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Implementation of a Prototype-Based Logistics Information System at the Blood Transfusion Unit of Indonesian Red Cross, Karawang Regency

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Abstract

This study addresses critical operational inefficiencies within the logistics unit of the Blood Transfusion Unit (UTD) of the Indonesian Red Cross (PMI) in Karawang Regency, which currently relies on manual processes. The existing system presents significant challenges in data recording, retrieval, and reporting, leading to substantial delays and an inefficient workload for the dedicated staff. To mitigate these challenges, a prototype software development methodology was adopted, emphasizing an iterative development cycle and direct user involvement. The proposed system is designed to computerize inventory management, streamline operational workflows, and facilitate faster, more accurate data handling across various logistical functions, including goods requests, distribution, receipt, and purchasing. The implementation of this system is anticipated to yield substantial benefits, including a significant reduction in data errors, accelerated item search and transaction processing, and enhanced reporting capabilities. These improvements are expected to alleviate the heavy workload on logistics personnel, making the management of essential supplies more efficient and reliable for UTD PMI. This research not only contributes to the technical advancement of information systems but also demonstrates a practical application of these principles to solve critical operational challenges within a vital humanitarian organization, thereby improving the efficiency and reliability of a crucial public service. The emphasis on minimizing errors and accelerating data search directly addresses the core pain points, indicating a tangible improvement in service delivery and strategic capabilities.

Keywords**:** *Logistics Information System, Prototype Development, Blood Transfusion Unit*

1. Introduction

The pervasive influence of Information Technology (IT) and other recent technological advancements is fundamentally reshaping various scientific fields, leading to significant shifts in both research and practical application. In Indonesia, IT is no longer merely an advantage but an indispensable tool for businesses, regardless of their size, to foster growth, optimize operations, and maintain a competitive edge in an increasingly stringent market. Computerized systems, particularly database applications and information systems, are pivotal for organizations, significantly enhancing decision-making processes, optimizing operational workflows, and facilitating the efficient management of vast quantities of corporate data by responsible individuals. This capability allows computerized systems to effectively meet the operational needs of a company.

The Indonesian Red Cross (PMI) stands as a prominent national social and humanitarian organization, deeply committed to seven guiding principles of the International Red Cross and Red Crescent Movement: universality, neutrality, humanity, equality, volunteerism, independence, and unity. With an extensive network comprising 408 branches across cities and regencies and 34 regional offices in various provinces, PMI plays a crucial role in public service. Within this extensive network, the Blood Transfusion Unit (UTD) of PMI Karawang Regency manages a substantial quantity of medical supplies and other essential goods within its logistics section. Despite the critical nature and volume of these supplies, the current logistics operations at UTD PMI Karawang heavily rely on manual methods. Historically, this sector has depended on agenda books for recording incoming goods, outgoing goods, and stock levels, a practice that inherently compromises the efficiency of data storage and utilization. This manual system leads to several pronounced inefficiencies: data recording and verification are slow and ineffective, report generation is time-consuming due to the text-based format of the data, and the workload for the two dedicated logistics staff members is rendered inefficient. The problem identified transcends a mere technical deficiency; it represents a fundamental operational bottleneck that directly impedes the strategic capabilities and service delivery of a vital humanitarian organization. The continued reliance on manual processes in a high-volume, critical environment like blood supply logistics not only introduces significant operational risks but also signifies a missed opportunity to leverage modern IT for enhanced public health outcomes.

2. Theoretical Basis

2.1. Fundamental Concepts (System, Information, Logistics)

To establish a robust conceptual framework for understanding the proposed information system, it is essential to define the fundamental concepts that underpin its design and analysis. A system can be defined in two primary ways: by focusing on its operations or by describing its constituent components. A system is a network of interconnected procedures that come together to perform an activity or achieve a specific goal. [1]. Complementing this, Aasinjery describes a system as "a collection of several components that are interconnected with one another forming a unity to achieve certain goals. [2]. Therefore, a system is a collection of interrelated parts working collaboratively towards a common objective.

