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Web-Based Book Recommender System: Design and Implementation

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KEYWORDS

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System Design

ABSTRACT

One of the most popular activities among teenagers is reading. However, with so many books to choose from, deciding which one to start reading might be difficult. Furthermore, the emergence of ebooks has made it more difficult for readers to browse through books before committing to reading them. As a result, a recommender system is developed in this study to assist readers in selecting the best books from the book list. The recommender system matches books that readers with comparable backgrounds have read based on a sample of the reader's background, such as gender and age. The system specifications and design of the book recommender system were proposed in this study. For ease of use by book readers, the system is implemented as a web-based system. The prototype was tested and reviewed by 30 people; the majority of them were teens. The majority of respondents gave positive feedback on the system's interface design and content, indicating that the system is well-liked. This demonstrates that the approach benefits book readers by assisting them in selecting the best books to read. The proposed specification can be used as a starting point for further research into the construction of a book recommender system.

1.0 Introduction

Information and communication technology (ICT) advancements have revolutionized the medium for storing and disseminating knowledge. Knowledge was once written on paper and then gathered into printed books. However, with the advancement of ICT, the method has evolved into the electronic book (eBook). An eBook is an electronic or digital version of a book [1]. It may be read on any digital device, including computers, tablets, and smartphones. An eBook web

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application typically includes features that allow readers to search for and browse books online. Some websites offer recommendations for relevant books based on similar titles.

A recommendation engine, often known as a recommender system, is software that analyses data to generate recommendations for whatever a website user could be interested in [2]. Recommender systems are growing more prevalent in our daily lives, and they are already an unavoidable part of our online activity. A typical recommender system employs either a collaborative or a content-based approach. Some studies combine the two approaches to create a hybrid method. The collaborative filtering method uses previous user interactions to determine similar users' interests or patterns and create recommendations. Content-based approaches, on the other hand, use extra information about users and/or books to create predictions based on these estimated proximities, such as age, gender, occupation, the interest field, and others [3].

However, some book recommender systems can only recommend books with comparable titles and use limited information about the readers. As a result, the suggested books may not appeal to the new reader. The usage of a comment area can be a good way to get feedback from readers and provide some insight into the book before a new reader reads it, as demonstrated by [4] in the tourism context. Hence, a book recommender system should have this feature to aid new readers in their book selection and decision-making.

This paper discusses the design and development of a book recommender system that makes recommendations based on the reader background and other readers' preferences. The system's library focuses on Malay ebooks. The comment area and rating system were also included to provide more information about the books.

2.0 Recommender System

Recommender systems assist users in discovering new products and services. Recommender systems make use of data such as user activity data, user demographic data, and product attribute data [5]. The recommendation system evaluates the information properties of a single book as well as the interrelated characteristics of books based on content similarity [6].

A recommender system is typically focused on a single sort of item. Its architecture, graphical user interface, and the basic recommendation mechanism used to create the recommendations are all tailored to deliver relevant and effective recommendations for that specific type of item. A recommender system can help users feel more satisfied. The user's subjective perception of the system will improve as a result of the system's mix of effective, accurate recommendations and a user-friendly interface. Also, because it may be applied to many different applications in the description of the user's preferences, which are collected either directly or projected by the system, the recommender system can better grasp what the user wants [7,8]. The recommender system can assist others by providing information, such as their evaluation of items (ratings), since they believe their contribution will benefit the community [9].

The five filtering techniques employed by recommendation systems are content-based, collaborative filtering, demographic, knowledge-based, and hybrid recommender systems [9]. The most popular filtering strategies are collaborative, content-based, knowledge-based, and hybrids [10]. The goal of content-based recommendation systems is to match the user profile's attributes to the item's attributes. Following that, the collaborative filtering approach gives recommendations to the active user based on past activities of other users with similar interest. The similarity in interest between two users is determined by the similarity in their rating histories. Demographic is one of the user-profile-based recommendation approaches. Many websites use simple and effective demographic-based personalization methods. Knowledge-based systems make recommendations based on domain knowledge about how specific item attributes match consumers' wants and preferences, as well as how the item is helpful to the user. The content-based method and collaborative filtering can be combined to create hybrid recommender systems [9].

3.0 Methodology

The design and development of the eBook Recommender System website is based on the Waterfall model. The waterfall model is a linear model that is simple to use. Furthermore, the resources needed to implement this model are minimal [11]. The steps include requirement identification, design, implementation, verification, and maintenance.

