**Stanford University Library Management System (LMS)**

**A group of people in a library

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**Introduction:**

Stanford University is a private research university in California. The university was founded in 1885 and as of today, 83 Nobel laureates, 28 Turing Award laureates, and 8 Fields Medallists have been affiliated with Stanford as students, alumni, faculty, or staff.

For the benefit of the students, Stanford started its library in 1885. The library at Stanford was housed in one large room capable of accommodating 100 readers. The library also grew as the university grew to enroll more than 20,000+ students each year. Today the library boasts of having more than 4 million books in it.

**Purpose of the project:**

The paper-based maintenance, organizing, and handling of countless books became a nightmare. The university wanted library management software to automate its library activities. Using the software one can find books with a click, issue/reissue books quickly, and it will manage all the data efficiently using this system. It also provides immediate and accurate information regarding any type of book, magazine, or research paper, saving time and effort.

**Business analysis core concept model (BACCM) as per BABOK guide:**

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|  |  |
| --- | --- |
| **BA Core Concept** | **Description related to business** |
| **Need** | * A lot of time is wasted managing the library manually. * The number of employees needed to manage the library is high. * No reports could be generated on books issued due to the manual system. * It is difficult to manage the 4 million books present in the library. * The fine calculation is a tedious and time-consuming affair.   Students could deposit the books only in the library timings. |
| **Change** | * Switching from a manual library management system to a software-based library management system to manage and organize 4 million books for library staff and helping 20,000+ students with better facilities in the library. * An automated system to issue and return books with a click. |
| **Solution** | * The university wanted a Library Management Software to automate their library’s activities. Using the software one can find books with a click, issue/reissue books quickly, and it will manage all the data efficiently using this system. It also provides immediate and accurate information regarding any type of book, magazine, or research paper, saving time and effort. |
| **Contexts** | * An increase in inventory of 4 plus million books and providing facilities to 20K+ students is challenging. * Staff manual work for calculating late return fees and creating reports is burdensome. * The current manual system is not ideal for students who need access to E-books and to track the desired books only in library timings. |
| **Value** | LMS software-based system will help:   * Student's engagement with the library increases without time limitations. * Search for books, magazines, and Journals will be more convenient. * To maintain data accurately and keep records and reports up to date. * Fine calculation will be easier and more accurate. * Manual effort will be reduced, and productivity of staff will be increased. |
| **Stakeholders** | **Internal stakeholders:**   * Library staff and library manager (DSME) * Developer (ISME) * Operations staff * Tester   **External stakeholders:**   * Students * Faculty * Vendors * Book suppliers * University management   **Simplilearn Business Analyst** |

**Identifying stakeholders (RACI Matrix):**

* **Responsible (R):** The persons who will be performing the work on the task.
* **Accountable (A):** The person who is ultimately held accountable for the successful completion of the task and is the decision maker. Only one stakeholder receives this assignment.
* **Consulted (C):** The stakeholder or stakeholder group who will be asked to provide an opinion or information about the task. This assignment is often provided to the subject matter experts (SMEs).
* **Informed (I):** A stakeholder or stakeholder group that is kept up to date on the task and notified of its outcome. Informed is different from Consulted as with Informed the communication is one-direction (business analyst to stakeholder) and with Consulted the communication is two-way.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Stakeholders** | **Responsible** | **Accountable** | **Consulted** | **Informed** |
| Business Analyst | **R** |  |  |  |
| Project manager | **R** |  |  |  |
| Library manager (DSME) |  | **A** | **C** |  |
| Technical team (ISME) | **R** |  |  |  |
| Students |  |  |  | **I** |
| Faculty |  |  |  | **I** |
| Regulator | **R** |  |  |  |
| Library staff | **R** |  |  |  |
| Tester | **R** |  |  |  |
| Sponsor |  |  | **C** |  |

**Identifying the problem statement in this system:**

Stanford University has 4 million books and 20,000 plus students at present and usage of the library has increased tremendously. As a result, the paper-based system couldn’t organize and maintain countless books and accommodate increased students. Many issues with time management and storage, manual work, and accessibility have been raised. This scenario is best explained with a fishbone diagram to demonstrate the concept of **Root cause analysis.**

Storage

Students and staff

Students issue/return books Difficult to locate a required book

Fine calculation manually by staff Wastage of space to maintain

Manual library system

More effort for generating reports manual documents

Operational time of the library is limited Maintaining records for 4m books

is difficult

A lot of time wasted in manual More staff required to manage

records maintenance records

Long queues for students

Book management

Time

**Identifying advantages of the new library system:**

To overcome the failure of the library's manual system, the idea of a **library management system (LMS)** has been proposed.

**Advantages of library management system software:**

* Reduce overheads and increase the productivity of library staff.
* Cost reduction.
* Up-to-date records of all books, research papers, magazines, and other materials available in the library.
* Improve student engagement in the library.
* It will generate dynamic reports for better decision-making.