Systems possess distinct characteristics. [3]. These include: Components, which are interacting parts forming a unified whole; a Boundary, defining the separation between one system and another; an Environment, comprising external factors that influence the system's operation, which can be beneficial or detrimental; an Interface, serving as the connecting medium between subsystems, allowing resource flow; Input, the energy introduced into the system, categorized as maintenance input (for operation) and signal input (for processing into output); Output, the processed energy, consisting of useful results and waste; a Processor, which transforms input into output; and a Goal, the purpose that determines the necessary inputs and generated outputs. These characteristics provide a comprehensive checklist for evaluating the completeness and robustness of the system design.

Systems can also be classified from various perspectives. [4]. **Natural Systems** (e.g., the solar system) develop organically without human intervention, while **Artificial Systems** (e.g., accounting systems) are human-made structures designed to meet specific needs, requiring human planning and oversight. **Deterministic Systems** (e.g., computer programs) rely on predetermined rules for predictable behavior, whereas **Probabilistic Systems** have uncertain future conditions due to elements of chance. Crucially, **Open Systems** (e.g., modern computer systems interacting with human culture) are open to and influenced by their environment, while **Closed Systems** operate independently, though truly isolated systems are rare in practice. The understanding of system characteristics and classifications, particularly the "open system" concept, is crucial for recognizing how the logistics system will interact dynamically with its internal departments and external suppliers, thereby ensuring its adaptability and sustainability.

Information, a core output of any system, is defined as "the result of data processing in a certain way so that it is more meaningful and useful for the recipient"[5]. Similarly,state that information is "a collection or set of data that has been processed into something that has more and broader meaning and benefits"[6]. The value of information is determined by its benefits relative to the cost of obtaining it, with the ideal scenario being benefits outweighing costs. Data generated by an information system is considered high quality if it effectively meets user needs and proves useful for their specific purposes, directly addressing the core problem of inefficient and unreliable data. The **Information Cycle** describes the continuous process where data is transformed into information by a model, leading to decisions and actions by recipients, which in turn generate new data.

Logistics, central to this research, The process of managing, moving, and storing production goods, spare parts, or finished goods from providers to consumers. forming an integral part of a well-functioning supply chain. [7]. This definition firmly anchors the entire project within the domain of supply chain management, contextualizing its practical relevance.

Finally, the technical foundation of the proposed system relies on several related concepts: a **Website** is a collection of web pages accessible online, a **Database** is a connected and organized collection of data for easy reuse. [8]. **MySQL** is a Relational Database Management System (RDMS)and **XAMPP** simplifies the installation and configuration of Apache, PHP, and MySQL. [9].These concepts collectively provide the necessary conceptual and technical underpinnings for the design and analysis of the proposed information system.

2.2. Supporting Theories (UML, ERD, Navigation Structures)

The design and representation of the proposed system are guided by specific modeling tools and design principles, ensuring a structured and comprehensive approach. **Unified Modeling Language (UML)** is a visual modeling method specifically used for designing object-oriented systems. UML serves as a powerful tool for integrating diverse modeling information, providing an expressive visual language for system development, and significantly enhancing user comprehension of complex systems. Its deliberate selection and application as a primary modeling tool signify a rigorous, structured, and object-oriented approach to system design, crucial for promoting modularity, reusability, and long-term maintainability of the software.
Two key types of UML diagrams are particularly relevant to this project:

- A **Use Case Diagram** explains the interactions between actors (users) and the system, as well as the relationships among different use cases within the system.
- An **Activity Diagram** provides a detailed, step-by-step visual representation of a system's processes, illustrating the flow from input to output.