The focus of this study is on the Malay ebook collection. The requirement phase gathers and defines the system's requirements and information in order to create a complete system and implementation plan for the Book Recommender System website. A basic survey is undertaken to acquire information about book readers and the books that they are interested in. This system's functional and technical requirements are defined in the design phase, which includes the interface and database design. The interface design is simple where extraneous features are removed and plain language is used on labels. All of the features of books in the database are included in the database design. For instance, the title of the book, the author's name, and the International Standard Book Number (ISBN). The prototype is then developed using PHP and the MySQL database.

In the verification phase, functional and non-functional testing is carry out to ensure that the systems fulfil the required specifications. All components of the system are checked for errors and the system must meet all of the user's requirements. If a defect is discovered by the user, it will be fixed as soon as possible during the maintenance phase [12].

4.0 Design and Development

The requirements gathering process yielded seven key requirements (and their priority) as shown in Table 1. The seven requirements are registration, login system, book rating, view recommendation, search book, comment, and logout.

Table 1: List of Requirements

ID	Requirements Description	Priority (M-Mandatory O-Optional)
BRS1	REGISTRATION	
BRS1_1	User create account (name, password, and email)	M
BRS1_2	System display invalid details	O
BRS1_3	User confirm their details before login	M
BRS1_4	User can cancel register	M
BRS2	LOGIN SYSTEM	
BRS2_1	Admin or user enter email and password	M
BRS2_2	Admin or user forget password	O
BRS2_3	Invalid email or password show when the user give wrong email or password	D
BRS2_4	Admin or user can cancel login	M
BRS3	BOOK RATING	
BRS3_1	User can make the rate of book in 1 rate star until 5 rate star	M
BRS3_2	System use this rate for recommend book for user	M
BRS3_3	User can reset the rating star	O
BRS3_4	User can cancel rate the book	O
BRS4	VIEW RECOMMENDATION	
BRS4_1	System recommend the book for user	M
BRS4_2	User can select the book to know the information	O
BRS5	SEARCH BOOK	
BRS5_1	User enter book (title, author name, or ISBN) that user want to find	O
BRS5_2	System show 'Invalid Book' when the book does not have in database	M

BRS6	COMMENT	
BRS6_1	User can give comment in the chat box either like/dislike about the book	O
BRS6_2	User can search any book if the user no want to give the comment	O
BRS7	LOGOUT SYSTEM	
BRS7_1	User click Logout on profile to logout	M
BRS7_2	System go back to homepage	M

The next step is to use the Unified Modelling Language (UML) to visualize and model the requirements for the Book Recommender System website. Two behavioral diagrams, namely use case (Figure 1) and activity diagrams (Figure 2), as well as a class diagram (Figure 3) that illustrates the website's structural components, were employed in this study. As illustrated in Figure 1, the system has two primary players (user and admin) and seven use cases (registration, login system, book rating, view recommendation, search book, comment, and logout). An activity diagram, as illustrated in Figure 2, depicts the control flow from a start point to an end point while the activity is being performed, highlighting the many choice routes that exist. The classes and their relationships were illustrated in a class diagram (Figure 3).

Figure 4 depicts the website's main interface for the book recommender system. As a summary of the system's content, the system presents several new and popular books from the current year. Figure 5 shows selected screenshots of the different interfaces; (a) personalize user's page, (b) list of books, (c) detail book's view, and (d) recommended books.

