ALBUKHARY INTERNATIONAL UNIVERSITY

Albukhary International University

School of Computing and Informatics

Semester 2 Requirement Engineering CCE2233

Assignment

Title of Assignment: Requirements Engineering of Library Management System (LMS)

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Submission Date	Week 10 (Friday, 30 May 2025, before/at 11:59 pm)

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Requirements Engineering Report: Library Management System (LMS)

Introduction

Library Management System is an application which refers to library systems. It is used by librarian to manage the library using a computerized system where they can record various transactions like issue of books, return of books, addition of new books, addition of new students etc. Books and student maintenance modules are also included in this system which would keep track of the students using the library and also a detailed description about the books a library contains. With this computerized system there will be no loss of book record or member record which generally happens when a noncomputerized system is used.

Project background

The development of Library Management System (LMS) is necessary to enhance and make available the operational processes of general libraries, digitizing them. Routine manual processes for circulation, student records and catalog management are common at most educational institutions leading to low efficiency rates of information loss and errors. However, LMS would be to automate those basic functions(borrowing and returning of books, catalog management, fine computing using an automated system. It assists librarians, students and faculty in managing library resources efficiently and reliably without human errors and facilitates better response to information.

Objective of the report

- Stakeholder engagement in functional/non-functional requirements identification and collection of Library Management System(LMS).
- Apply a structured requirements engineering (re) process: elicit, analyze, specification, validate and manage
- Document requirements clearly in documents, Word excles and Trello for sort, tracking and priority.
- Use case diagrams and descriptions to model the system functionalities as well as stakeholders interactions.
- Requirement Categorizing and Prioritizing-using techniques like MoSCoW for Planning/iteration purposes.
- Ensure proper fit at the user need, institutional and technical level to make a successful implementation of LMS.

Requirements Engineering Process Applied

The requirements engineering in the libraries software included a series of organised steps to collect, investigate, document, validate and maintain system requirements. These were the steps that would help you ensure that the systems being developed would accurately address a user’s needs, and would perform according to their expectations.

a. Requirements Elicitation

The phase was aimed at collecting feedback among stakeholders with respect to what they wanted the system to achieve, what challenges and work issues were encountered right now, what a perfect system should look like (Ali,2017).

Stakeholder Interviews:

Interviews LDPs and students were also interviewed to get first hand information on the current workflow, problems experienced and expected features of the new system.

Document Review:

Paper-based records and forms in circulation were reviewed to better describe current processes, such as circulation of books, returns, cataloging, and fine collection.

System Analysis:

The study catalogued the features, usability problems, and opportunities for improvement in the available library management software.

b. Requirements Analysis

The collected data was analyzed to categorize and prioritize system requirements based on stakeholder input and system feasibility.

- **Functional Grouping:**
  Requirements are categorized under functional templates like login, book search user interface, inventory control and report generation.
- **Analysis of Dependance and Priority:**
  Logical relationships of the requirements were decomposed and user needs or implementation difficulties set priority or levels.

c. Requirements Specification

This step involved converting the analyzed requirements into well-structured documentation to guide system design and development.

- **Use of Microsoft Word:**
  However, Requirements were developed in a structured format using MS Word for declarative specifications and MS Word to portray tabular functional/non-functional requirements with an ID, Priority and Acceptance criteria.
- **Template-Based Documentation:**

  Structured templates ensured clear and consistent results. Each requirement was sent an array of the following, namely Title, description type, priority rationale, and result that is expected.

d. Requirements Validation

Validation activities confirmed that the recorded requirements aligned with users' expectations and system constraints.

- **Stakeholder Review Meetings:**
  Word docs shared with librarians and student representatives the drafted requirements. Feedback was collated and revisions were made thereafter.
- **Checklist-Based Evaluation:**

  A validation checklist is used to verify that all tasks, concepts, and requirements are completely covered by true implementation.

e. Requirements Management

Requirements were continuously monitored, updated, and controlled throughout the development cycle to accommodate changes.

- **Use of Trello for Tracking:**
  I used Trello Spreadsheets to track and manage each requirements status Requirement Title ID Current Status Responsibility (t e m p) Columns — requirement id/proposed or
- **Change Management:**
  Software (Manually using files with updated version and change logs as Microsoft Word documents) to maintain version control of the modifications and stakeholder approvals.

