Systems Analysis

and Design

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**Teamwork1 ver.2**

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**Introduction**

Our subject, The Library Management System, is mainly for the problems or functions you might meet or use when you are at the library. If you are not in the library, you still can use website to search book information. And we focus on book, ignore other objects’ situations. (e.g. tablet, discussion room)

* On the basis of different user, they will get different authority.
* When users are in the library, the system will identify their identity by membership card;  
  when users are not in the library, the system will identify their identity by account and password.
* The system can’t trace back the records of books and members.

**Use case diagram**

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* Members can have self-borrowing-service (self-serve when borrowing books) or reading E-Books.
* The only things guests can do are searching book information or reading books in the library.
* Librarian can administrate data of all the books, E-books and memberships.
* Returning books must be done through the librarian.

**Use case description**

1. Search Book Information

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| --- | --- | --- | --- | --- | --- | --- |
| **Use Case Name:** | Search Book Information | **ID:** | 1 | **Importance Level:** | | Medium |
| **Primary Actor:** | User | **Use Case Type:** | | | Essential, Detail | |
| **Stakeholders and Interest:** | | | | | | |
| User – someone can search book and view book. | | | | | | |
| **Brief Description:** | | | | | | |
| This use case describes member and guest can search book in system. When they find any book want to know more. They can view that book. | | | | | | |
| **Trigger:** | User can search book and view data about it. | | | | | |
| **Type:** | External | | | | | |
| **Relationship:** | | | | | | |
| **Association:** | User | | | | | |
| **Include:** |  | | | | | |
| **Extend:** |  | | | | | |
| **Generalization:** |  | | | | | |
| **Normal Flow of Event:** | | | | | | |
| 1. If the user is guest, then press “Guest” button and go to step 4. 2. The user input account and password on the system. 3. The user press “Login” button.   If he inputs wrong account or password, then input it again.   1. The user clicks “Search-Book” button and executes search book process. 2. The user input keyword in system. 3. The user press “Start Search Button” to search book   If system doesn’t find the book id, then go to step 5.   1. The system will show book list about what user finds.   If user don’t want to view summary about book, then stop in show book list.   1. The user chooses book from book list. 2. The user view book’s summary he/she chooses,   If user want to search more book, go to step 4, else end search book. | | | | | | |
| **Sub Flow:** | | | | | | |
| S-1: | | | | | | |
| **Alternative / Exception Flow:** | | | | | | |
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1. Read E-Book

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| --- | --- | --- | --- | --- | --- | --- | --- |
| **Use Case Name:** | Read E-Book | **ID:** | 2 | | **Importance Level:** | | Medium |
| **Primary Actor:** | Member | | | **Use Case Type:** | | Essential, Detail | |
| **Stakeholders and Interest:** | | | | | | | |
| Member –The people who has been registered in the system and wants to read E-book. | | | | | | | |
| **Brief Description:** | | | | | | | |
| The member who wants to read E-book, and needs to login system to read E-book. | | | | | | | |
| **Trigger:** | Member wants to read E-book and click Read “E-Book” button. | | | | | | |
| **Type:** | External | | | | | | |
| **Relationship:** | | | | | | | |
| **Association:** | Member | | | | | | |
| **Include:** |  | | | | | | |
| **Extend:** |  | | | | | | |
| **Generalization:** |  | | | | | | |
| **Normal Flow of Event:** | | | | | | | |
| 1. The member input account and password on the system. 2. The member press “Login” button to login.   If he inputs wrong account or password, then go to step 1.   1. The member clicks “Read E-Book” button and executes read e-book process. 2. The member needs to input key word in system. 3. The member press start search button..   If system doesn’t find the book id, then go to step 4.   1. The system will show book list about what member finds.   If member don’t want to view summary about book, then stop in show book list.   1. The member chooses E-book from book list. 2. The member view E-book’s summary he/she chooses.   If member doesn’t want to read, stop in view E-book summary.   1. The member can read E-book’s context he chooses. 2. The system will show E-book’s context.   If member want to read more book, go to step 4, else end read E-book. | | | | | | | |
| **Sub Flow:** | | | | | | | |
| **Alternative / Exception Flow:** | | | | | | | |
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1. Borrow Book

