**Library Management System**

**Requirements Specifications**

CSCE 3513 – Software Engineering

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**Introduction**

The Library Management System’s (LMS) purpose is to decrease the amount of administrative and logistical overhead created when operating a library. The LMS is targeted toward smaller libraries whose entire collection is close to 2,000 books.

This document lays out the requirement specifications for the LMS. First, basic terms are defined to ensure the clarity of what this document describes. These definitions are followed by user stories describing the expected behavior of the LMS. Next, the system requirements which describe the operations and processes that are needed to accomplish the functionality described by the user stories are listed. Lastly, the nonfunctional requirements which describe the policies, performance requirements, and operating environment that the LMS should follow are listed.

**Definitions**

Below are some basic definitions which are used throughout this document.

1. *Administrator* – Someone who manages the overall operation of the library. There is only one administrator per library.
2. *Book’s Status* – Refers to whether a book is currently checked-out or is in-house.
3. *Checked-out* – A book is considered “checked-out” if it is still part of the library’s collection; however, it is not on the shelf and in the possession of a patron.
4. *In-house* – A book is considered “in-house” if it is part of the library’s collection and is currently on the library’s shelves.
5. *Librarian* – An employee working at a library.
6. *Library’s Collection* – All books which belong to the library regardless if they are currently checked-out to a patron.
7. *LMS* – Library Management System. Usually referring to the application as a whole.
8. *LMS failure* – An event where the LMS does not respond within the expected time frame, or does not produce the expected output.
9. *Patron* – One who uses the library’s services.
10. *Workstation* – A desktop program which allows librarians and administrators to perform their specific tasks.

**User Stories**

Below are all user stories that are relevant to the LMS divided into three major categories: Patron, Librarian, and Administrator. Each section contains stories that explain how users in all three roles should interact with the LMS.

Each user story has four basic metrics used to reference it throughout the rest of the documentation: Number, Name, Priority, and Effort Required. The “Number” metric is used throughout the documentation to refer to a specific user story. For example, “*US 2.1*” refers to the first user story of the second category. The “Name” metric gives a short synopsis of what function the user story describes. The “Priority” metric indicates the priority placed on fulfilling the functionality described by the story. Finally, the “Effort Required” metric describes how long an ideal user should spend completing the tasks described by the story. For example, if the “Effort Required” is 0.25 then the user should be able to complete the task in 0.25 hours or 15 minutes.

1. Category: Patrons
   1. Name: Check availability of a book

Priority: 1

Effort Required: 0.03 hrs.

Description: A patron wants to see if the library is in possession of a particular book. If the book is in the library’s collection, the LMS should return a webpage with information regarding the book. The information returned should consist of: title, author, ISBN, and number of patrons who have “liked” or “disliked” the book. If the book is currently on loan to another patron, the current patron may want to be put on a waiting list which will automatically reserve that book for them when that book becomes available again.

* 1. Name: Manage basic patron functions

Priority: 1

Effort Required: 0.17 hrs.

Description: A patron wants to manage their account functions through their web browser. These functions include: logging in to their account, changing their passwords, allowing email notifications, see any late fees/fines, view currently checked out books and the see the amount of time left before having to return a book.

* 1. Name: Creation of patron accounts

Priority: 1

Effort Required: 0.25 hrs.

Description: A patron would like to create an account on the library website. The patron should be able to choose a unique username and password and provide an email address for verification. After this account is created, the patron should be able to access the LMS features requiring a user account.

* 1. Name: A review system for books

Priority: 3

Effort Required: 0.01 hrs.

Description: A patron has recently read a book and would like to submit a review for it. The patron should be able to log on to the library website, navigate to this book and press a “like” or “dislike” button. This will add to a “like tally” and “dislike tally” for every book in the library’s collection. The LMS should keep track of what books the patron has liked and disliked and the patron should be able to alter their review if they so choose.

1. Category: Librarians
   1. Name: Obtain information regarding a specific book.

Priority: 1

Effort Required: 0.01 hrs.

Description: A librarian would like to gather information regarding a specific book using its ISBN. Once found the librarian is shown of the book’s title, author, status and shelf-location. If the book is not in the library’s collection, the librarian will be notified by the application.

* 1. Name: Check-out books to a patron

Priority: 1

Effort Required: 0.01-0.09 hrs.