Requirement Engineering Tool Used

Tool Chosen: **Trello**

- Used for categorizing user stories (e.g., "To Do", "In Progress", "Done")
- Attached requirement documents and notes to cards
- Used labels for priority and stakeholder mapping

Stakeholder Analysis

Stakeholder analysis is a critical component of requirement engineering, as it identifies all parties involved in or affected by the system and outlines their specific needs and expectations. A comprehensive understanding of stakeholders ensures that the final system is both functional and user-centered (Sommerville, 2011).

List of Identified Stakeholders

For a Library Management System, the primary stakeholders include:

No	Stakeholders
1	Library Users (Students, Faculty, and General Public)
2	Librarians
3	Library Administrators
4	IT Support Staff
5	System Developers
6	Institutional Management (e.g., University or School Administration)
7	Vendors or Publishers
8	Government or Regulatory Bodies

Description of each stakeholder's Needs or Interests

Stakeholder	Needs/Interests
Library Users	We need a user-friendly interface that makes it easy to search for, borrow, and return books. It should also provide access to digital resources and have a notification system for due dates and new arrivals. Users expect the system to be highly available with minimal downtime.
Librarians	Looking for effective tools to help with cataloging, issuing, returning, and managing inventory? It's also important to have reporting and data analytics features to keep track of overdue books and usage statistics.
Library Administrators	Interested in system-wide oversight, user management, budget control, and compliance with institutional policies. They require dashboards for performance metrics and resource allocation.
IT Support Staff	To keep the system running smoothly, it's essential to have thorough documentation, logs, and configuration tools. This helps us maintain security and tackle any technical issues that may arise.
System Developers	To effectively design, implement, and maintain the LMS, we need to gather clear and comprehensive functional and non-functional requirements. It's also essential to get feedback from stakeholders to support our iterative development process.

Institutional Management	Interested in alignment with educational goals, cost-effectiveness, student satisfaction, and integration with other institutional systems like student portals or ERP systems.
Vendors or Publishers	Require integration capabilities (e.g., APIs) for digital content distribution, licensing, and updates to catalog entries.
Government or Regulatory Bodies	Require compliance with data protection laws, accessibility standards, and reporting for educational audits or funding purposes.

Understanding these stakeholders and their different requirements is important for designing a robust and inclusive library management system. Prioritizing these needs ensures higher user satisfaction, operational efficiency, and compliance with institutional and legal frameworks (Pressman & Maxim, 2014)

Requirement Elicitation and Documentation

Functional Requirements (FRs)

Based on the attached table, here is all the functional requirements for a library management system.

Req ID	Requirement Description	Priority	Source
FR-01	The LMS should store all information about librarians and patrons, including their access keys, priority, etc.	High	System Analyst / User Interview
FR-02	The LMS should store all information about items and patrons in two separate databases.	High	Database Design Document
FR-03	The LMS should allow searching items by author, title, or keywords	Medium	User Requirements Document
FR-04	The LMS should allow librarians to add, delete, and modify items in the database, and check the availability of the items	High	Librarian Uses Case
FR-05	The LMS should generate request reports for librarians every day, on the basis of which librarians could make decisions about acquiring or retiring the items.	Medium	Management Requirements

Non-Functional Requirements (NFRs)

Based on the attached table, here is all the non-functional requirements for a library management system.

Req ID	Requirement Description	Priority	Source
NFR-01	Search results should be displayed within 3 seconds	Medium	System Admin
NFR-02	System should support 500 concurrent users	High	Project Brief
NFR-03	Daily backups must be stored securely	High	IT Policy

