Software Requirements Specification

for

Smart Library Management System

Version 1.2 approved

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Revision History

Name	Date	Reason For Changes	Version
Constantin Monica Andreea	06.03.2025	Completed 1.Introduction and 2. Overall Description	1.0
Popa Oana Maria	07.03.2025	Completed 3. External Interface Requirements and 4. System Features	1.1
Ruieneanu Dorian	09.03.2025	Completed 5. Other Nonfunctional Requirements and 6. Other Requirements	1.2

1. Introduction

1.1 Purpose

This document specifies the software requirements for the **Smart Library Management System** (SLMS). The system is designed to facilitate the management of library operations, providing an efficient way for clients to borrow books, track due dates and manage their accounts.

1.2 Document Conventions

This document follows a set of formatting and typographical conventions to ensure clarity and consistency. The key conventions are as follows:

1. Text Formatting:

- **Bold text** is used to highlight section headers, key terms, and important points.
- *Italicized text* is used for emphasis or to denote document-specific terminology.
 - 2. Requirement Numbering and Prioritization:
- Requirements are uniquely identified using the format **FREQ-XXX**, where "XXX" is a sequential number.
- Priorities are categorized as follows:
 - **High (H)** Critical for system functionality and must be implemented.
 - **Medium** (M) Important but can be deferred if necessary.
 - Low (L) Optional or nice-to-have features.
- Higher-level requirement priorities are inherited by their detailed sub-requirements unless explicitly stated otherwise.
 - 3. Diagrams and Figures:
- All diagrams and figures are labeled sequentially (e.g., **Figure 1: System Architecture**).

All requirements are numbered and clearly labeled. Any technical term is defined in the Glossary section.

1.3 Intended Audience and Reading Suggestions

This document is intended for librarians, IT administrators, developers and end users of the system. It is recommended to read the introductory section to understand the purpose and structure of the document, then explore the requirements in detail.

This document is intended for various stakeholders involved in the development, management, and usage of the system. The primary audiences include:

- developers to understand functional and non-functional requirements for system implementation.
- testers to design test cases and validate system functionality based on the specified requirements
- system architects to align the system design with the defined requirements.

Reading Suggestions

This Software Requirements Specification (SRS) is structured to facilitate a clear understanding of the system. It is recommended that readers follow this sequence:

- 1. **Introduction** Provides an overview of the document's purpose, scope, and key definitions. Recommended for all readers.
- 2. **Overall Description** Describes the general factors affecting the system, including assumptions, dependencies, and constraints. Essential for project managers, business analysts, and system architects.
- 3. **External Interfaces Requirements** Details interactions with other systems, user interfaces, and features. Important for UI/UX designers, developers, and testers.
- 4. System Features—Includes additional supporting information.
- 5. Other Nonfunctional Requirements

1.4 Product Scope

The scope of the system is to modernize the library by introducing a **smart and efficient book management system**. The final product will integrate **QR code technology** to enhance user experience, allowing clients to quickly access **book reviews, author information, and availability status** by scanning a QR code on each book.

The library information system will allow users to search for books, make reservations, borrow volumes, and receive notifications regarding return deadlines. The system also supports library management, including book inventory, user management, loans and returns, reports, and analysis. Additionally, administrators will have control over the catalog and users.

1.5 References

www.aman.ro

https://app.diagrams.net/

https://github.com/shieldui/shieldui-lite/tree/master/grcode/js

https://www.w3schools.com/html/html css.asp

https://github.com/topics/library-management-system

https://github.com/DeveloperWide/HTML-CSS-Projects

https://www.geeksforgeeks.org/spring/

2. Overall Description

2.1 Product Perspective

The system will be a distributed software accessible through a web application. It will allow users to perform specific actions based on their role, whether they are readers, librarians, or administrators.

2.2 Product Functions

The following functions make up the core of the web app:

- 1. Authentication and account management
- 2. Book search and filtering
- 3. Book reservation and borrowing
- 4. Automatic notifications
- 5. User and catalog management
- 6. Report and statistics generation

2.3 User Classes and Characteristics

There are three types of users that interact with the web app:

- 1. **Readers:** Search and borrow books, receive notifications about return deadlines.
- 2. **Librarians:** Manage the catalog, monitor loans and returns.
- 3. **Administrators:** Configure the system, create accounts, generate reports.