Description: A librarian would like to be able to check out books to patrons using the librarian’s workstation. During the check-out process, the librarian may view any other items which are checked-out to this patron. The librarian may only check the book out if it has not been reserved for another patron. If the book is checked-out to the patron, this change should be reflected in the library’s database, so both librarians and patrons may know if a specific book is currently on the library’s shelves.

* 1. Name: Mark books returned by patron as in-house

Priority: 1

Effort Required: 0.01 hrs.

Description: A librarian has a stack of books which have been returned by several patrons and need to be marked as in-house. The librarian will enter the ISBN for each book, and the LMS will change the status of each book. This allows other librarians and patrons to see that the book is in-house when searching for the book in the library’s collection.

* 1. Name: Accept patron’s payment of fines/fees

Priority: 1

Effort Required: 0.05-0.09 hrs.

Description: A patron would like to pay a fine/fee which is charged to their account. To do so, a librarian should first request the current status of the patron’s account to determine the value of the fine/fee. After receiving a cash payment from the patron, the librarian can then remove the fine from the patron’s account.

* 1. Name: Add new books into the library’s database

Priority: 1

Effort Required: 0.09-0.17 hrs.

Description: A librarian would like to be able to add recently purchased books to the library's database. They should be able to enter the books’ ISBN number and the system should pull information such as title, and author from the Internet and save that data into the library’s database. If the information cannot be gathered automatically, the librarian should be able to enter the books information manually through the application.

* 1. Name: Change librarian’s password

Priority: 1

Effort Required: 0.05 hrs.

Description: A librarian would like to change their password which they use when logging-in to their workstation. To authenticate themselves, the librarian should first enter their current password before being allowed to create a new password. After completing the process, the new password should be effective immediately, and the old password should no longer be valid for that librarian.

1. Category: Administrator
   1. Name: Add a librarian accounts

Priority: 2

Effort Required: 0.2 hrs.

Description: The administrator would like to add a new librarian account for a newly hired librarian. The administrator should supply the name of the new librarian, and the LMS should create a librarian account under that name.

* 1. Name: Remove librarian accounts

Priority: 2

Effort Required: 0.2 hrs.

Description: The administrator would like to remove the account of a librarian who no longer works at the library. The administrator should enter the name of the librarian and request the account be removed. After confirming that they wish to complete this action, the librarian’s account and data should be permanently removed from the LMS.

* 1. Name: Setup late fees and fines

Priority: 2

Effort Required: 0.25 hrs.

Description: The administrator would like to configure the system to charge a certain amount of money per day for late fees/fines. Once these rates are set, the system should keep track of the amount of money owed for each late book for each patron.

* 1. Name: View library’s activity

Priority: 3

Effort Required: 0.10 hrs.

Description: The administrator would like view the library’s activity for the current day, previous seven days, or the previous thirty days. The administrator may request to view the following activity measures: total number of books in the collection, number of books in-house, number of books checked-out, total sum of fines/fees owed by patrons, total sum of fines/fees paid by patrons, and librarians employed by the library.

* 1. Name: Change administrator password

Priority: 1

Effort Required: 0.05 hrs.

Description: An administrator would like to setup or change their password which they use when logging-in to their workstation. To authenticate themselves, the administrator should first enter their current password before being allowed to create a new password. After completing the process, the new password should be effective immediately and the old password should no longer be valid for the administrator.

**System Requirements**

Below are the system requirements, which specify the actions which the LMS needs to execute to fulfill the user stories previously described.

Each system requirement has four basic metrics used to explain its purpose: Number, Name, Priority, and Fulfills. The “Number” metric is used throughout the documentation to refer to a specific system requirement. For example, “*SR 2.1*” refers to the first system requirement of the second category. The “Name” metric gives a short synopsis of what function the requirement describes. The “Priority” metric indicates the value of the highest priority user story which depends on the given requirement. Lastly, the “Fulfills” metric indicates which user story this requirement fulfills.

