred to as the classic life cycle, is formally known as the "Linear Sequential Model." This model outlines a systematic and sequential approach to software development. It begins with the specification of user needs and progresses through several distinct stages: planning, modeling, construction, and delivery of the system to users (deployment). The process concludes with support for the complete software that has been produced. In this model, each phase must be completed before the next one begins, which emphasizes a structured and methodical progression through the development process. This approach is beneficial in projects where requirements are well understood from the outset, as it allows for clear documentation and milestones. However, it may be less flexible in accommodating changes that arise during the development cycle, as any alterations typically require revisiting earlier stages.

System design is a systematic process of selecting and integrating components to create a functional system. The primary objective is to ensure that the drug distribution management information system operates optimally and efficiently. The system design process involves several steps, including needs analysis, technology selection, implementation planning, and testing. To ensure the effectiveness and efficiency of the system, it is essential to follow these critical steps carefully. Each step plays a vital role in the overall success of the system. Needs analysis

identifies the requirements and expectations of users, while technology selection ensures that the chosen tools and platforms align with those needs. Implementation planning outlines how the system will be deployed, including timelines and resource allocation. Finally, thorough testing verifies that the system functions as intended, allowing for any necessary adjustments before full-scale operation. Adhering to these steps contributes to a robust and reliable drug distribution management system.

The front or login display serves as the initial interface that appears when a user attempts to access the Drug Distribution Management Information System (DOSIS). Designed as a web-based application, DOSIS eliminates the need for installation on individual client computers. This means that as long as a computer is connected to the network and equipped with a web browser, users can conveniently access the application without any complex setup. To begin using DOSIS, users should open their preferred web browser—Mozilla Firefox or Google Chrome are recommended for optimal performance. In the browser's address bar, they should enter the application's URL: http://192.168.1.250/dosis/. Upon hitting Enter, users will be directed to the application's start page.

This straightforward approach to accessing DOSIS not only enhances user experience but also ensures that the system is readily available from any compatible device on the network. Once on the start page, users can log in and begin utilizing the features of the Drug Distribution Management Information System, which is designed to streamline the processes involved in pharmaceutical distribution. The web-based nature of DOSIS also allows for easy updates and maintenance, ensuring that users have access to the latest functionalities and security enhancements.

To access the Drug Distribution Management Information System (DOSIS), users must begin at the login screen, which serves as the gateway to the application. The login screen is user-friendly and designed to provide a seamless entry point for authorized personnel. Here's a step-by-step guide on how to log in effectively.

First, locate the Username column on the login screen. In this field, type your assigned username, which is unique to each user and serves as your identification within the system. This username is typically provided by your system administrator during the onboarding process. After entering your username, proceed to the Password column. Here, carefully input your password, ensuring that you respect any case sensitivity and special characters that may be part of your password. This is crucial for maintaining the security of your account.

Once you have filled in both the Username and Password fields, direct your attention to the LOGIN button, which is prominently displayed on the screen. Clicking this button initiates the authentication process. The system will verify your credentials against the database, and if both your username and password are correct, you will be granted access to the application. Upon successful login, the system will redirect you to the home page, also known as the HOME screen.

The HOME screen is your dashboard within the DOSIS application, providing you with various functionalities tailored to your role in the drug distribution process. Here, you will find options to manage inventory, process orders, and access reports, among other features. The design of this screen is intended to enhance user experience, allowing for intuitive navigation through the system's various modules.

It's important to remember that once you have completed your work or if you need to step away from the application, logging out is essential for protecting your account and ensuring the confidentiality of sensitive information. To log out of the system, look for the User Settings menu, which is usually located in a corner of the screen for easy access. Click on this menu to reveal several options, and then select the Logout option.

By clicking Logout, you will securely exit the application. This action not only ensures that your session is terminated but also prevents unauthorized access by individuals who may use your computer after you. Once logged out, the front page of the application will reappear, indicating that you are no longer signed in. This process is crucial for maintaining the security and integrity of the DOSIS system, as it helps protect both your personal information and the sensitive data managed by the application. Always take a moment to log out properly whenever your session is complete.

The main display of the Drug Distribution Management Information System (DOSIS) is designed to be user-friendly, featuring a clear and organized main menu interface. This interface comprises four primary menus: the Transaction Menu, Utilities, Master Data, and Reports. Each of these menus serves a distinct purpose, enabling users to navigate the system effectively and perform necessary functions related to drug distribution management.

To input data into any of these four menus, users simply need to select the desired menu option. Upon selection, the system will guide users through a series of input fields where they can enter the relevant information as outlined in the user manual. This streamlined process ensures that users can efficiently manage data entry without confusion. For instance, the Transaction Menu allows users to record and manage various transactions related to drug distribution, such as sales and inventory adjustments. The Utilities menu offers additional tools and settings that can enhance the functionality of the system, providing users with options to customize their experience.