2.4 Operating Environment

The system will run on a PostgresSql database server with the logic being handled by a Java administration program running under Windows 10 . The system will be accessible via the internet using any widely used browser platform and the device camera will be used to scan the QR code for the review and preview functionalities.

Any person who will use this application must have the following:

- Internet access 10.0.56
- Microsoft Windows 8 at least installed
- One of the next modern browsers: Google Chrome (version 133.0.6943.142), Microsoft Edge (version 134.0.3124.51)

2.5 Design and Implementation Constraints

Constraints:

IDE: Intellij Idea Ultimate 2024.2.4, Webstorm 2024.3.4

Back-end development: Java 23.0.1 Framework: Spring Boot 3.4.3

Database: PostgreSQL 17

Front-end development: HTML/ CSS, JavaScript

2.6 User Documentation

The Smart Library Management System (SLMS) is designed to be **intuitive and self-explanatory**. This word document represents the software requirements documentation for the project. This document will replace the user guide and other documentation.

2.7 Assumptions and Dependencies

It needs an internet connection and must be usable on various devices.

3. External Interface Requirements

3.1 User Interfaces

- Modern, intuitive, and responsive design
- Features accessible on desktop

Signup

Signup					
First Name	Last Name				
first name	last name				
Date of Birth	Gender				
date of birth	gender				
Phone Number	Adress				
phone number	adress				
User Name	Email				
user name	email				
Password	Confirm Password				
Data processing agreement By creating an account you agree	with the processing of personal data				
	gnup n account? Login				

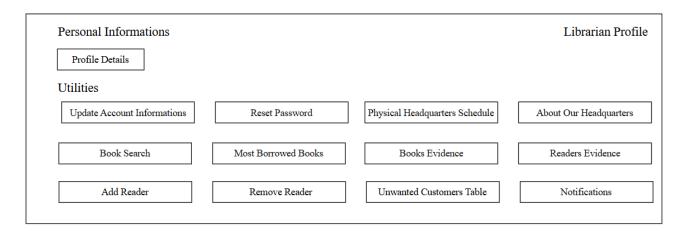
Login page

	Login
Email	
email	
Password	i
	Forgot Password?
	Login
Don' t	have an account? Signup now

Reader Menu

Personal Informations	Reader Profile
Profile Details Reading Worksheet Delete Profile	
Utilities	
Update Account Informations Reset Password Physical Headquarters Schedule	About Our Headquarters
Book Search Most Borrowed Books New Book Reservation	Notifications

Librarian Menu



Administrator Menu

Personal Informations			Admin Profile
Profile Details			
Utilities			
Update Account Informations	Reset Password	Physical Headquarters Schedule	About Our Headquarters
Add Reader	Remove Reader	Add Librarian	Remove Librarian
Books Evidence	Readers Evidence	Librarians Evidence	Administrators Evidence
Recovery Account	Book Search	Add New Book	Most Borrowed Books
Unwanted Customers Table	Notifications		

Profile Details

Profile Details					
First Name	first name				
Last Name	last name				
Date of Birth	xx-xx-xxxx				
Gender	gender				
Phone Number	XXXX-XXX				
Adress	adress				
User Name	user name				
ID	xxxxxx				
Email	email				
Password	xxxxxxxxx				
	Exit				

Update Profile Details

Update Profile Details					
First Name	first name				
Last Name	last name				
Date of Birth	xx-xx-xxxx				
Gender	gender				
Phone Number	XXXX-XXX-XXX				
Adress	adress				
User Name	user name				
ID	xxxxxx				
Email	email				
Password	xxxxxxxxx				
	Update Cancel				

Reset Password

Reset Password				
Enter the current password Enter the new password Confirm the new password				
Reset Pa	ssword Cancel			

Delete Profile



Profile recovery

Profile recovery					
ID	xxxxxx				
	Recovery	Cancel			

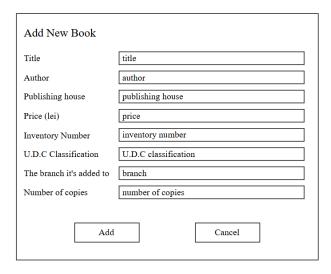
Reading Worksheet

Reade	Reader username: Reader ID:									
Crt. No.	Title	Author	Publishing house	Price (lei)	Inventory Number	U.D.C Classification	Loan Date (day, month, year)	Return Date (day, month, year)	The branch where the loan was made	Book status
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										

