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*Article*

# Smart Book Hub: Empowering Literary Discovery Experience, Tailored Book Recommendations Using Mern and Lamp Stack

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**Abstract:** Every new technology that comes out has some new features that meet the needs of users. A lot of innovations come and go from the market, but some have a big effect, make big improvements, and stay on top. The proposed online marketplace for used books and textbooks, which was made in PHP, includes user authentication, a strong system for uploading books with categories like business, sports, management, tourism, informatics, accounting, applied science, and more. It also includes important information like the ISBN, condition, price, and cover image. Users can browse the platform to see what books are available, add them to their shopping cart, and then go through a safe checkout process. The app has a user dashboard where you can manage your books, see your order history, and change your profile. To protect against any weaknesses, security procedures like input validation, using HTTPS, and storing passwords securely are put in place. You can add a payment gateway to the platform if you want to. In general, the system puts a responsive design first so that it works on all devices, and it comes with full documentation for future maintenance. We use the MERN (MongoDB, Express.js, React.js, Node.js) stack for temporary server functionality and the LAMP (Linux, Apache, MySQL, PHP) stack for home server operations. This gives us the best of both worlds.

**Keywords:** User Authentication, Comprehensive Documentation, Temporary Server Functionality, Encompasses User Authentication, Book Management, Input Validation

## 1. Introduction

The goal of this paper is to create an online e-bookstore platform that lets people buy and sell books from the comfort of their own homes. An online bookshop is a virtual store where clients may look through a list of books and choose the ones they want to buy. The customer can then go through the buying procedure after these items have been added to a virtual shopping cart [11]. The suggested method is meant to help students and other users by creating a marketplace for both new and secondhand books. This will encourage people to sell and recycle books. Also, users will be able to ask questions about certain books on the platform, which will make it easier for buyers, sellers, and site administrators to talk to each other [12]. The main goal of the paper is to create a fully working online platform for buying and selling books, with a focus on helping students get the most out of their textbooks. The site will help make educational resources more useful by letting students easily share textbooks and other study materials. This will lead to a more sustainable way of using academic resources [13]. This system adds an inquiry feature

that lets someone who wants to buy a book or upload one talk to either the site administrator or the person who is interested in the book. This feature makes it easier to get the information you need about the books, including their availability, condition, edition, or price, which makes the whole experience better for users [14].

The website that is planned will be a full online bookshop where people can buy and sell books in a wide range of genres, such as academic, fiction, non-fiction, competitive test materials, and more. The system's architecture and features are meant to make buying and selling books easier [15]. Users can look for books by category, add the ones they like to their shopping cart, and then buy them [16]. People who want to sell books can also upload information about the book, such as the title, author, price, condition, and a picture, which potential purchasers can then look at and think about [17]. One of the best things about this system is that it can bring all book requests and transactions together in one easy-to-use place. Users may easily do important things like uploading a book to sell, buying a book, or submitting a question with only a few clicks [19]. A streamlined layout makes it easy for anyone with different levels of tech knowledge to find their way around and use the website. Several non-functional requirements have been found to ensure the platform works well and meets users' needs. Scalability is important to make sure the system can handle more and more users and transactions over time without slowing down [20]. To make sure that transactions go through quickly, the platform's speed needs to be improved so that pages load quickly and navigation is smooth. Another important thing is security, since the system handles personal information and payment information [21]. To keep user data safe and private, it will be important to implement strong security measures such as SSL encryption, secure login, and data validation [22]. Usability is also important because the platform needs to have an easy-to-use and straightforward interface. To make sure that the platform is always online and that all transactions go through correctly, it needs to be reliable [18].

From a technological perspective, the development of this paper incorporates both the MERN (MongoDB, Express.js, React.js, Node.js) and LAMP (Linux, Apache, MySQL, PHP) stacks. The MERN stack will be used primarily for the front-end development and temporary server handling [23]. React.js will provide a responsive and dynamic user interface, while Node.js and Express.js will manage server-side logic and API calls. MongoDB will store user and product data, ensuring a flexible, document-based storage system [24]. Simultaneously, the LAMP stack will be integrated to support backend operations on a home server environment. This dual-stack approach provides flexibility, as well as the ability to leverage the strengths of both technology stacks [25]. The system will also incorporate third-party services for functionalities such as payment gateways, hosting, deployment, and email notifications. These integrations will ensure the system remains robust, user-centric, and scalable as it expands [26].

