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Controlling stock data collection and pricing in the inventory system using RAD method

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Abstract — Data collection regarding the activities and transactions of products entering and leaving a company is intimately linked to inventory management in businesses. CV. Amalia Books is an individual company located on Jl. Juminahan, Purwokinanti, and Pakualaman operate in the field of book sales. CV. Amalia Books still has a low level of efficiency in processing data and the speed of data collection carried out in the inventory system. Based on these problems, this research designs and builds a mobile web-based book inventory system. This system was built using the rapid application development method and uses Laravel framework, while mobile with Android Studio whose programming language is Kotlin. The data processed in this system are incoming book data, outgoing book data, book stock data, and user data, which can collect data on stock reports, incoming book reports, and outgoing book reports. The results of this research produce a mobile web-based book inventory system that can be used by CV. Amalia Books.

Keywords – bookstore, inventory, kotlin, Laravel, rapid application development

I. Introduction

Inventory is an important asset in a company that can determine the company's direction in achieving the desired profit. Therefore, an appropriate inventory control process is needed [1]. Inventory management is a continuous and planned process that aims to organize goods and materials according to company needs, ensure adequate supply, balance supply and demand, and avoid excess stock [2]. Getting the proper amount and quality is one of the primary objectives of inventory management. Knowing when, how much, and how often to order can help mitigate this goal by ensuring that the company always has the appropriate amount of finished goods and raw materials on hand at the lowest possible cost of total inventory while avoiding material shortages or excesses [3]. Because inventory is so important for companies, the existence of an inventory system based on information technology (IT) is needed to make recording and processing data easier compared to manual methods.

CV. Amalia Books is an individual company located on Jl. Juminahan, Purwokinanti, and Pakualaman operate in the field of book sales. There are several types of books sold at CV. Amalia Books, namely religious books, health books, economic books, and others. Duplicate or incorrect information will cause an increased workload for managing the product. Because the records in the document are incorrect, errors may occur to employees and create many problems such as the wrong product name or the wrong price listed [4].

The sales process and data collection for book stock reports, incoming book reports, and outgoing book reports is one of the most important parts of a bookstore. A system for inventory management that can gather information on book stock reports, incoming book reports, and outgoing book reports must be developed according to this issue.

Based on the existing problems, this research designed and built a mobile web-based book inventory system that can be accessed by staff and managers. Currently, rapid application development (RAD) is the most common method utilized to create inventory apps. The core of this approach is the iterative development of applications combined with thorough feedback [5]. Resources and development time for systems can be reduced with the RAD approach. The RAD approach

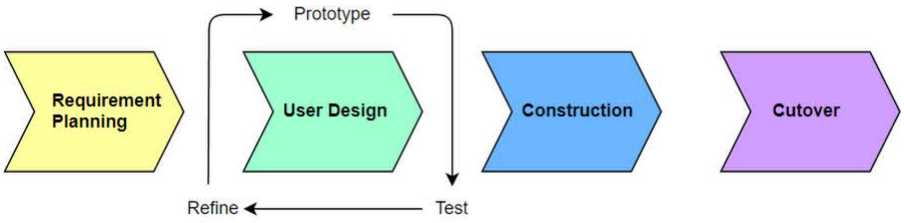

Fig. 1. Rapid application development (RAD).

can reduce the time needed to design systems, according to earlier studies [6]. This book data will be entered into a database that can be accessed for the needs of applications that use a DBMS. The data that will be managed includes incoming book data, outgoing book data, book stock data, and admin data. With the Laravel framework's model and controller, the software design uses the HTML and PHP programming languages [7], the method used is REST while the mobile application is created using Android Studio with the Kotlin programming language. It is hoped that the design of this inventory system can help and make it easier to collect book data at CV. Amalia Books.

II. Research Methods

This section discusses the rapid application development, research flow, data collection procedures, and data obtained.

A. Rapid Application Development (RAD)

Methods for software development are also required for this study. The planning and development of new systems are aided and facilitated by the step-by-step programming process. The software development methodology employed in this study, known as the RAD method, places a strong emphasis on quick, efficient system development cycles [8]. In the practitioner literature, RAD is a popular strategy for designing information systems [9]. The RAD method adapts the "high speed" of linear sequential development with a component-based construction approach. By developing software using the RAD method, the process of developing a complete functional system can be completed in a very short period (approximately 60-90 days).

