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A Web-based Book Application using MongoDB & Nodejs

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Abstract – *The main objective of this research paper is to develop a web application for bibliophiles all around the world with the ease of a click. This online platform not only overcomes the need of physically going to the bookstores and libraries, but also enables users to develop a community of like-minded people. Moreover, it also extends its services to those preparing for various competitive exams. As various students find it financially challenging to buy many books before exams, this platform provides them with the best facility of borrowing or lending textbooks or practice papers. The borrower can thus keep the book based on the requirement in exchange for a minimal amount.*

BookBea is a book-lovers' platform where people can exchange, share, and sell books according to their interests and tastes. Once a user logs in, he/she is registered in the system and a new profile is created, where the user may construct their own bookshelf with all the books they want to read or swap. Our idea is aimed to cater to the needs of voracious readers who have a wide range of reading preferences and often find acquiring each book from a bookstore quite cumbersome, thus, making BookBea the right place for them in this instance. Each book's edition and description are provided, giving the user a gist of what they are interested in buying or borrowing. A chat room feature is also integrated in the system enabling the user and lender to contact each other directly, giving the user the belief that the opposite end person is genuine. Apart from cash-on delivery, an online payment gateway has been created to keep track of all the payments and protect the users from any kind of privacy issues.

Key Words: Nodejs, MongoDB, Interactive Web Application, Book Management System, JW token, middleware.

1. INTRODUCTION

BookBea is an online book rental website which is built with an aim to provide users a user-friendly experience while they rent a book. With the onset of the pandemic buying books from the stores is a tiresome task for most and with available online book sites users prefer to read books on their phones, laptops and tabs. To preserve the experience of reading books the traditional way, our online book rental site provides users with wide variety of genres they can select from and also for price less than the one on store.

BookBea provide the users a personalized experience as it offers not only a range of books for rent but also a section where the books that have been rented/borrowed are displayed. One user can upload as many books as they want on their account and these books are present on the bookshelf that is there on the site and books can be added and removed from the shelf. To rent the book one user has to make request to the other user for a book that they want, there is a section in the site which displays all the request a user gets for book others want and the user can accept the request and rent the book. There is a real time chat room which enables the two users to contact each other and discuss about the payment, place for book pick up and drop, know the condition of the book, etc. The site has a portal for payment where user can select the mode they want to pay for the book (like COD, net banking, credit/debit card and UPIs).

2. BACKGROUND

Purchasing anything online gives users more confidence as they enjoy the convenience of purchasing from their devices.

Online book rental site is quite similar to Netflix, a popular video renting service established in California. In India, online book rental is becoming more and more popular. According to the recent statistics India is world's third largest market for books and with the online book market it is assumed that it will grow 30-35% more in coming years.

Most online book rental sites are managed by some central authority which facilitates book renting. All the books that a site has are owned by a single entity and then distributed from there. This system is more like an online library where users can rent the book from the library online. This seems to be like any other online shopping platform the only difference is here books are given on rent.

BookBea is an online book rental site but it is not owned by a central authority. The books here belong to the users who are members of BookBea and for someone who is looking for some book can request the user who owns it for rent, and the chat room help the two users to communicate. Generally, these sites have books that belong to different genres but for someone looking for some study material related to school and college users have to go to some shop that sells second-hand books. BookBea tries to overcome this problem as it offers a section where users can find course books on rent. It's also helps you keep track of the books that a user has rented or of the books that he owns.

3. METHODOLOGY

3.1 Module Description

The BookBea website majorly consists of 8 modules.

3.1.1 Login Page

A login page is a web page or login page that requires user identification and verification, usually using a combination of username and password. Signing in may give you access to the entire website or just a portion of it. Logging in allows the website to track the user's activity and behavior in addition to giving them access to the site. Removing a web page or site can be done manually or can be done automatically in certain situations (such as closing a page, shutting down a computer, a long-time delay, etc.) occur. An error notice will appear on the screen if the user fails to plunge in the correct information.

3.1.2 My Books

My Books page on our website can be easily described as the available books section in a library. The books present here can be borrowed, shared, or purchased as per the user's wish. In this module, the user will be able to view the book title, author name, description of the book, the publication year and the rating of the book. All these attributes help the user select the appropriate one.

3.1.3 Add Books

In the Add Books module, users will be able to add as many books as they want in their individual portal. The bookshelf of one user will not interfere with the bookshelf of the other. Deletion of any existing book in the bookshelf can also be done based on the user's choice.