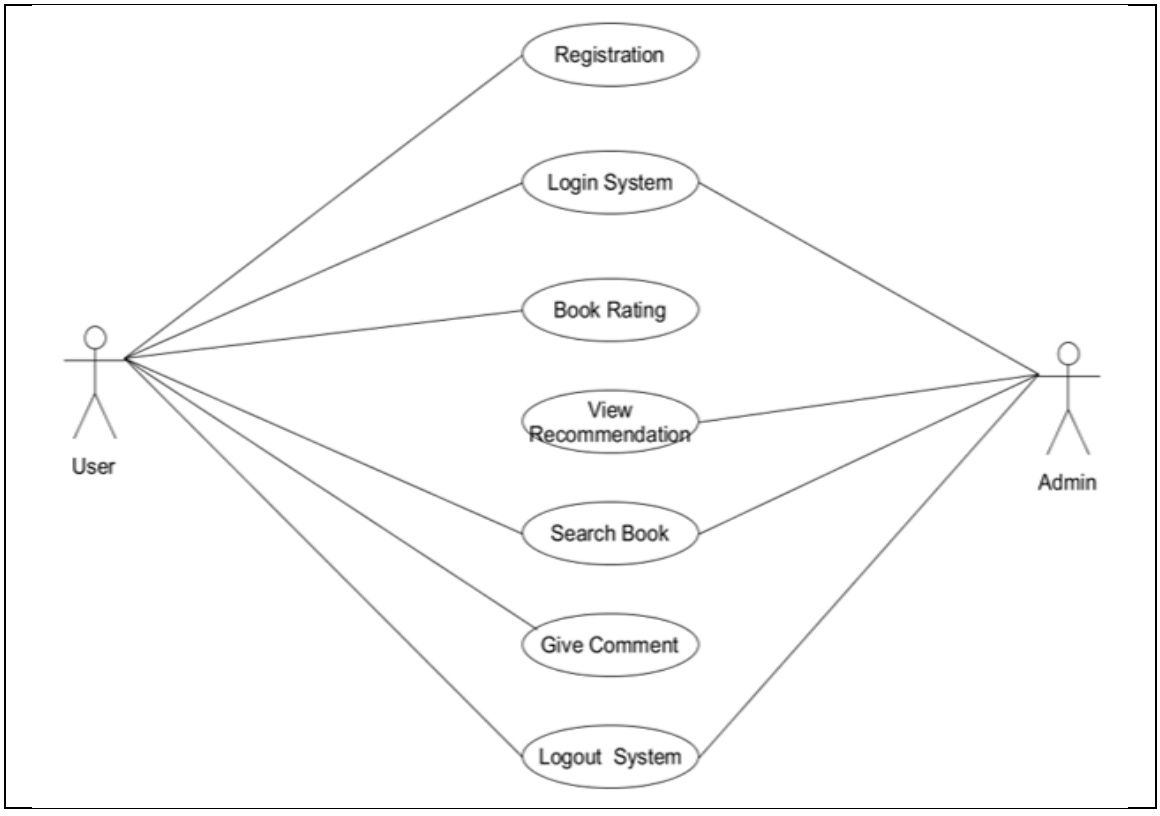


Figure 1: The Use Case Diagram

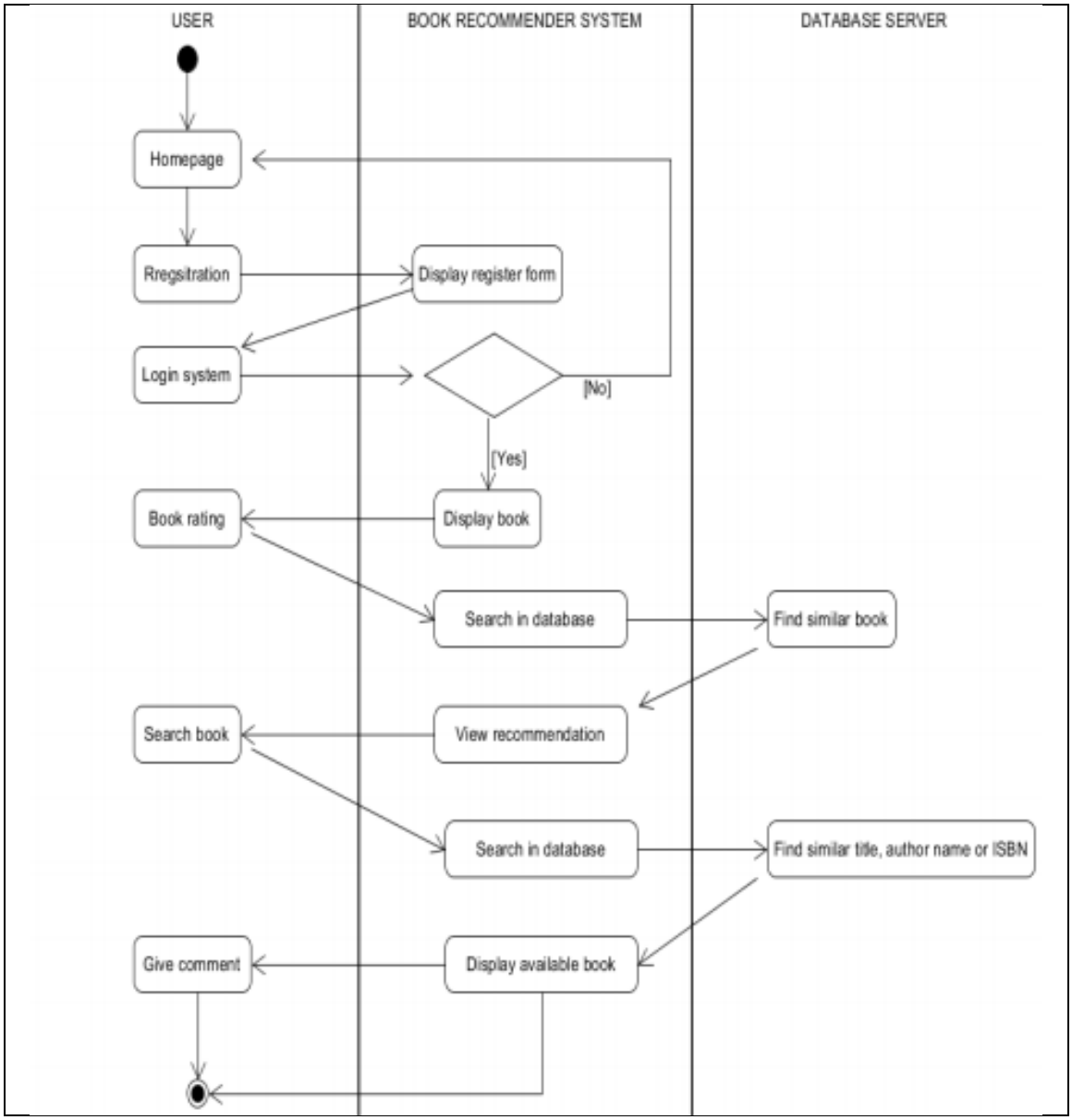


