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Design of a Rule-Based Digital Check Ordering Web System at Bank Sumut KCP Binjai

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Abstract

The rapid advancement of digital technology has highlighted the limitations of manual check application and ordering processes, which remain time-consuming, error-prone, and inefficient. Such conditions may hinder the bank's operational performance and negatively impact service quality for customers. To address these issues, an automated system that simplifies, accelerates, and streamlines check ordering is required. Therefore, this study aims to design a rule-based digital check ordering web system for Bank Sumut KCP Binjai, enabling a faster, more accurate, and well-structured application process. The proposed system automates each step of the check ordering workflow based on predefined rules, including data verification, request processing, and order recording. A rule-based approach ensures consistent operations aligned with standard procedures, reducing reliance on manual tasks and minimizing the risk of human error. Additionally, the system is designed to improve data accuracy, strengthen internal controls, and facilitate efficient information management related to check orders. The main objective of this research is to develop an effective and efficient rule-based web system that supports digital check ordering processes. With the implementation of this system, banking services are expected to become faster, more accurate, and more aligned with sustainable digital transformation efforts, ultimately improving overall customer satisfaction and operational reliability.

Keywords*: Web system, Digital check, Rule-based, Ordering, Bank*

1. Introduction

The development of information technology has driven significant changes in banking services, shifting from conventional models toward digital services that are faster, more accessible, and more efficient. The use of applications and web-based services has been proven to improve service quality, accelerate transaction processes, and reduce reliance on face-to-face interactions at branch offices [1].

As a regional development bank in North Sumatra, Bank Sumut plays an important role in supporting regional economic activities, including through improved services at sub-branch offices such as KCP Binjai, which serves a high transaction volume, particularly from MSME customers. However, operational processes at this branch still face challenges, especially the manual check-ordering procedure, which requires 30–60 minutes per transaction and may reduce service quality and competitiveness amid the growing adoption of digital banking services nationally.

Nationally, the acceleration of financial service digitalization is reinforced by Bank Indonesia's Blueprint for the Indonesian Payment System 2025, which emphasizes the integration of the digital financial ecosystem and the strengthening of non-cash payment infrastructure, including the digitalization of check-based services. This condition positions operational process innovation in regional banks as a strategic necessity to enhance efficiency, ensure regulatory compliance, and meet customer expectations in the increasingly cashless era.

At Bank Sumut KCP Binjai, the manual check-ordering process which includes completing physical forms, direct data verification, and internal coordination creates long queues during peak hours, potential service delays, and risks of recording errors. The implementation of a web-based system would allow check orders to be submitted online 24/7, provide real-time status information, and reduce employee workload by up to half, aligning with the digitalization trends in Indonesian banking services [2].

To ensure that digital check-ordering services operate in accordance with internal requirements such as minimum balance, active account status, and identity verification a structured decision-making mechanism is required through a rule-based approach. A rule-based system enables automated validation based on if–then logic, thereby

increasing verification accuracy, accelerating approval processes, and minimizing operational risks [3]. This approach is particularly relevant given that a majority of the branch's customers are MSME actors [4] with high transaction needs, requiring consistent validation to reduce potential misuse and ensure compliance with OJK regulations [5].

Therefore, the development of a rule-based digital check-ordering web system at Bank Sumut KCP Binjai represents a strategic step in supporting the digital transformation of regional banking, improving operational process efficiency, and enhancing service quality for customers in Binjai and the surrounding areas.

1.1 Theoretical Basis

The literature review presented in this section forms the theoretical foundation for developing a rule-based digital check-ordering system at Bank Sumut KCP Binjai. The reviewed theories provide a comprehensive conceptual understanding of information systems, banking check-ordering procedures, rule-based decision-making mechanisms, web-based application development, database management, and system modeling using UML. These theoretical components collectively support the design and implementation of a web-based system capable of automating check-ordering processes, enhancing data accuracy, streamlining validation procedures, and improving the overall efficiency of banking operations.

