Information System for Drug Sales at Advent Hospital Medan

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Article Info

ABSTRACT

The management of drug sales data in hospitals plays a crucial role in ensuring operational efficiency and patient safety. However, the semi-manual process at Advent Hospital Pharmacy in Medan often leads to issues such as stock data inaccuracies and reporting delays, with a transaction error rate reaching 20%. This study aims to design and build a desktop-based drug sales information system using Microsoft Visual Basic.net to address these problems. The development method used is Research and Development (R&D) with a waterfall model, which includes the stages of requirements analysis, design, implementation, and testing. The system was evaluated through two approaches: a usability test with a questionnaire administered to 5 users and a black-box test with 13 functional scenarios. The results showed that the developed system achieved a usability score of 81%, which falls into the "Good" category. Meanwhile, the black-box test results indicated a system effectiveness rate of 85%, with 11 out of 13 test scenarios being successful. This system has been proven to improve data accuracy and sales process efficiency, although further improvements are needed for the input validation and report printing features.

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1. INTRODUCTION

Operational efficiency in the healthcare sector is a key factor in improving service quality and patient satisfaction. One critical area in hospitals is pharmacy management, which includes inventory management and drug sales transactions [1], [2]. A reliable information system enables process automation, reduces the potential for human error, and accelerates the flow of information, which ultimately supports better clinical and managerial decision-making [3], [4], [5]. A sound management information system concept serves as the backbone for modern organizations to effectively manage data and transform it into valuable information [6], [7]. Without adequate technological support, hospitals often face challenges in stock data accuracy, service delays, and complexity in financial reporting [8].

Advent Hospital Pharmacy in Medan, as a healthcare institution, faces similar challenges. The previous drug sales management system was semi-manual and considered inefficient and complicated to operate. Internal data shows that approximately 20% of all sales transactions encountered problems, ranging from stock recording errors to data discrepancies in financial reports. This situation not only risks lowering the quality of service to patients but also hinders the audit process and management decision-making. This problem highlights the urgent need for a more modern, integrated, and user-friendly system built through a structured research methodology [9], [10], [11].

To address this need, this research adopts the Research and Development (R&D) method with a systematic software engineering approach [12], [13], [14]. The development process follows the waterfall model, which begins with careful system analysis and design [15], [16], before proceeding to the implementation phase. The chosen technology is Microsoft Visual Basic.net, a platform proven to be reliable for developing feature-rich desktop applications [17], [18]. The foundation of this system is supported by a practical database design to ensure the integrity and efficient management of drug, transaction, and user data [19].

Several previous studies have developed information systems for sales and archiving, such as the one by Putri and Putri (2018) who designed a system for a commercial entity [20], and Adham and Yadi (2017) who built a student archiving system [21]. However, these studies did not specifically address the unique workflow in a hospital pharmacy, which demands high speed and accuracy. This research fills that gap by designing, building, and testing a drug sales information system tailored specifically to the needs of Advent Hospital Pharmacy in Medan. The system's success is evaluated comprehensively, not only in terms of functionality through black-box testing but also from the user experience perspective through usability testing [22], [23], which emphasizes the importance of an effective and intuitive interface design [24], [25]. It is hoped that this system can provide a concrete solution to improve data accuracy, accelerate reporting processes, and enhance the overall efficiency of pharmacy services at Advent Hospital Medan.

2.   METHOD

This study uses the Research and Development (R&D) method to produce a drug sales information system. The software development procedure adopts the waterfall model, which consists of four sequential stages as described below.

2.1. Requirements Analysis

The first stage is to identify system requirements and existing problems. Data was collected using three main techniques:
a. Observation: Direct observation of the drug sales workflow at Advent Hospital Pharmacy, from prescription receipt to stock reporting.
b. Interview: In-depth discussion with the head of the pharmacy to understand the constraints, functional requirements of the system, and the desired workflow.
c. Documentation: Collection of related documents such as drug lists, sales report formats, and existing standard operating procedures.