The **Entity Relationship Diagram (ERD)** is described as an abstract representation of data relationships stored within a system, composed of entity sets and relationship sets. the main symbols used in ERD include:

- **Entity:** Represented by a rectangle, signifying any distinguishable object, person, place, event, or concept.
- **Attribute:** Represented by an ellipse, detailing the properties or characteristics of an entity or relationship. Various types include single-valued, multi-valued, composite (e.g., full name from first, middle, last), and derived attributes.
- **Relationship:** Represented by a diamond, illustrating connections between one or more entities. Relationships are categorized by degree: Unary (self-referencing), Binary (between two entities), and Ternary (among three entities)[10].

In database design, relationships between entities are also characterized by **Cardinality**, which measures the extent of entity involvement in a relationship. This is categorized into One-to-One, One-to-Many, and Many-to-Many relationships. The detailed exposition of ERD components and cardinalities demonstrates a robust database design philosophy, indispensable for ensuring data integrity and efficient data management within a complex logistics system.

Finally, **Navigation Structures**, also known as program flow structures, organize the connectivity and workflow of various system areas. four common types are:

- **Linear Navigation Structure:** Consists of a series of stories displayed sequentially.
- **Hierarchical Navigation Structure:** A fundamental structure, sometimes called a linear structure with branching, where users move along the branches of a tree-like structure.
- **Non-Linear Navigation Structure:** Provides branching navigation, allowing users to navigate content freely without predetermined paths.
- **Composite Navigation Structure:** A mixed architecture allowing non-linear movement but potentially limited by linear display needs or hierarchical organization of information.

The explicit use and detailed definitions of UML and ERD in this section demonstrate adherence to established software engineering best practices. This directly underpins the proposed system design, where these diagrams serve as the blueprint. The thorough explanation of ERD attributes and relationships is vital for ensuring that the database accurately models the complex interdependencies of inventory data, users, and transactions. Furthermore, the discussion of navigation structures is relevant for designing an intuitive and user-friendly interface, a critical factor in user acceptance and overall system efficiency, especially for staff transitioning from manual processes.

3. Research Methods

This section details the specific methods employed for data collection and the chosen software development lifecycle model, providing a clear roadmap of the research process.

3.1. Data Collection Methods

The primary methods for data gathering involved direct observation conducted at the Logistics section of the Blood Transfusion Unit (UTD) PMI Karawang Regency. This allowed researchers to gain firsthand insights into the manual processes, identify pain points, and understand the real-world context, such as the actual time spent on recording or searching. Additionally, existing documents pertinent to the current operational system were systematically collected and analyzed. Document collection, conversely, provided formal records, historical data, and insights into existing data structures and reporting requirements. The combined approach of direct observation and comprehensive document analysis provided a holistic understanding of the "as-is" system, capturing both explicit procedural workflows and implicit operational nuances. This qualitative depth is essential for accurately identifying the root causes of existing inefficiencies and for tailoring the proposed solution to the specific, nuanced needs of the organization. Together, these methods ensured that the subsequent system design is grounded in a realistic and comprehensive assessment of the current state, which is a crucial initial step within the "Requirements Gathering" phase of the prototype method.

3.2. Software Development Method: Prototype Model Stages

The prototype method was specifically chosen for this project to facilitate the creation of an initial application overview, which could then be iteratively evaluated by end-users. This evaluated prototype would subsequently serve as a foundational reference for the development of the final application. This method was deemed highly suitable for the development of the logistics procurement information system at UTD PMI Karawang Regency due to its inherent emphasis on direct user involvement throughout the development process. This engagement ensures that user needs are accurately understood, captured, and implemented into the system, which is a critical determinant for developing a system that genuinely addresses the complex and potentially evolving needs of a logistics unit transitioning from deeply entrenched manual processes. This methodology significantly mitigates the risk of developing a system that users might find impractical or ultimately reject, thereby ensuring higher adoption rates and long-term success.