The advantage of using RAD in this project is developing a quality web application of the inventory management system. This is because web application prototypes that are close to the implementation system are provided as tests for clients and users who will get a higher success rate to obtain results in user acceptance testing [10]. Prototyping's underlying idea is that when people see something in action, they can articulate their needs. A full information system is eventually developed from a prototype in RAD [11]. Minimizing the time needed in the system life cycle between design and implementation is the main objective of the RAD method. Prototyping's underlying tenet is that when people see something in action, they can articulate their needs. The prototype information system in RAD eventually becomes the final product.

The process of the RAD method is iterative when developing a system. The working model of a system is constructed at an early stage of system development to determine the needs of system users. The following is an overview of each stage of the RAD method which can be seen in Fig. 1.

This process is divided into four phases planning requirements, user design, construction, and cutover [12], which are as follows:

1) Requirements Planning: The requirement planning stage carried out in this study is to describe the functional requirements that explain the features contained in the system and non-functional which explain the software and hardware of the system to be developed and adapted to user needs.
2) User Design: The user design stage is the stage for designing the proposed system design that has been made. In this research, user design is made using unified modeling language (UML) tools. UML made in this study include: Use Case Diagram which explains the functional requirements of a system and Activity Diagram which is used to explain the sequence of activities in the running application process.
3) Construction: At this construction stage, the user design that has been created using UML tools is implemented into an application by carrying out a coding process. In this research, two applications must be created, namely a mobile application and a website. The car application was created using the Kotlin programming language, while the website was created using the PHP programming language with the Laravel framework.

B. Research Flow

The research flow of this study is shown in Fig. 2.

1) Observation is an activity by making observations on an object or field under study. Direct observation at CV. Amalia Books is useful for

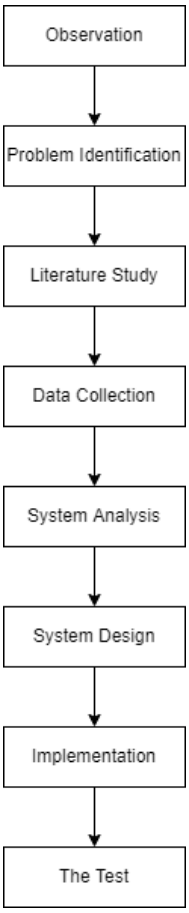

Fig. 2. Research flow.

obtaining the necessary information by making observations and recording by direct observation of the object of research which can be used as research data.

2) Problem Identification found at the agency is CV. Amalia Books still has a low level of efficiency in data processing and the speed of data collection carried out on the inventory system.
3) Literature study is a method of obtaining material related to research. This method is used to study journals and books about goods inventory application systems or about mobile web-based goods inventory systems.
4) Data collection is carried out to obtain the information needed in order to achieve research objectives. At this stage there are several things that must be done to build a system, including interviews, data collection in the form of secondary and primary data.
5) System Analysis involves identifying and defining the required system requirements. These needs may include functional needs such as login features, main menu features, etc. As well as non-functional needs such as running software and hardware requirements.
6) System Design refers to the process of designing or planning a desired system based on the results of the previous system analysis. System analysis involves architectural design, user interface design and explains the design of the system design using use case diagrams, and activity diagrams.
7) Implementation is the step in the system development cycle where the plans and designs of the system that have been made are carried out and implemented in reality. The implementation process involves implementing the designed system components and testing their functionality. Such as software development, hardware configuration and system testing.
8) The tests carried out on this application use the black box method which is a test of the functionality of the software to determine some of the expected needs without paying attention to the flow of program execution but whether each function in the application runs properly.

C. Data Collection Procedures

In a study, data collection techniques are one of the most important parts of the research, therefore, this step cannot be wrong and must be carried out carefully according to procedures [13].

1) Observation direct observation of CV. Amalia Books are useful for obtaining the necessary information by observing and recording with direct inspection of research objects which can be used as research data.
2) Interview is an interaction or communication process to collect information through questions and answers between researchers and research subjects or informants. The interview was conducted by asking questions and answers to the Manager from CV. Amalia Books.
3) Literature study, is a method for obtaining material related to research. This method is used to study journals and books about goods inventory application systems or mobile web-based goods inventory systems.

D. Data Obtained

In this application, some data is needed to be obtained from CV. Amalia Books to help carry out this research. This data was obtained by direct observation at the CV. Amalia Books and conducted a direct interview with the manager. The data obtained from this research process can be seen in Table 1.

