

Emerging Trends in the University Library Management System

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Abstract

The research paper titled Trends in and Future of Library Management System focuses on the current trends that have been implemented in the most important and traditional part of any educational institution – the library. The paper looks at the innovation and trends that have taken place since the traditional book-in-shelf to E-Library system, to how they are being managed, why the change, what difficulty users experience with these new systems as well as predicts the possible future advancements in the same. The paper includes a case study module on the university library system and based on the research, suggests a virtual library mobile application system that uses a unique token generation system to borrow, renew and return books. The mobile application also allows its users, students and professors alike, to login to their respective profiles and view the availability of books, journals, research papers or focus booths from an exclusive online product catalog, irrespective of the user's location.

Keywords: library management system; information systems; enterprise applications.

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I. Introduction

University libraries provide access to many of the knowledge networks from many disciples and authors, which is a necessary component of any educational and research experience. Any well-established university consists of an extensive range of research papers, journals, magazines, academic books, fiction, and non-fiction reading, newspapers, images, dictionaries, encyclopedias, among others, which students and professors use to enhance their knowledge and research experience. University Library has a wide selection of books as well as an e-library database, for its users to select from. Keeping in mind the current advancements in technology, especially with respect to recent technologies being incorporated by educational institutions, the aim of the paper is to suggest a digitalized improvement of the Library system by providing for its users a virtual library mobile application, that allow them to access various library features from the comfort of their own hand-held devices. The paper aims to not change but improve the user and administrator experience in the library by incorporating recent technological advancements that have taken place in the library management system. The aim is also to increase student engagement with the library and the virtual library mobile application is the perfect tool to help bridge the gap between the traditional library system and the users search for a more digitalized resource platform.

II. Literature Review

Major headings should be typeset in boldface with the first letter of important words capitalized. Charles William Eliot, an American academic and Harvard's president in 1869 who is credited for having transformed the provincial college into the pre-eminent American research university it is today, once said, "The library is the heart of the University". And rightfully so. The university library plays a very important role in promoting the progress of knowledge. When a student becomes a member of the library, they are given the unlimited privilege of borrowing and reading a number of valuable books. Of course, the rules vary from university to university, but the concept is always the same.

As gateways to knowledge and culture, university libraries play a fundamental role in society. The resources and services they offer create opportunities for learning, support literacy, and education, and help shape the new ideas and perspectives that are central to bringing forward the next generation of creative and

innovative individuals. They also help ensure an authentic record of knowledge created and accumulated by past generations. Libraries are just not about the collection of books. Nowadays, libraries are more commonly famous as a study space.

However, with the advent of the digital age, numerous writers and even artists have given thought to what the future of the library will bring. Many predict that the digital age will wipe bookshelves clean, and permanently end the centuries-old era of libraries. As libraries' relevance comes into question, librarians face an existential crisis at a time when students need them the most. Despite their perceived traditionalism in the digital age, both libraries and librarians are irreplaceable, for many reasons.

a. University library collections employ a well-formulated Citation System: Books and journals found in libraries will have been published under rigorous guidelines of citation and accuracy and are thereby allowed into libraries' collections. These standards are simply not imposed on websites. They can show up in search results whether or not they provide a citation. With enough research, the accuracy of web resources often can be

b. School libraries and librarians improve student test scores: A 2015 study of the Illinois School Libraries shows that students who frequently visit well-stocked and well-staffed school libraries end up with higher ACT scores and perform better on reading and writing exams. Interestingly, the study points out that access digital technology plays a strong role in test results, noting that "high schools with computers that connect to library catalogs and databases average 6.2 percent improvement on ACT scores".

c. Academic librarians are trained in how to find unbiased information of all kinds. They are the link between the users searching for answers and the vast knowledge of information available in the library as well as online. Librarians know how information is organized, and the special places it can be found. They are an invaluable resource who help students as well as professors, to find and acquire data to support their essays or even their thesis.

d. The internet is not free: Numerous academic research papers, journals, and other important materials are virtually inaccessible to someone seeking to pull them off the web for free. Rather, access is restricted to expensive subscription accounts, which are typically paid for by college libraries. Visiting a college library in person or logging in to the library through your university account, is, therefore, the only way to affordably access necessary archived resources.