3.1.4 My Request

In this module, users will have the Approve Request and Your Request section. In the Approve request section, users will have the pending requests from the other users who wished to borrow their books. If the user wants to, he/she can approve the request and can let other readers read his book but if the user doesn't want to then he can reject the request too. Then in the Your Request section, the user will have a list of books he/she requested to borrow from the other users.

3.1.5 Books Shared

In the Shared book section, the user will have a list of books he/she shared with other users. This module is created to track the number of books shared by the user to any other user. A digital proof remains with both the users so that the user can claim his book in case of any unwanted behaviour.

3.1.6 Books Borrowed

In this module, the user will have a list of books he/she borrowed from the other users. This module is created to keep the track of borrowed books in the user's profile so that in any case if there exists a discrepancy between the borrower and the lender, they can verify it from our website.

3.1.7 Chat Room

In this module, we created an interactive chat room for the users to provide them with a source of interaction. The main purpose of this module revolves around making our users trust the borrower or the lender before sharing or buying the product. To avoid any cases of activities like fraud or theft we introduced this feature to get a proper understanding of the customer or the buyer. Moreover, this chat room will help all the readers to stay connected, share their thoughts, and will aid in creating a reading community.

3.1.8 Payment Gateway

The Payment Gateway page is the final page on our website. This is created to direct the user to the payment portal for instance- net banking, pay or credit cards. Once the lender approves the borrower's request of borrowing his book, the borrower will take him to the payment gateway through which he/she can make payment and get the book from the lender. All the transactions are saved in the database.

3.2 System Architecture

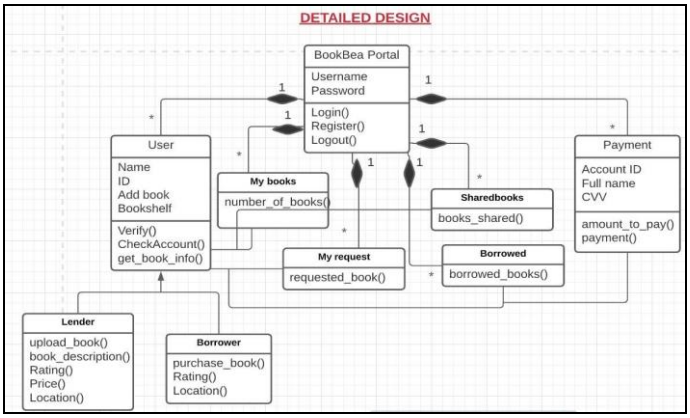

Fig-1: Entity Relationship Diagram

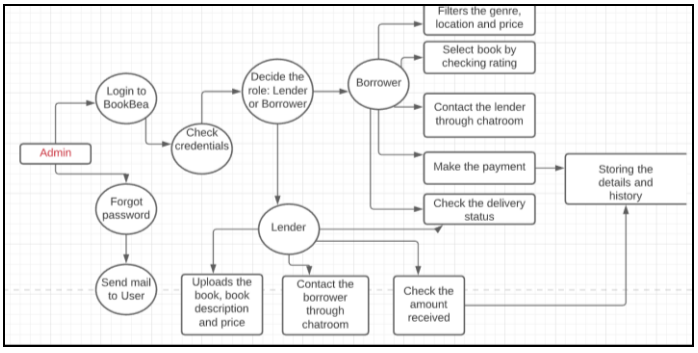

Fig-2: Proposed System Design

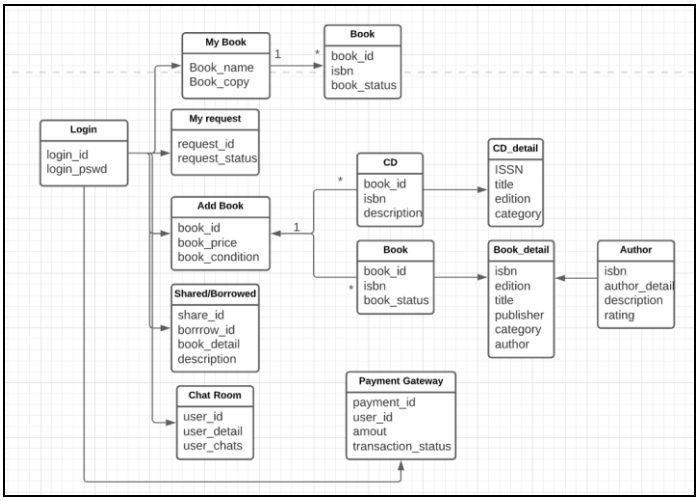

Fig-3: Database Design

4. EVALUATION METHOD

The system testing process aimed to determine all defects in our project. Our website was subjected to various sets of tests and then observations were made whether the website is working as expected or not. If there is any default in the working then all those were removed after the system testing process.