Table 1. Obtained Data

No.	Title	Writer	Price	Stock
1.	The 48 Laws of Power	Robert Greene	139,500	30
2.	Negeri 5 Menara	A. Fuadi	98,000	35
3.	Komet	Tere Liye	95,000	45
4.	Origin	Dan Brown	145,000	25
5.	Hujan	Tere Liye	68,000	40

III. RESULTS

The results section will discuss the process of creating web and mobile-based applications. These results are the stages of the RAD method, namely requirement planning, user design, construction, and cutover. The results of the process of making this application are as follows:

A. System Requirements Analysis

1) Functional requirements

- Functional requirements analysis explains the features that run on applications and the web.
- The Login feature functions to display the form used to enter the web or application which can be accessed by staff and managers.
- The Main Menu feature functions to display the features available on the web and applications that can be accessed by staff and managers.
- The Entry Book Data feature functions to display the form used to record entry books which can be accessed by staff and managers.
- The Outgoing Book Data feature functions to display the form used to record outgoing books which can be accessed by staff and managers.
- The Book Stock Data feature functions to display the number of available books that can be accessed by staff and managers.
- The Report feature functions to display book data information contained in incoming book data, outgoing book data, and book stock data which can be accessed by staff and managers.

2) Non-functional requirements

MySQL software requirements:

- XAMPP
- Android Studio
- Chrome Browser
- Visual Studio Code
- Microsoft Windows 10 Home Single Language 64-bit

Hardware requirements in website creation:

- Processor: Intel(R) Core(TM) i5-3320M CPU @ 2.60 GHz, 2601 Mhz, 2 Core(s), 4 Logical Processor(s)
- VGA: Intel(R) HD Graphics 4000
- HDD: 298 GB
- Memory: 4 GB

Hardware requirements in mobile manufacturing:

- OS: Android 6 (Marshmallow), Color OS 3
- Chipset: Mediatek MT6750T (28 nm)
- CPU: Octa-Core (4X1.5 GHZ Cortex-A53 & 4X1.0 Ghz Cortex-A53)
- GPU: MALI-T860MP2
- Memory: 4 GB

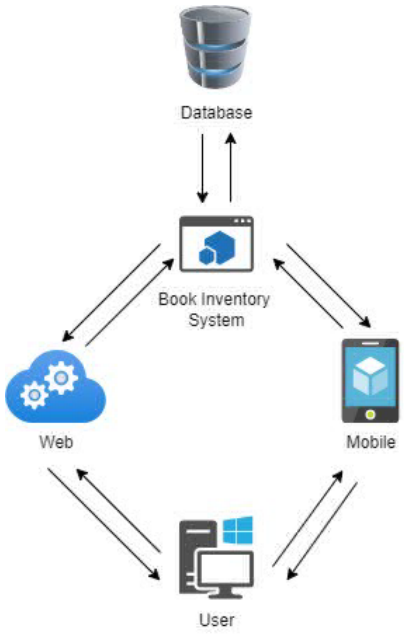

Fig. 3. Model architecture.

B. Logic Design

1) Model architecture

From the architectural model shown in Fig. 3, the website and mobile have data that is connected. In the model architecture, it is also explained that users use web and mobile applications to input book data contained in the CV. Amalia Books.

2) Use case diagrams

Use case diagrams are used in this research to explain a system's functional requirements. Actor identification's current goal is to identify users of the inventory system [14]. Use case diagrams, which are created during the design phase, give a high-level overview of how the system is used from the viewpoint of outsiders, or actors. Use case diagrams are used to show how the system will behave during implementation [15]. Fig. 4 shows that there is 1 actor in the use case diagram with interaction. Staff can view the main menu, incoming book data menu, incoming book data, the outgoing book data menu, input outgoing book data, view the book stock data menu, and update book stock data.

3) Activity diagrams

In this research, activity diagrams are used to explain the sequence of activities in the running application process. Activity diagrams are used to model detailed operations in class diagrams. Activity diagram notation is divided into two categories: edges and nodes. There are two action nodes and one control node that make up the node. The control node controls the order in which the execution nodes occur, while the action node carries out the statements found in its body [16]. Activity diagrams are thought to be one of the most effective and complete design objects for representing all desired behaviors because of their broad symbolic vocabulary [17]. Fig. 5 shows the activity diagram between the user and the system starting from