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| --- | --- | --- | --- | --- | --- | --- |
| **Use Case Name:** | Borrow Book | **ID:** | 3 | **Importance Level:** | | High |
| **Primary Actor:** | Member | **Use Case Type:** | | | Essential, Detail | |
| **Stakeholders and Interest:** | | | | | | |
| Member –The people who has been registered in the system and wants to borrow paper book.  Librarian – The people who help member borrow books on system. | | | | | | |
| **Brief Description:** | | | | | | |
| The member who wants to borrow paper book, needs login system to borrow book. | | | | | | |
| **Trigger:** | Member wants to borrow paper book, then clicks the “Borrow Book” button. | | | | | |
| **Type:** | External | | | | | |
| **Relationship:** | | | | | | |
| **Association:** | Member, Librarian | | | | | |
| **Include:** |  | | | | | |
| **Extend:** |  | | | | | |
| **Generalization:** |  | | | | | |
| **Normal Flow of Event:** | | | | | | |
| 1. The user input account and password on the system. 2. The user press login button to login.   If he inputs wrong account or password, then input it again.   1. The member or librarian clicks “Borrow Book” button and executes borrowing process.   If librarian clicks button go to stepS-1;   1. The member or librarian needs to input book id in system. 2. The system will check book ID   If system doesn’t find book, then go to step 4.   1. The system will check book’s state.   If the book is unavailable, show book’s state message and go to step 4.   1. The system will check member’s state.   If member has overdue book, show member’s state message and end the function.   1. The system will alarm librarian does he really want to borrow this book?   If member want to borrow this book and press “Yes” button, then go to step 9.  If member doesn’t want to borrow this book and press “No” button, then end this function.   1. After member confirm borrow book, showing successful message. 2. The system will change book’s state to borrowed.   If the member wants to borrow other book, then go to step 4.  If the member completes borrowing book, then end function. | | | | | | |
| **Sub Flow:**  S-1: Librarian input member id go to step 4. | | | | | | |
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| **Alternative / Exception Flow:** | | | | | | |
| 1. If the member didn’t overdue any book, but the member’s state message tell you have overdue some book. Go to find librarian and solve problem. 2. If the member wants to borrow the book, but book state’s message tell this is overdue book. Please bring the book to find librarian. | | | | | | |

1. Return Book

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| --- | --- | --- | --- | --- | --- | --- |
| **Use Case Name:** | Return Book | **ID:** | 4 | **Importance Level:** | | High |
| **Primary Actor:** | Librarian | **Use Case Type:** | | | Essential, Detail | |
| **Stakeholders and Interest:** | | | | | | |
| Librarian – someone needs to handle return books. | | | | | | |
| **Brief Description:** | | | | | | |
| The use case describes when someone bring back book and the librarian should handle it. | | | | | | |
| **Trigger:** | Librarian handle return book. | | | | | |
| **Type:** | External | | | | | |
| **Relationship:** | | | | | | |
| **Association:** | Librarian | | | | | |
| **Include:** |  | | | | | |
| **Extend:** |  | | | | | |
| **Generalization:** |  | | | | | |
| **Normal Flow of Event:** | | | | | | |
| 1. The librarian input account and password on the system. 2. The librarian press login button to login.   If he inputs wrong account or password, then input it again.   1. The librarian clicks “Return Book” button to use return-book function. 2. The librarian needs to input book id on system. 3. The system will check book ID   If system doesn’t find book id, then go to step 4.   1. The system will check book’s state.   If the book state is overdue, reduce member’s number of overdue book, then go to step 7.  If the book state is borrowed, then go to step 7.  If the book state is not borrowed, show book’s state message and end function.   1. The system will change book’s data , like borrower, book time and overdue time. | | | | | | |
| **Sub Flow:** | | | | | | |
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| **Alternative / Exception Flow:** | | | | | | |
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1. Manage Paper Book (the most important)