The university traditional in-house library has various benefits over the digital library. Then why is it that the library attendance is fading. Why are more users reaching out for their phones instead of the library when in search of knowledge or information? Why has the digital library industry boomed at the rate that it has? Has the new generation taken its pick? Is this really the end of the traditional library? Has the era of digitalization finally taken over?

An attendance study conducted at the American History Archives, Wisconsin Historical Society show that, with approximately 50,000 visitors a year, attendance at the library has dropped 40% since 1987. This statistic, when set alone, may prove sufficient for anybody casually predicting the collapse of the library. But it is only half the story. The archives have also been digitized and placed online. Every year the library receives 85,000 unique online visitors. The number of schools offering online degrees is constantly on the rise as well. Many of these schools are improving their virtual libraries by the day. Simply put, the library attendance isn't failing, it is just more virtual than ever before.

Technology is integrating itself into the library system, not bulldozing it. Pushing this trend to its logical extreme (although it's likely not to happen), we could eventually see libraries' entire stacks relegated to databases and have books only accessible digitally.

Predictions of the "end of the book era is here" are a predictable response to digitization and other technologies, especially with the current increase in mobile-friendly downloadable e-books being published by various publishers. But this is far from reality. Radio lives on despite TV, the film is still in high demand despite the video, people still talk on the telephone despite email. People who like paper books will continue to read paper books even if mobile downloads prompt the majority of publishers to release e-books instead of paper. After all, an immense backlog of printed books will still be accessible to readers. The presence of the digital library will continue to be an extremely important role for college students in their research, whether it's paper or electronically based.

For decades society has been seeking a more holistic understanding of the world and increased access to information. The search for new methods of organizing educational structures (including libraries) has long been active. And while libraries might not be on many peoples' top priority, they have been adapting.

Ever since the birth of the internet, the world has been going through what experts call the "technological boom". Everything is being digitalized and there doesn't seem to be any stopping; not any time in the near future at least. And at this rate, it is necessary for educational institutions to adapt with this change. It is important to note, that the internet compliments libraries, but don't replace them. The face of libraries needs to

change as content is moving toward a digital platform and internet access is becoming more of a human necessity than a privilege.

Washington State University director of libraries Virginia Steel, for example, is a proponent of maximizing the social and interactive nature of physical library space. Group study, art exhibits, food, and coffee talking, not whispering; this is the new library. It's not obsolete, it's just changing.

The current library system allows its users to manually borrow, renew and return books, book focus rooms, and read journals and research papers on site only. Students and professors must manually look for the book they wish to borrow by:

- a. Manually checking through the library bookshelves
- b. Searching through the MAHE Dubai official library website
- c. Asking the administrator to check the online product catalog for the availability of the book.

To book focus rooms, the individual has to manually check availability with the library administrator at the desk and only then book the room. The individual has to also leave with the administrator proof of ID until the discussion in the focus booth is completed.

A late fine fee must be paid by students who fail to return the books on time. This information is given to the students on the spot while they are returning the book, and the payment is done manually by the students. There is no notification system in place that could notify users about due dates and book over-due fine payments.

The proposed system is a virtual library mobile application system. Virtual is defined as “not physically existing as such but made by software to appear to do so”. This means that the mobile application will encompass the knowledge of the products (books, journals, academic reports, etc) available in the library and provide a summary of the product but will not have the entire book available for reading immediately online. The reason for selecting a virtual library rather than an all-sufficient e-library system is for three main reasons:

- a. The virtual library mobile application does not intend to replace the already existing Library, but rather improve it through the implementation of popular technology.
- b. To enable the user with a more convenient way of accessing the existing facilities of the library.
- c. To solve existing user concerns/issues by providing additional facilities via the mobile application.