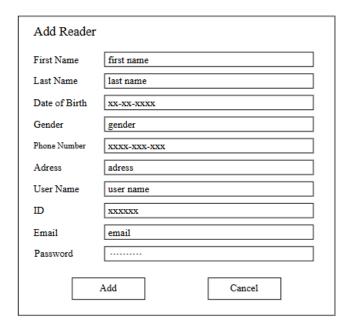
New Book Reservation

New	v Book Rese	ervation	
Title Author Loan Date (day, month, year) Return Date (day, month, year) The branch where you want to n Availability	nake the loan		
[Rese	erve	
[Ex	rit	

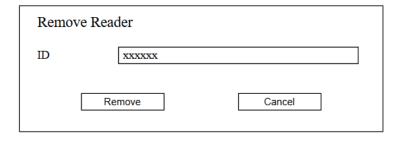
Add New Book



Add Reader



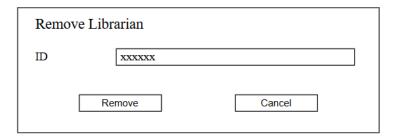
Remove Reader



Add Librarian

Add Libraria	an
First Name	first name
Last Name	last name
Date of Birth	xx-xx-xxxx
Gender	gender
Phone Number	xxxx-xxx
Adress	adress
User Name	user name
ID	xxxxxx
Email	email
Password	
	Add Cancel

Remove Librarian



Readers Evidence

Readers Evidence											
User Name	ID	Email	Title	Author	Price (lei)	Inventory Number	U.D.C Classification	Loan Date (day, month, year)	Return Date (day, month, year)	The branch where the loan was made	Reader status
			The state of the s								

Librarians Evidence

First Name	Last Name	ID	Email	User Name	Employment date	The branch where he is employ

Administrators Evidence

First Name	Last Name	ID	Email	User Name	The branch he manages	Administrator type

Unwanted Readers

User Name	ID	Email	Title	Author	Price (lei)	Inventory Number	U.D.C Classification	The branch where the loan was made	Loan Date (day, month, year)	Return Date (day, month,)
					1					

Books Evidence

Tid.	A sette a se		Daire (1-2)		IID C Classification	Stock in the branch		
Title	Author	Publishing house	Price (lei)	Inventory Number	U.D.C Classification	Branch	Number of available copies	Number of borrowed co

Search Book

Search Book					
☐ Title	title				
☐ Author	author				
☐ Publishing house	publishing house				
U.D.C Classification	U.D.C classification				
☐ Branch where it is available	branch				
Search	Cancel				

Most Borrowed Books

Most b	oorrowed books			
Crt. No.	Title	Author	Publishing house	U.D.C Classification
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Physical Headquarters Schedule

Sche	dule
Monday	08:00 - 19:00
Tuesday	08:00 - 19:00
Wednesday	08:00 - 19:00
Tursday	08:00 - 19:00
Friday	08:00 - 19:00
Saturday	10:00 - 16:00
Sunday	Closed