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| --- | --- | --- | --- | --- | --- | --- | --- |
| **Use Case Name:** | Manage Paper Book | **ID:** | 4 | | **Importance Level:** | | High |
| **Primary Actor:** | Librarian | | | **Use Case Type:** | | Real, Detail | |
| **Stakeholders and Interest:** | | | | | | | |
| Librarian – someone needs to manage book in the system. | | | | | | | |
| **Brief Description:** | | | | | | | |
| This use case describes when librarian get new book, how librarian add new book data in database. If book’s information is wrong or need to be change, librarian can edit exist book information or change state about book. For example, book is missing. Book’s state will change book state to missing or other situation such as damaged, repaired, and deregistered. | | | | | | | |
| **Trigger:** | Librarian get new book and add new book information or edit exist book data or change book state. | | | | | | |
| **Type:** | Real | | | | | | |
| **Relationship:** | | | | | | | |
| **Association:** | Librarian | | | | | | |
| **Include:** |  | | | | | | |
| **Extend:** |  | | | | | | |
| **Generalization:** |  | | | | | | |
| **Normal Flow of Event:** | | | | | | | |
| 1. The librarian logins into the system.   If librarian inputs wrong account or password, input it again.   1. The librarian chooses function.   If the librarian wants to add a new book data,  then go to S-1: create book data is performed.  If the librarian wants to edit book data,  then go to S-2: edit book data is performed.  If the librarian wants to update book state,  then go to S-3: update book state is performed. | | | | | | | |
| **Sub Flow:** | | | | | | | |
| S-1: Add book information   1. The librarian presses add book button. 2. The system will automatic create new book id. 3. The system will show add book form to librarian. 4. The librarian can input book information on add book form.   If librarian does not want add book, then press cancel button and go to normal flow step 2.   1. The librarian needs to choose basic book state.   If this book is normal book, then choose available state.  If this book is restricted book, then choose unavailable state.   1. The librarian press save button after input book information. 2. The system will alarm librarian does he really want to add this book?   If librarian presses “No”, go to sub flow step S-1-3.   1. The system will save data which from add book form to database.   S-2: Edit book information   1. The librarian press edit book button. 2. The librarian input book ID he want to edit.   If system doesn’t find book, then show message tell the librarian didn’t find book, go to normal flow step 2.   1. The system will show edit book form for librarian. 2. The librarian can change book information.   If librarian does not wants to edit book, then press cancel button and go to normal flow step 2.   1. The librarian press save button after input book information 2. The system will alarm librarian did he really want to change this book’s information?   If librarian presses ”No”, then go to sub flow step S-2-3   1. The system will save data from edit book form to database.   S-3: Update book state   1. The librarian press update book state button. 2. The librarian input book ID he want to update.   If system doesn’t find book, then show message tell the librarian didn’t find book, go to normal flow step 2.   1. The system will check original book state   If book is borrowed, the system shows message tell the librarian can’t change state when book is Borrowed, go to normal flow step 2.  If book is Overdue, the system shows message tell the librarian can’t change state when book is Overdue, go to normal flow step 2.   1. The system will show book state choice form for librarian.    1. If the librarian want to change book to available, then librarian chooses available state.   4-1-1.The system will alarm librarian does he really want to change this book’s state?  If librarian presses “No”, go to sub flow step S-4.  4-1-2.The system will change book’s state to available.   * 1. If the librarian want to change book to unavailable, then librarian chooses unavailable state.   4-2-1.The system will alarm librarian does he really want to change this book’s state?  If librarian presses “No”, go to sub flow step S-4.  4-2-2.The system will change book’s state to unavailable.   * 1. If book is damaged, then librarian chooses damage state.   4-3-1.The system will alarm librarian does he really want to change this book’s state?  If the librarian presses “No”, go to sub flow step S-4.  4-3-2.The system will show message ask the librarian if the damage come from member?  If the librarian press “Yes”, the system will show message tell the librarian the book’s price which member need to compensate, go to sub flow 4-3-3.  4-3-3.The system will change book’s state to damage.   * 1. If book is on repaired schedule, then librarian chooses repaired state.   4-4-1.The system will alarm librarian did he really want to change this book’s state?  If librarian press ”No”, go to sub flow step S-4.  4-4-2.The system will change book’s state to repaired.   * 1. If book has been lost, then librarian chooses missing state.   4-5-1.The system will alarm librarian did he really want to change this book’s state?  If librarian press “No”, go to sub flow step S-4.  4-5-2.The system will show message ask the librarian if the missing by member?  If the librarian press “Yes”, the system will show message tell the librarian the book’s price which member need to compensate, go to sub flow step 4-5-3.  4-5-3.The system will change book’s state to missing.   * 1. If the librarian want to deregister book, then librarian chooses deregistered state.   4-6-1.The system will alarm librarian did he really want to change this book’s state?  If librarian presses ‘No”, go to sub flow step S-4.  4-6-2.The system will change book’s state to deregistered. | | | | | | | |
| **Alternative / Exception Flow:** | | | | | | | |
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1. Manage Member