2.2. System Design

Based on the results of the requirements analysis, the system architecture and interface were designed. This process included designing the database to store drug, user, and transaction data, as well as designing the user interface for each module. The system was designed to have six main forms: (1) Login Form, (2) Main Form as navigation, (3) Drug Management Form (CRUD), (4) Sales Transaction Form, (5) User Management Form, and (6) Sales Report Form. The design focused on user-friendliness and workflow efficiency.

2.3. Implementation

The implementation stage is the process of translating the system design into program code. This information system was built using the Microsoft Visual Basic.net programming language with the Microsoft Visual Studio development environment. A database was implemented to manage all the data required by the system in a structured manner.

2.4. System Testing

Testing was conducted to ensure the system functions correctly and meets user needs. Two types of tests were performed:
a. Black Box Test: This test aims to verify the system's functionality without looking at the internal code structure. A total of 13 test scenarios were prepared to cover all main functions, such as login, data CRUD, transactions, and reporting. The result of each scenario was recorded as "Pass" or "Fail". The system's effectiveness was calculated using the formula: Effectiveness = (Number of Passed Scenarios / Total Scenarios) x 100%
b. Usability Test: This test aims to measure the system's ease of use from the user's perspective. The test involved 5 users (pharmacy employees) who interacted directly with the system. Afterward, each user completed a questionnaire adapted from the Computer System Usability Questionnaire (CSUQ), which

consists of 19 statements with a 1-5 Likert scale. The usability score was calculated using the formula:
Usability Score (U) = Total Score Obtained (P) / Maximum Score (Q)

The results of both tests were then analyzed to draw conclusions about the feasibility and effectiveness of the developed system.

3.   RESULTS AND DISCUSSION

The testing phase produced quantitative data regarding the functionality and usability of the developed information system. The results of the black-box and usability tests are presented and discussed in this section.
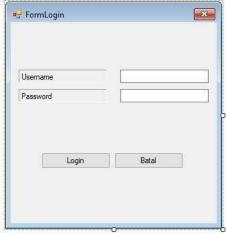

Figure 1. Login form

The Figure 1 is designed as the first form that appears when a user enters this information system. This Login Form contains various objects, including a username label, a password label, a username text box, a password text box, a login button, and a cancel button. The Username and password text boxes function as the place for the user to enter the predetermined username and password. After that, the user can press or click the login button to enter the main form. To ensure that the entered username and password are correct, the login button is programmed to read the correct username and password.

Figure 2. Drug management form

Figure 2 is specifically designed to manage the drug data available in the system, and it allows users to perform various operations related to drug management, such as searching, adding, editing, and deleting drug data.

Figure 3. Sales transaction form

The Figure 3 displays the Drug Sales Transaction Form, which is a part of the drug sales information system based on Microsoft Visual Basic.NET. This form is used to process drug sales transactions, from selecting the drug to completing the transaction.

3.1. Functionality Test Results (Black Box)

The black-box testing was conducted based on 13 scenarios designed to test the core functions of the system. Out of the total scenarios, 11 showed results that "Passed," while 2 showed "Failed" results. A summary of the test results is presented in Table 1.