About our headquarters

About Our Headquarters	
ORGANIZATION	
DOLJ COUNTY LIBRARY "ALEXANDRU ŞI ARISTIA AMAN"	
str. M. Kogalniceanu nr.9, e-mail: bib@aman.ro, website: http://www.aman.ro	
https://www.facebook.com/bibliotecajudeteanaaman	
ORGANIZATIONAL STRUCTURE	
DIRECTOR/MANAGER	
MANAGER: Name PUBLIC RELATIONS SERVICE	
Head of Service: Name email: name.name@yahoo.com	
ADULT BOOK LOAN DEPARTMENT	
CHILDREN AND YOUTH BOOK LOAN DEPARTMENT BRANCH DEPARTMENT:	
BRANCH NO. 1: Brazda lui Novac Neighborhood, Block G8, ground floor;	
BRANCH NO. 2: Craovita Nouă Neighborhood, Orizont Complex, ground floor;	
BRANCH NO. 3: Valea Roșie Neighborhood, Block 52, room 1, ap. 1;	
BRANCH NO. 4: Rovine Neighborhood, Block E21, room 2, ap. 1. GENERAL DEPOSIT AND READING ROOMS SERVICE	
Head of Service: Name BASIC COLLECTIONS DEPOSIT SECTION PERIODICAL PUBLICATIONS AND READING ROOMS SECTION MEDIA THEAT RE/AMERICAN CORNER SECTION ROMANIAN EXILE INSTITUTE/ROMANIAN BOOK AND EXILE MUSEUM	
DIRECTOR: Name ADMINISTRATIVE SERVICE	
Head of Service: Name HUMAN RESOURCES SECTION LEGAL SECTION	
SECRETARIAT-ADMINISTRATIVE SECTION FINANCIAL ACCOUNTING – ACQUISITIONS SECTION	
BOOKBINDING SECTION ARCHIVE SECTION	
CHIEF ACCOUNTANT	
Chief Accountant: Name RESEARCH, ART, LITERARY HISTORY SECTION	
DIGITISATION AND PROJECTS	
Head of Service: Name	
DOCUMENTATION DEPARTMENT INFORMATION DEPARTMENT	
DIGITISATION DEPARTMENT BIBLIOGRAPHICAL INFORMATION DEPARTMENT	
EXILE MUSEUM SERVICE	
Head of Service: Name LIBRARY/CONSERVATION DEPARTMENT	
EXILE, ART, LITERARY HISTORY DEPARTMENT	
ELENA FARAGO MEMORIAL HOUSE	

Notifications

Notifications	Received
Compose	
Received	
Unread	
Sent	
Exit	

3.2 Hardware Interfaces

Not compatible with standard web servers./ Dedicated hosting server with appropriate processing capacity.

3.3 Software Interfaces

Interface with SQL databases.

REST API for integration with other systems.

3.4 Communications Interfaces

Notifications via email . HTTP/HTTPS protocol.

4. System Features

4.1 Authentication and Account Management

4.1.1 Description and Priority

This functionality allows users (readers, librarians, local administrators , executive administrators) to log into the system using predefined credentials.

Priority: High – essential for the security and access to the system.

4.1.2 Stimulus/Response Sequences

The user enters the username and password in the designated fields and presses the login button.

The system verifies the credentials and grants access based on the user's role.

If the authentication is successful, the user is redirected to the page corresponding to their role.

If authentication fails, the system displays an error message.

4.1.3 Functional Requirements

FREQ-1: If the user enters valid credentials, the system grants access.

FREQ-2: If authentication fails, the system displays an error message.

FREQ-3: The system assigns a specific role to the user (Reader, Librarian, Administrator).

FREQ-4: The system logs each authentication attempt for monitoring purposes.

FREQ-5: Access to the application must be protected with a username and password, with differentiated access for different user roles (Administrator, Librarians).

FREQ-6: The system must allow password reset.

FREQ-7: Each user will have an account with different levels of access.

FREQ-8: Authentication and security: Users (readers and employees) must log into the system with a username and password, and personal data must be protected according to GDPR regulations.

4.2 Library Catalog

4.2.1 Description and Priority

This functionality allows users to search and filter books available in the library.

Priority: High – essential for users in locating desired resources.

4.2.2 Stimulus/Response Sequences

The user enters the title, author, or keywords in a search field.

The system returns a list of relevant results.

The user can access the details of each book.

4.2.3 Functional Requirements

FREQ-9: Each book has a unique number, title, authors, and the publisher where it was published.

FREO-10: The system must allow searching for books by multiple criteria.

FREQ-11: The system will display the available stock for each branch.

FREQ-12: The system will allow adding multiple authors for a single book.

FREQ-13: The system will generate statistics regarding the most borrowed books.

FREO-14: Users can see the availability of books.

FREO-15: The system will suggest books similar to those already borrowed by the user.

FREQ-16: If the user performs a search, the system will display relevant results.

FREQ-17: The details of each book are accessible by clicking on the result.

4.3 Loan and Reservation Management

4.3.1 Description and Priority

This functionality allows users to borrow, reserve, and return books.

Priority: High – essential for managing the library's resources.

4.3.2 Stimulus/Response Sequences

The user selects an available book and requests a loan.

The system checks the user's status and the book's availability.

If the loan is approved, the book is registered as "borrowed."

When the loan period expires, the user receives a notification for the return.