1. Category: Patrons
   1. Name: Check availability of a book

Priority: 1

Fulfills: US 1.1

Expected Steps:

1. The patron navigates to the library website using a web browser.
2. The patron searches for a book using its title, author and/or ISBN. This query is sent to the LMS book database and returns a webpage with information regarding the book including:
   1. Title of the book.
   2. Author of the book.
   3. ISBN of the book.
   4. Number of patrons who have “liked” the book.
   5. Number of patrons who have “disliked” the book.
3. If the patron submits a request to be put on a waiting list for the book, the LMS should update its database to reflect this and email the patron when the book is available if the patron has enabled email notifications.

If the query does not locate the book in the database, an error message should be sent to the user indicating that the query is either incorrect or the book is not in the library’s collection.

If the patron does not have an account in the LMS, the LMS should not allow the patron to place a reserve on a book. Instead it should prompt the patron to create an account or login to an existing account.

* 1. Name: Manage basic patron functions

Priority: 1

Fulfills: US 1.2

Expected Steps:

1. The patron navigates to the library website using a web browser.
2. The patron logs in to the LMS website using their username and password. The LMS authenticates this log in attempt by comparing the password entered with the password for the specified username.
3. The patron navigates to the “Patron Information” section. The patron can then view:
   1. Any books currently checked-out to them
   2. Due dates for books checked out to them
   3. Any late fines/fees charged to their account
   4. Any books that they currently have on reserve.
4. If the user wishes to change their account settings they may do so by navigating to the “Patron Settings” section. From here they may change:
   1. Their password used to login to the LMS
   2. The email address to which notifications are sent
   3. Their preference to allow or disallow email notifications

If the patron enters an invalid username and password combination, they should be notified with an error message and prompted to renter their credentials.

* 1. Name: Creation of patron accounts

Priority: 1

Fulfills: US 1.3

Expected Steps:

1. The patron navigates to the library website using a web browser.
2. The patron navigates to the “Create an account” section.
3. The patron enters a username, password, and email address into the LMS.
4. The LMS verifies that the username is not taken and sends a verification email to the provided email address.
5. The patron navigates to the link contained in the verification email.
6. The patron will then be logged in to the library website as the newly created patron account.

If the username is already taken, or the email address is invalid, an error will be displayed and the patron will be asked to enter valid information.

* 1. Name: A review system for books

Priority: 3

Fulfills: US 1.4

Expected Steps:

1. The patron navigates to the library website using a web browser.
2. The patron logs in to the LMS website using their username and password. The LMS authenticates this log in attempt by comparing the password entered with the password for the specified username.
3. The patron searches for a book using its title, author and/or ISBN. This query is sent to the LMS book database and returns a webpage of information regarding the book.
4. The user presses the “like” or “dislike” button on the book’s web page. The LMS saves this to the “like tally” and “dislike tally” for the selected book and adds this book to the list of books reviewed by the user.

If the patron enters an invalid username and password combination, they should be notified with an error message and prompted to re-enter their credentials.

If the query does not locate the book in the database, an error message should be sent to the user indicating that the query fields are either incorrect or the book is not in the library’s collection.

1. Category: Librarians
   1. Name: Obtain information regarding a specific book using an ISBN

Priority: 1

Fulfills: US 2.1

Expected Steps:

1. The librarian will login to their workstation.
2. Librarian will supply an ISBN and ask the LMS to search its database.
3. The LMS will then query its database using the provided ISBN to determine if the book is in the library’s collection.
4. The librarian should then be given the following information regarding the book:
   1. The book’s title
   2. The book’s author
   3. The book’s ISBN
   4. The book’s status
   5. The book’s location on the shelf

If the book is checked-out, the date at which it due to be returned should be given to the librarian in addition to the information given in 4.

If the query does not locate the ISBN in the database, an error message should be sent to the librarian indicating that the ISBN is either incorrect or the book is not in the library’s collection.

* 1. Name: Check-out books to a patron

Priority: 1

Fulfils: US 2.2

Expected Steps:

1. The librarian will login to their workstation.
2. A librarian will supply the LMS with the name of the patron who wishes to check-out the books.
3. The LMS will query its database of patrons and display any other books currently checked-out to the given patron.
4. The librarian will then enter the ISBN number of the books which the patron wishes to check-out.

If the patron’s account cannot be found by the LMS, an error will be shown indicating that no account exists under that name.

A patron should not be allowed to check-out a book which another patron has placed on reserve, and the librarian checking the books out to the current patron should be notified via an error message.

