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Design of a Web-Based Pawn Management System Using the Waterfall Model at Enoni Cell

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ABSTRACT

The rapid development of information technology encourages various sectors to adopt web-based systems to improve the efficiency and accuracy of data management. Enoni Cell is one of the companies engaged in the pawn sector, and therefore requires an integrated and easily accessible data management system. This study aims to design a web-based data management system inin a web-based data management system using the modelWaterfall software development. The Waterfall model is chosen for the systematic and structured stages, including needs analysis, system design, implementation, testing, and maintenance. This system is intended to not only improve data security and accuracy, but also to facilitate the process of recording, tracking and notification of data in deposit items. The results of this study are expected to provide an effective solution for Enoni Cell in sediment management, becoming more efficient and a reference for the development of similar systems in the future.

1. Introduction

In today's digital era, the development of information technology has brought significant changes in various aspects of life, including in the business and financial services sectors. One area that has experienced significant development is the pawn management system. Conventional systems that are still widely used in various pawnshops often face serious challenges, such as manual recording that is prone to errors, delays in the service process, lack of efficiency in data management, and limited access to information for customers.

The development of information technology has undergone very significant changes over time. Changes and advances in increasingly sophisticated information systems are needed to help complete human work in various fields. As stated by Metandi in JISCOM (2023), information technology is a development in the field of information that plays an important role in carrying out daily tasks, both to obtain and disseminate information. This shows that information technology is able to provide efficiency, speed, and convenience in data services and processing in various agencies. Traditional recording methods, such as the use of Microsoft Excel, are very prone to human error and make operational processes inefficient. In fact, dependence on manual systems causes potential data loss and difficulty in monitoring transactions in real time. Therefore, an information system is needed that is able to automate business processes and support faster and more accurate decision making.

Pegadaian as a non-bank financial institution also realizes the importance of technology-based services in increasing competitiveness. As explained by Putri (2021) Pegadaian is required to provide optimal services to the community, so that the community can be more effective in obtaining funds for their needs.

As a form of adaptation to changing times and market needs, Pegadaian is transforming its business through digitalization. Pegadaian has begun transforming the company in an effort to become a financial company through the G-5Star Generation strategy. This step of change is marked by the launch of Pegadaian Digital Service (PDS) and Pegadaian Syariah Digital Services (PSDS).

In developing this system, the Waterfall model is used as a software engineering methodology. The development method follows the Waterfall approach, with stages of needs analysis, design, implementation, testing, and maintenance. With this approach, it is expected that the system built will be able to meet the required functionality as a whole and can be tested gradually.

The automation of the reporting process offered by this system will greatly help in reducing the workload of employees and reducing errors that may occur due to manual processes. In addition, the web-based system allows data and services to be accessed in real-time and flexibly from various devices, thereby improving the quality of service and transparency of information to customers.

This study aims to design and develop a web-based pawn management system at Enoni Cell, a business engaged in pawn services. Enoni Cell faces challenges in managing transactions and recording pawn data efficiently, so it requires a digital solution that can improve the effectiveness and efficiency of its business processes. This system is designed to facilitate transaction recording, monitoring the status of pawned goods, and providing easy access to information for customers and business managers. With this system, it is expected to improve operational efficiency, reduce recording errors, and provide a better service experience for customers.

2. Literature Review

Information Systems

An information system is a collection of interrelated entities including hardware, software, data, procedures, and people designed to collect, organize, process, and disseminate information within an organization to support decision-making and operational activities. According to Paul et al. (2021) from the Scholedge International Journal of Management & Development, information systems include "collection, selection, organization, processing, management and dissemination" of information through electronic means to meet the needs of institutions and society.

Pawn Item Data Management

Pawn data management must be carried out systematically and transparently so that transactions are easy to track, data is safe from manipulation, and information retrieval is efficient. In manual practice, recording with physical books often results in data loss, input errors, and delays in due date reminders. In contrast, the use of a web-based information system allows for digital recording, automatic classification, and fast access to transaction history. As noted by Surbakti et al. (2023), in the Journal of Web-Based Pawn Business Information System Development, "the development of this system ... simplifies the pawn service process, updates pawn data, and makes it easier to search for pawn data".