Table 1. Summary of black box test results

No.	Test Scenario	Expected Result	Test Result	Conclusion
1	Entering the correct username and password	Login access successful	Login access successful	Pass
2	Pressing the Login Button without filling in the Password	Login access fails and a message appears: "Password cannot be empty!"	Login access fails and a message appears: "Password cannot be empty!"	Pass
3	Pressing the Login Button without filling in the Username	Login access fails and a message appears: "Username cannot be empty!"	Login access fails and a message appears: "Username cannot be empty!"	Pass
4	Accessing Login with the wrong username/password	Login access fails and a message appears: "Incorrect username or password!"	Login access fails and a message appears: "Incorrect username or password!"	Pass
5	Adding data correctly	System successfully saves data	System successfully saves data	Pass
6	Adding data correctly	System successfully saves data	System successfully saves data	Pass
7	Adding data without filling all columns	System rejects saving data and displays "Item not yet recorded!"	System successfully saves data	Fail
8	Editing the "Quantity" stock data	System successfully saves data and the data matches the edited stock quantity	System successfully saves data and the data matches the edited stock quantity	Pass
9	Clicking the "Delete Item" button and selecting the data to be deleted	System Successfully Deletes Data	System Successfully Deletes Data	Pass
10	Clicking the "Delete Item" button without selecting data to be deleted	System rejects deleting data and the Delete button is non-functional	System rejects deleting data and the Delete button is non-functional	Pass
11	Accessing the "Add to cart" button without entering item quantity	System Rejects and a message appears: "Enter a valid Quantity"	System Rejects and a message appears: "Enter a valid Quantity"	Pass
12	Searching for a sales report in a specific date range	System displays the sales report for the selected date range, then displays the sales results below it	System displays the sales report for the selected date range, then displays the sales results below it	Pass

13	Access the print report button	System converts the report to a printable document	System does not respond	Fail

The two failed scenarios were:

a. Input Validation (Scenario 7): The system was supposed to reject data saving if any field was empty, but during the test, it still saved the data. This indicates a weakness in the input validation logic that could affect data integrity.

b. Print Report Function (Scenario 13): The print report button did not respond when clicked. This indicates that the functionality for exporting or printing reports was not implemented correctly.

Based on these results, the system's effectiveness value was calculated as follows: Effectiveness = (11 / 13) x 100% = 84.6% ≈ 85%. An effectiveness value of 85% falls into the "Good" category, indicating that most of the system's main functions are working as designed. Nevertheless, the two failures found are crucial aspects that require improvement for system refinement.

3.2. Usability Test Results

The usability test involved 5 users from Advent Hospital Pharmacy. The total score obtained from all respondents (P) was 385, out of a maximum possible score (Q) of 475. The usability score calculation is as follows: Usability Score (U) = 385 / 475 = 0.8105 ≈ 81%. A usability score of 81% is categorized as "Good." This result indicates that users found the system easy to learn and operate. The simple interface and intuitive workflow successfully met the users' need for an uncomplicated system, unlike the previous one. Users felt more comfortable and could complete tasks such as drug data entry and sales transactions more efficiently. This high level of satisfaction shows that, from a user experience perspective, the developed system has achieved its goal.

3.3. Discussion

Overall, the test results show that the developed drug sales information system successfully improved the efficiency and ease of pharmacy data management. An effectiveness score of 85% and a usability score of 81% quantitatively prove that this system is a valid solution to the problems faced at Advent Hospital Medan. This success aligns with the research objective of creating a modern and user-friendly system.

However, this study also revealed some limitations. The failure in the input validation function is a risk that needs to be addressed immediately to ensure data accuracy and consistency. Additionally, the non-functional report printing feature reduces the system's practical value, as physical reports are often still required for auditing and documentation purposes. These two findings are important notes for further development. Compared to the previous system, this new system offers significant advantages in terms of data access speed, ease of transactions, and digital reporting, although its printing feature still needs to be perfected.

4. CONCLUSION

This research has successfully designed and built an effective drug sales information system based on Microsoft Visual Basic.net for Advent Hospital Pharmacy in Medan. Based on the test results, it can be concluded that the developed system has a functionality level of 85% and a usability level of 81%, both of which are categorized as "Good." The system is proven to be able to overcome the efficiency and data accuracy problems of the previous system, as well as provide ease of use for users in carrying out daily operational tasks. Nevertheless, two main weaknesses were found in the data input validation and report printing functions. Therefore, for future research, it is recommended to focus on refining these two features to improve data integrity and complete the system's overall functionality.

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