* 1. Name: Mark books returned by patron as in-house

Priority: 1

Fulfills: US 2.3

Expected Steps:

1. The librarian will login to their workstation.
2. Librarian will supply an ISBN and indicate to the LMS to mark the book as in-house
3. The LMS will query its database and mark the book as in-house

If the ISBN cannot be found in the LMS’ database, the librarian should be notified via an error message.

* 1. Name: Accept patron’s payment of fines/fees

Priority: 1

Fulfills: US 2.4

Expected Steps:

1. The librarian will login to their workstation.
2. Librarian will supply the LMS with the patron’s name.
3. The LMS will query its database and return the patron’s account information which includes:
   1. The patron’s name
   2. Any books checked-out to the patron
   3. The total amount of fines/fees charged to the patron in dollars
4. The librarian enters the amount which the patron has paid in cash and asks the LMS to deduct that value from the total amount owed by the patron.
5. The updated fine/fee total should be returned the next time the patron’s account is viewed by the patron, librarian, or administrator.

The librarian should not be allowed to proceed and given an error if the patron’s name is not found or the patron pays an amount greater than the total fine/fee charged to their account.

* 1. Name: Add new books into the library’s database

Priority: 1

Fulfills: US 2.5

Expected Steps:

1. The librarian will login to their workstation.
2. Librarian will supply the LMS with the ISBN of the book and indicate that it needs to be added to the library’s collection.
3. The LMS will attempt to determine the book’s title, author, and publication date using the ISBN API available through Google.
4. Upon determining the book’s information the LMS will display what it has found and ask the librarian to confirm the data’s truthfulness.
5. After obtaining the librarian’s approval, the book will be added to the LMS database.

If the book’s information cannot be determined automatically by use of the Google API, the librarian will be prompted to manually enter the book’s title, author, and publication date.

* 1. Name: Change a librarian’s password

Priority: 1

Fulfills: US 2.6

Expected Steps:

1. The librarian will login to their workstation.
2. The librarian will indicate to the LMS that they wish to change their password.
3. The LMS will request that the librarian enter their current password.
4. Provided that the information provided to the LMS matches the information stored in the LMS’ database regarding the given librarian, the LMS will request the librarian enter the new password.
5. The LMS will then update its database to reflect the password change for this librarian.
6. The password change should be effective immediately after the process is complete, and the old password should be invalid for the given librarian.

If the information provided to the LMS does not match any librarian in the LMS’ database, an error message should be given to the user indicating that the information is invalid, and the entire process should be cancelled.

1. Category: Administrator
   1. Name: Add a librarian account

Priority: 2

Fulfills: US 3.1

Expected Steps:

1. The administrator will login to their workstation.
2. The administrator will supply the LMS with the name of the librarian they wish to add along with a password to be used by the new librarian.
3. The LMS will then create a new librarian account with the information supplied by the administrator.
4. The new librarian should be shown in the list of librarians currently employed.

If a librarian already exists in the LMS with the same name as the new librarian, the administrator should be given an error indicating that the name is already taken and asked to enter a different name.

* 1. Name: Remove a librarian account

Priority: 2

Fulfills: US 3.2

Expected Steps:

1. The administrator will login to their workstation.
2. The administrator will supply LMS with the name of the librarian they wish to remove.
3. The LMS will then ask the administrator to confirm that they would like to remove the librarian from the LMS.
4. Upon confirmation from the administrator, the LMS will then remove all data pertaining to the given librarian from its database.
   1. Name: Setup late fees and fines

Priority: 2

Fulfills: US 3.3

Expected Steps:

1. The administrator will login to their workstation.
2. The administrator will supply the LMS with the daily rate (in cents-per-day) at which fines/fees are charged to a patron who is late returning a checked-out book.
3. The LMS will then save this rate to apply it throughout the other uses of the LMS.
4. Any change the administrator makes should be reflected when librarians and patrons view a patron’s account to determine if any late fines/fees have been charged to that account.

If the administrator enters a negative value for the daily rate at which fines/fees are charged, the administrator should be given an error message indicating that this is not allowed and be asked to enter a value which equal-to or greater-than zero.