Web Based System

The web-based system provides easy access via a browser without the need for installation, so users can log in to the system from anywhere, either via computer or mobile phone. This greatly saves costs and time because there is no need to check the installation on each device. Moreover, system updates can be applied directly to the central server, so all users automatically get the latest version. As explained by Nur & Maulana (2021) in Kohesi: Jurnal Sains dan Teknologi, a web-based student attendance system is able to "reduce recording errors, increase transparency, time efficiency, and save operational costs by reducing paper use".

Software Development Methods

Software development methods are frameworks that guide teams in building systems, from planning to maintenance. One of the most widely used methods is the Waterfall linear approach where each stage (analysis, design, implementation, testing, and maintenance) must be fully completed before proceeding to the next stage. Its main advantages are a clear structure and complete documentation so that it is easy to follow, especially when the needs are mature from the start.

However, its disadvantages are the lack of flexibility in dealing with changes and tend to take longer than iterative methods such as Agile. For example, Ghinafikar et al. (2023) through the Journal of Information Technology Management reported that although Waterfall provides clarity of development paths, projects using Agile can be completed up to 33% faster.

Waterfall Method

The Waterfall method is a sequential software development model consisting of several main stages, namely needs analysis, system design, implementation, testing, and maintenance. Each stage is carried out systematically and must be completed before proceeding to the next stage, so that the flow resembles a waterfall. This model is suitable for projects that have clear needs from the start and minimal changes in the middle of the process.

Previous Research

Several previous studies have shown that the implementation of a web-based information system has a positive impact on the efficiency of data management and customer service. Designing a web-based inventory and stock purchase transaction system using the Waterfall method, where the results are able to minimize recording errors, speed up the reporting process, and increase overall operational efficiency. Another study by Anugrah et al. (2024) developed a web-based inventory system that is able to handle real-time stock management, so that employee workload can be reduced and errors due to manual processes can be minimized. Meanwhile, Sagala & Haryono (2023) built a web-based WiFi customer management application, which has been proven to be able to simplify the registration process and speed up service to customers. In the context of financial institutions, Putry (2021) stated that the implementation of an information system in pawnshop services can increase service efficiency and encourage increased competitiveness of non-bank financial institutions. This is in line with the findings of Putri (2021) who emphasized the importance of digitalization in microfinance services such as Pegadaian, in order to improve ease of access and quality of service to the public. Based on various studies, it can be concluded that the implementation of web-based systems and the Waterfall development method has proven effective in improving accuracy, efficiency, and quality of service. However, there is still rarely any research that specifically designs a web-based pawn management system for small businesses such as Enoni Cell. Therefore, this research is here to answer these needs through the right technological approach and structured development methodology.

3. Research Methods

The research method used by the author in this project includes three main components, namely: data collection method, data analysis method, and system development method. These three stages are interrelated to ensure that the system developed is in accordance with real needs in the field and based on valid data.

Method of Collecting Data

In this stage the author uses the following techniques:

A. Observation
   Observations were conducted directly at the work location to see and record Enoni Cell's operational activities. The purpose of this observation was to gain a real understanding of the business flow and ongoing pawn transaction processes.
B. Interview
   Interviews are conducted directly with related parties, such as business owners or operational staff, to explore information and system needs in more depth and obtain more valid and accurate data.
C. Literature Study
   Literature studies are conducted by reviewing scientific references, in the form of books, journals, and previous theses, which are relevant to the topic of pawn management information systems, software development,as well as the technology used.

System Development Model

The method used in this study is the Waterfall model, because this approach has a well-organized development structure and is supported by complete documentation. Each stage in this model is carried out based on planning that has been carefully prepared since the beginning of the development process. The Waterfall model consists of five main stages, namely: needs analysis, system design, implementation, integration and testing, and operation and maintenance.