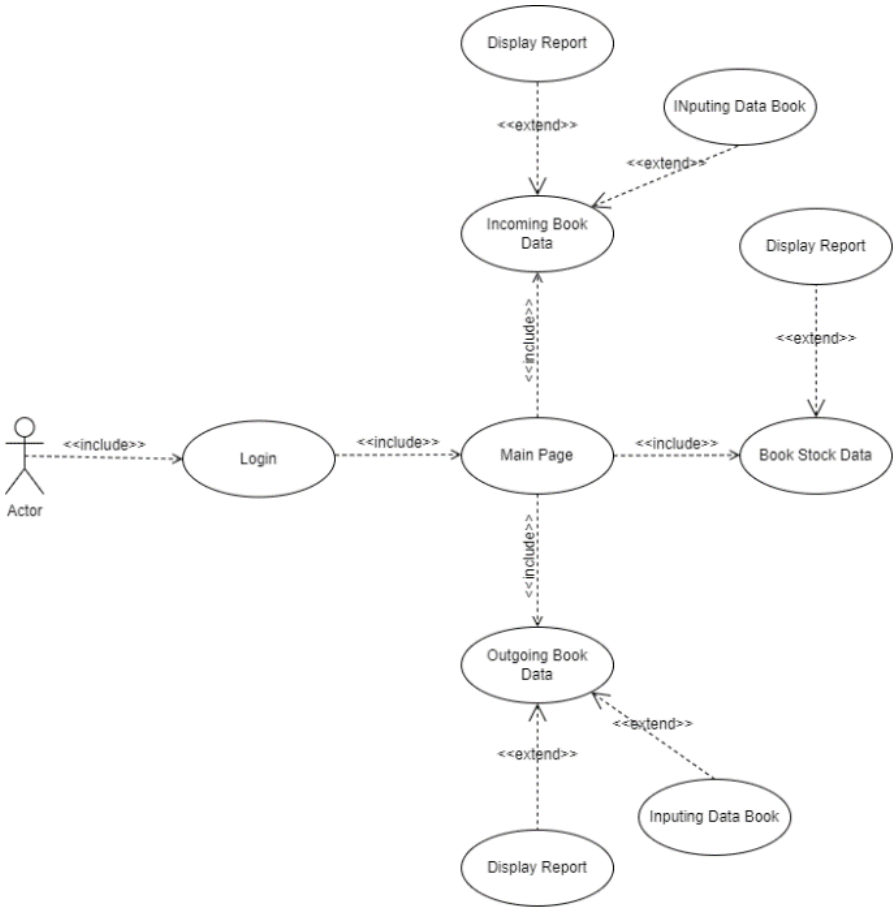

Fig. 4. Use case diagrams.

logging in, entering the main menu, entering data on incoming books, outgoing books, and updated book stock data.

C. User Interface

At this stage, the system that has been designed is implemented through coding programs. The following is the interface of the web and mobile application.

1) Web user interface

- Main Menu Page
  On this main menu page, there are several features, namely the incoming book data page, the outgoing book data page, the book stock page, and user management. The following is a display of the main menu page which can be seen in Fig. 6.
- Incoming Book Data Page
  On the incoming book data page, there is a table to display the incoming book data that has been entered into the database, in the form of entry date, book code, book name, price, unit price, wholesale price, and number of entries. The following is a display of the entry book data page which can be seen in Fig. 7.
- Outgoing Book Data Page
  The outgoing book data page contains a table to display the outgoing book data entered into the database, in the form of outgoing date, book code, book name, and outgoing amount. The display of the outgoing book data page can be seen in Fig. 8.
- Book Stock Data Page The book stock data page displays book stock data taken from incoming and outgoing book data in the form of date, book code, book name, price, unit price, wholesale price, and stock which can be edited or deleted. The display can be seen in Fig. 9.

2) Mobile user interface

- Main Menu Page
  On the main menu page, there are several features, namely incoming book pages, outgoing book pages, book stock data, and user management. The following is a display of the main page which can be seen in Fig. 10.
- Incoming Book Data Page
  On the incoming book data page, there is a table to display the incoming book data that has been input into the database, in the form of book code, book name, and number of entries. The following is a display of the entry book data page which can be seen in Fig. 11.
- Outgoing Book Data Page
  The outgoing book data page contains a table to display the outgoing book data entered into the database, in the form of book code, book name, and number of outgoing books. The display of the