1.1.1 Information Systems

In the competitive banking industry, the utilization of information technology has become a key element for enhancing operational effectiveness and the quality of services provided to customers. Banking information systems process financial data and transactions electronically through computers and digital networks to enable fast and integrated services. At Bank SUMUT, this implementation is reflected through network-based services such as ATMs, phone banking, and internet banking, which allow customers to conduct transactions without visiting branch offices and connect data across branches in real time. These services support various activities such as balance inquiries, fund transfers, payments, and account statements, enabling transactions to be performed anytime and from various locations. Despite offering convenience and time efficiency, the use of banking information systems still involves risks such as potential data breaches and dependency on internet speed and availability [6].

1.1.2 Bank Check Ordering

A bank check is an unconditional payment order issued by a customer to a bank to disburse a certain amount of funds to a designated recipient or the bearer of the check. It functions as a practical, secure, and effective giro payment instrument in financial transactions. As a non-cash payment instrument, checks play a crucial role in business and trade activities because they enable fund transfers without physical cash and serve as proof of debt acknowledgment as well as a transferable value instrument through op naam, order, or bearer mechanisms. In banking practice, ordering and issuing checks are conducted through the opening of a giro account by fulfilling administrative requirements such as completing an application form, depositing initial funds, identity verification, and assessing customer character and eligibility before the checks are printed and issued in booklet form. This procedure reflects the application of prudential banking principles aimed at maintaining the security of payment systems and reducing risks of misuse, including the possibility of bounced or lost checks that may harm recipients [7].

1.1.3 Rule-Based System

A rule-based system is a system used to solve problems through a set of rules formulated based on expert knowledge. These rules are arranged in condition–action pairs (if–then) and implemented into an inference engine within the application. When executed, the system performs pattern matching between the input data and the available rules to determine the most appropriate decision. Rule-based systems are simple, easy to understand, and easy to implement. However, they lack the capability to generate or update rules automatically, as they are not designed as self-learning systems [8].

1.1.4 Web Development

A web application is an internet based information medium that enables rapid data dissemination and can be accessed through a browser using the HTTP protocol within a client server environment, where the server manages system requests and users access information through URLs on the World Wide Web. In its development, a web application is typically written using HTML for page structure, while PHP is utilized as a server side programming language to process system logic and generate dynamic output. Data management is performed using relational database systems such as MySQL, which store and manage data in a structured manner and support processing by

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the web application. The use of these technologies enhances information distribution efficiency and service automation because it enables independent access without manual processing through offline systems [9].

1.1.5 Database

A database is a collection of interconnected data stored in a structured manner with controlled redundancy to meet an organization's information needs, enabling orderly processes of data insertion, modification, and retrieval. Data in a database are organized into elements such as fields as the smallest data units, records as collections of related fields, and files as collections of records that form a single storage unit. Database management is conducted using a Database Management System (DBMS), software that regulates data storage, access, manipulation, security, and maintenance through transaction mechanisms and data manipulation languages such as SQL. A DBMS also provides essential functions such as backup, access control, and performance optimization. In addition, database design generally follows a relational model that represents entities and relationships in the form of tables, which are then modeled using schemas or diagrams such as ERDs to illustrate relational structures and constraints between entities within the system [10].

1.1.6 UML (Unified Modeling Language)

Unified Modeling Language (UML) is a visual modeling language used to describe and design software systems in a structured manner, facilitating analysis, documentation, and communication of system design among developers prior to implementation.

1) Use Case Diagram

   This diagram is used to illustrate the relationship between actors (users or external systems) and the main functions of the system. A Use Case describes user requirements and the system's boundaries at a high level, making it suitable for early stages of requirements analysis.

2) Activity Diagram

   An Activity Diagram explains the workflow or business processes within the system in a structured manner. It is useful for visualizing the sequence of steps in a process, including decision branches and parallel tasks, thereby clarifying the system's operational logic.