4.1. Unit testing

In our model, unit test plans (UTPs) were developed in the module design phase. Unit Testing is characterized as a kind of programming testing where individual parts of a product are tried. In V Model, Unit testing is the first degree of testing done before reconciliation testing. Unit testing is such a sort of testing method that is typically performed by the developers.

The objective of Unit Testing are:

- To check the accuracy of code.
- To test every function and procedure.
- To help for code reuse.
- To fix errors in the early phase of the project and save the money.

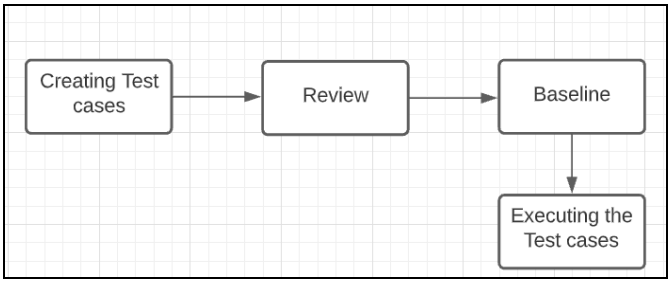

Fig-4: Unit Testing Flowchart

4.2. Integration Testing

Integration test is the most common way of testing the connection point between two programming units or modules. It's focused on determining the correctness of the interface.

Integration Tests were implemented in the Architectural Design Period. Test results were shared to the users as these results prove that the unit formed and verified independently can coexist and communicate among themselves.

4.3. System Testing

System Testing is a software testing that is performed on a total integrated system to assess the consistency of the framework with the comparing prerequisites. Passed components of Integration testing are taken as input in System testing. System testing helps in detecting the defects in both integrated and overall systems.

4.4. User Acceptance Testing

User Acceptance Testing (UAT) is the final phase of testing which is done after unit, integration, and system testing. In UAT testing is done by the end user or the client to check or acknowledge or accept the product framework prior to moving it to the production environment. UAT demonstrates that the conveyed framework meets the client's need and the framework is prepared for use in the real time world.

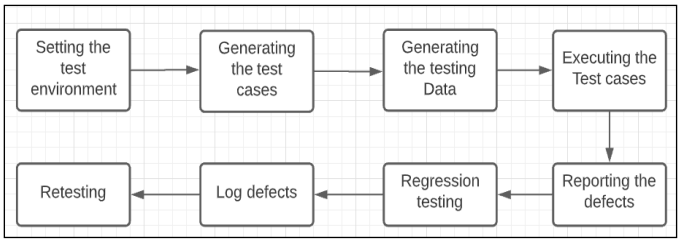

Fig-5: Steps involved in System Testing

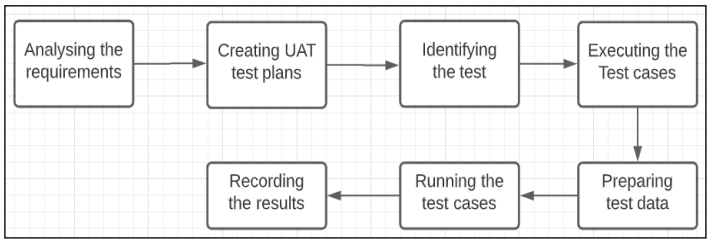

Fig-6: User Acceptance Testing workflow

5. EXPERIMENTAL RESULTS

In this section, we have discussed the results we got from our proposed system. These results will help us in concluding the overall accuracy, usefulness and efficiency of

our website. By these results we have summarized how computerized work is more efficient than manual work.

Table-1: explains the Test cases, system requirements, design specifications, and functional specifications.