Figure 2: The Activity Diagram

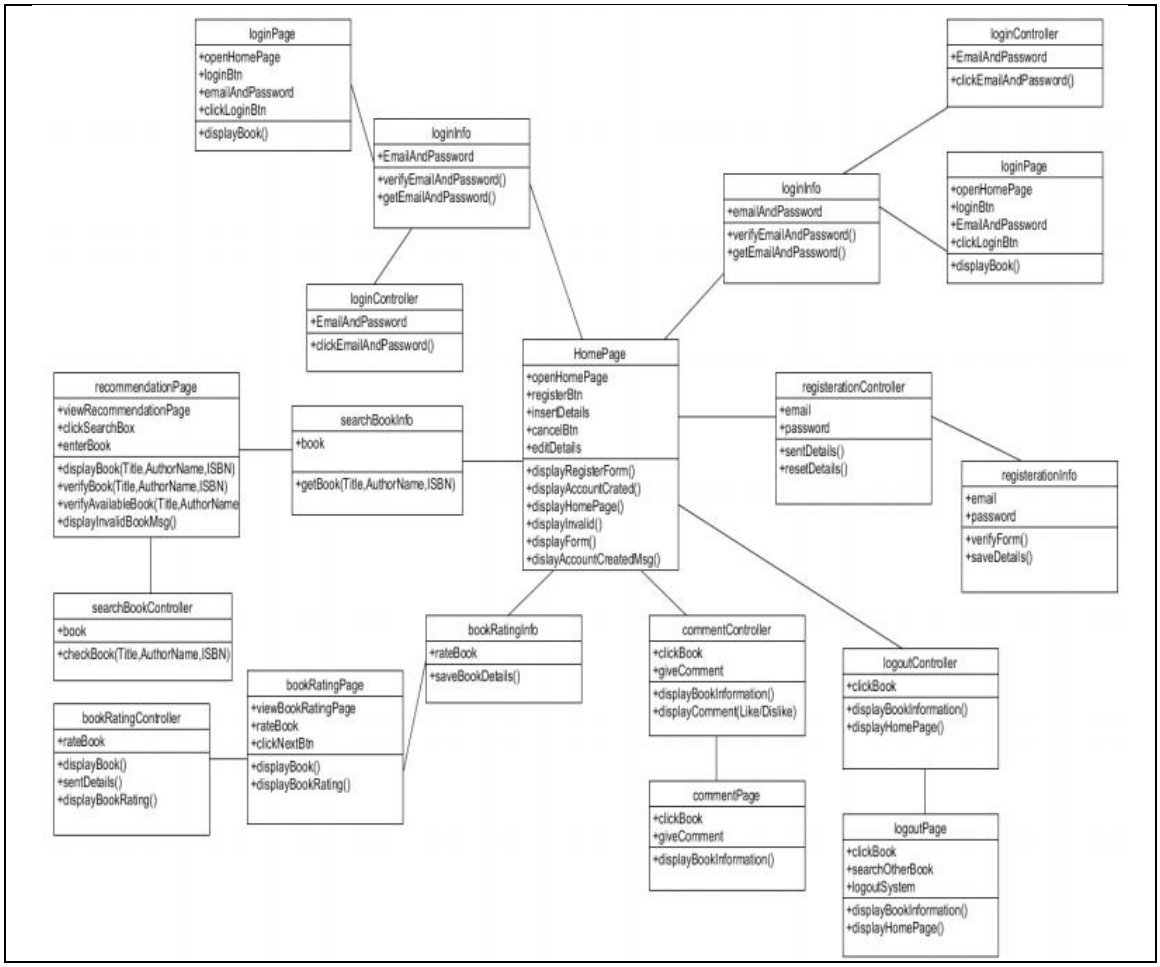