According to Pressman (2010), the prototype method consists of several main stages :

1. **Requirements Gathering (Communication):** This initial stage involved identifying and meticulously collecting system requirements through active engagement with relevant stakeholders, particularly the staff of the UTD PMI logistics section. Information was primarily garnered via interviews, direct observation of existing processes, and a thorough study of current documents used in logistics operations. The overarching goal was to comprehensively understand the existing workflow, the types of data managed, and the specific problems encountered in the current manual logistics recording process.
2. **Quick Design:** Following requirements gathering, an initial design of the system's user interface and underlying data structure was rapidly developed. This design encompassed the user interface layout, the overall system flow, and a data model specifically tailored to represent the processes of procurement, recording of incoming and outgoing goods, and comprehensive stock management.
3. **Building Prototype:** A functional, albeit not yet perfectly refined, prototype of the system was constructed based on the quick design. The primary objective at this stage was to visually demonstrate the core functionalities of the system, enabling users to gain a tangible understanding of the proposed solution.
4. **User Evaluation and Testing:** The developed prototype was then presented to end-users for rigorous testing and evaluation. Feedback obtained from users was deemed critical for assessing whether the system adequately met their needs and expectations. Any identified deficiencies or inconsistencies led to subsequent revisions in the system design.

5. **Refining Prototype:** Based on the comprehensive user evaluations, iterative refinements were made to the system, encompassing improvements in its appearance, functionalities, and overall workflow. This iterative process continued until the system was considered viable and optimally aligned with user requirements.
6. **Implementation and Maintenance (Final Product Implementation):** Once the prototype was deemed final and approved, the system underwent full development and was subsequently implemented within the operational environment of UTD PMI Karawang Regency. The deployed system is subject to continuous monitoring and ongoing improvements to address any emerging technical issues or new operational needs.

While Pressman's stages provide a foundational framework, a broader understanding of prototype development includes more granular phases that delineate increasing levels of fidelity and stability. These include:

- **Appearance Model:** Creating rendered images or physical mock-ups to demonstrate size, colors, and visual features, often used for initial feedback and concept design.
- **Proof of Concept (PoC):** Physical bench-top mock-ups or breadboards used to evaluate the feasibility and performance of a subsystem or technical component, aiding in component selection and specification development.
- **Alpha Prototype:** The initial attempt to design and fabricate the product to meet specifications, aiming to look and function like the final version, used for internal testing and design refinement.
- **Beta Prototype:** Incorporates refinements from Alpha development into production tooling, molds, and designs, prepared for verification and preliminary validation testing.
- **Pilot Production:** Refinements from Beta testing are incorporated, and the design is transferred to manufacturing, suitable for initial market release.
- **Matured Product:** Incorporates user feedback and production monitoring, resulting in a stable design with high yields and cost-saving measures.

These supplementary stages provide a valuable framework for discussing the progression and maturity of the prototype, implying that the "Implementation and Maintenance" phase is not a terminal point but rather a continuous cycle of refinement, aligning with the concept of a "Matured Product."

This section offers a comprehensive analysis of the existing logistics operations at the UTD PMI Karawang, encompassing its historical context, current organizational structure, detailed operational procedures, and the identified core shortcomings.

3.3. Company Overview and Organizational Structure

The Indonesian Red Cross (PMI) traces its origins to the humanitarian efforts of Henry Dunant during the Battle of Solferino in 1859, which ultimately led to the formation of the International Committee of the Red Cross (ICRC) and the establishment of the Geneva Conventions. PMI itself received official global recognition from the ICRC on June 15, 1950, and was recognized by the League of Red Cross and Red Crescent Societies (now IFRC) in October 1950, becoming its 68th National Society member. The PMI Kabupaten Karawang branch was established on April 1, 1958, with a documented history of its chairmen and changes in physical location over the decades, reflecting its long-standing presence and evolution.

PMI operates across various humanitarian fields, including disaster prevention and, critically, the provision of blood to patients in hospitals through its specialized Unit Transfusi Darah (UTD). This context highlights that logistics is not an isolated function but an integral and foundational component of a broader, life-saving humanitarian mission. Consequently, any delays or errors within the logistics system can have direct and significant humanitarian consequences, underscoring the critical importance of an efficient and reliable logistics system.