III. Technology

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The key features of the virtual library mobile application will include:

- a. Online product catalog
 - i. Allows users to check product availability.
 - ii. Reserve focus booths or reference materials to reads, for a specific time slot.
 - iii. Allows librarian to monitor, update, edit, delete and manage, existing or new product details
- b. Product cart system allows users to:
 - i. add selected books to cart and keep the books in the cart
 - ii. checkout to borrow the books
 - iii. reserve books that are out of stock
- c. Renew already borrowed books via the mobile application.
- d. Automatic fine calculation and notification to user
- e. Send a request to return books via the mobile application.
- f. History tab allows users to view previously borrowed books, product reservations, and late fines if any.
- g. The exclusive online community allows users to:
 - i. Create separate handles to:
 1. Request for new books of specific topics not already available in the library
 2. Have educational discussions on specific topics of interest with respect to a book with other library users
 3. Discuss any library-related concerns

- ii. View most borrowed books, highly rated books and top picks of the month selected exclusively by library administrators and university professors.

ASP.NET is an open-source server-side web application framework designed for web development to produce dynamic web pages. It was developed by Microsoft to allow programmers to build dynamic web sites, web applications, and web services.

ASP.NET should be used for the mobile application development simply because it is a flexible and dynamic tool that allows programmers and developers to build dynamic, rich web sites and web applications using compiled languages like VB and C#.

ASP.NET is not limited to script languages, it allows you to make use of .NET languages like C#, J#, VB, etc. It allows developers to build very compelling applications by making use of Visual Studio, the development tool provided by Microsoft. ASP.NET is purely server -side technology. It is built on a common language runtime that can be used on any Windows server to host powerful ASP.NET web sites and technologies.

A product catalog is a detailed list of the inventory of a store. The mobile applications product catalog will contain all the data related to the products which include product image, descriptions and/or summary, specifications like author name, production house, publisher name, reference number, and the amount of stock available in real time. This product catalog data can be viewed by users before making a checkout decision. However, users will not have access to editing the product catalog information. This feature will be available only the librarian and the library administrators.

Microsoft SQL Server, a relational database management system developed by Microsoft, can be used to create and design the product catalog. As a database server, it is a software product with the primary function of storing and retrieving data as requested by other software applications—which may run either on the same computer or on another computer across a network.

The reason SQL database is being suggested is because it is the most mainstream language that is used to access databases because it can work with any database. Essentially, Structured Query Language (SQL) is used to retrieve data or otherwise interface with a relational database. As a standard going back to the 1970s, SQL is a popular way to get information out of relational database systems. SQL is known to have high speed, great portability, well-defined standards, multiple data views, and an interactive language.

A commerce server is a server that provides the basic components and functions of an online storefront, such as a shopping cart, credit card processing, and product displays and is intended for e-commerce websites or e-commerce applications. Commerce servers also manage and maintain accounting and inventory data, also called back -end data.

Microsoft Commerce Server is a Microsoft product for building e-commerce systems using Microsoft .NET technology. Using Microsoft commerce server, we can design the main features of the app i.e. the shopping cart style checkout system which makes it stand out from other virtual library mobile applications in the market right now.

The main features of Microsoft Commerce Server include:

- a. Multichannel functionality
- b. Service-oriented architecture
- c. A default site with 30 Web parts and controls
- d. What-you-see-is-what-you-get (WYSIWYG) editing
- e. Catalog, order and inventory management
- f. Management of ads and set rules for ads
- g. Profile management
- h. Data integration with third-party systems
- i. 64-bit support

At the backend, the librarians should be able to get daily, weekly, monthly or annual report of the progress of the system as well as user engagement. This information can really help the librarian and library administrators to spot specific trends in user engagement, which can help increase the user experience in the library. It will also help the librarian to get specific reports based on fine generation, list of new requested books, and accordingly target problem areas or provide new services and products to the library users.

Crystal Reports is a well-reputed business intelligence application, currently marketed to small businesses by SAP SE. It is used to create custom reports from a variety of data sources. The package includes the major features needed for a business to create a database reporting environment, such as data access, report design/formatting, report viewing, and application integration. The greatest benefit of using Crystal Reports for report creation is its simplicity and ease of use. The report design interface is extremely user-friendly and accommodating for users of different skill levels.