4.3.3 Functional Requirements

FREO-18: The system checks the user's status before approving the loan.

FREQ-19: Users can reserve unavailable books for later borrowing.

FREQ-20: Readers can borrow multiple books from different library branches for a limited period.

FREQ-21: The system records the date a book was borrowed and the date of its return.

FREO-22: Users can view their borrowing history.

FREO-23: The system notifies the user about the due date for returning books.

FREQ-24: Inter-branch loan: Readers can request a book from another branch, and the system will manage its transfer.

4.4 User Management

4.4.1 Description and Priority

This functionality allows administrators to manage user accounts.

Priority: High – essential for access control.

4.4.2 Stimulus/Response Sequences

The administrator accesses the user management section.

They can add, edit, or delete accounts.

4.4.3 Functional Requirements

FREQ-25: Administrators can create and manage user accounts, add and edit members.

FREQ-26: Users can update their own account information.

FREQ-27: Administrators can delete accounts of inactive users.

FREQ-28: The system must allow the recovery of accounts deleted accidentally.

FREQ-29: The system will allow setting a timeout period of inactivity after which users are automatically logged out.

4.5 Notifications and Alerts

4.5.1 Description and Priority

This functionality allows users to receive notifications about reservations, loans, and returns.

Priority: High – enhances the user experience.

4.5.2 Stimulus/Response Sequences

The system sends notifications via email for important deadlines.

4.5.3 Functional Requirements

FREQ-30: The system notifies users about loan expirations.

FREQ-31: Users receive notifications for completed reservations.

FREQ-32: Administrators receive alerts for out-of-stock books.

FREQ-33: Readers are notified about new books added to the library.

FREQ-34: The system allows users to personalize their notification preferences.

FREQ-35: Librarians are alerted about overdue returns.

4.6 Report Generation

4.6.1 Description and Priority

This functionality allows administrators to generate detailed reports on the library's activity.

Priority: Medium – helps in analyzing statistics.

4.6.2 Stimulus/Response Sequences

The administrator selects the type of report desired.

The system generates an exportable document.

4.6.3 Functional Requirements

FREQ-36: The system must allow exporting reports in PDF format.

FREQ-37: The system will generate monthly reports on the library's activity.

FREQ-38: Reports on the most borrowed books will be generated.

FREQ-39: Reports will include data on active and inactive users.

FREQ-40: Librarians will be able to view the borrowing history per user.

FREQ-41: Administrators will be able to filter reports by categories (books, users, loans).

FREQ-42: The system will allow generating a detailed report on overdue returns.

FREQ-43: The system will allow comparing statistics across different periods.

FREQ-44: Reports on newly registered users will be generated.

4.7 Library Resource Management

4.7.1 Description and Priority

This functionality allows librarians to monitor and manage both physical and digital resources of the library.

Priority: High – essential for organizing and optimizing the library's inventory.

4.7.2 Stimulus/Response Sequences

The librarian accesses the resource management section.

The system displays a list of all available resources.

The librarian can add, edit, or delete resource entries.

The system updates the inventory based on loans and returns.

4.7.3 Functional Requirements

FREQ-45: Librarians can add and update information about books.

FREQ-46: Librarians can mark certain books as "reference-only."

FREQ-47: The system will highlight damaged or lost books.

FREQ-48: Librarians can set rules for special loans (e.g., limiting the number of simultaneous loans).

FREQ-49: Admins can schedule maintenance sessions for library resources.

4.8 User Interface

4.8.1 Description and Priority

This functionality refers to how users interact with the system.

Priority: Medium – influences the user experience and system adoption.

4.8.2 Stimulus/Response Sequences

The user accesses the web platform.

The system displays a personalized dashboard based on the user's role.

The user navigates through intuitive menus to access the desired functionalities.

4.8.3 Functional Requirements

FREQ-50: The system will have a web interface accessible from desktop.

FREQ-51: The design of the interface will be optimized for accessibility.

FREQ-52: The system will offer contextual suggestions to users.

FREQ-53: The web application will have QR scanning functionality for quick searches.

FREQ-54: The system will allow direct feedback from the users.

5. Other Nonfunctional Requirements

5.1 Performance Requirements

The system must meet the following performance criteria under different conditions:

- The average response time for API calls should be under 3 seconds.
- The system should support at least 100 concurrent user sessions without degradation in performance.