The Master Data menu is particularly critical, as it serves as the foundation of the system's database. Within this menu, users will find several subcategories, including Principal Data, Outlet Data, Drug Class Data, Drug Data, Drug Type Data, Drug Unit Data, Drug Packaging Data, Stock Batch Data, and User Data. It is essential that all fields within the Master Data menu are filled in accurately, as this establishes the initial database that the system will use for operations. The information entered must comply with the latest regulations, specifically the 2020 Good Medicine Distribution Method (CDOB) guidelines and the standards set forth by the Ministry of Health.

Finally, when users have completed their tasks within the system, exiting the interface is straightforward. They should navigate to the top right corner of the screen, where the logout menu, represented by a recognizable symbol, can be found. By selecting this option, users will securely log out of the application, ensuring that their session is terminated and that unauthorized individuals cannot access the system using their credentials. This step is crucial for maintaining the security of both personal and sensitive data managed by DOSIS.

The subsequent display within the Drug Distribution Management Information System (DOSIS) is the Transaction Menu. This menu is crucial for managing the core operational activities of the system and comprises several key functionalities, including Purchases, Sales, and Adjustments. Each of these components plays a vital role in ensuring the efficient handling of drug distribution transactions.

To effectively utilize the Transaction Menu, it is imperative that all relevant data has been properly entered into the Master Data Menu. This foundational data acts as a comprehensive database for products and customers, ensuring that transactions can be processed in compliance with the latest regulations established by the National Agency of Drug and Food Control (BPOM) and the Ministry of Health. This adherence to regulations is vital for maintaining quality standards and ensuring that the distribution of pharmaceutical products is conducted legally and ethically.

When accessing the Purchases section, users can record incoming stock from suppliers. This feature enables the tracking of all pharmaceutical preparations received, including details such as the quantities, batch numbers, expiration dates, and prices. Ensuring accurate records in this section is essential for effective inventory management and financial accounting. In the Sales section, users can process transactions involving the sale of pharmaceutical products to customers. This area of the Transaction Menu allows for the input of customer details, drug quantities sold, and pricing, facilitating smooth sales operations. Accurate sales data contributes to overall revenue tracking and helps in generating reports for analysis.

Additionally, the Adjustments feature allows users to rectify any errors encountered during transaction processing. If discrepancies arise—such as incorrect quantities, pricing errors, or other inaccuracies—this function enables users to make necessary adjustments to maintain accurate records. This is particularly important for ensuring the integrity of inventory data and financial reporting. Overall, the Transaction Menu is an integral part of the DOSIS, streamlining the process of managing purchases, sales, and adjustments, while ensuring compliance with regulatory requirements and promoting efficient operational practices.

The Drug Distribution Management Information System application, known as DOSis, employs the waterfall method to streamline processes within the Pharmaceutical Distribution Company (PBF). DOSis serves as a comprehensive solution that integrates various operational components such as administration, warehousing, and distribution into a single, centralized digital platform. This integration allows for efficient management of critical data, product information, customer details, and regulatory compliance.

For PT Tiga A Pharmacy in Bandung, the implementation of DOSis is essential for enhancing operational efficiency. By digitizing and centralizing processes, the system significantly reduces distribution costs and minimizes the time required for drug delivery. This is particularly important in the pharmaceutical industry, where timely access to medications can greatly impact patient care and satisfaction.

The benefits of DOSis extend beyond cost and time savings. The system's robust features enable PT Tiga A to improve the quality of drug distribution services, ensuring that the right products reach the right customers with greater accuracy and reliability. With streamlined processes, the company can enhance its responsiveness to market demands, ultimately leading to improved customer satisfaction and loyalty.

Moreover, by optimizing operational workflows, DOSis positions PT Tiga A to expand its market share. As the company leverages the efficiencies gained from the system, it can better compete with other players in the industry, providing a higher level of service and meeting the evolving needs of healthcare providers and patients alike. In summary, the implementation of the DOSis application not only addresses the immediate operational challenges faced by PT Tiga A but also paves the way for sustained growth and enhanced service delivery in the pharmaceutical distribution landscape.

The implementation of menu design in the drug distribution management information system, known as DOSis, plays a pivotal role in enhancing the functionality and user experience within PBF. By creating distinct divisions for business menu displays, database menus, and report menus, the system improves modularity, flexibility, and maintainability. This organized structure allows users to navigate the system efficiently, enabling them to access

various functions without confusion. A critical component of DOSis is the presentation of the product database, which encompasses product data, incoming products, and outgoing products. This aspect is vital for any drug distribution management system, as it directly impacts inventory accuracy and efficiency. A well-organized and user-friendly interface facilitates the viewing, searching, managing, and tracking of product-related information. Such functionality not only enhances the accuracy of inventory management but also streamlines operations, ultimately reducing the likelihood of errors. When designing DOSis, it is crucial to consider user requirements comprehensively. Engaging with users during the design process helps ensure that the system meets their needs and expectations. Furthermore, securing data is paramount, as the system handles sensitive information regarding products and customer transactions. Implementing robust security measures protects against unauthorized access and ensures compliance with regulatory standards. Integration with other related systems is another important consideration in the design of DOSis. By establishing connections with product and customer database control systems, reporting systems, and financial management tools, the overall efficiency of the drug distribution process can be significantly enhanced. Such integration allows for seamless data sharing and minimizes redundancies, which can lead to a more cohesive operational workflow. The implementation of a practical and efficient drug distribution management information system like DOSis has the potential to yield substantial benefits for PT Tiga A in Bandung. By optimizing the management of good drug distribution methods in accordance with the latest regulations, DOSis not only enhances productivity but also improves customer service. This focus on efficiency and quality can ultimately lead to increased profitability for PBF PT Tiga A. In conclusion, the thoughtful design and implementation of the DOSis system at PT Tiga A will foster an environment of improved operational efficiency, accuracy, and regulatory compliance. By prioritizing user needs, securing data, and ensuring integration with related systems, DOSis is positioned to enhance the overall drug distribution process, providing a competitive advantage in the pharmaceutical market.