3) Class Diagram

   A Class Diagram is used to model the data structure of a system through representations of classes, attributes, methods, and relationships between classes such as association, generalization, and aggregation. This diagram forms the foundation of programming design because it shows the system's logical structure prior to being translated into code [11].

2. Research Method

This study adopts the Rule-Based System method in developing a rule-based Credit Information System to determine customer status at PT. Bank Sumut, Binjai Branch. This method is used to build a system capable of performing automated decision-making based on a set of rules formulated according to the bank's credit assessment procedures and requirements [12]. The approach is chosen because it can represent human logic and considerations quickly, consistently, and objectively, thereby supporting credit officers in evaluating customer eligibility and credit repayment accuracy more effectively [13].

2.1. Research Approach

This research employs a Research and Development (R&D) approach, as it aims to develop a digital check-ordering information system starting from needs analysis to prototype evaluation. This approach aligns with iterative system development models that emphasize staged development and continuous evaluation to ensure the produced software meets functional requirements [14].

In addition, this study is descriptive in nature, as it examines the actual business process of check ordering prior to designing the digital-based system. Descriptive methods are commonly used in information system research to provide a factual illustration of organizational workflows and user requirements as the basis for system development [15].

This research also adopts a qualitative method, as data collection is conducted through workflow observations and interviews with stakeholders involved in the check-ordering process. Qualitative methods are effective for

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identifying user needs, understanding operational procedures, and forming a solid foundation for system requirement analysis [16].

2.2. Data Collection Techniques

In this study, data were collected using several methods to support the analysis and design of the rule-based digital check-ordering system.

1) Interviews, conducted with operational staff such as tellers and related personnel to obtain information on the conventional check-ordering workflow and the challenges encountered in the process.
2) Direct Observation, performed by observing operational activities in the bank to understand the actual business processes involved in manual check ordering.
3) Documentation, carried out by gathering supporting documents such as check-ordering forms, standard operating procedures (SOPs), policies related to check issuance, and other administrative records used as the basis for rule formulation in the system.
4) Literature Review, which involves collecting information from scientific sources such as journals, research articles, and books related to rule-based systems, information system design, and banking business procedures as the theoretical foundation for system development.

2.3. System Analysis

System analysis was conducted to understand the existing manual check-ordering process (AS-IS) and to design a more efficient digital system (TO-BE). The initial stage involved analyzing user requirements to identify the information, features, and roles needed by tellers and operational staff. A similar approach is used in web-based credit information system studies, where user requirement gathering serves as the foundation for system design.

The manual business process was then examined to identify issues such as service delays, data redundancy, and the lack of automated controls. AS-IS process mapping methods are also applied in UML-based system analysis research to document workflows before designing a new system.

These findings form the basis for developing a rule-based digital system capable of performing automatic data validation according to bank policies, enabling faster and more consistent decision-making. The rule-based approach has proven effective in decision-support studies for credit eligibility assessment.

The system model was then represented through Use Case Analysis, and the requirements were classified into functional needs (automatic validation, data management, transaction tracking) and non-functional needs (security, speed, reliability) to ensure the system meets banking service standards.

2.4. Rule-Based Method

The rule-based method is applied in this study to automate verification and decision-making in the digital check-ordering process based on the bank's operational policies. The system stores knowledge in IF–THEN rules that map specific conditions to appropriate actions, ensuring decisions that are consistent and objective. A similar approach is used in rule-based credit assessment systems, which replicate analyst evaluations in a systematic and efficient manner.

The rules are formulated based on parameters relevant to check ordering, such as the status of the previous checkbook, account type, and minimum balance requirements. Translating manual procedures into logical rules aligns with web-based credit information system development, where administrative processes are converted into automated decision mechanisms.