* 1. Name: View library’s activity

Priority: 3

Fulfills: US 3.4

Expected Steps:

1. The administrator will login to their workstation.
2. The administrator will indicate to the LMS that they would like to view the library’s activity.
3. The LMS will ask which of the following measures of activity the administrator would like to view:
   1. Total number of books in the library’s collection
   2. Total number of books in-house
   3. Total number of books checked-out
   4. Total sum of fines/fees owed by patrons
   5. Total sum of fines/fees paid by patrons
   6. Total librarians employed
4. After indicating which measure to view, the administrator will be shown the values for the given measure for the current day, the previous seven days, and the previous thirty days.
   1. Name: Change the administrator password

Priority: 1

Fulfills: US 3.5

Expected Steps:

1. The administrator will login to their workstation.
2. The administrator will indicate to the LMS that they wish to change their password.
3. The LMS will request that the administrator enter their current password.
4. Provided that the information provided to the LMS matches the information stored in the LMS’ database regarding the given librarian, the LMS will request the administrator enter the new password.
5. The LMS will then update its database to reflect the password change for this administrator.
6. The password change should be effective immediately after the process is complete, and the old password should be invalid for the given administrator.

If the information provided to the LMS does not match any administrator in the LMS’ database, an error message should be given to the user indicating that the information is invalid, and the entire process should be cancelled.

**Nonfunctional Requirements**

Below are the nonfunctional requirements for the LMS which specify requirements which are not directly related to the system’s interaction with a specific user story.

1. Category: Product
   1. Usability
      1. Patrons should be able to access their account information 24 hours a day via the library’s website.
      2. The LMS should be available to the librarians and administrators during the library’s normal hours of operation.
      3. Librarians should be able to fully utilize the LMS after 2 hours of training.
      4. Administrators should be able to fully utilize the LMS after 4 hours of training.
      5. Patrons should be able to create an online account within 15 minutes. After account creation, patrons should be able to utilize the internet features of the LMS with no formal training.
   2. Performance
      1. Under the circumstances that the LMS is allowed to operate on a dedicated server which meets the environmental nonfunctional requirements specified in this document, the LMS should handle requests from up to three librarian workstations and respond to any requests from the library’s website within a five second window of the response time specified in the user stories.
   3. Dependability
      1. Should the LMS fail, all records in its databases regarding the library’s collection and patron’s account information should be preserved.
      2. Provided the LMS failure was not due to a hardware failure or a failure beyond the control of the LMS, the LMS should be operational within an average of 30 minutes.
   4. Security
      1. The privacy and integrity of a patrons’ data should be preserved throughout any failures of the LMS.
      2. A patron’s account data should only be viewed by the given patron. Administrators and librarians may only see a patron’s information during the check-out process or when the patron is paying a fine/fee.
      3. Logging into patron accounts via a web page will require the patron to submit their username and password for validation by the LMS.
      4. Librarians and administrators using the LMS shall authenticate themselves using unique usernames and passwords.
      5. Sensitive information (such as usernames, passwords, and email addresses) will be encrypted by the LMS before being transmitted.
2. Category: Organizational
   1. Environmental
      1. The operation of the library’s website should be consistent across the Internet Explorer 11, Mozilla FireFox version 35, and Google Chrome version 40 web browsers.
      2. The workstations used by librarians and administrators should operate correctly using Java 8 and the Windows 7 operating system.
      3. The webserver and databases used for the LMS should be compatible with Ubuntu 12.04 and consume no more than 1 GB of disk storage or 512 MB of RAM at a given time during its operation.
   2. Operational
      1. Librarians and administrators share the same workstation software. When a particular librarian or administrator would like to use a workstation, they should login using their name and a password. Upon leaving the workstation the librarian and administrators should be allowed to logout of the workstation
      2. All passwords maintained by the LMS should remain private and may not be viewed by any librarian or administrator at any time.
3. Category: External
   1. Ethical
      1. The LMS should observe the privacy of a patron’s information given to it. As stipulated in the American Library Association (ALA) [Library Bill of Rights](http://www.ala.org/advocacy/intfreedom/librarybill/interpretations/privacy), “Libraries should not share personally identifiable user information with third parties or with vendors that provide resources and library services unless the library has obtained the permission of the user or has entered into a legal agreement with the vendor. Such agreements should stipulate that the library retains control of the information, that the information is confidential, and that it may not be used or shared except with the permission of the library.”