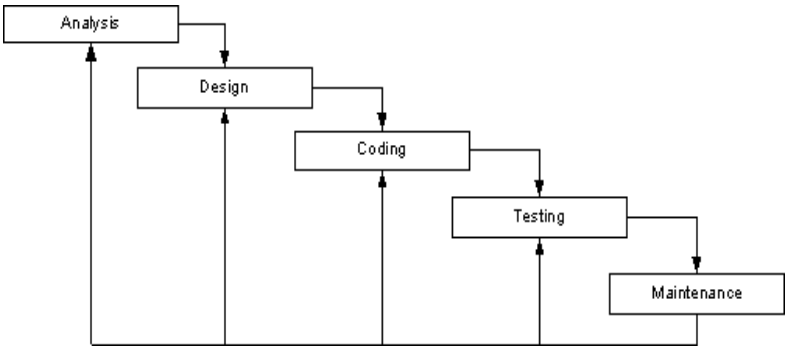

Fig.1. Waterfall Model

Waterfall Method Stages

1. **Analysis**
   This initial stage aims to analyze system requirements based on predetermined priorities. Before software development begins, developers must understand user requirements for the system to be created. The information gathering process can be done through discussions, observations, surveys, and interviews. The data obtained is then processed and analyzed so that the system requirements specifications can be clearly defined.
2. **Design**
   At this stage, the system design is made based on the data that has been collected. The design of this web-based inventory system uses the Unified Modeling Language (UML) as a modeling tool to visually describe the structure and workflow of the system.
3. **Coding**
   The implementation stage is carried out by applying programming code based on the design that has been made. This system was developed using the PHP programming language and MySQL database to manage data.
4. **Testing**
   After the software is developed, testing is carried out to ensure that all features are functioning as expected. Testing is carried out using the method Black Box Testing**,** which focuses on examining the output based on the given input without looking at the internal code structure.
5. **Maintenance**
   The maintenance phase is carried out after the system is implemented. The system must be updated.and are periodically repaired to address bugs, improve performance, and ensure that the system continues to run optimally according to user needs.

4. Results and Discussions

The purpose of analyzing the procedures in a running system is to understand the system's workflow as a whole, so that its advantages and disadvantages can be clearly identified. The following is a description of the activities of the system currently in use:

Fig.2. Activity Diagram of the Running System

Proposed System Analysis

Based on the results of the evaluation that has been carried out, a website-based system design can be proposed as follows:

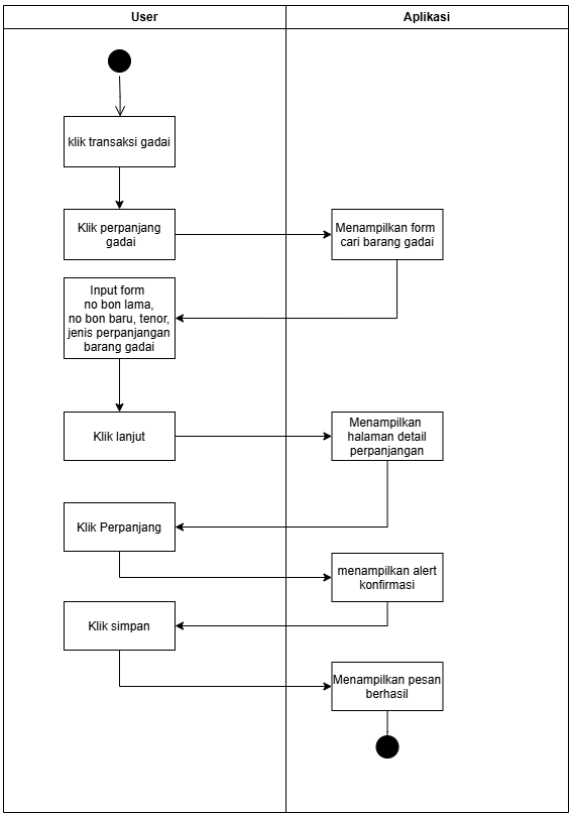

Fig.3. Activity Diagram of Pawn Extension

UseCase Diagram

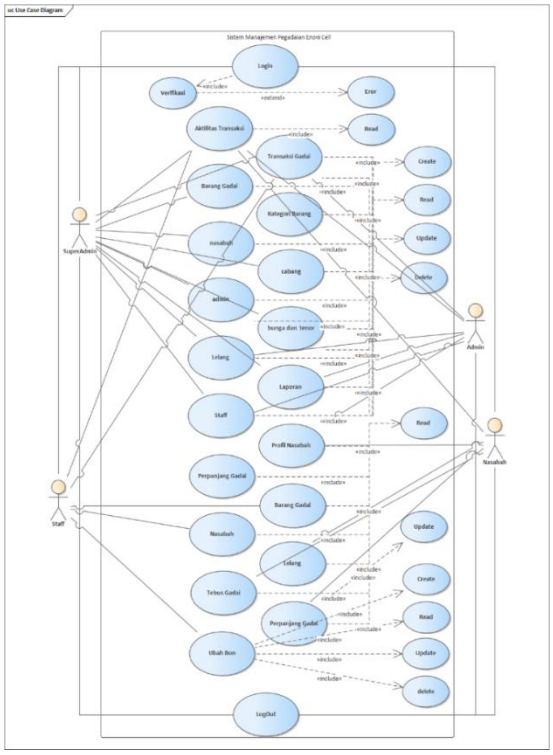

Fig.4. Usecase Diagram

Sequence Diagram

Sequence Diagram is a diagram that describes dynamic cooperation between several objects. The goal is to display a series of messages sent between objects and interactions between objects. Something that happens at a point in time when the system is running. Here is a Sequence Diagram for what will be created:

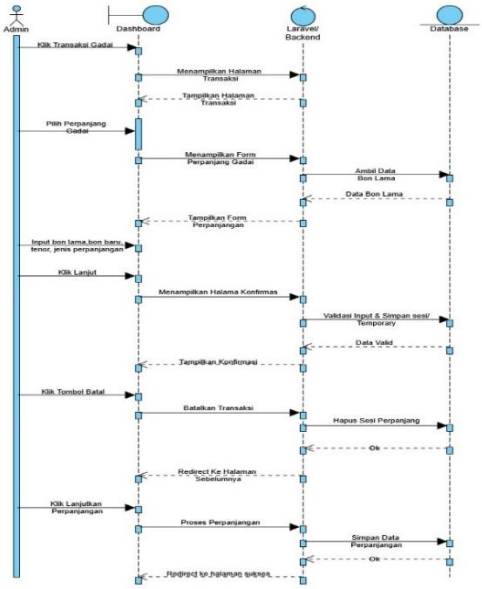

Fig.5. Sequence Diagram of Pawn Extension

ERD

Entity Relationship Diagram (ERD) is one of the tools in database design that functions to describe the relationship between entities in a system. ERD is used in the system design stage to model the logical structure of the data needed, as well as explain how data relates to each other between tables in the system.