IV. Application Model

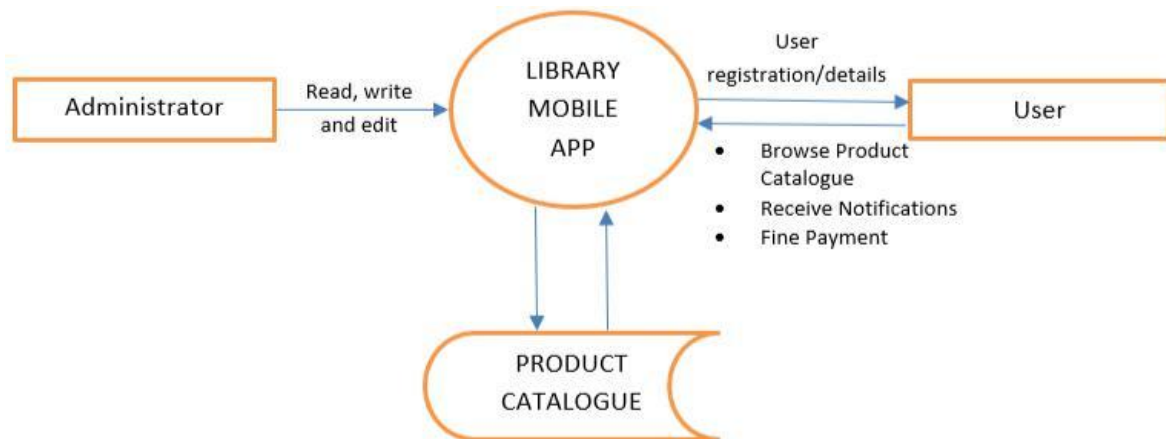


Figure 1: Virtual Library Mobile Application Model

The Virtual Library Mobile Application is the focus of the business model. It has various features and interacts mainly with the user and administrator. At the backend, the mobile application is supported by the product catalog database, that will be managed, monitored and edited exclusively the head librarian only. While on the user interface level, the users can access the product catalog to check product details and availability.

V. Information Gathering

Various information gathering techniques were used to make sure that the information received was as accurate as possible. The main focus of the interview with the librarians was to understand how the current system works, what are some problems or issues the library or library users are currently facing and how could a new system help solve these problems.

- a. A library website exists for the users, where they can check their library profile status i.e. whether any books have been issued or not.
- b. Availability of books and research/reference book material and library timings can also be checked via the website.
- c. History of books borrowed can also be checked online.
- d. Library Management System called AutoLib is already integrated into the website
- e. External question paper bank is also available online
- f. A third-party E-library database is also available, but this can be accessed only on campus as it is IP restricted.

Current constraints or issues library administrators/users face with the current system:

- a. Library user issues – Some users forget their login credentials
- b. Library Administrator concerns – need a more easy and user-friendly product catalog database to manage, monitor and edit, given the advances in current technologies.

Main concerns with having a new system imposed:

- a. the new system should support existing features of the current system.
- b. The new system should not change but rather enhance the experience of the current system.
- c. Students should come to the library to receive their borrowed books
- d. Students may lose the experience of searching for books physically on the bookshelf. This also helps students to explore other authors of similar titles.

It was necessary to make sure that all the survey entries were:

- a. Students of University Campus
- b. Users of the University Library

After further evaluation and consolidation of similar user replies from the survey as well as conducting interviews with users and administrators, these were the 6 main segments recognized:

- a. 57.8% - study
- b. 53.1% - borrow, return and renew books
- c. 51.6% - book focus rooms
- d. 32% - use provided assets like laptops and pcs,
- e. 34.4% - hangout with friends and pass the time
- f. 4% - Read magazines and newspapers

Common constraints faced by the users were (from top concern to lowest):

- a. 65% - manually ask library administrator about availability of books
- b. 43% - manually ask library administrator about the availability of focus booths
- c. 42% - manually ask library administrator about to extend focus booth time slot
- d. 35.9% - have to visit the library to renew already borrowed books
- e. 26.5% - No way to find out about late fines without manually asking the library assistant
- f. 17% - waiting in line to borrow books
- g. 9% - haven't faced any issues

On further analysis, it was found that even though there exists a website that allows users to check the availability of books online and the user's book status, more than 81% of users have either never used the website or had no idea about it. The virtual library mobile application, on the other hand, will be available on hand, in every user's mobile phone, making it easily accessible, anywhere and at any time.