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| **Use Case Name:** | Manage Member | **ID:** | 6 | **Importance Level:** | | High |
| **Primary Actor:** | Librarian | **Use Case Type:** | | | Essential, Detail | |
| **Stakeholders and Interest:** | | | | | | |
| Librarian – someone needs to create, delete, and edit member’s data. | | | | | | |
| **Brief Description:** | | | | | | |
| The librarian can create new member data, edit and delete member data when he needs. | | | | | | |
| **Trigger:** | If the guest wants to join to member, and create new member data. If the member wants to change the password, member needs to edit the data. If the member doesn’t want to use the system anymore so I asked to librarian to delete the data. | | | | | |
| **Type:** | External | | | | | |
| **Relationship:** | | | | | | |
| **Association:** | Librarian | | | | | |
| **Include:** |  | | | | | |
| **Extend:** |  | | | | | |
| **Generalization:** |  | | | | | |
| **Normal Flow of Event:** | | | | | | |
| 1. The librarian input account and password in system. 2. The librarian press “Login” button to login.   If he inputs wrong account or password, input it again   1. The librarian chooses function.   If the librarian wants to create a new member data,  then go to S-1: create member information is performed.  If the librarian wants to edit member data,  then go to S-2: edit member information is performed.  If the librarian wants to delete member data,  then go to S-3: delete member information is performed. | | | | | | |
| **Sub Flow:** | | | | | | |
| S-1: Create member information   1. The librarian needs to input member id.   If member id has been used then go to step S-1.   1. The librarian inputs any member’s information it needs to be saved. 2. The system will alarm the librarian, does he really want to create this member?   If the librarian doesn’t confirm, go to step S-1.   1. Saving every member’s information that the librarian has input.   S-2: Edit member information   1. The librarian needs to input member id to system. 2. System will check the member id.   If system doesn’t find member id, then go to step S-2-1.   1. The librarian can update any member information except member id. 2. The system will alarm the librarian does he really want to create member?   If the librarian doesn’t confirm, go to step S-2.   1. Saving every member’s information that the librarian has input.   S-3: Delete member information   1. The librarian needs to input member id to system. 2. System will check the member id.   If system doesn’t find member id, then go to step S-3-1.   1. The system will check member’s state.   If the member has overdue books, show member’s state message and go to step S-3.   1. The system will alarm the librarian does he really want to delete member?   If the librarian confirms, then the member will be deleted in database.  If the librarian doesn’t confirm, then go to step S-3. | | | | | | |
| **Alternative / Exception Flow:** | | | | | | |
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1. Manage E-Book

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| --- | --- | --- | --- | --- | --- | --- |
| **Use Case Name:** | Manage E-book | **ID:** | 7 | **Importance Level:** | | High |
| **Primary Actor:** | Librarian | **Use Case Type:** | | | Essential, Detail | |
| **Stakeholders and Interest:** | | | | | | |
| Librarian – someone needs to create, delete, and edit E-book’s data. | | | | | | |
| **Brief Description:** | | | | | | |
| The librarian can create new E-book data in system. Then librarian can edit or delete E-book data when he needs. | | | | | | |
| **Trigger:** | Create new E-book data, edit or delete when the librarian needs. | | | | | |
| **Type:** | External | | | | | |
| **Relationship:** | | | | | | |
| **Association:** | Librarian | | | | | |
| **Include:** |  | | | | | |
| **Extend:** |  | | | | | |
| **Generalization:** |  | | | | | |
| **Normal Flow of Event:** | | | | | | |
| 1. The librarian input account and password. 2. The librarian press “Login” button to login   If he inputs wrong account or password, input it again   1. The librarian chooses function.   If the librarian wants to create a new E-book data,  then go to S-1: create E-book information is performed.  If the librarian wants to edit E-book data,  then go to S-2: edit E-book information is performed.  If the librarian wants to delete E-book data,  then go to S-3: delete E-book information is performed. | | | | | | |
| **Sub Flow:** | | | | | | |
| S-1: S-1: Create E-book information   1. The system will auto create new book ID. 2. The librarian input E-book’s information in system. 3. The system will alarm the librarian does he really want to create this E-book?   If the librarian doesn’t confirm, go to step S-1.   1. Saving every E-book’s information that the librarian has input.   S-2:S-2: Edit E-book information   1. The librarian needs to input E-book id to system. 2. The system will check E-book ID.   If system doesn’t find E-book id, then go to step S-2-1.   1. The librarian can change any E-book information except E-book id. 2. The system will alarm the librarian does he really want to update E-book?   If the librarian doesn’t confirm, go to step S-2.   1. Saving every E-book’s information that the librarian has input.   S-3:S-3: Delete E-book information   1. The librarian needs to input E-book id to system. 2. The system will check E-book ID.   If system doesn’t find E-book id, then go to step S-3-1.   1. The system will alarm the librarian does he really want to delete E-book?   If the librarian confirms, then the E-book will be deleted in database.  If the librarian doesn’t confirm, then go to step S-3. | | | | | | |
| **Alternative / Exception Flow:** | | | | | | |
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**Activity diagram**