Several constraints have been acknowledged during the planning and development of the paper. These include time constraints due to academic or organisational deadlines, budget limitations that may restrict the use of certain advanced technologies or services, and resource constraints such as the availability of developers, testers, and infrastructure [27]. Effective paper management and clear prioritisation of features will be essential to ensure that these constraints do not hinder the successful deployment of the system. The feasibility of the paper has been assessed from technical, economic, and operational standpoints [28]. Technically, the chosen technology stacks are widely used, well-supported, and suitable for the functional requirements of the paper [29]. Economically, the paper is feasible due to the availability of free or low-cost development tools and open-source software. Hosting services can also be optimised to reduce costs during initial deployment [30]. Operationally, the paper has strong potential for successful implementation in educational institutions and among student communities where book exchange and resale are common but currently fragmented practices [31].

The long-term goal of this e-bookstore paper is to provide students and general users with an accessible and efficient platform to engage in book transactions online. The website should serve as a reliable and secure environment where users can confidently buy and sell books [32]. Furthermore, it is anticipated that the platform will foster a culture of reuse and sharing among students, which aligns with sustainability goals and economic efficiency. The platform will be designed to be easy to navigate, with well-organised categories, a responsive design for multiple devices, and clear navigation tools [33]. It should also facilitate administrative tasks such as order tracking, user management, content moderation, and sales reporting through a secure and easy-to-use admin interface. Several specific objectives support the overarching goal of the paper. One of the key objectives is to offer a dependable means for users to purchase books online, minimising the need for physical travel or time-consuming searches through offline bookstores [34]. Another important aim is to provide a mechanism for recycling textbooks and other educational materials by allowing users to resell them to others who may benefit from their use [35]. This not only promotes resource optimisation but also offers financial benefits to students. Users can generate income from books they no longer need and purchase required books at lower prices than new ones [36].

The system is also meant to be a user-friendly bookstore management solution that can handle a range of duties efficiently [37]. The technology is meant to make running a bookshop easier and more efficient by automating tasks like adding and categorising books, keeping track of customer questions, and maintaining inventories. The paper also plans to have a place where customers can offer comments [38]. This will help other purchasers make smart choices and give vendors and administrators useful information on how to make things better [39]. Another important part that would make users happier and trust the platform more is recognising their interactions and giving them real-time confirmations or status updates. In the end, the creation of this online e-bookstore initiative fills in some of the holes in the current system for students and academic communities to buy and trade books [40]. The paper has the potential to change the way educational resources are shared and used by providing a safe and scalable platform that includes buying, selling, asking questions, and administrative tasks [41]. In addition, the system is flexible enough to handle future development and changes in technology since it has ways for users to give feedback, security features, and an interface that responds quickly [42]. This system has more effects than just book transactions. It builds community, encourages students to work together, and supports long-term education by making it easier to reuse learning materials.

**Literature Survey**

Mathew Reynolds explains that e-commerce refers to the process through which businesses sell goods, products, and services over the World Wide Web. It allows business owners to make their catalogue available online, thereby making their offerings accessible to a larger customer base. According to Reynolds, any business can formulate its own e-commerce strategy to adapt to the demands of the digital marketplace [43]. However, for such strategies to succeed, businesses must understand that the operational model for an online store is inherently different from that of a traditional physical store. In order to be effective, the e-commerce model must be carefully developed and executed, incorporating features and functions that address the unique challenges and opportunities presented by the online environment. The implementation of a sound business model is crucial for navigating the complexities of online commerce and achieving sustained growth and profitability [1].

Donnelly further contributes to this understanding by emphasising the importance of user-centric design for successful e-commerce sites. He argues that if a website expects users to find products, make purchases, and share sensitive information such as credit card details, the site must be built with the user's goals as its central focus. It must streamline

the user journey and ensure that every step, from product discovery to checkout, is intuitive and seamless [44]. The website should not only meet functional expectations but also foster a sense of trust and reliability, which are essential when financial transactions are involved. The user should be able to complete their intended tasks efficiently and confidently, without unnecessary delays or confusion. This approach places the user experience at the forefront of web design, acknowledging that ease of use is a determining factor in whether a visitor becomes a paying customer [2].