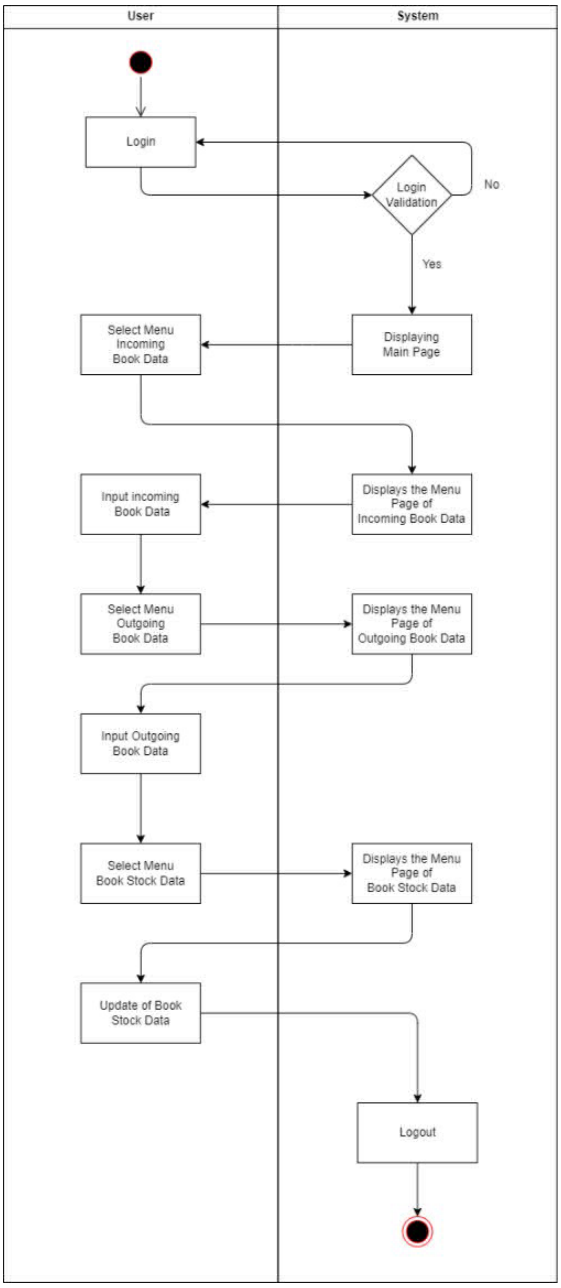

Fig. 5. Activity diagrams.

outgoing book data page can be seen in Fig. 12.

- Book Stock Data Page
  The book stock data page displays book stock data taken from incoming and outgoing book data, book code, book name, and stock which can be edited or deleted. The display can be seen in Fig. 13.

From the results that have been achieved in this study, it can be stated that the desired result is adjusted to the objectives of this study, which is to implementing a mobile web-based book inventory system that can input, store, and display book data at CV. Amalia Books. There are several challenges in conducting this research such as the observation or interview process carried out during data collection, the selection of methods used, and the adjustment of the inventory system to the mobile application.

IV. Discussion

The problem that occurs is the recording of inventory of incoming and outgoing goods at CV. Amalia Books is still done by recording in a notebook. As a result of this, the level of efficiency in processing data and the speed of data collection carried out in the inventory system is low. therefore, a mobile web-based inventory system was created which can facilitate CV. Amalia Books in collecting data. This research has a relation with research that has been done before, in this study, the design of a book inventory system using web-based and mobile RAD methods. The difference factor from this research lies in the usability features, which is this system is designed to make it easier for managers and staff to do the data collection and reporting process at CV. Amalia Books. do the data collection and report process at CV. Amalia Books. A test called ”black box” testing provides program users access to a set of input conditions that completely satisfy all the functional requirements for the program [18].

Black box testing is carried out to observe execution results through tester data and check software functionality. When someone looks at a black box, they may only observe the outer appearance without needing to find out what is happening inside. Therefore, testers only evaluate the interface and functionality of the system without checking the internal mechanisms and processes. They want to know the input and output only [19]. In this research, system testing was carried out using the Black Box testing method. With this method, users can try to find errors that are in categories such as whether it is malfunctioning or not. There are errors in user display, errors in performance, and behavior of a system [20]. The following are the results of Black Box testing on websites and mobile for inventory which can be seen in Table 2. Functionality testing that has been carried out using black box testing above can provide an overview of whether the test is successful or not. So, the test results can be said that of the 14 existing scenarios, all have been successful.