According to research conducted, the majority of users showed preference over an automated library system rather than the existing system

Creating a virtual library mobile application gives users many functionalities, including:

- a. Browsing online product catalog
- b. Notification system
- c. Exclusive online community

VI. Requirement Analysis

The main requirement analysis for a new system, from the librarians, was that it should support existing features of the current system. The new system should not necessarily change or replace the current system but rather enhance and improve the experience of the current system for its users as well as administrators. It is important that students should come to the library to receive their borrowed books and not have an e-library style system where the book is available to read online via softcopy. Students should be given the opportunity to explore new authors while searching for topics of their interest.

The main requirements from the user perspective were that, if a new system is imposed it should eliminate the constraints being faced by them using the current system. These include:

- a. manually asking library administrator about availability of books and focus booths
- b. manually asking library administrator to extend focus booth time slot
- c. having to visit the library to renew already borrowed books
- d. No way to find out about late fines without manually asking the library assistant
- e. Should not have to wait in line to borrow books

Majority of students agreed that having a virtual library mobile application will help to improve user experiences in the MAHE Dubai library as well as encourage more students and faculty alike to use the library. The mobile application should provide a unique online product catalog, allowing students to look for books as well as focus booths available in the library as well as view their stock availability. Students should be able to renew the book/focus booths borrowed via the application. Notification system should be in place to allow students to receive notifications about approaching due dates as well as pay off late fines.

VII. Project Development Lifecycle

The project development life cycle used is an Agile Methodology. The conventional Waterfall development method follows strict phases, sticking to the original requirements and design plan created at the beginning of the project. However, the agile method is designed to accommodate change and the need for faster software development. This was an important feature the research paper depended on, as student needs and concerns kept coming. The flexibility of the agile methodology helped in accommodating these concerns, issues and update the system features accordingly.

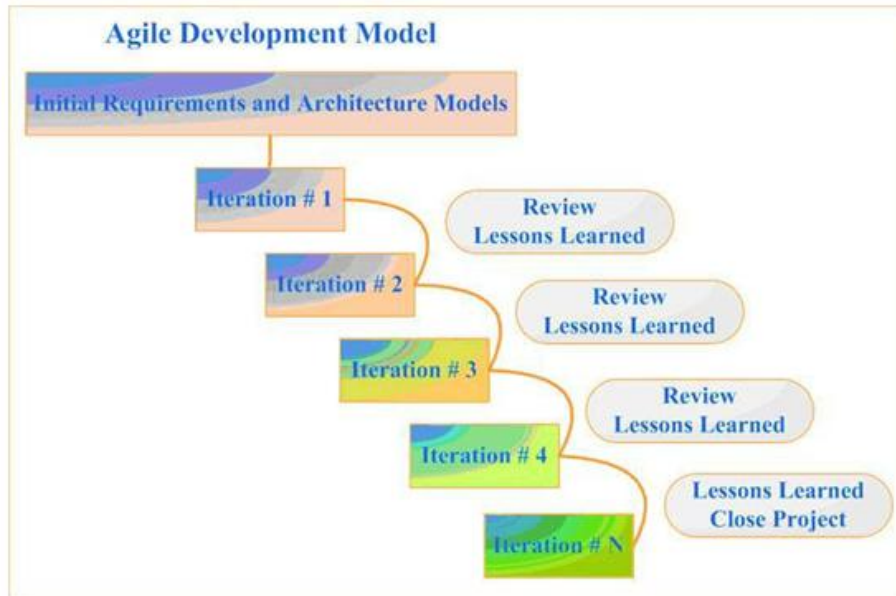


Figure : Agile Methodology

Further, the agile methodology helped facilitate the work of the development team, eliminate bottlenecks, and stay focused to deliver updates on the system on a regular basis. It is less about milestones than it is about hours, feature selection, prioritization, and meetings.