In alignment with this perspective, Bandyo emphasises the critical role of user interface design in the development of e-commerce platforms. He insists that users should be actively involved in the design process through continuous feedback loops that inform iterative development cycles [45]. This methodology ensures that the design is not only based on theoretical assumptions but also reflects actual user behaviour and preferences. According to Bandyo, the design should be user-centred, meaning that it should prioritise the needs, expectations, and limitations of its intended users at every stage of development. Moreover, he underscores the importance of addressing legal and logistical aspects, including regulatory compliance and the practical realities of shipping and delivery. These considerations are vital to the credibility and operational viability of the e-commerce platform. Failure to comply with legal standards or efficiently manage logistics can result in operational setbacks, customer dissatisfaction, and potential legal consequences [3].

An online bookstore is a specific type of e-commerce platform that hosts a wide array of books across different genres and subject areas. The objective is to cater to the diverse needs and preferences of customers by providing access to educational, literary, technical, and professional books [46]. This variety ensures that the platform appeals to a broad spectrum of users, from students and teachers to casual readers and professionals. Traditionally, managing a physical bookstore involves maintaining extensive records of inventory, sales, purchases, and customer interactions. These tasks are critical for assessing the financial health of the business and for planning future operations [47]. Every successful business must maintain detailed records to analyse its performance, evaluate profit and loss, and make informed decisions [4].

But as life moves faster these days, people have less time and more things to do. In this case, the old way of managing books, which sometimes involves entering data by hand and keeping records on paper, is no longer useful or feasible. Updating and checking records by hand takes a lot of time and is prone to making mistakes [48]. To keep track of book stocks, sales, and client questions, you need to keep a lot of registers and forms, which makes the system slow and out of date [49]. This not only uses up tangible resources like paper and pens, but it also makes the business less productive overall. The inefficiency of manual systems becomes even more obvious as the volume of transactions increases, making it impossible to give timely service and maintain accuracy [5].

In view of these issues, there is a compelling need to design a more efficient system that automates the normal activities of a bookstore while offering users an intuitive and dependable experience. Developing new software begins with a detailed review of the system's key requirements [50]. In this case, "analysis" means the methodical process of figuring out what the program should do and how it should fix problems that already exist. It includes a thorough analysis of user needs, system features, data flows, and performance standards. A good analysis phase lays the groundwork for effective software development by making the project's goals and expectations clear and helping with design and implementation choices [6].

The suggested online bookshop system has a number of important advantages over older approaches. It helps people keep track of and find information on books in a neat and quick way. By automating important tasks like finding books, updating inventory, making reports, and handling customer questions, the system cuts down on the time it

takes to handle data by a large amount [51]. This makes it easier to get information quickly and get better service, which makes the whole experience better for users [52]. The system can also handle changes to book information, including changes to price, availability, or condition. It can also make reports that are tailored to match the needs of each user. This versatility makes the system a great tool for both users and administrators because it helps them make smart choices and run things smoothly [7].

The change from manual to digital systems is a big change in how bookshops do business. Not only does it eliminate the necessity for maintaining physical registers, but it also provides a scalable architecture that can grow with the business [53]. The system may be modified and made bigger to handle more users and transactions without slowing down performance. On the other hand, when operational needs expand, it gets harder to handle manual systems. Furthermore, a digital system improves data security by lowering the danger of physical loss or damage to records. It also has ways to back up and restore data, so that important information is safe even if the system goes down or anything else goes wrong [8].

The opening of an online bookshop is also in accordance with larger trends in society, such as the move towards digital services, the expanding use of internet-based solutions, and the rising expectations for convenience and ease of use. People today want services that are available when they need them, can be accessed from anywhere, and can get things done quickly and reliably [54]. An online bookshop addresses these needs by letting people look through and buy books from the comfort of their own homes, compare prices and features, and have the books delivered right to their doors. It also gives consumers the chance to take part in the digital economy by giving them a place to sell their books again, which helps the environment and makes better use of resources [9].

In conclusion, creating an online bookshop solves many of the problems that come with traditional book management systems. The system makes book-related services easier to get to, faster, and more reliable by using digital technology and e-commerce tactics. Experts like Mathew Reynolds, Donnelly, and Bandyo have shared their thoughts on how important strategic planning, user-centred design, and being ready for legal and logistical issues are for creating a successful e-commerce platform [55]. The online bookshop makes it easier to buy and sell books, and it also offers a new solution that suits the changing needs of today's shoppers. As the system grows and changes, it might make it easier for people to get an education, encourage more sustainable purchases, and help businesses go digital [10].