V. Conclusion

Based on the research that has been done, namely the creation of web-based and mobile book inventory applications, it can be concluded that the results of designing a book inventory system designed using the RAD method have been tested with black box testing. this system can input incoming books, outgoing books, and book stocks so that it can facilitate the recording of books. Staff only need to do data collection through the web or mobile application. Staff can also monitor existing data collection directly through the web or mobile application. Book data collection via the web or mobile application can avoid the accumulation of book

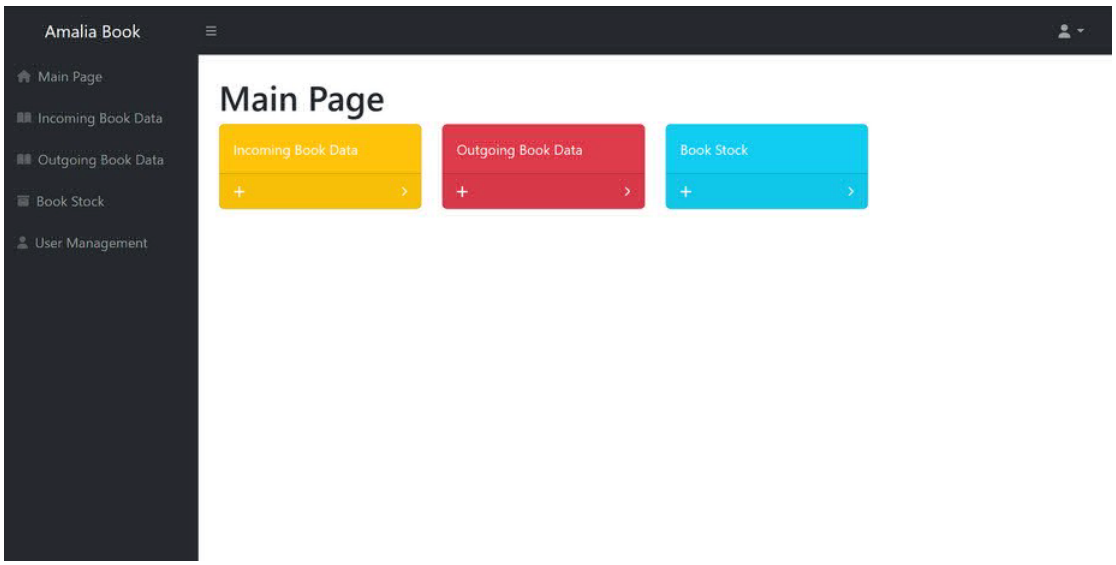

Fig. 6. Web user main page.

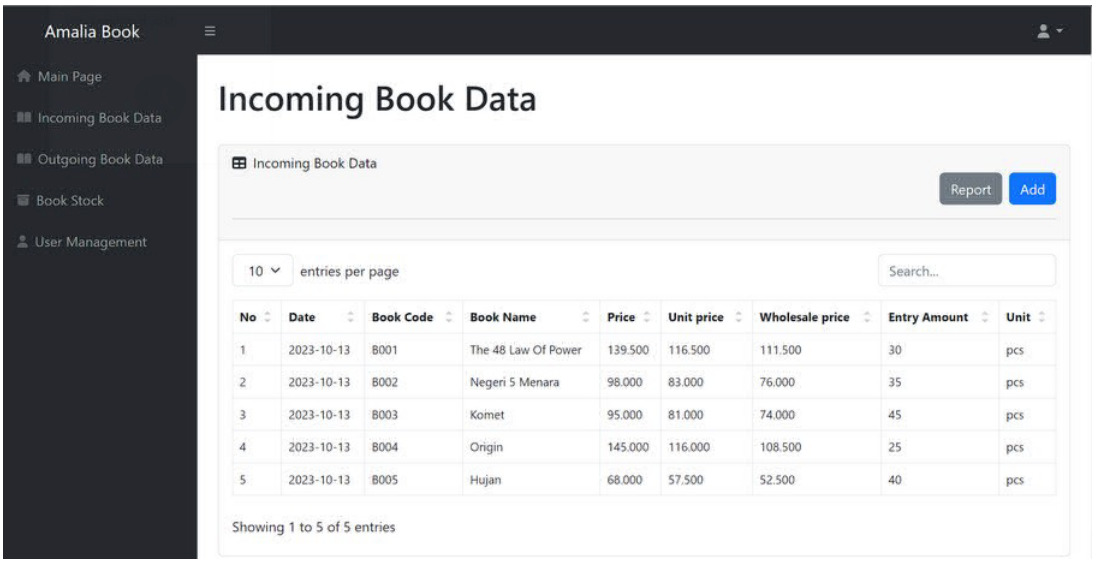

Fig. 7. Web user incoming book data.