The organizational hierarchy of PMI Karawang includes the PMI Branch Management (Pengurus PMI Cabang), responsible for overseeing the central office and UTD operations; the PMI Branch Headquarters (Markas PMI Cabang), which provides administrative support, manages finance, assets, and public relations, and supports disaster prevention; and the Unit Transfusi Darah (UTD). The UTD is functionally divided into several key sections:

- The **General Section** is responsible for administration, finance, and logistics planning, including document drafting, correspondence, archiving, reporting, asset management, and payroll.
- The **Technical Section** manages blood services and Infection Marker for Transfusion Transmitted Diseases (IMLTD) examination, fulfilling blood requests from hospitals and examining blood samples.
- The **Public Relations Section** coordinates donor scheduling and manages donor activity archives and reports.
- The **Finance Section** manages the cash flow within UTD PMI Karawang.
- The **Quality Section** oversees quality control and product release, ensuring all blood products meet Ministry of Health and BPOM standards.

This detailed exposition of the organizational structure and functional breakdown reveals the inherent complexity of UTD PMI's operations. The clear positioning of the logistics unit within this larger entity demonstrates that logistics directly supports other critical functions, such as blood services. This implies a direct causal link: inefficiencies in logistics can create ripple effects throughout the organization, potentially compromising the core humanitarian service delivery.

3.4. Existing Logistics Procedures

The analysis of the current inventory information system in the logistics section of UTD PMI Kabupaten Karawang reveals predominantly manual and paper-based procedures.

The **Goods Request Process** begins with all work units within UTD PMI Karawang submitting physical requests for goods to the logistics department. The logistics department then manually verifies stock availability. If stock is available, the request is processed; if not, a purchase request is manually generated. All request forms are then physically archived by the logistics department.

Following this, the **Goods Distribution Process** involves the logistics department manually preparing the requested items and completing a physical goods distribution form, which serves as proof of handover. Goods are then dispatched to the respective work units based on the previously submitted request form. The logistics department physically archives these handover forms.

For **Goods Receipt**, the logistics department receives items from suppliers, manually cross-referencing delivery notes and invoices to ensure completeness. Upon verification, the goods are physically transferred to the warehouse for inventory.

The **Goods Purchase Process** involves the logistics department manually drafting a purchase request letter, typically using Microsoft Excel, for the UTD PMI Karawang leadership's signature. Once approved, the logistics department manually contacts the supplier to process the order. This detail highlights an organization attempting to leverage digital tools but without a centralized database or integrated system, leading to disconnected data and manual efforts to combine information.

Finally, for **Report Generation**, the logistics department compiles all goods data on a monthly basis, performing manual stocktaking and generating reports for all transactions that occurred within that month.

The current system for managing goods inflow and outflow at UTD PMI Karawang exhibits several significant shortcomings and weaknesses:

- The existing goods inventory system is fundamentally not yet computerized. This is the overarching issue, leading to a cascade of other problems.
- Data recording and verification processes for stock are inefficient and ineffective. This is a direct consequence of the manual nature of the system.
- Report generation is a time-consuming process, primarily due to the data still being in text-based formats. The reliance on physical records and fragmented digital tools like Excel makes data compilation and analysis cumbersome.
- The workload for the entire logistics or warehouse section is inefficiently managed by only two employees, highlighting a significant human resource constraint exacerbated by manual processes. This is not merely a staffing issue but a symptom of underlying process inefficiencies, as manual tasks are inherently more labor-intensive, prone to error, and difficult to scale.

These identified problems are deeply interconnected, forming a detrimental feedback loop: the persistence of manual processes directly leads to increased errors and significant delays, which in turn escalates the workload, further hindering overall efficiency and the timely generation of accurate reports. The lack of comprehensive computerization is the fundamental root cause, triggering a cascading effect that impacts operational bottlenecks and severely limits strategic decision-making capabilities. This clear chain of causality provides a compelling and urgent justification for the proposed system.