An example of a production rule used is:

```
IF checkbook_active = false AND balance ≥ minimum_requirement
THEN check_order_approved
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Through these rules, the system can validate requests automatically without manual intervention, accelerating the process and reducing potential input errors.

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3. Results and Discussions

3.1 System Analysis Result

The system analysis identifies the manual check-ordering process (AS-IS) at Bank Sumut KCP Binjai, which requires 30–60 minutes per transaction and often results in queues during peak hours with 50–100 daily requests. The manual workflow leads to data redundancy, verification errors, and the absence of automated controls for rules such as minimum balance and account status. Interviews with customer service staff and supervisors highlight the need for automatic validation, status tracking, and reduced repetitive input.

Based on these findings, the TO-BE system was modeled using Use Case, Activity, and Class Diagrams involving three actors: Customer, Customer Service, and Supervisor. System requirements were categorized into functional (rule-based validation, order management, real-time tracking) and non-functional (HTTPS security, role-based access, response time under 5 seconds, and 99% reliability). These analysis results form the foundation for developing a faster, more controlled, and modern digital check-ordering system.

3.2 System Design

The system design stage is carried out based on the functional requirements and business process analysis to develop a rule-based digital check-ordering system. In this phase, the system model is constructed using a Use Case Diagram as the primary representation to ensure that the