Figure 3: The Class Diagram

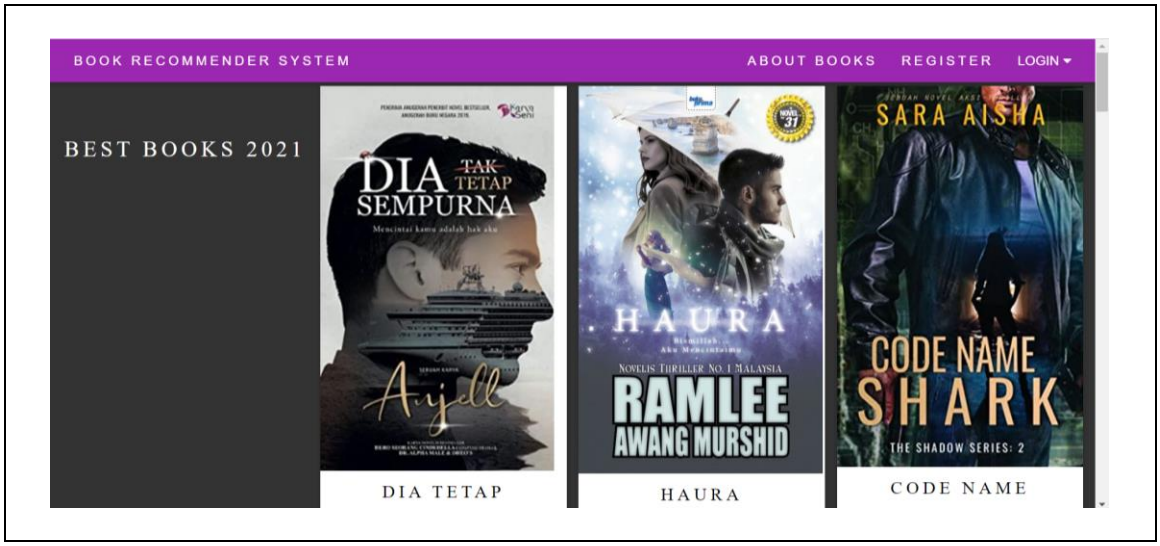
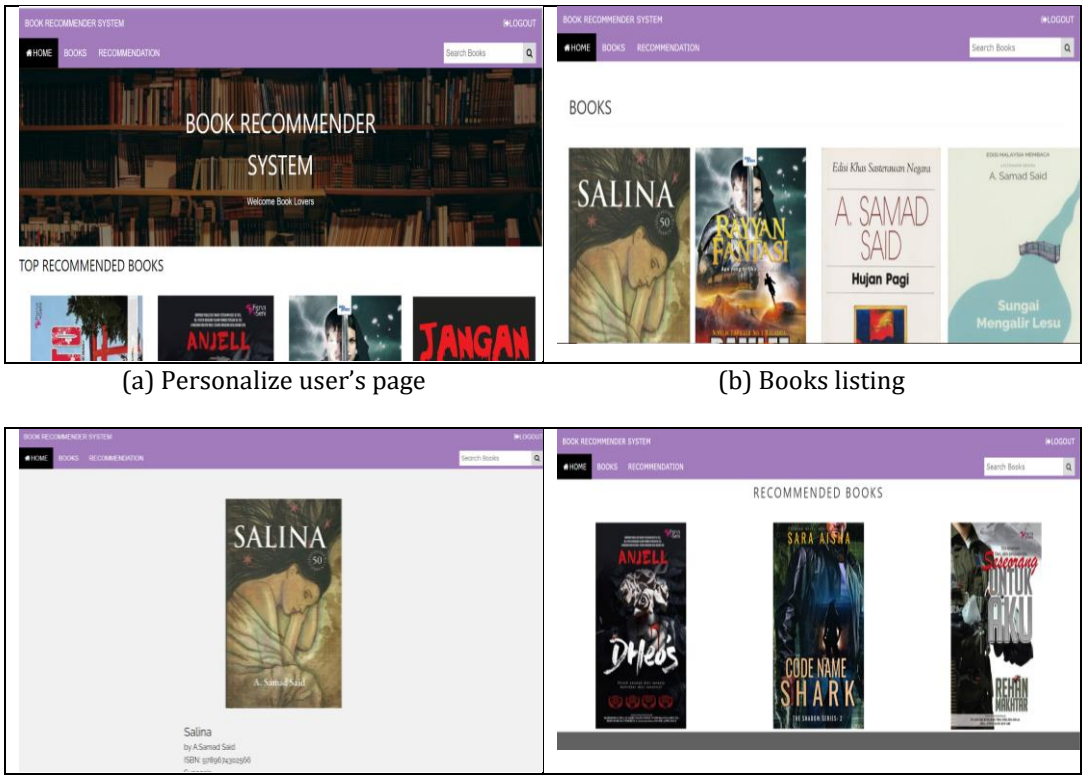