In conclusion, the implementation of the Drug Distribution Management Information System (DOSis) at PT Tiga A marks a transformative advancement in the organization's pharmaceutical distribution operations. The adoption of the waterfall method for this system reflects a structured approach that facilitates careful planning, execution, and evaluation of each development phase. This method ensures that all aspects of distribution management—ranging from inventory control to customer relations—are effectively integrated, thus promoting a seamless flow of information and operational processes.

This research has emphasized the critical importance of efficient distribution channels in the pharmaceutical sector, where the safety, quality, and timely delivery of medications are paramount. By establishing a robust and automated system like DOSis, PT Tiga A can significantly enhance its ability to comply with regulatory requirements set forth by agencies such as BPOM and the Ministry of Health. The reduction of manual errors through automated processes not only streamlines operations but also mitigates risks associated with medication distribution, thereby ensuring that patients receive the right medications at the right time.

Moreover, the insights gathered from the selected informants—who possess firsthand experience with the DOS system—underscore the need for ongoing training and development to fully leverage the capabilities of this technology. Continuous feedback from employees involved in the distribution process is vital, as it fosters an environment of collaboration and innovation, ultimately leading to improved service quality and efficiency. As PT Tiga A navigates the complexities of the pharmaceutical market, remaining responsive to the evolving needs of its workforce and customers will be essential.

Looking ahead, the successful implementation of DOSis is expected to yield substantial benefits beyond just operational efficiency. The system will enable PT Tiga A to enhance its competitive edge by providing superior service to healthcare providers and patients, fostering long-term relationships built on reliability and trust. By improving reporting capabilities, the organization can ensure better visibility into its operations, facilitating informed decision-making and strategic planning.

In summary, the journey towards implementing the Drug Distribution Management Information System at PT Tiga A is not just about technological advancement; it represents a commitment to excellence in pharmaceutical distribution. As the organization continues to refine and optimize its operations, the lessons learned from this research will serve as a cornerstone for future developments. With a focus on quality, safety, and customer satisfaction, PT Tiga A is poised to solidify its position as a leader in the pharmaceutical distribution industry in Indonesia, ultimately contributing to better health outcomes for the communities it serves.

5. CONCLUSION

The designed system utilizes the waterfall method, which outlines a structured approach to software development through distinct stages: analysis, design, implementation, testing, and ongoing maintenance. This systematic

progression ensures that each phase builds upon the previous one, leading to an optimized drug distribution process. By adhering to this method, the system aims to enhance operational efficiency while minimizing errors associated with drug supply management. The initial phase, analysis, involves a comprehensive assessment of the current distribution practices, identifying areas that require improvement. Following this, the design phase translates the analyzed requirements into a coherent system architecture. This includes defining user roles and their corresponding access rights within the system. To ensure effective functionality, the system generates three specific access rights: admin, warehouse, and person in charge (PIC). The admin role is crucial as it manages initial operational transactions within the system, overseeing the overall functionality and user access. This role is pivotal in maintaining data integrity and system security. The warehouse role focuses on managing the input of products entering the distribution chain. This function ensures that all entries comply with the latest regulations, thereby upholding the standards set by regulatory bodies. Accurate input at this stage is vital for maintaining a reliable inventory and preventing discrepancies that could arise from manual entries. The person in charge (PIC) role is designated to oversee the reporting functions of the system. This role allows designated personnel to view and generate reports in accordance with the regulatory requirements established by agencies such as BPOM and the Ministry of Health. This ensures that PT Tiga A remains compliant with legal mandates while providing transparency in its operations. The implementation phase involves the actual deployment of the system, where all designed components are integrated and tested for functionality. Rigorous testing ensures that any potential issues are identified and resolved before the system goes live. Following implementation, ongoing maintenance is essential to address any emerging challenges, incorporate feedback, and ensure the system adapts to changing regulatory environments. In summary, the waterfall method provides a well-defined and organized structure for developing the drug distribution information system at PT Tiga A. By focusing on each stage of the process, from analysis to maintenance, the system is designed to optimize the distribution process, enhance operational efficiency, and minimize errors in drug supply management. With clearly defined user roles and responsibilities, PT Tiga A can ensure a seamless and compliant distribution operation, ultimately contributing to improved service quality and patient safety.

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