Test Case	Testing Purpose	Testing Condition	Expected Outcomes	Actual Results
Login	Checks the username and password	If user details are not correct, it will display the error message	Grant access to the applicable main system	User successfully logs into the system upon submission of correct login credentials or user forgets the password and had to change again.
My Books	Users are able to see the home page, bookshelf.	Book title, author name, description of the book, the publication year and the rating of the book are not visible	Book title, author name, description of the book, the publication year and the rating of the book should be visible to the registered user	Users are able to select/see different books in the bookshelf.
Add Books	Ensuring that users are able to add a new book or it's copy on the website.	If a book already exists on the website, then the system will increase its number of copies.	User should be able to successfully upload the book on the website	Users are able to upload the book and if the book already exists on the website, then the number of copies are increased.
My Request	Ensuring that approval and pending request are received by the user	If the user is able to reject the approval request or not.	Users are able to approve pending requests and also able to send requests to other users.	Users are sending requests to other users and approving their requests also.
Books Shared	To ensure that the user has the list of books he/she shared.	If any shared book is not updated on the Books Shared page, users are requested to refresh the website.	Users have the proof of books shared to other users.	Users can see the details of the book shared to other users and can contact the person if required.
Books Borrowed	To ensure that the user has the list of borrowed books	If any borrowed book is not updated on the Books Borrowed page, users are requested to refresh the page.	Keeps the track of borrowed books for the user.	Users can see the details of the books borrowed by others from them and if any discrepancy is there they can contact them.
Chat Room	To ensure that we have an enthusiastic community of book lovers on our website.	If a user wants to leave the chat room, he/she has the required option.	Book lovers from different countries are able to connect with each other on our website	Users' private information is kept safe until they want to reveal

				it. Users are able to connect and share reviews on different books.
Payment Gateway	To ensure safe transaction from users account	If the payment is failed user will receive an error message	Users are able to pay safely for the books they borrowed.	Transactions were safe and the user was successfully able to borrow books.

From Fig-7 to Fig-14 illustrates the graphical interface of our application.