**System Design**

A class diagram is a kind of diagram used in software engineering to demonstrate how a system is put together by illustrating the classes, their properties, methods, and how they are related to each other. It shows how the classes in a system are connected to one another and gives an overview of them. The class diagram is a plan that helps programmers figure out how a system is built and how it works. It is a handy tool for planning and seeing how software programs will work, see Figure 1.
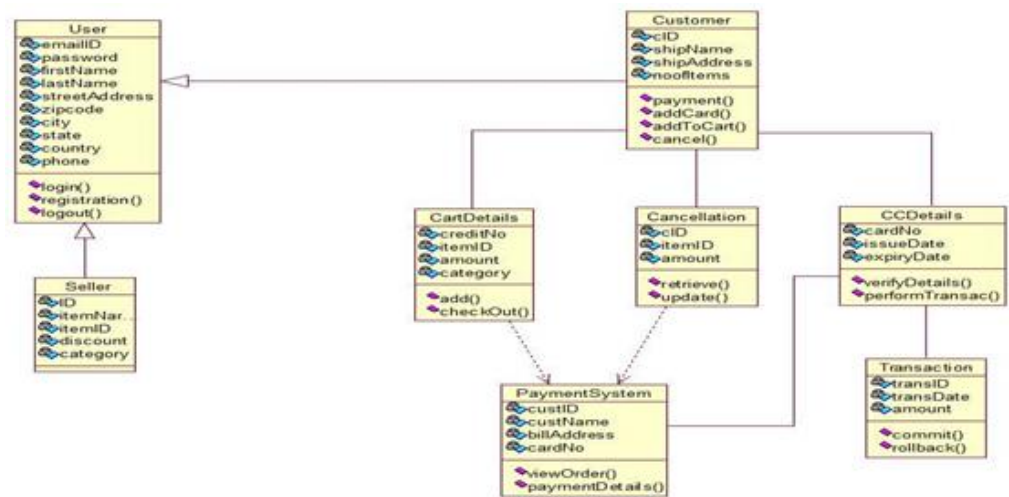
**Figure 1.** Class Diagram.

The activity diagram is another important UML diagram for showing how the system changes over time. It is just a flowchart that shows how one action changes into another. The action can be characterised as a system operation. The flow of control goes from one task to the next. This flow could be straight, branched, or parallel, see Figure 2.



**Figure 2.** Activity Diagram.

## 2. Methodology

MERN Stack is mainly used as a temporary server for the paper. It stands for MongoDB, Express.js, React.js, and Node.js. MongoDB is a NoSQL database used for flexible data storage, which is ideal for handling various data types and is scalable for growth. Express.js is a minimalist web framework for Node.js that simplifies the creation of APIs and handling of HTTP requests. React.js is a JavaScript library used for building user interfaces, enabling the creation of dynamic and interactive front-end experiences. Node.js serves as a JavaScript runtime environment for executing server-side code, which

allows for scalable and efficient server operations. LAMP Stack is mainly used as a permanent server for the paper. It stands for Linux, Apache, MySQL, and PHP. Linux is an open-source operating system that provides a stable and secure foundation for server operations. Apache is a widely used web server software that delivers web content efficiently and reliably [56].

MySQL is a relational database management system (RDBMS) used for structured data storage and efficient querying using SQL. PHP is a server-side scripting language that facilitates dynamic web content generation and database interaction [57]. The implementation of the system is divided into several modules. On the admin side, secure login is provided to verify authentication details, and if correct, the user is directed to the admin profile [58]. The admin dashboard provides access to summaries of products, orders, and categories. Admins can manage the book list by adding, updating, and deleting books or e-books. Inventory management allows for setting prices and quantities of books [59]. Admins can also manage categories and subcategories, which creates a tree-like structure for easier navigation. Orders from customers can be accepted or rejected by the admin, and all customer orders are listed [60]. Admins have the authority to manage user accounts, including adding, updating, or blocking users. The system ensures security through a secure login and logout system [62]. Payment is handled via PayPal and credit cards. On the client side, users must register and log in to use the system. They can search for books or e-books and add them to their cart. Orders can be placed and the purchase history viewed in detail [63]. Clients or lower-level admins can manage the book list by adding secondhand books or updating existing ones. Inventory management for clients allows them to offer books at less than 50% of the original price and specify quantities [64].