1. Search Book Information

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1. Read E-Book

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1. Borrow Book

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1. Return Book

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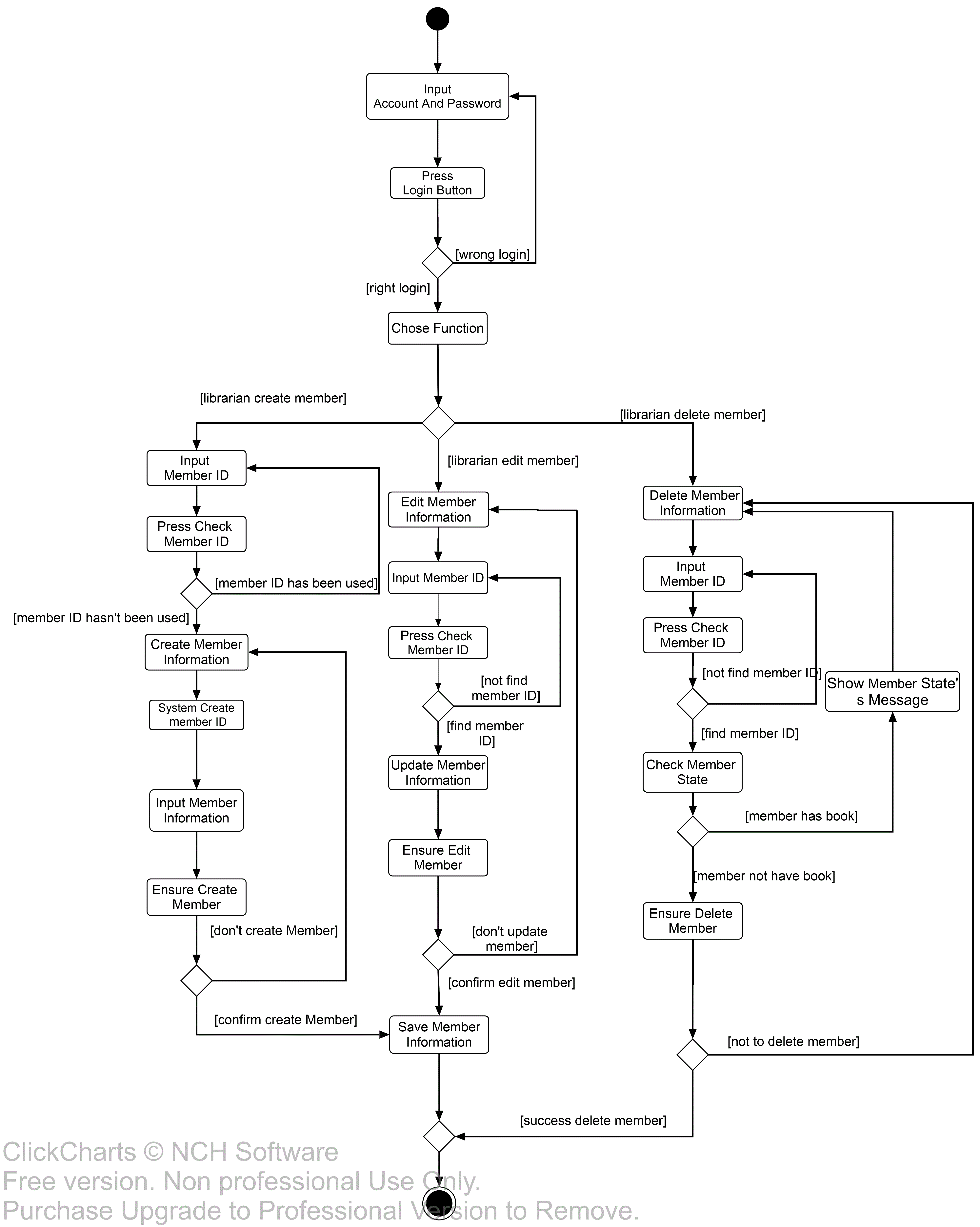
1. Manage Paper Book (the most important)