Figure 4: The Book Recommender System's Main Interface



(a) Personalize user's page (b) Books listing

(c) Detail book's view (d) Recommended books

Figure 5: The System's Other Interfaces

5.0 Usability Evaluation and Findings

A usability test was conducted on 30 respondents, all of them were book enthusiasts from Universiti Utara Malaysia. The participants were asked to try out the system and provide feedback on the interface and content of the system via a questionnaire. The questionnaire consists of five-point Likert scale questions, with one indicating strong disagreement and five indicating strong agreement. The respondents completed the evaluation in the following order: (1) read the instructions in the survey form, (2) used and interacted with the system, and (3) answer the questionnaire.

According to the demographics and background information provided by the respondents, females have a majority of gender responses (83.3 percent, or 25 respondents), while males have just 16.7%, or 5 respondents (Figure 6). As shown in Figure 7, 53.3 percent of the respondents have used the Book Recommender System website before. While 46.7 percent of respondents never use the Book Recommender System. Based on the age of the respondents (Figure 8), the age group 18–24 years old has the highest number of responses (86.7 percent, with 26 respondents). Following that, the age group of 25–34 years old has 6.7 percent with two respondents, while the age groups of 35–44 years old and 45 years old and above have the same percentage of 3.3 percent with one respondent each.