4. Results and Discussion

This section meticulously details the proposed solution, outlining its architectural design, technical specifications, and the strategic plan for its phased deployment.

The core solution involves developing a comprehensive computerized information system capable of managing all inventory data. This includes establishing a centralized database for efficient recording, control, and storage of stock information. The system is designed to facilitate faster and easier reporting, thereby significantly enhancing the overall efficiency of logistics operations for employees. This approach directly addresses the identified operational inefficiencies by centralizing data management and automating key logistical processes.

The system's design is based on a thorough analysis of user needs and roles, ensuring tailored functionalities for each stakeholder:

- **Admin:** The warehouse administrator will be responsible for managing user accounts and master item data within the system.
- **Logistics/Warehouse User:** This role will be empowered to view current inventory levels, confirm incoming item requests from various work units, manage both incoming and outgoing goods transactions, initiate purchase requests to the purchasing department, and generate various logistics reports.
- **Work Unit:** Work units will be capable of submitting item requests directly to the warehouse section through the system, streamlining the request process.
- **Purchasing:** The purchasing department will be able to manage item data, maintain item catalogs, manage supplier information, confirm purchase requests originating from the logistics/warehouse department, process purchase orders, and generate comprehensive order reports.

The clear delineation of roles and responsibilities within the system design reflects a user-centric development approach, ensuring that the system is precisely tailored to support the specific needs of each stakeholder. This targeted design is expected to significantly improve overall organizational workflow, enhance accountability, and reduce bottlenecks. This structured approach to problem-solving and user requirements is a cornerstone of successful system development.

4.1. System Design Diagrams

The architectural blueprint and operational workflows of the proposed system are visually presented using standard modeling notations, ensuring clarity and precision in design.

- A **Use Case Diagram** provides a high-level overview of the system's functionalities and the interactions between various actors and the system.
- **Use Case Scenarios**, systematically described in tables outline the step-by-step interactions for each major use case. These include Login, managing Item Request (by both Work Unit and Logistics), managing Item Outgoing, managing Purchase Request, managing Incoming Goods, generating Incoming Goods Report, Outgoing Goods Report, Purchase Request Report, and Purchase Order. These tables meticulously outline actor actions and corresponding system reactions.
- **Activity Diagrams** for the proposed system visually illustrate the new, streamlined workflows for Login, Transaction Item Request, Outgoing Goods, Incoming Goods, Purchase Request, User Management, Item Data Management, Supplier Data Management, and Manage Item Category. These diagrams highlight the optimized flow of processes, providing a clear contrast to the existing manual workflows.
- The **Entity Relationship Diagram (ERD)** depicts the relationships between key entities within the system's database, such as User, Barang (Items), Kategori (Categories), Supplier, BarangMasuk (Incoming Goods), BarangKeluar (Outgoing Goods), PermintaanBarang (Item Requests), PermintaanPembelian (Purchase Requests), and PO (Purchase Orders).
- The **Logical Record Structure (LRS)** provides a detailed logical structure of the database records, derived directly from the ERD.
- A **Class Diagram** illustrates the relationships between various classes within the system's object-oriented design, detailing their attributes and methods.
- **Sequence Diagrams** demonstrate the chronological interactions between objects for key processes including Login, Transaction Item Request, Purchase Request, Incoming Goods, Outgoing Goods, Purchase Order, Manage Supplier Data, Manage Item Data, and Manage User Data.

The presentation of a comprehensive suite of UML diagrams alongside robust database design diagrams unequivocally demonstrates a thorough and systematic approach to software engineering. This level of detail is paramount for ensuring the system's logical coherence, functional completeness, and efficient data management. The inclusion of multiple diagram types is not merely for academic completeness but serves a crucial purpose in providing diverse perspectives on the system's architecture and behavior. This comprehensive modeling approach significantly reduces ambiguity, facilitates clear communication among development teams, and ensures a well-engineered solution that directly addresses the "ineffective data recording and verification" problem.