The system process begins with user registration, where new users fill out an online form to receive a unique user ID. Existing users can sign in with their credentials [65]. Book details are entered by the admin, including name, author, language, publication, and price. This module supports the functionality of others. Users can search for books by name or author and view the complete list of available books [66]. While both registered and unregistered users can view books, only registered users can make purchases. Inventory management utilises algorithms such as Economic Order Quantity (EOQ) or Just-In-Time (JIT) to determine optimal inventory levels and reorder points. Searching and sorting of inventory items may be handled using algorithms like binary search or hashing [67]. The recommendation system uses collaborative filtering, content-based filtering, or hybrid systems to suggest books based on user preferences and browsing behaviour. Sorting algorithms are used to rearrange book lists by ISBN, pricing, or alphabetical order [68].

User management employs authentication and authorisation algorithms, such as bcrypt for password hashing and JWT (JSON Web Tokens) for session management [69]. Data analytics algorithms analyse sales trends, customer behaviour, and market dynamics to generate actionable insights [70]. Search and recommendation engines may use TF-IDF for text analysis, cosine similarity for document comparison, or machine learning algorithms for content-based and collaborative filtering. Finally, optimisation algorithms like linear programming, genetic algorithms, or simulated annealing may be used for resource allocation or optimising delivery routes [61].

## 3. Results and Discussion

Testing is a critical component of software development, ensuring that the system functions as expected and aligns with its original requirements. It plays an essential role in identifying defects, verifying functionalities, and confirming the overall reliability and security of the software [71]. Without proper testing, even the most well-designed system may harbour hidden errors or performance issues that could affect its usability and effectiveness in a real-world scenario [72]. System testing forms the backbone of the quality assurance process and serves as the ultimate review of analysis, design, and coding. It provides a comprehensive assessment of the entire system by focusing on test case design

and ensuring that all test conditions are thoroughly evaluated [73]. This process encompasses both manual and computerised operations, including the review of programs, procedures, computer operations, and system controls [74].

The main aim is to validate whether the developed system functions according to its stated objectives and requirements. System testing is typically conducted based on pre-defined test conditions, ensuring thorough coverage and structured execution. To achieve complete validation, various types of testing are conducted during the system testing phase [75-81]. These include black-box testing, white-box testing, unit testing, specification testing, integration testing, functionality testing, and acceptance testing. Black-box testing is used to evaluate the software at the interface level without delving into the internal logic of the application. This type of testing focuses on examining how the system responds to specific inputs and whether it generates the expected outputs. It is particularly useful for identifying errors related to incorrect or missing functions, graphical user interface inconsistencies, and errors in data formats such as binary and integer formats. Other issues, like file handling errors and variable mismanagement, are also detected during this testing phase. The emphasis is on verifying system behaviour rather than code structure.

In contrast, white-box testing—also referred to as glass-box testing—analyses the internal workings of the application. It helps ensure that all independent paths within a module are exercised at least once, all logical decisions are tested on both true and false conditions, and loops are tested at their boundaries and within their expected operational range. White-box testing also focuses on specific code-level aspects, such as matching input parameters with arguments, confirming consistent data types, verifying unit systems, and ensuring that global variables are consistently defined and utilised across modules. This method allows for thorough scrutiny of logic, control flow, and data handling [82-87].