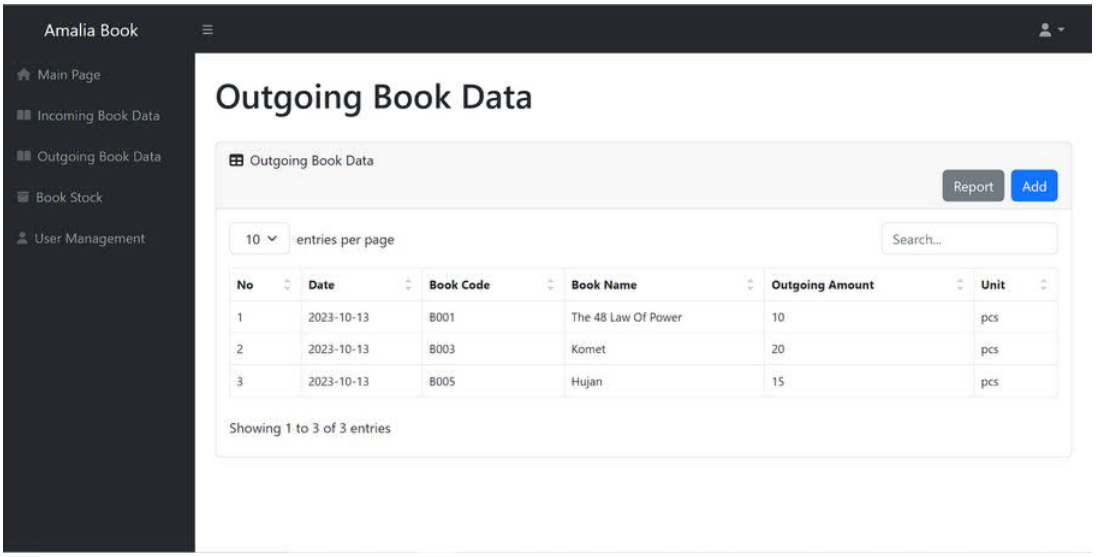

Fig. 8. Web user outgoing book data.

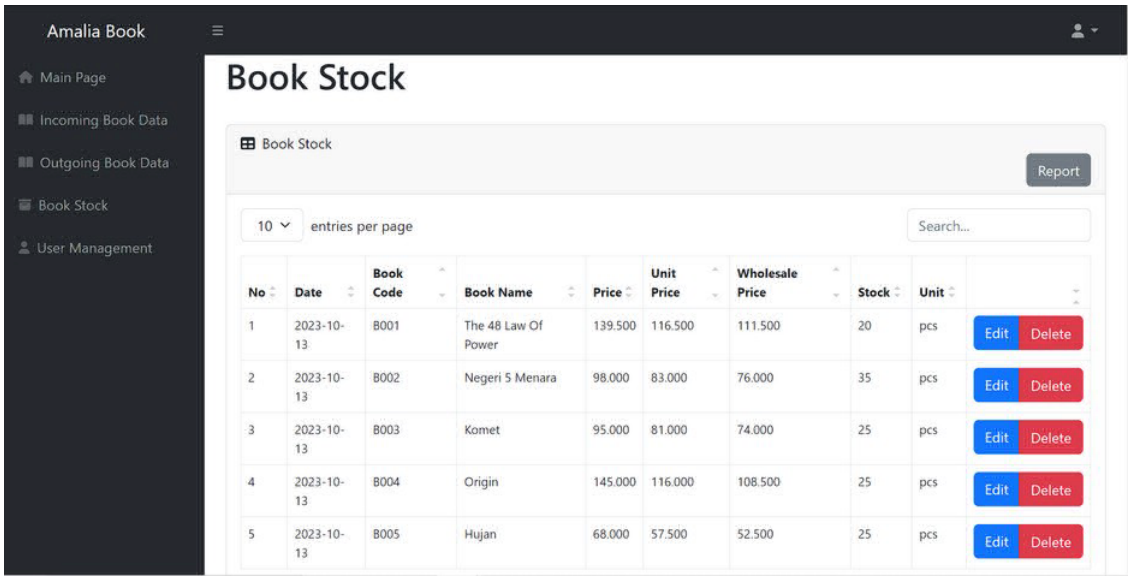

Fig. 9. Web user book stock data.