4.2. Document and File Specifications

The proposed system introduces new digital input and output documents, marking a critical shift from manual records, along with precise specifications for its underlying database files.

Input Document Specifications (New System): The proposed system will utilize digital input forms, signifying a critical shift from manual records. These include:

- Form Permintaan Barang (Item Request Form): Functioning as the requirement for item release from logistics, sourced from the Work Unit, and managed via computer.
- Form Pendistribusian Barang (Item Distribution Form): Serving as the requirement for item release from logistics, sourced from the Logistics Department, and managed via computer.
- Form Permintaan Pembelian (Purchase Request Form): A prerequisite for creating a Purchase Order (PO), sourced from the Logistics Department, and managed via computer.
- Form PO (Purchase Order Form): Used for ordering goods from suppliers, sourced from the Purchasing Department, and managed via computer. This explicit shift from paper to computer as the primary medium directly addresses a core inefficiency of the previous system.

Output Document Specifications (New System): The system will generate standardized output reports, ensuring consistency and accuracy. These include:

- Laporan Permintaan Barang (Item Request Report): Serving as an archive of item requests, sourced from the Work Unit, and can be printed on paper for archival or distribution.
- Laporan Pendistribusian Barang (Item Distribution Report): An archive of item distribution, sourced from the Logistics Department, and can be printed on paper.
- Laporan PO (Purchase Order Report): An archive of Purchase Orders, sourced from the Purchasing Department, and can be printed on paper.

File Specifications: The system's database is structured with several key files, each with specific attributes, types, and primary/foreign keys to ensure data integrity and efficient storage. The logical structure of these files is derived from the ERD and LRS, forming the backbone of the system's data management capabilities.

- File Barang (Item File): Stores item data, with id_barang as the primary key and foreign keys for category and supplier.
- File User (User File): Manages user data, with id_user as the primary key.
- File Kategori (Category File): Stores item category data, with id_kategori as the primary key.
- File Supplier (Supplier File): Contains supplier information, with id_supplier as the primary key.
- File Barang Masuk (Incoming Goods File): Records incoming goods transactions, with id_barangmasuk as the primary key and foreign keys for user and purchase request.
- File Barang Keluar (Outgoing Goods File): Records outgoing goods transactions, with id_barangkeluar as the primary key and foreign keys for user and item request.

- File Permintaan Barang (Item Request File): Stores item request data, with id_permintaanbarang as the primary key and a foreign key for user.
- File Permintaan Pembelian (Purchase Request File): Stores purchase request data, with id_permintaanpembelian as the primary key and a foreign key for user.

File PO (Purchase Order File): Stores purchase order data, with id_po as the primary key and foreign keys for user and purchase request. These detailed file specifications, as outlined in Tables 4.11 through 4.19 in the source document, are crucial for supporting the system's ability to store and retrieve data efficiently, directly addressing the problem of ineffective data recording and verification Economy: TikTok supports content creators through tools and monetization options, fostering a thriving ecosystem that encourages fresh and engaging content User-Friendly Interface: The app is easy to use, which helps in attracting a broad user base, including those who may not be tech-savvy.

4.3. Hardware and Software Specifications

The successful operation of the proposed logistics information system requires specific hardware and software configurations:

Table 1: Hardware and Software Specifications

Software	Hardware
Operating System: Windows 10 Home	Processor: Intel Celeron
Application Program: PHP 8.0.11	RAM: 2 GB
Database Application: MySQL	Hard Drive: 118 GB
Framework: CodeIgniter (CI) 3	Peripherals: Printer, Mouse, Keyboard, and RJ45 Cable

4.4. Interface Design Testing

Interface design testing for the proposed system was conducted using the **Black Box testing** method, which focuses exclusively on the functional requirements of the developed software without delving into its internal structure. A series of tests were performed across various system functionalities, and the results consistently indicated successful outcomes, with all expected behaviors observed and accepted.