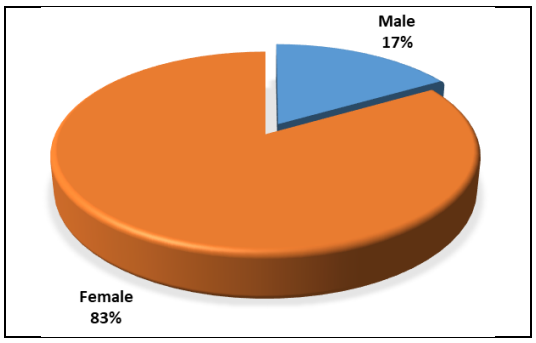


Figure 6: Gender

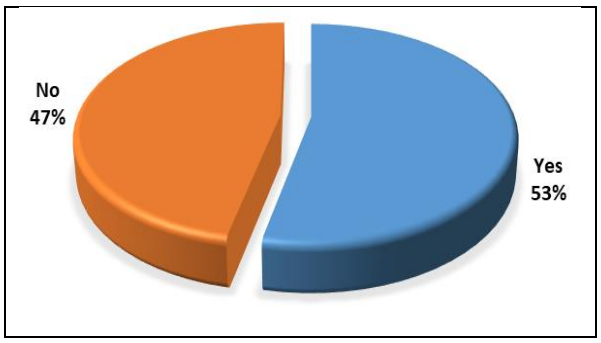


Figure 7: Experience using Book Recommender System

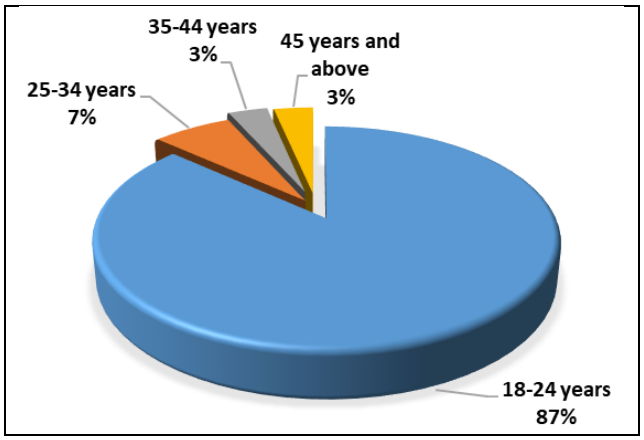


Figure 8: Respondents' Age Group

Table 2: Interface Design

Questions	Scales					Average
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	
1. Do you like the design of the Book Recommender System?	0	1 (3.33%)	0	11 (36.67%)	18 (60%)	4.53
2. Do you think the colours of the Book Recommender System is appropriate?	0	1 (3.33%)	1 (3.33%)	13 (43.33%)	15 (50%)	4.40
3. Do you think the size of the pictures on the website is appropriate?	0	1 (3.33%)	0	10 (33.33%)	19 (63.33%)	4.57
4. Does the design of the Book Recommender System render well in browser?	0	1 (3.33%)	0	10 (33.33%)	19 (63.33%)	4.57

5. Do you think the interface of the system is pleasing?	0	1 (3,33%)	0	14 (46.67%)	15 (50%)	4.43

Tables 2 and 3 illustrate how people felt about the system's interface and content. The results demonstrate that respondents are extremely pleased with the system's interface and design, with an average score of higher than 4 for all questions. The majority of respondents strongly agree with all of the questions. Only one respondent found the interface and content design to be unsatisfactory. The respondent may have experience using the related system, and he or she may foresee major differences from it.

As indicated in Table 3, the system has successfully generated recommendations, with the majority of respondents being satisfied with the results. This algorithm provides recommendations based on the age and gender of the respondents. Based on the findings, the Book Recommender System website can be determined to be beneficial and easy to use by book lovers.

Table 3: System Content

Questions	Scales					Average
	Strongly disagree	**Disagree**	**Neutral**	**Agree**	**Strongly agree**	
1. The information provided by the Book Recommender System is clear.	0	1 (3.33%)	1 (3.33%)	8 (26.67%)	20 (66.67%)	4.57
2. The information provided by the Book Recommender System can effectively help to me as a book lover.	0	1 (3.33%)	0	11 (36.67%)	18 (60%)	4.53
3. The content that provided by the website is meaningful.	0	1 (3.33%)	0	12 (40%)	17 (56.67%)	4.50
4. Do you find the relevant content on the Book Recommender System?	0	1 (3.33%)	0	13 (43.33%)	16 (53.33%)	4.47
5. Was the information on this Book Recommender System helpful to you?	0	1 (3.33%)	0	10 (33.33%)	19 (63.33%)	4.57

6.0 Conclusion

The eBook Recommender System has been developed and tested in this study. The system aimed to solve the problem that book lovers had to go to a bookstore or library to see the current selection of books (Malay novel). The system's performance has been satisfactorily assessed. Based on the readers' information, such as age and gender, the system can recommend a top Malay novel.

Following that, for future projects, we intend to increase the capabilities of the system website, such as online book reading. Also, some features, such as an audiobook, should be added. On the community page, the user can also share the books with other friends. Other types of books, not

just Malay novels, could be added to the system's database. A hybrid algorithm can be added to the recommender system algorithm to deliver better recommendations to the user.

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