**Benefits of using library management software system (LMS)**

Increase productivity & less manual effort of staff

24/7 access to students

Highly secure and reliable

Generating dynamic reports

Boosts student engagement

Up-to-date records of books/journals/magazines

**Create as-is and future process map (using flowcharts):**

**As-in process:**

**A diagram of a work flow

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**Future-state process:**

**A diagram of a student's work flow

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**Main features that need to be developed:**

* Students/staff should be able to register or log in with credentials.
* The LMS should keep records of different categories of material available in the library like books, magazines, research papers, journals, and newspapers.
* The books should be classified subject-wise in the software.
* Each category like books, magazines, research papers, journals, and newspapers will have different issuing periods. For example, a book can be issued for 3 weeks but a magazine only be for 1 week. Newspapers cannot be issued for use outside the library and so on.
* Every reading material available shall have an RFID tag on it. The record of the same will be stored in the database. For each reading material record information like author, book name, publisher name, book edition, date and year of publication, cost of the book, and date of purchase of the book.
* When a student wants a reading material from the library, they will select the material and go to the checkout counter. The library staff will use an RFID reader to capture the details of the book. The student's name is tagged along with the book they borrowed.
* The system will record the issue date and return date of the book.
* System shall do an automatic calculation of fines in case of delayed return of books.
* Library staff should be able to search for books on the LMS by search criteria like the name of the book or author.
* Should be able to access the library system online to know the return date. They should be able to access it via the web or mobile interface.
* The system shall send automated emails to the students 3 days before the return date to avoid a late return of books.
* Access to free e-journals and e-books through the software.
* Anti-theft detection: RFID readers are placed at the exit gate of the library and the RFID reader tracks books to a range of 2 meters and would trigger the alarm with a loud sound in case anyone tried to pass through the gate with an unissued book.
* Book drop box stations to be installed outside the library: Students can return books at any time in the RFID-enabled book drop box station. The student’s loan is immediately cancelled once the student deposits the book in the drop box.

**In-scope and out-of-scope items for this software:**

**In-scope requirements**

**In-In-scope**

**Out-of-scope requirements**

Students and staff information access

Fine calculation feature for late returns

Books classification subject-wise and easy database maintenance

Auto-generated reports for library management on daily basis

Issue receipt emails and reminder texts for return/re-issue

Books for sales/donations

Books issue without records or theft/stolen

Access to outside users and user without login credentials

Availability status of desired books for registered users

Install RFID sensors and RFID tags on all books/Journals/magazines/papers

LMS software should be a user-friendly interface and self-explanatory

**Data flow diagram for the system:**

A diagram of a library management system

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**ER diagram for the library management system (LMS):**

**A diagram of a data flow

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**Functional and Non-functional requirements for LMS (In a business sense)**

**Functional requirements:**

**User registration:**

* Users should be able to log in and register into LMS.
* Students should be able to access the library system online to know the return date. They should be able to access it via the web or mobile interface.

**Books management:**

* The LMS should keep records of different categories of material available in the library like books, magazines, research papers, journals, and newspapers.
* The books should be classified subject-wise in the software.
* Each category like books, magazines, research papers, journals, and newspapers will have different issuing periods. For example, a book can be issued for 3 weeks but a magazine only be for 1 week. Newspapers cannot be issued for use outside the library and so on.
* Every reading material available shall have an RFID tag on it. The record of the same will be stored in the database. For each reading material record information like author, book name, publisher name, book edition, date and year of publication, cost of the book, and date of purchase of the book.
* Library staff should be able to search for books on the LMS by search criteria like the name of the book or author.

**System management:**

* The system will record the issue date and return date of the book.
* System shall do an automatic calculation of fines in case of delayed return of books.
* The system shall send automated emails to the students 3 days before the return date to avoid the late return of books.
* Access to free e-journals and e-books through the software.
* Anti-theft detection: RFID readers are placed at the exit gate of the library and the RFID reader tracks books to a range of 2 meters and would trigger the alarm with a loud sound in case anyone tried to pass through the gate with an unissued book.
* Book drop box stations to be installed outside the library: Students can return books at any time in the RFID-enabled book drop box station. The student’s loan is immediately cancelled once the student deposits the book in the drop box.

**Reporting and analytics:**

* Generating reports of records with books issued/returned, and amount of fine collected.
* Number of lost books
* Report on total number of books, journals, etc.
* Age of books, that is, which books are more than 20 years old. College generally would prefer not to have very old books since new versions come up every few years.

**Non-functional requirements:**

**Usability – The** LMS system should be self-explanatory and user-friendly.

**Performance-** The system should be able to accommodate more than 20,000 users.

**Scalability-** The system should be capable of handling with increase in student count in the future without a significant impact on performance.

**Reliability-** The system should be reliable and scalable with regular back-ups and minimize the occurrence of system failures.

**Compatibility-** The system should be capable of both Windows and MacOS users. It should be RFID ready and needs an active internet who is using it.

**Privacy and Security-** The system should implement security measures to protect students' and staff confidentiality.

**Wireframes or Mock screens:**

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