VIII. Project Design

In order to use the mobile app services, the user has to register via the mobile application.

Registration can be done easily by providing the following details:

- a. Username: unique SLCM number.
- b. Password: Students own with character and number requirements followed according to university guidelines
- c. Email ID: University provided official email id
- d. Receive an email confirmation and login to access the library features via the mobile app.

The reason the SLCM number is being used is:

- a. The registration number was not used as this information may be easily accessible to other students.
- b. In order to pay fines, the student will be lead directly to the MAHE payment portal. Therefore, SLCM number is used as it is linked with the user's financial activity.
- c. The main purpose of using SLCM number is for tracking payments in a secure manner.

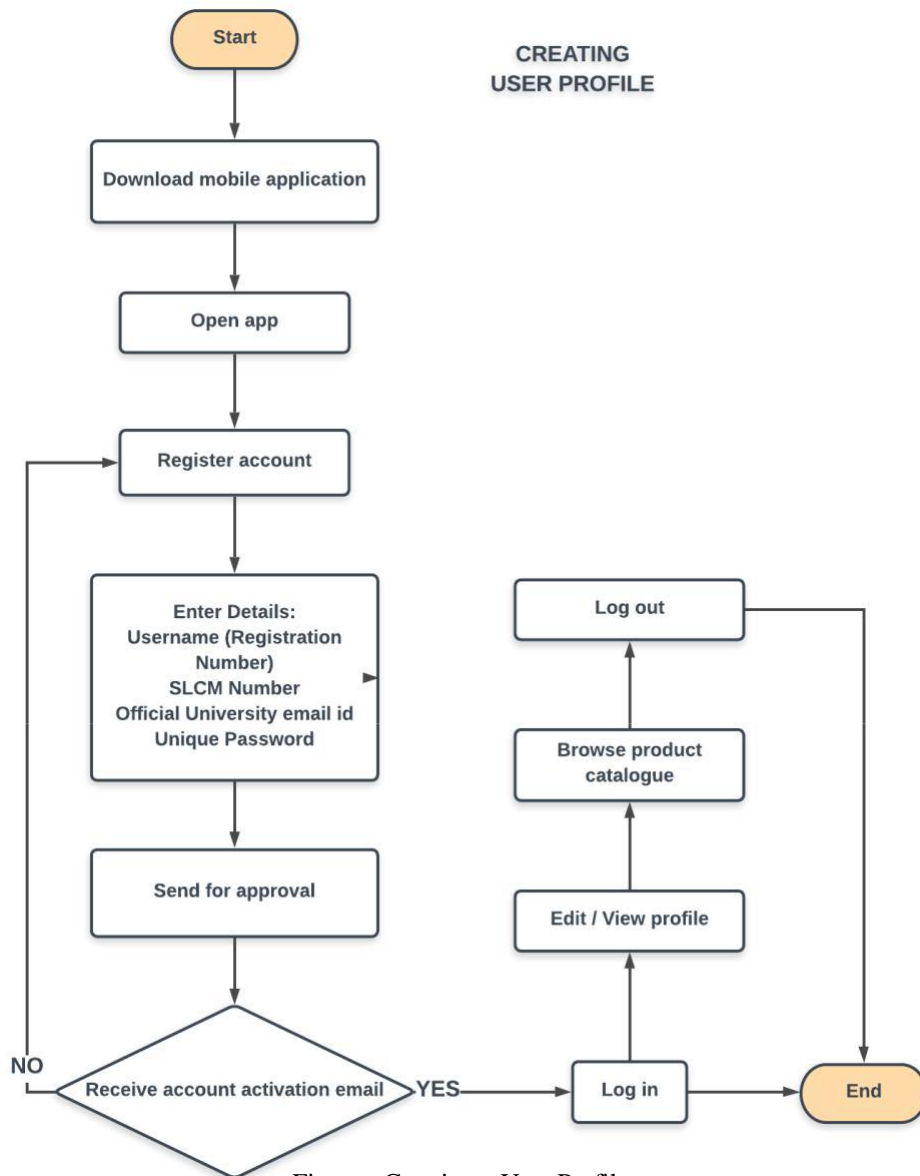


Figure : Creating a User Profile

Product catalog features:

- a. Search for books
- b. Books can be searched for using topics of interest in the search bar or filters can also be applied
- c. Filters can be on the category of university programs offered, courses, semester or even most borrowed by other users.
- d. When viewing a specific book, the books front cover, author name, short description, reference number, ISBN number, number of books currently available, and other necessary details of the book will be present.
- e. If the product is a focus booth then focus booth number, the number of seatings available, and a picture of the booth along with its availability slots will be viewable

Product catalog can be browsed to check for product availability and stock. The product can even be borrowed is available by placing it into the cart. When the user checks out, they shall receive a unique token number. This token number is generated not only for the student but for the library administrator as well.

The unique token number should then be generated by the student to the library front desk within the next 24 hours for the user to be able to borrow the book/s. On presenting the token to the library administrator, the user will immediately receive the books borrowed via the mobile application. However, if the user fails to present the token within the next 24 hours, the token number will expire, and the products stock availability will be updated and made available once again on the product catalog. If the product is not available, it can be reserved by the user. When products are reserved students are notified when the product is available once again.

Some of the cart features include:

- a. Books added to cart are saved in the cart for the next 24 hours, after which the cart will be emptied again.
- b. Adding any products to the cart does not mean the product will be reserved for the user.
- c. If another user checks out with the product, while it is still in the cart of another user, the product will be removed from the second user's cart.
- d. If some products in the product catalog go through a stock update, this does not affect the product added to cart i.e. the cart will not be emptied. Only the stock availability numbers will be updated.

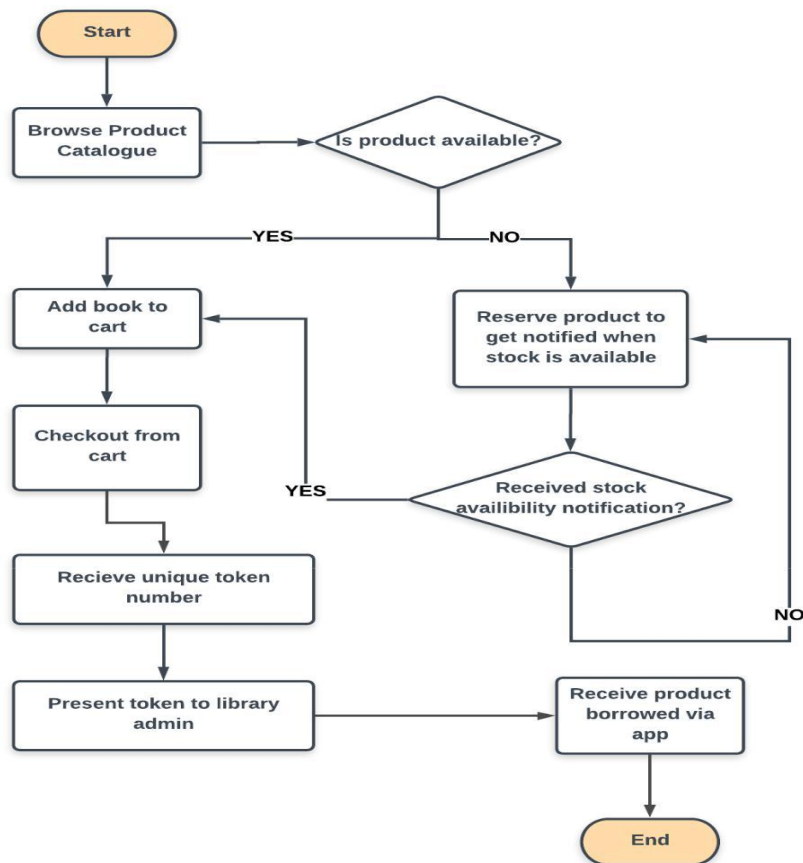


Figure: E-commerce Style Checkout Cart

Focus booth can also be booked online. Users can view the focus booth time slots available and select a favorable time slot. If a student wishes to renew the same focus booth, the next available time slot will be reserved for them. So if the next available time slot is after 2 hours, the user can return to the focus booth after 2 hours but has to leave until then as other users have already booked the next 2 slots.