interactions and process flows are clearly and structurally defined. The Use Case Diagram is utilized to map user roles such as tellers and administrators and their interactions with the system in performing tasks such as submitting, validating, and managing check-order requests, ensuring that the system design aligns with actual operational needs.

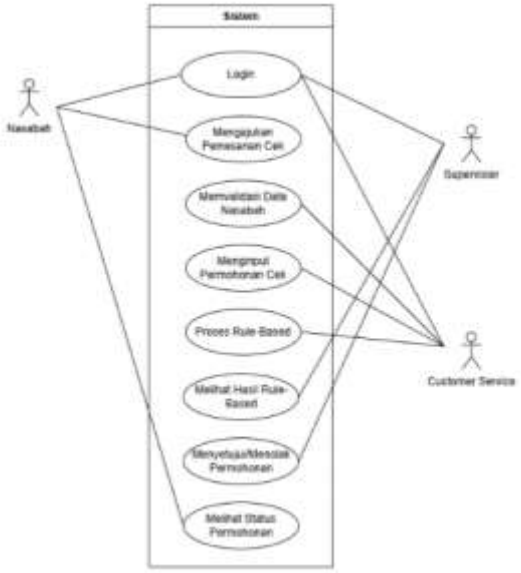

Figure 1 Use Case Diagram of the Rule-Based Digital Check-Ordering System at Bank Sumut KCP Binjai

3.3 System Implementation

1) Login Page Interface

The login page of the Digital Check Ordering Web System at Bank Sumut KCP Binjai serves as an authentication gateway that requires users to enter their user type, username, and password. This ensures that only authorized users can access the system according to their designated access rights.

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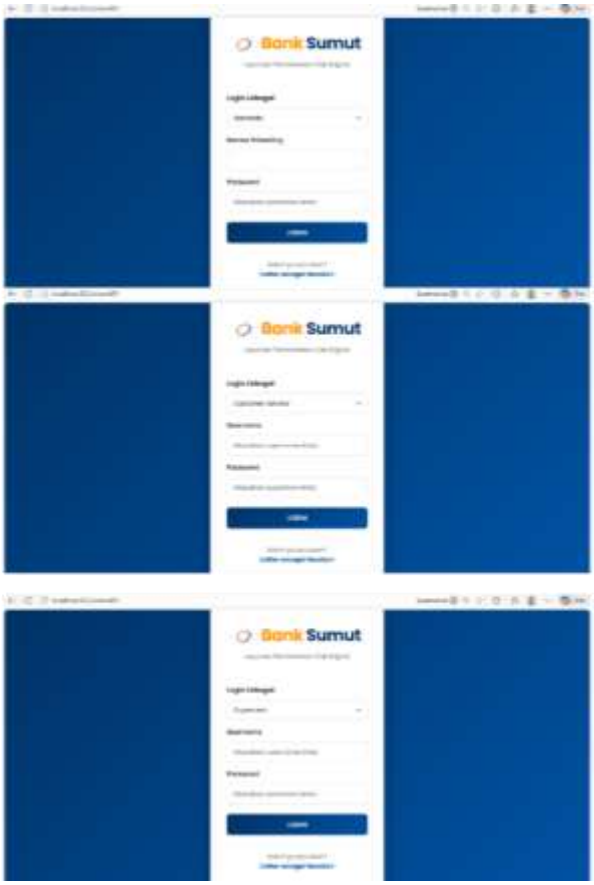

Figure 2 Customer, Customer Service, and Supervisor Login Page

2) Customer Page Interfaces

The customer dashboard page displays user information, account balance, the cheque order submission form, and the history of submitted requests. Each request status is generated automatically through the rule-based system, allowing customers to track the progress and outcome of their cheque orders.

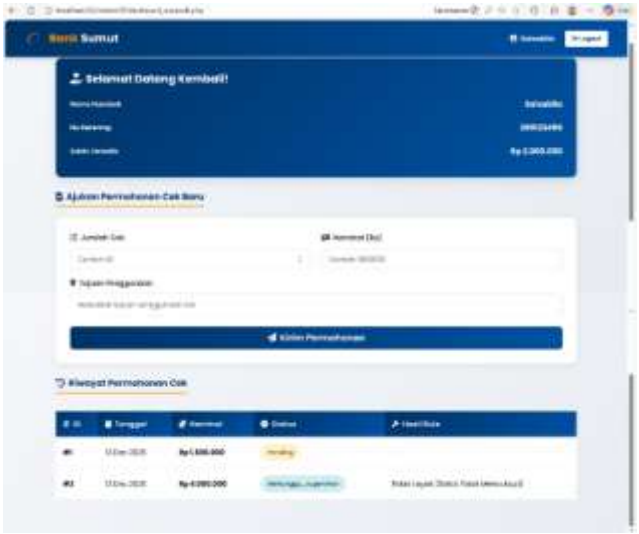

Figure 3 Customer Page after Submitting a Cheque Order Request

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3) Customer Service Interface and Rule-Based Processing Page

The Customer Service page displays incoming cheque order requests along with customer information, account details, transaction amount, balance, and request status. A rule-based verification process automatically evaluates data compliance before the request is processed by customer service officers.