Table 2. Blackbox Testing

No	Function	Expected ouput	Results	
			Succeed	No
1.	Login Page	Displays the main page	V	
2.	Main Page	Displays the features available on the system	V	
3.	Book Data Page	Displays information about book data	V	
4.	Book Data Page (Add Book Data)	Displays a form for adding book data	V	
5.	Book Data Page (Change Book Data)	Displays a form for changing book data	V	
6.	Incoming Book Data	Displays information about incoming book data		
7.	Incoming Book Data Page (Input Book Data)	Displays a form to add information regarding incoming book data	V	
8.	Outgoing Book Data Page	Displays information regarding outgoing book data	V	
9.	Outgoing Book Data Page (Input Book Data)	Displays a form to add information regarding outgoing book data	V	
10.	Book Stock Report Page	Displays information about book stock	V	
11.	Incoming Book Data Report Page	Displays information about incoming book data	V	
12.	Outgoing Book Data Report Page	Displays information regarding outgoing book data	V	
13.	User Management Page	Displays user data information	V	
14.	User Management Page (Input User Data)	Displays a form for adding new user data	V	

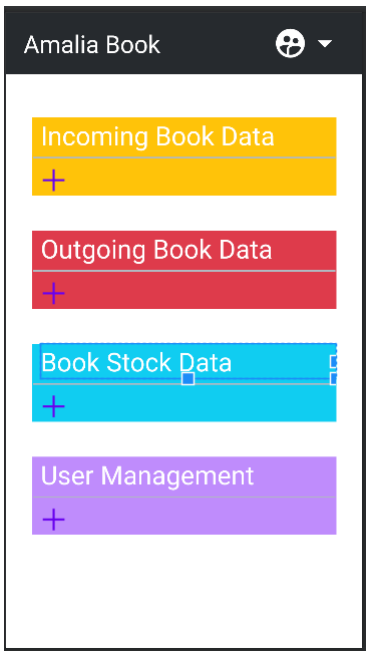

Fig. 10. Mobile user main page.

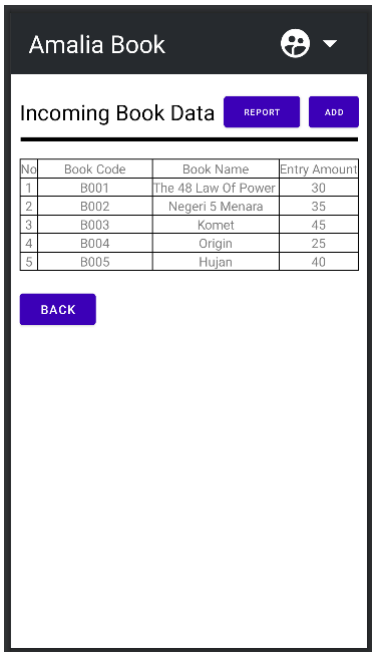

Fig. 11. Mobile user incoming book data.

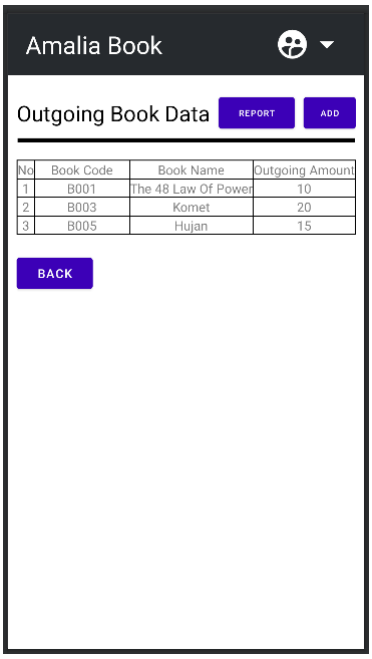

Fig. 12. Mobile user outging book data.

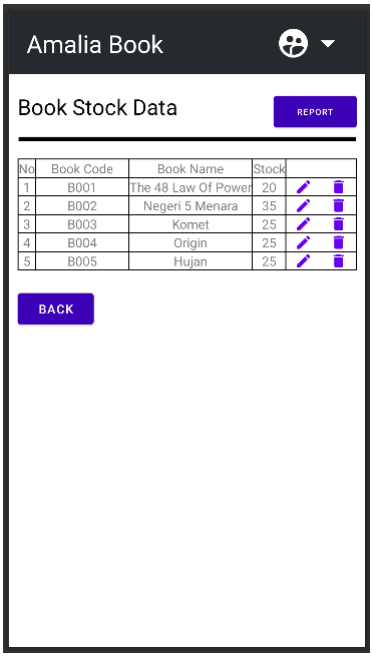

Fig. 13. Mobile user book stock data.

data in bookstores so that the data collection process at CV. Amalia Buku runs more efficiently and does not take much time.

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