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1. Manage Member

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1. Manage E-Book



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**Sequence diagram**

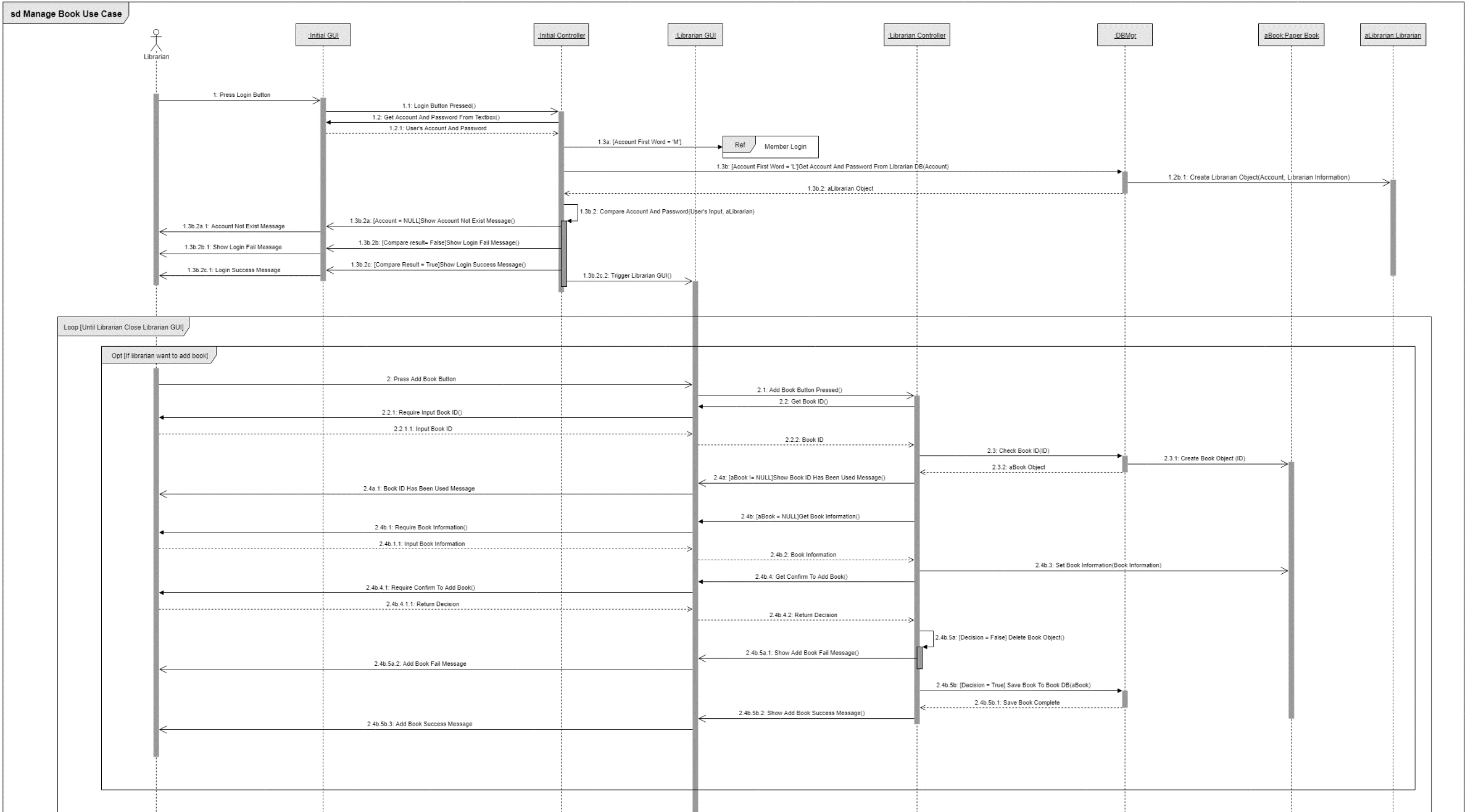
To use Manage Book’s function, the Librarian needs to input Account and Password to login the system to verify identity if the user has access to use this function. If identity verify fail, the system will show log-in fail message. If identity verify success, the system shows the librarian GUI for librarian.