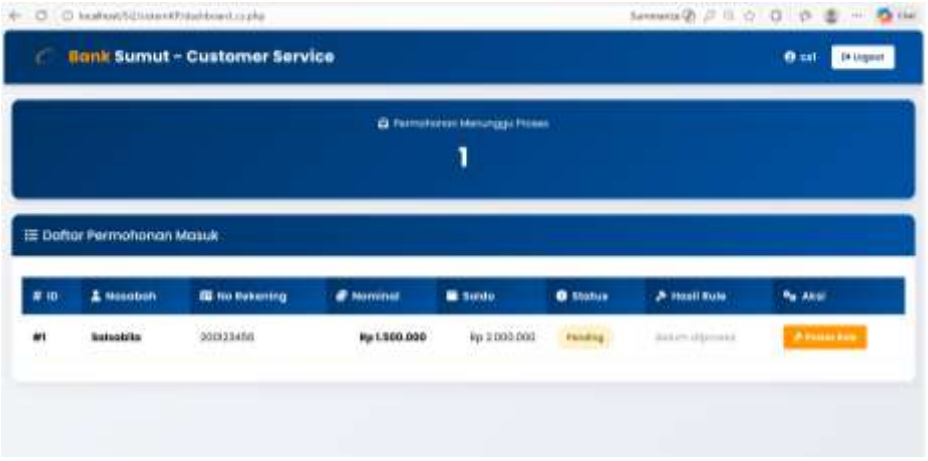

Figure 4 Customer Service Page and Rule-Based Verification Process

4) Supervisior Page Interface

The Supervisor page displays pending cheque order requests requiring approval, including customer data, account details, transaction amounts, and rule-based verification results. Supervisors can approve or reject each request based on the system's automated evaluation.

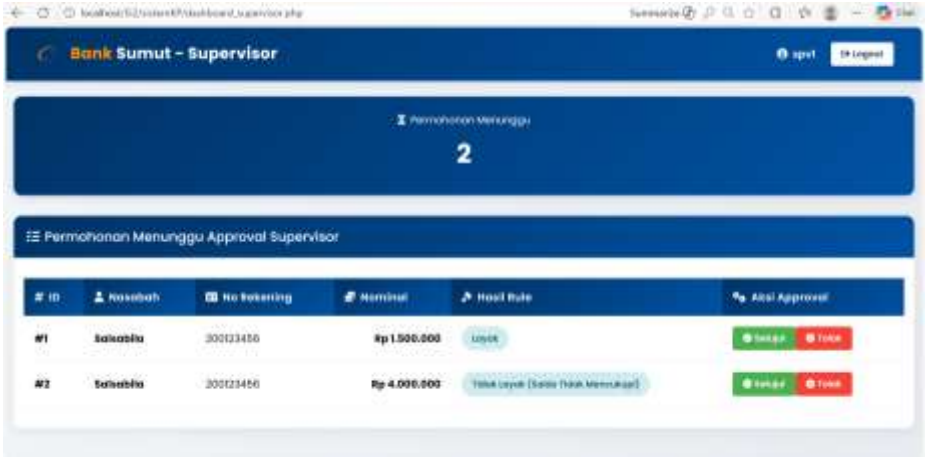

Figure 5 Supervisor Page

5) Customer Page after Approval

The customer page shows the status of approved cheque requests and allows users to submit new requests. It also provides rule-based verification results for previous submissions, indicating whether each request was approved or rejected.

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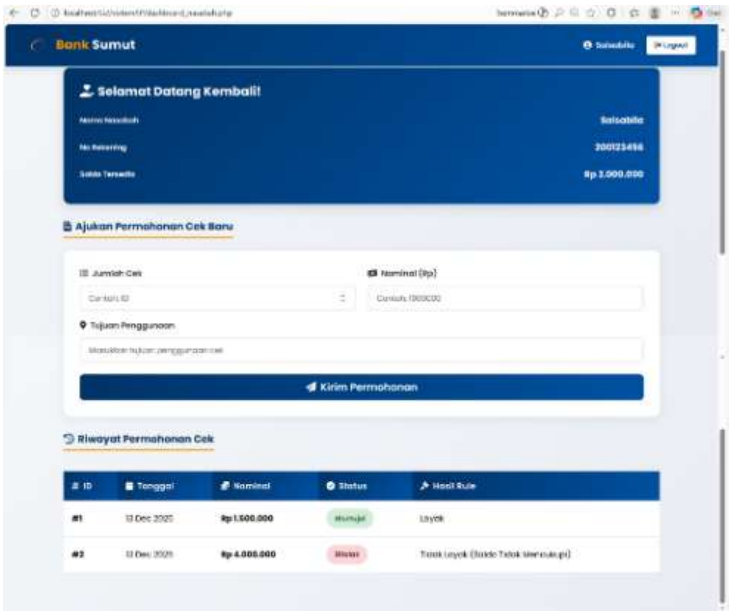

Figure 6 Customer Page after Approval

4. Conclusion

The development of a rule-based digital cheque ordering system at Bank Sumut KCP Binjai has successfully improved service efficiency by automating processes that were previously conducted manually, from customer submission to supervisor approval. The system, designed using UML modeling and implemented with web-based technologies, is capable of providing role-based authentication, application status monitoring, and consistent automatic validation in accordance with internal bank regulations. The implementation of this system contributes to faster service delivery, reduced queuing time, and improved decision-making quality, particularly for MSME customers, and has the potential to be further developed through integration with notification features and mobile platforms to enhance service accessibility.

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