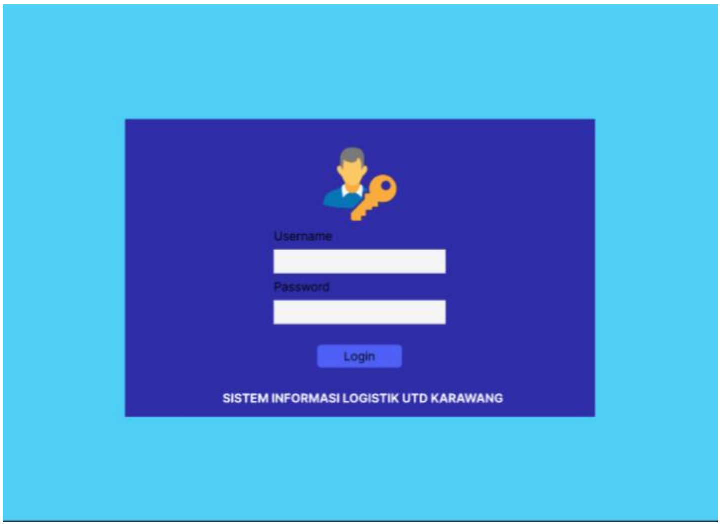

Figure 1: Log in Interface Sistem Informasi Logistik UTD Karawang

The strategic plan for the phased deployment of the proposed system is outlined in a detailed implementation schedule, ensuring a structured and methodical approach to its realization. The progress of implementation represents the stages of system realization. The schedule is as follows:

- **Preparation of initial data:** This activity is scheduled for the 2nd and 3rd weeks of March, involving the preparation of physical evidence that supports the observation results.
- **Analysis:** This phase is planned for the 3rd and 4th weeks of March.
- **System Design:** The design of the proposed system, based on the analysis, will take place during the 1st, 2nd, 3rd, and 4th weeks of April.
- **Software Design:** This activity is allocated for the 1st, 2nd, and 3rd weeks of April.
- **Program Creation:** The development of the software is scheduled from the 4th week of April to the 2nd week of May.
- **Program Testing:** The testing of the developed program will occur from the 2nd to the 4th week of May.

This phased implementation schedule ensures a systematic progression from foundational activities to the final deployment and testing of the system. This strategic approach is crucial for managing complexity, allocating resources effectively, and ensuring thorough validation at each stage before full operationalization.

5. Conclusion

Based on the research conducted on the design of the logistics procurement information system at the Blood Transfusion Unit (UTD) of the Indonesian Red Cross (PMI) Karawang Regency, several key conclusions can be drawn regarding the system's impact and future potential.

The implementation of this prototype-based information system is expected to significantly ease the workload for logistics personnel, making the management of goods used at the UTD PMI lighter and simpler. This direct improvement in operational efficiency addresses the previously identified problem of inefficient workload distribution and reliance on manual processes.

Furthermore, the system is designed to minimize errors in the management and reporting of inventory data. By computerizing data recording and verification, the system directly counters the inefficiencies and inaccuracies inherent in the former paper-based methods. This enhancement in data integrity is crucial for reliable stock control and informed decision-making.

Finally, the system will accelerate the process of searching for goods, and all transactions will be securely stored in a centralized database. This transition from time-consuming manual searches and fragmented records to a streamlined, digital database significantly improves data accessibility and overall operational speed. The ability to quickly retrieve transaction data also enhances accountability and auditability.

While the current research has successfully laid the groundwork for a more efficient logistics system, it is acknowledged that the system is not without limitations. Specifically, the current reporting functionalities require further development, as reports cannot yet be generated on a monthly, quarterly, or annual basis. Therefore, for future development, it is recommended to enhance the reporting capabilities to allow for more flexible and comprehensive data analysis across various timeframes. This continuous refinement will ensure the system evolves to meet the growing analytical needs of UTD PMI, further optimizing its logistics operations and supporting strategic planning.

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