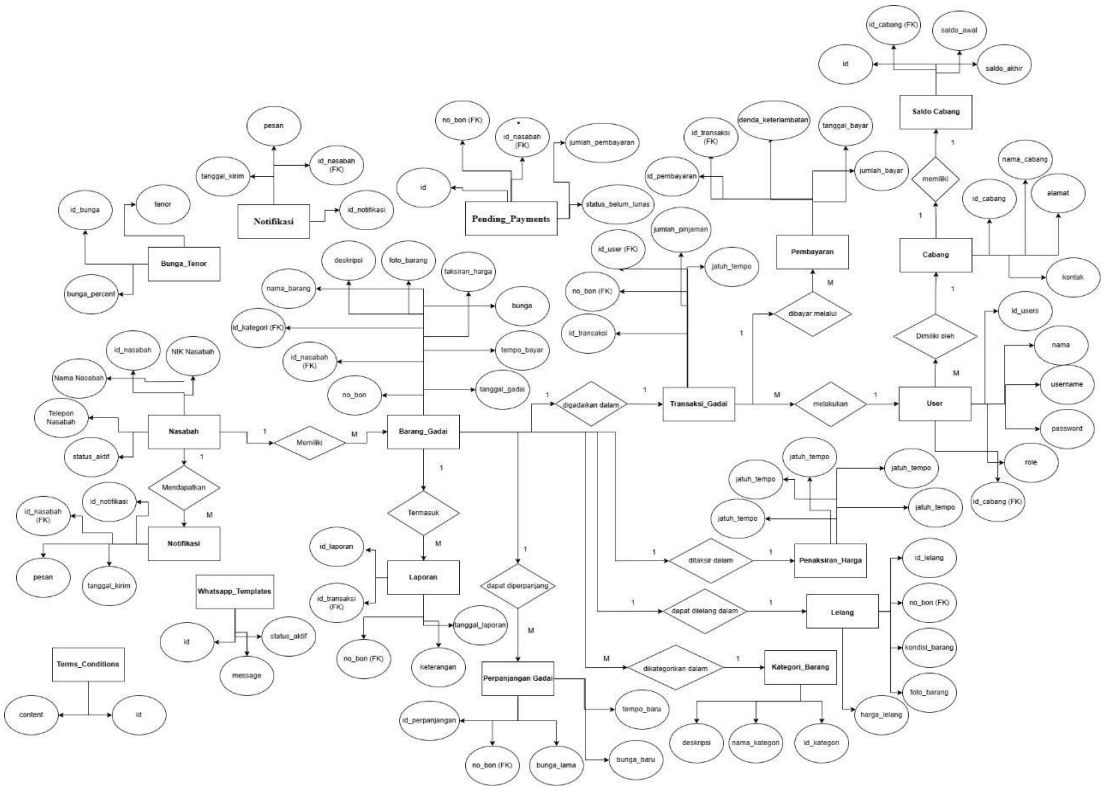

Fig.6. ERD

Interface Design

Interface design is done to provide an overview of the appearance of the application to be proposed. The following is the interface design of the system to be developed:

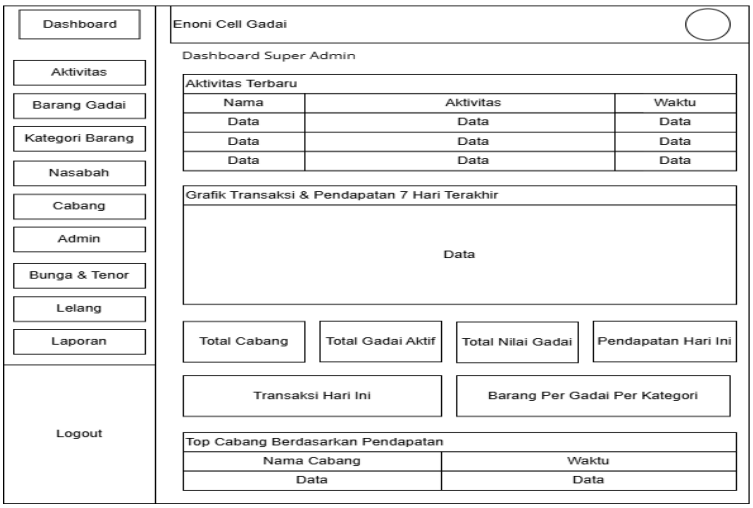

Fig.7. Superadmin Dashboard Screen Design

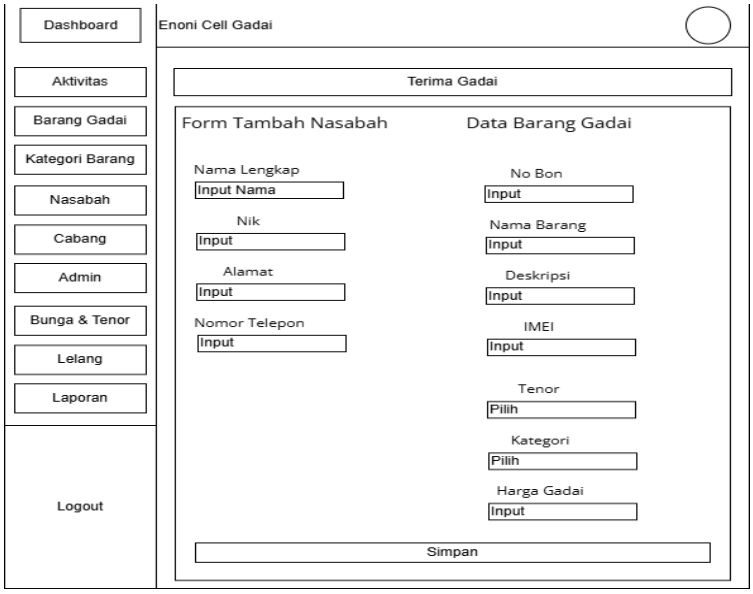

Fig.8. Pawn Acceptance Page Screen Design

Interface Implementation

a. Dashboard Page

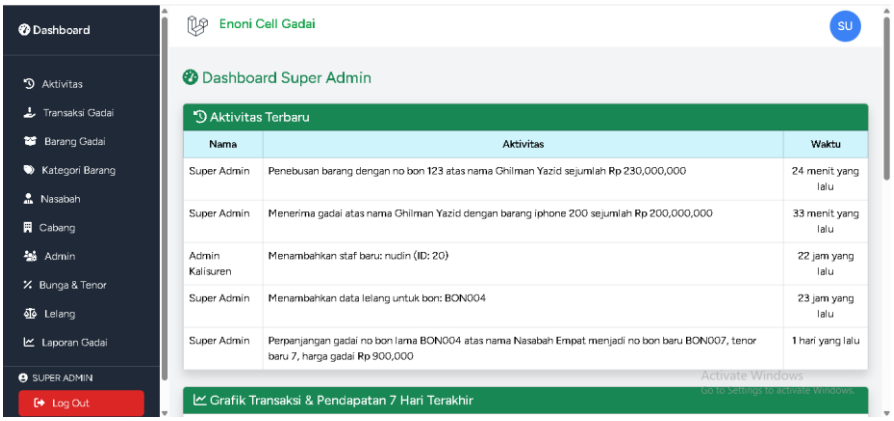

Fig.9. Dashboard Page

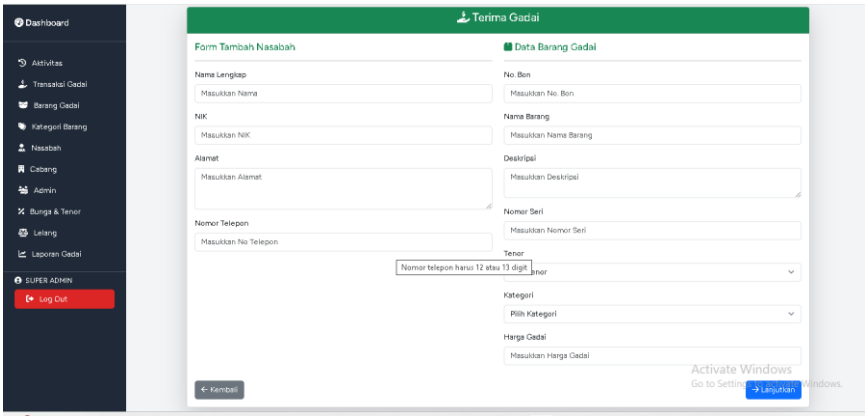

Fig.10. Accept Pawn Page

5. Conclusion

Based on the results of the practical work that has been carried out at Enoni Cell, the author concluded that the pawn goods data management system that previously ran manually still had many shortcomings, especially in terms of recording, searching for data, and monitoring transactions. To answer these problems, the author designed a web-based pawn management system using the Waterfall method. This system is built with the Laravel framework and MySQL database, resulting in an application that is more structured, fast, and easy to use by internal parties of the company. Through this design and implementation process, the author gained direct experience in applying software development theory to the world of work. The system developed is expected to be able to improve operational efficiency at Enoni Cell, while also providing convenience for customers in monitoring the status of their pawn goods. Some of the main features implemented include fast data search, automatic notifications, and neater transaction management. Thus, this system can be a relevant and useful digital solution in supporting small to medium-scale pawnshop business activities.

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