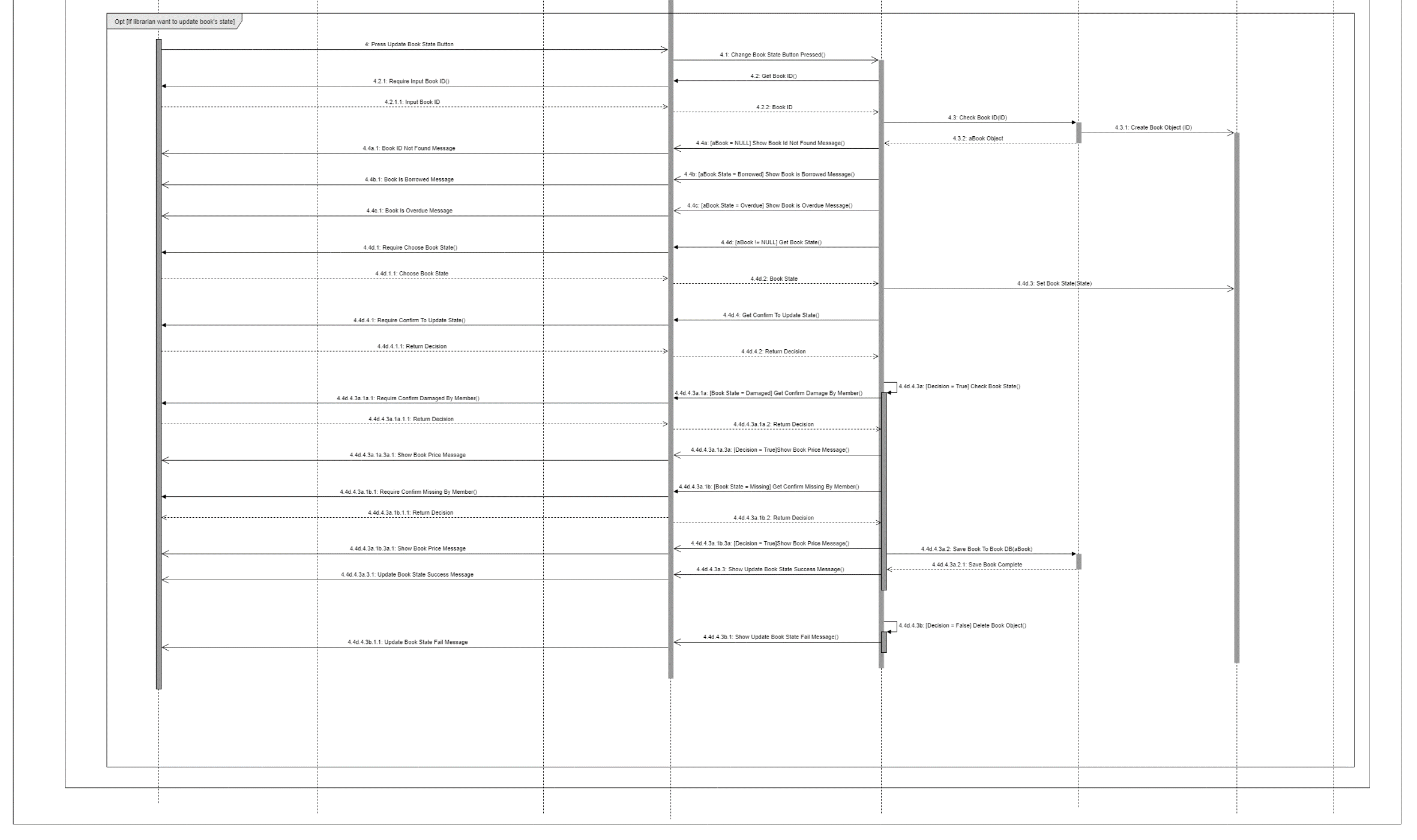
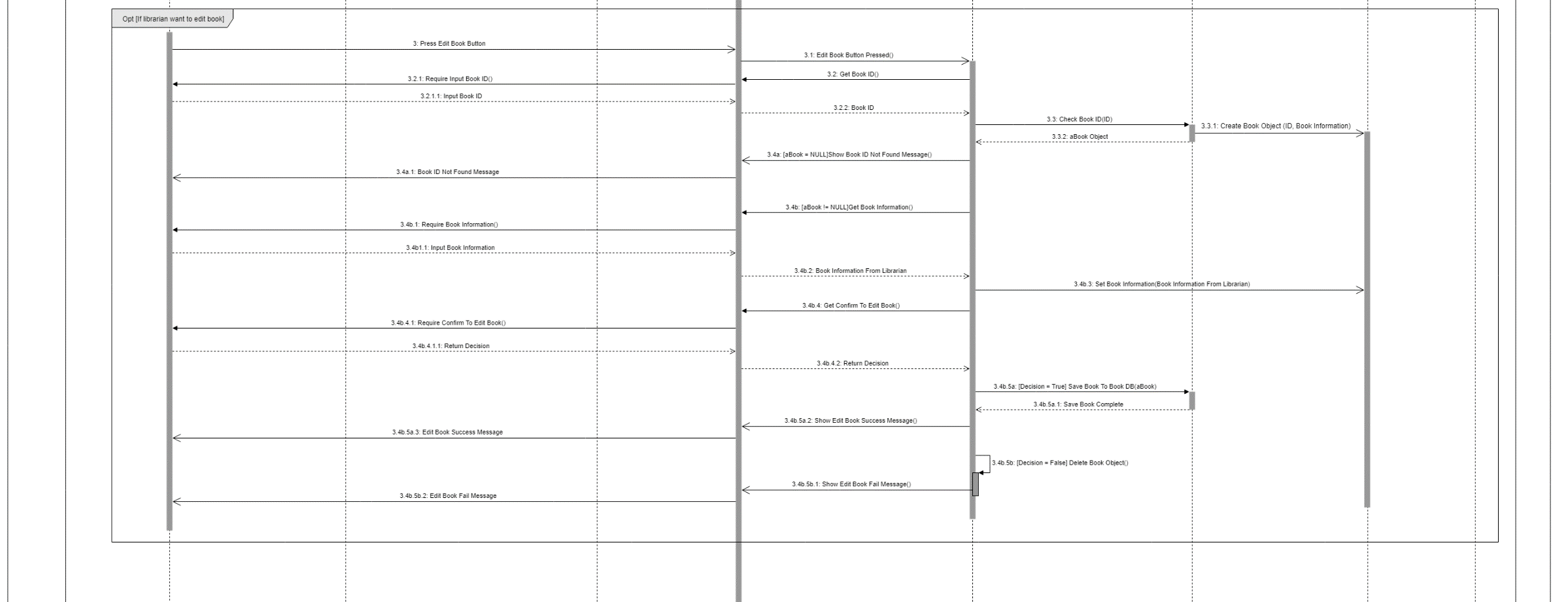
In the librarian GUI, the librarian can press “Add Book”, “Edit Book” and “Update Book” button to choose function he wants to use.