Unit testing follows next, where individual modules or components of the system are tested in isolation. Each module undergoes rigorous testing using both sample and live data to verify the correctness of logic and calculations. This ensures the foundational elements of the system work properly before integration, see Figure 3. Specification testing evaluates the system based on its stated specifications. Rather than focusing on internal code or structure, this testing assesses whether the system performs correctly under various conditions as outlined in the initial paper requirements [88-94]. This approach is highly valuable as it ensures the system behaves as users expect, according to its documentation. Integration testing is then carried out to verify how well different modules work together. After successful unit testing, individual modules are combined into subsystems and tested collectively to ensure seamless integration [95-98]. The goal is to detect issues in the communication or interaction between modules. Integration testing is further divided into two strategies: top-down and bottom-up integration. It shows us a user interface for our Smart Book Hub, see Figure 4.
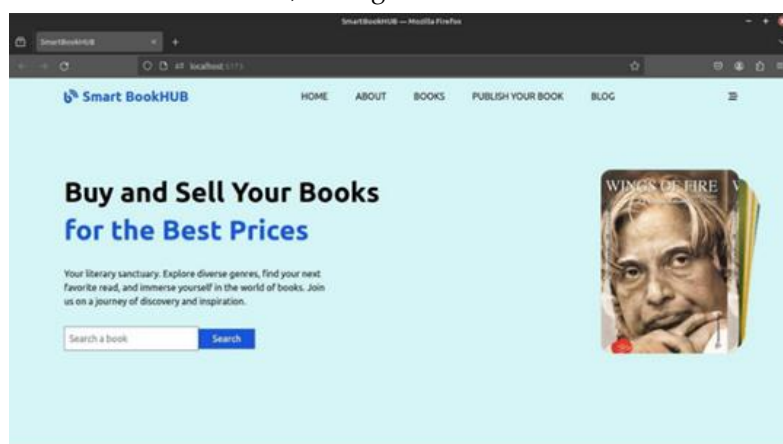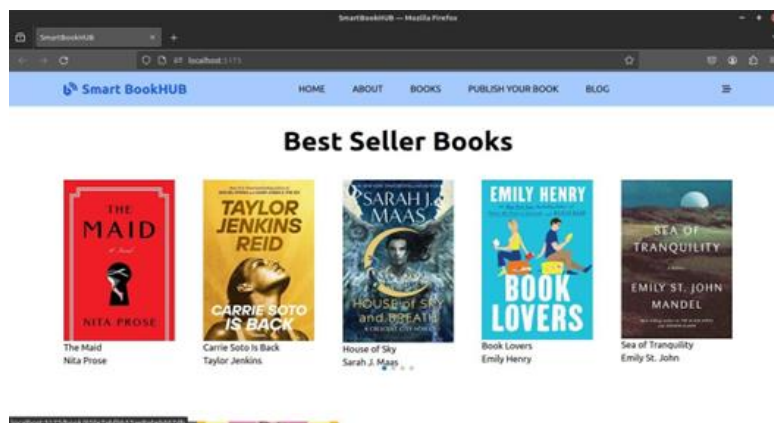


**Figure 3.** User Interface.

**Figure 4.** Best Seller Books on Smart Book HUB Website.

In top-down integration, higher-level modules are tested first, and lower-level modules are emulated using stubs—temporary substitutes that replicate the behaviour of the actual modules. This method lets you test the top-level design and control flow early on in the development process. On the other hand, bottom-up integration begins with testing the lower-level components, which are then gradually merged into higher-level structures. This method makes sure that the most important functions are checked first. This makes it easier to find and fix important problems in complicated modules early on. Functionality testing is a more comprehensive phase when the complete software system is reviewed. The requirement definition paper is the main source for this testing. It is a way to check that the finished program fits the requirements and functional goals that were set at the beginning.

This step is very important to make sure that the finished product is ready to be used and fits all of the business's needs. Last but not least, acceptability testing is done in a real-world setting with real client data. The main purpose here is to find out if the program works well in real-world situations. Acceptance testing looks at how the system works on the outside, not how it works on the inside. I typically mark the last step before the software is sent out to users and put into use. Users test the app themselves at this phase to make sure it fits their needs and expectations. This not only makes sure the system is ready, but it also makes users more confident in the solution, which makes it more likely to be successful. In short, each phase of testing is very important for making sure that the software system works, is stable, and is easy to use. From initial validation of individual modules to extensive system-wide tests, a well-structured testing process is crucial to providing a reliable and high-quality software product.

## 4. Conclusion

A nice buying and resale book design needs to go together with an easy-to-use shopping cart and reselling application logic. Customers should be able to easily see what's in their cart and add or remove products from it. This paper's shopping cart app has a lot of features that are meant to make the customer feel more at ease. This paper teaches us how to make an interactive web page and the tools we need to do so. The paper's architecture, which comprises the Data Model and Process Model, shows how the database is developed with different tables, how the database relates to the data, and how the data and web pages are changed to give users access to reselling cart applications. Looking back, our adventure to make an E-book website utilising the MERN and LAMP stacks has been both rewarding and educational.

The literature review was like a guiding light that showed me how complicated digital publishing, web development technology, and user-centred design principles can be. With this information in hand, we set out to build a platform that goes beyond just

giving people access to e-books. Our goal is to build a community of lifelong learners and ardent readers. We learnt a lot about the MERN and LAMP stacks, and each one has its own pros and cons. Because we used an iterative approach to development, we were able to change and improve our platform based on what users told us, making it better able to fulfil their requirements and expectations as they changed over time.

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