5.2 Safety Requirements

Not applicable.

5.3 Security Requirements

User Authentication and Authorization: The security will be ensured by implementing role-based access to the data (three roles: readers, librarians and administrators). Every role has different permissions and privileges.

Data Encryption: All communications will be encrypted via HTTPS.

5.4 Software Quality Attributes

- 1. Maintainability The code should be easy to update and modify with minimal effort, following best practices such as modular design, clear documentation, and adherence to coding standards to facilitate long-term maintenance.
- 2. Reusability Components, functions, and modules should be designed to be reusable across different parts of the application or even in other projects, reducing development time and improving efficiency.
- 3. Extensibility The software should be designed to accommodate future enhancements or modifications with minimal changes to the existing code, using design patterns such as Open/Closed Principle (OCP) and dependency injection.
- 4. Use of CamelCasing All local variables and method arguments must be named using CamelCase to ensure readability and maintain a consistent coding convention.
- 5. Use of PascalCasing Class names and method names should follow PascalCase formatting to clearly distinguish them from variables and method arguments.
- 6. Avoiding abbreviations Variable names should be descriptive and avoid abbreviations, except for well-known acronyms such as "ID," to maintain clarity in the code.
- 7. Clear naming for boolean variables and methods Boolean variables and methods should have meaningful names that clearly indicate their purpose, using prefixes such as is, has, or can (e.g., isActive, hasPermission).
- 8. Consistent naming conventions All variables, functions, and classes should have clear and descriptive names that accurately reflect their purpose and functionality.
- 9. Modularity Code should be well-structured by separating business logic from the user interface and breaking functionality into reusable modules to enhance maintainability and scalability.
- Avoiding redundancy (DRY Don't Repeat Yourself principle) Code duplication should be minimized by using reusable functions and components, reducing complexity and improving maintainability.
- 11. Data validation User inputs must always be validated to ensure security and prevent potential vulnerabilities.
- 12. Performance optimization Unnecessary database calls should be avoided, and SQL queries must be optimized to improve application efficiency.
- 13. Code testability and error handling The code should be written in a way that makes it easy to test, avoiding duplication and implementing proper error-handling mechanisms to ensure robust functionality.
- 14. Relevant and concise comments Comments should clearly explain the logic of functions, being concise and useful for a quick understanding of the implementation.

15. Adherence to the "Single Responsibility" principle – Each class and method should have a well-defined single responsibility, following SOLID principles to ensure clarity, maintainability, and scalability of the code.

5.5 Business Rules

This software product is designed for the first implementation in Romania of a smart library.

6. Other Requirements

Not Available.

Appendix A: Glossary

- SRS Software Requirements Specification: A detailed document that outlines the functional and non-functional requirements of a software system, serving as a foundation for development.
- UI User Interface: The graphical layout of an application, including buttons, text fields, images, and other elements that users interact with.
- UX User Experience: The overall experience a user has while interacting with a system, focusing on usability, accessibility, and satisfaction.
- QR Quick Response: A type of two-dimensional barcode that stores information such as URLs, text, or contact details and can be scanned using a smartphone or QR scanner.
- SLMS The Smart Library Management System: A software system designed to automate and optimize the management of library operations, providing an efficient way for clients to borrow books, track due dates and manage their accounts.
- UDC Universal Decimal Classification: A classification scheme that uses Arabic numerals arranged decimally to represent a class.
- DB Database: A structured collection of data that stores information related to readers, librarians and administrator.
- DBMS Database Management System: Software that enables the creation, organization, and retrieval of data in a structured manner.
- RDBMS Relational Database Management System: A type of DBMS that stores data in structured tables with relationships between them.
- API Application Programming Interface: A set of functions and protocols that allow different software applications to communicate with each other.
- RBAC Role-Based Access Control: A security model that grants user permissions based on their assigned roles (readers, librarians and administrator).
- PDF Portable Document Format: A file format used to present and exchange documents in a way that is independent of software, hardware, or operating systems.
- UML Unified Modeling Language: A standardized modeling language used to visualize, specify, construct, and document the components of a software system.

Appendix B: Analysis Models

In addition to this document, analysis models will be included to better understand the application. The UML models that will be included are use-case, activity diagram, class diagram, relational model for database.

Appendix C: To Be Determined List

Not Available.