When the librarian presses “Add Book” button, first of all, system will create new Book ID, then add book’s form will appear. Now librarian can input any information he/she needs. Librarian should choose the book states. If the book can only be read in the library, it can’t be borrowed, then choose book’s state to unavailable. Else if book can be borrowed, then choose book’s state to available. After librarian input book’s information and change book’s state. Librarian can press save button to save data, or the librarian can just close form and select other function. If librarian want to save data. System will show a message to tell librarian, did he/she really wants to add this book data? Librarian can press yes or no button on this message. If librarian choose yes button, the system will save add book form’s information to database.

When the librarian presses “Edit Book” button, system will show a form to the librarian to input the information about book which he wants to edit, the system will check two things before executing edit-book process. First, system will notice the librarian confirm to do this book changed, if the librarian isn’t sure to do this, system will cancel edit-book form and wait for next action. Second, system will check whether the book’s ID is existed, If the book ID isn’t existed, system will show “book ID is not found” message. If the book ID is existed, system will execute edit-book process then show “edit book success” message when edit-book process completed.

When the librarian press “Update Book” button, system will show a form to the librarian to input the book’s ID which he wants to update. If input wrong book ID, the system will show a message to tell librarian this is wrong book ID. If librarian input right book ID, system will check book’s state. If book is overdue or borrowed, the system will show a message and tell librarian book’s state. So, if book isn’t be borrowed or overdue, librarian can choose book’s state, including available, unavailable, damaged, repaired, missing and deregistered. After librarian choose book state’s, librarian can press save button. Now, the system will check, if book’s state is damaged or missing, system will ask librarian, is member cause this problem? If it is, the system will show message tell the librarian the book’s price which member need to compensate. After check, the system will save data and change book’s state.

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**Class diagram**

First, system run class Time to check whether time is at midnight (00:00). If it is at midnight (00:00), system will run checkOverdueBook() method to check overdue book, and the system will show class UserGUI let user can login and according to his login to decide which GUI user can use.

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**Behavior state machine**

When the library gets new books, the book will be adding to collection and the state will start at “available”. Member can borrow book and the book state will change to “borrowed”. If the member return book in time, state will change back to “available”. If not, the state will change to “Overdue” until member return book.

The member may lose the book. He must inform the librarian that the book is missing, then the state will change to “missing”. If it can’t be find then the state will go to the end, but if it is found then the state will go back return to “available”.

When the member returns the book and it is damaged, the state will change to “damaged” and it will go to “being repaired” state. If the book is too damage, too old, or can’t be repaired, the state will go to the “Deregister”. The state will be end.

The book will change to “available” if the book can be birrowed. The book will change to “unavailable” if the book can only read in library.

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**Participate In Assignments**

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| --- | --- | --- | --- |
| ID | Name | Participate | Responsibility |
| A10523006 | Maggie | 100% | Use case diagram  Activity diagram  Class diagram |
| A10523049 | Peggy | 100% | Use case diagram  Use case description  Activity diagram  Class diagram |
| B10423003 | Kurumi | 100% | Word  Introduction  Use case diagram  Use case description  Activity diagram  Class diagram  Sequence diagram  Behavior state machine |
| B10423029 | Bean | 0% |  |
| B10523020 | Kendy | 100% | Use case diagram  Use case description  Activity diagram  Class diagram  Sequence diagram  Behavior state machine |
| B10523030 | Jerry | 100% | PPT  Use case diagram  Activity diagram  Use case description  Behavior state machine  Class diagram  Behavior state machine |
| B10523053 | Lynn | 100% | Use case diagram  Use case description  Activity diagram  Class diagram  Sequence diagram  Behavior state machine |
| M10723001 | Joe | 100% | Use case diagram  Use case description  Activity diagram  Class diagram  Sequence diagram  Behavior state machine |