Or the user can view the availability of the other focus room for the next immediate time slot by entering the required details through the filters.

IX. Discussion

This research papers focus is to conduct the research on the current technological trends in the library management system and recommend a new system that will help enhance and improve the user experience in the Library. However, I would also like to recommend and suggest how some of the crucial stages should be carried out if ever a university or the reader wishes to develop this project.

In order to conduct this research, the agile methodology was used. And if this idea is to be implemented, using agile product development life cycle is recommended. The agile methodology will give the development team the flexibility to make changes as agile allows the team to focus on iterative processes. This method of development makes sure that the whole project does not have to be changed or redone in case of any errors in a certain stage of the development process. Instead, only the specific stage needs to be focused on and troubleshoot. Development stage will mainly consist of creating the mobile application framework using vb.net, product catalog database framework using SQL Server databases, user interface development e-commerce application development using Microsoft Commerce Server and backend report generation integration into the main application using Crystal Reports by SAP.

Following is a sample development and implementation process recommendation, divided by stages, with feedbacks after every stage.

Discussion

Using the proposed virtual library mobile application, students will have access to:

- a. Mobile Application
 - i. Access to library functions, regardless of location
 - ii. Interactive E-commerce style check out cart system for borrowing and reserving products
 - iii. Store books in check out cart for up to 24 hours
 - iv. Unique token generation system allowing users to borrow and return books with added 24/48 hour leeway periods
- b. Online Product Catalogue
 - i. Check product stock availability and number of products available
 1. Borrow, renew or reserve product depending on availability
 2. View books based on filters like:
 - a. university program specific,
 - b. course specific,
 - c. semester-specific,
 - d. most borrowed books,
 - e. highly rated books,
 - f. top picks of the month selected exclusively by library administrators and university professors.
 3. View history of books borrowed and late fines if any.
- c. Notification System
 - i. Due date approaching notification
 - ii. Product back in stock notification
 - iii. Late fee fine notification
- d. Exclusive online community
 - i. Rate books and leave comments.
 - ii. Encourage discussions between users
 - iii. Create separate handles to discuss technical issues or queries with library administrators.
- e. Main Functionalities exclusive to the administrator:

- i. Update product catalog
- ii. Administer and accept/deny product borrowing, renewal, booking requests.
- iii. Monitor and manage late fines, if any.
- iv. Monitor and respond (If required) to comments and user queries

X. Result

The library is an important and irreplaceable part of any educational institution. It enlightens its user with knowledge and resources for research projects, thesis, and other academic endeavors. However, in today's day and age technology seems to be taking a forefront. Users appreciate and learn more towards e-library systems that make books available online without the need to physically borrow the book from the library. It is mainly the ease of use and time saved that users are appreciative of.

Technological advancements are and will be impossible to avoid. It is necessary for organizations to adapt to this change, listen to the consumer and create or adapt their systems according to the recent trends and demands of the consumer. However, with most facets of educational institutions becoming more and more digitized, many have raised concern over the preservation of the traditional touch to these systems. It is here that one needs to strike a balance. There is no avoiding the technological boom that the world is going through, and will keep doing so for generations to come. It is necessary in the wake of this technical wave, to create systems that incorporate these technical advancements while keeping the traditional touch in place.

The suggested virtual library mobile application for library system aims to do exactly that. To implement an advanced system into the library, that users will appreciate using, while at the same time-solving user constraints with the current system. The proposed system tries its best to keep the traditional touch as students still have to visit the library to receive the borrowed books, return the books, use the focus booths and other library provided devices. The proposed system will also encourage others to use the library system often due to the ease of access and convenience factor. All in all, the virtual library mobile application is an advance and unique system, with an aim to seamlessly integrate the traditional library with recent technologies and tries its best to accommodate the requirements of both the librarians as well as its users.

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