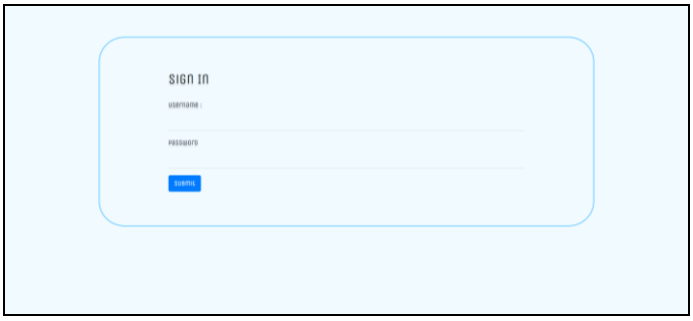

Fig-7: Login/Sign In Page

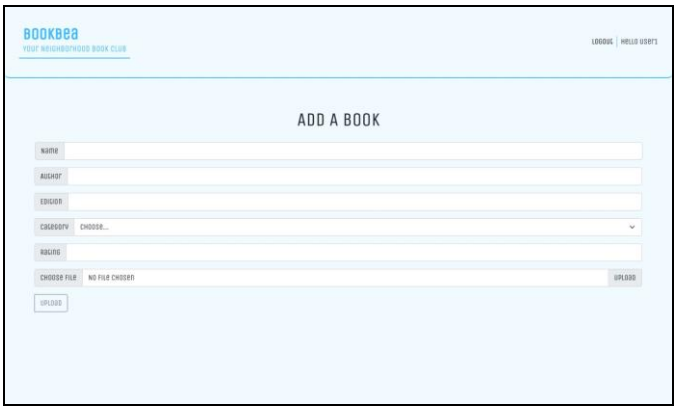

Fig-8: Add Book Page

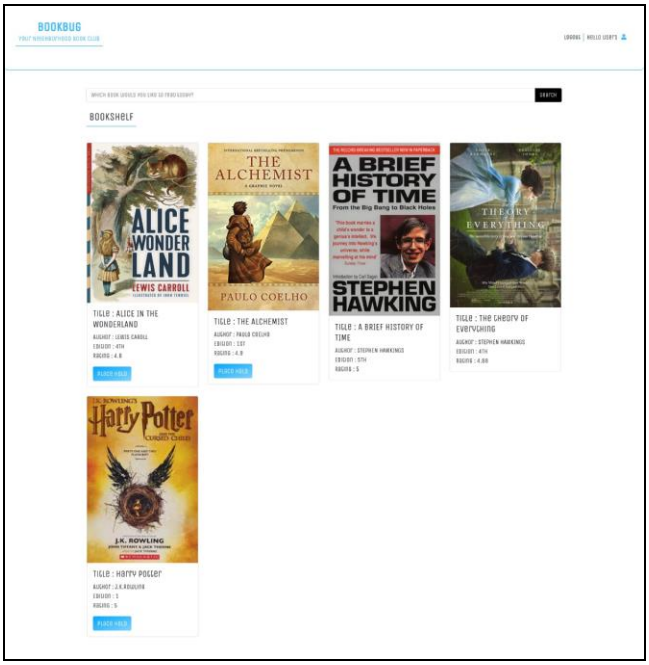

Fig-9: Bookshelf Page

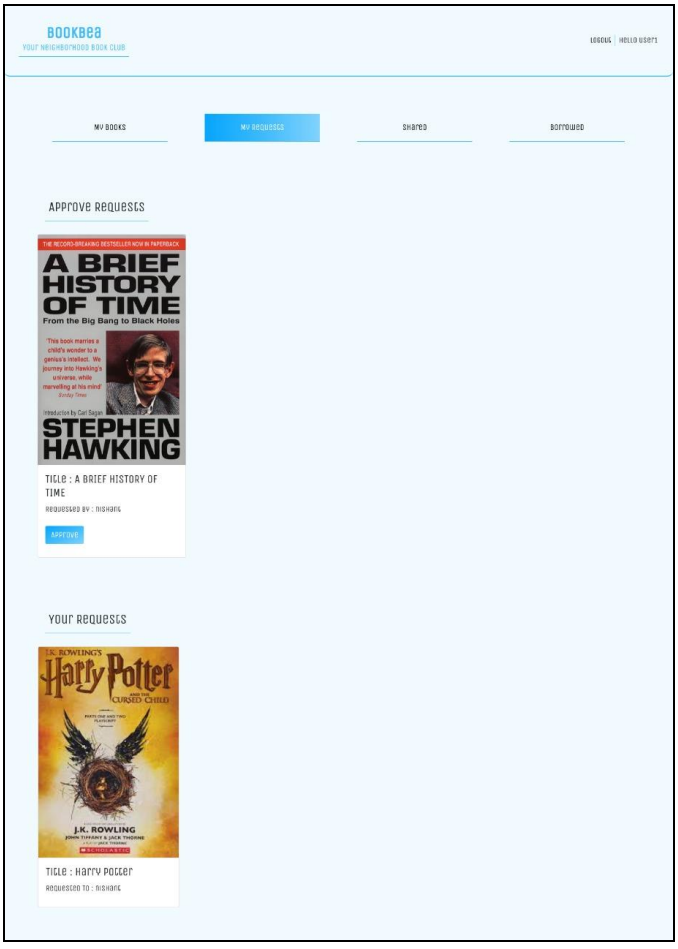

Fig-10: My Request Page

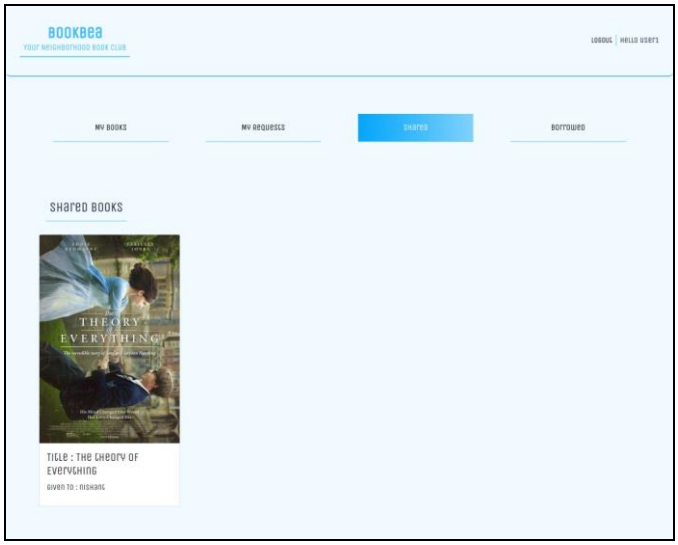

Fig-11: Shared Books Page

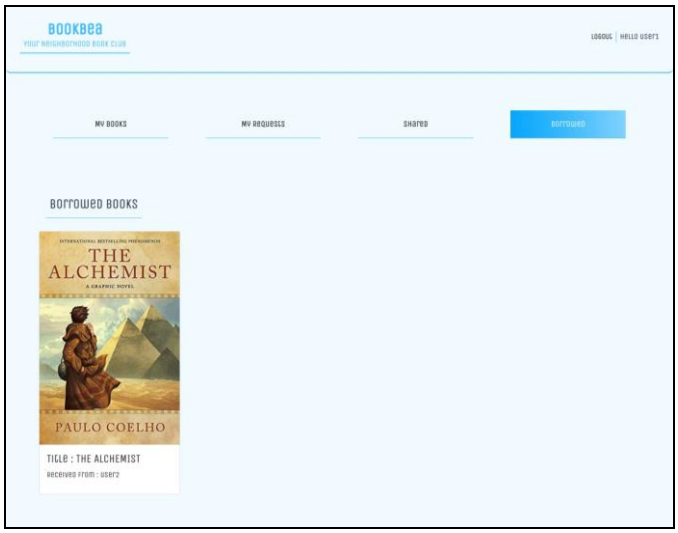

Fig-12: Borrowed Page

Fig-13: Chatroom Page

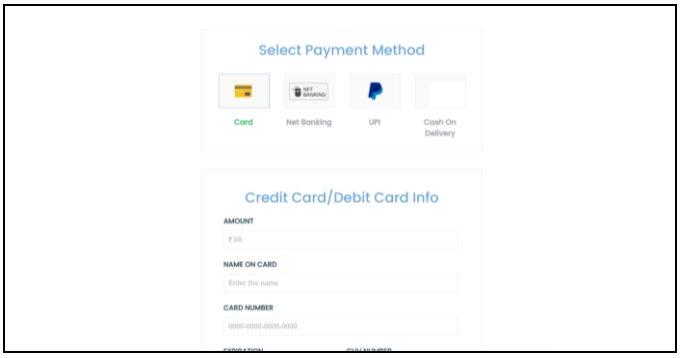

Fig-14: Payment Page

A database is used to store many types of files in the system. Although the database is built to allow users to modify, delete, and add documents at any moment. Fig-15 and Fig-16 displays the record of users accessing our system and the books present in the bookshelf of individual users.

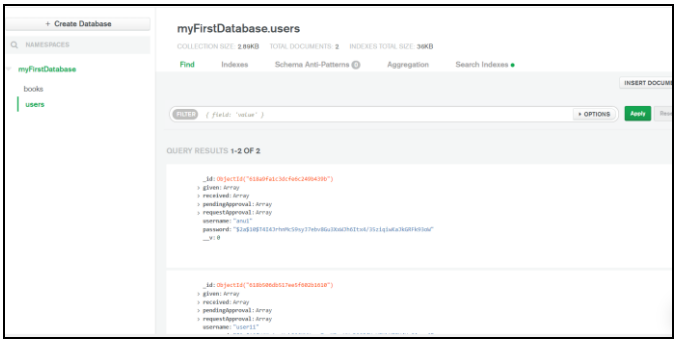

Fig-15: User's Database

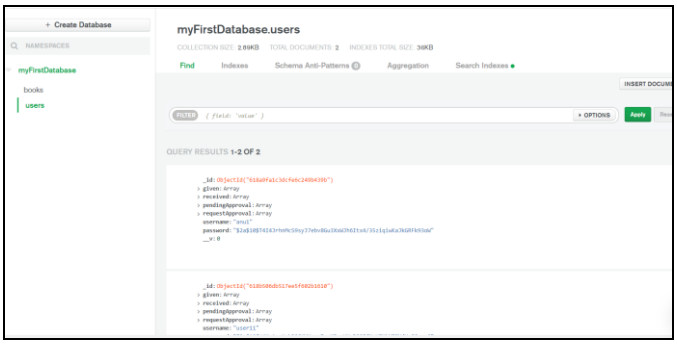

Fig-16: Books Database of individual users

6. CONCLUSION

The model that we proposed for the project was to build a website that has a user-friendly interface which makes it easy for the user to use it and access the information. The built-in chat room would help the readers stay connected to each other and make a reading community of their own where like-minded people can share and exchange ideas along with their favourite books. The website would help all the bibliophiles to read as many different books as they want without worrying about spending money. They don't have to waste their time on the internet to know the reviews, ratings

of the book as our website will be giving honest opinions about the book and feedback from different readers. In case of second thoughts, the user can put a message in the chat room and directly contact other readers to know their experience. Our project targets avid readers who have a wide variety of tastes in books and students who wish to exchange their previous books for other reference materials.

The promising experimental results prove that the portal is user-friendly and enables the user to lend and borrow books without any hassle in mere seconds.

A future enhancement would be to add GPS to our website to make it more reliable and user-friendly, adding a database to the payment portal, and adding filters in the bookshelf section which would result in a better user experience.

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