Constraints

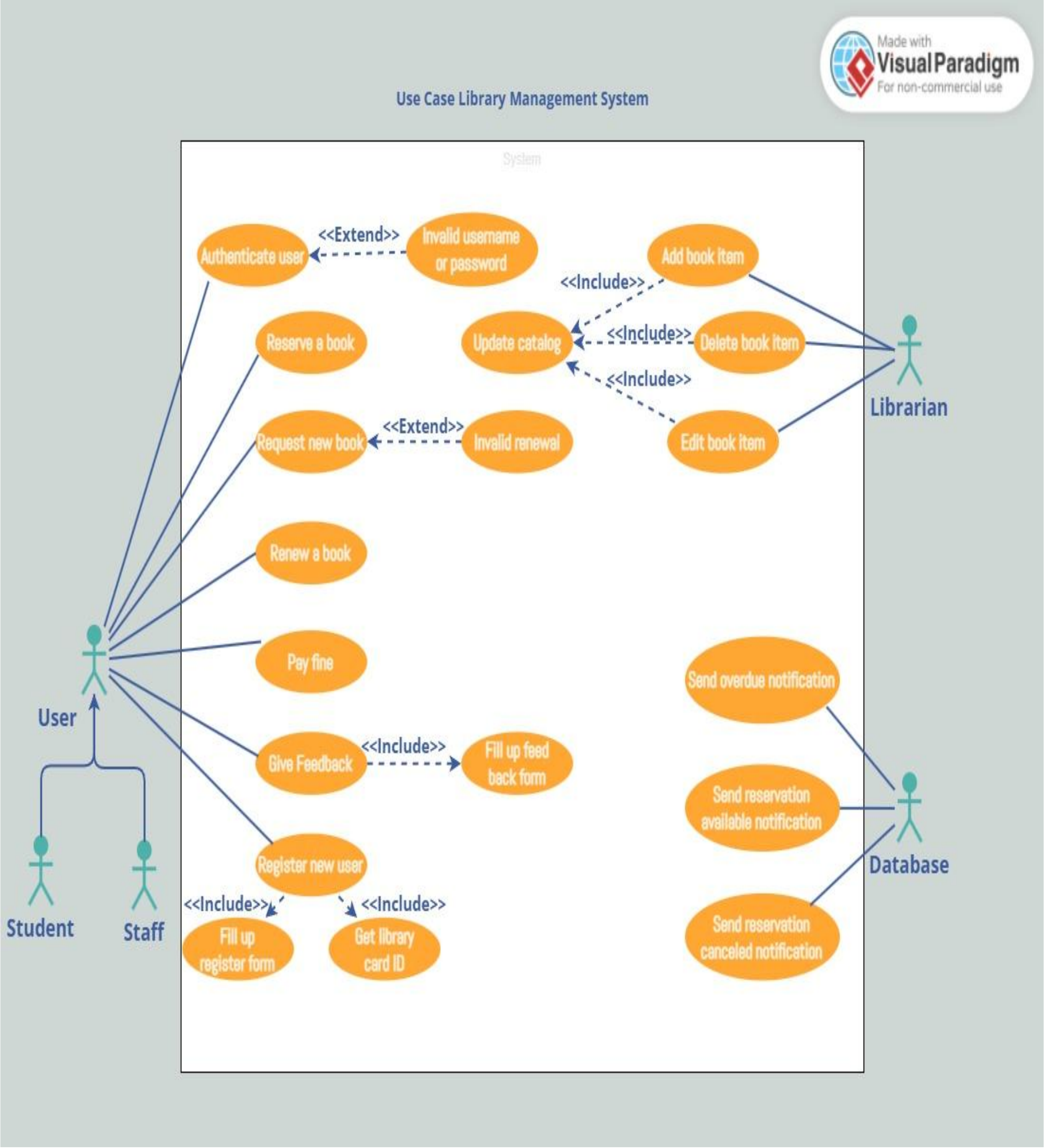
Req ID	Constraint Description	Priority	Source
CR-01	The system must support up to 500 concurrent users.	High	Non-Functional Requirement – Project Brief
CR-02	Features like RFID tracking and external library integration are out of scope due to budget constraints.	High	MoSCoW Prioritization Table
CR-03	The system must comply with data protection laws and accessibility standards.	High	Stakeholder Analysis – Government or Regulatory Bodies

Use Case Modelling

The following steps show how to visually map out the relationships and interactions and also the textual description of what the diagram would look like:

1. Actors	User (Staff or Student) Librarian
2. Use Cases	Register New User Issue Library Card Request New Book Reserve Book Renew Book Pay Fine Fill Feedback Form Manage Records Delete Records Update Database
3. System Boundary:	The system boundary will encompass all the use cases mentioned above.

Below is the use case diagram of a Library Management System:



Explanation of Use Case Diagram of a Library Management System

I have provided the key steps for use case diagram of the library management system as below:

1. User who registers himself as a new user initially is regarded as staff or student for the library system.

- For the user to get registered as a new user, registration forms are available that is needed to be fulfilled by the user.
- After registration, a library card is issued to the user by the librarian. On the library card, an ID is assigned to cardholder or user.

2. After getting the library card, a new book is requested by the user as per there requirement.
3. After, requesting, the desired book or the requested book is reserved by the user that means no other user can request for that book.
4. Now, the user can renew a book that means the user can get a new due date for the desired book if the user has renewed them.
5. If the user somehow forgets to return the book before the due date, then the user pays fine. Or if the user forgets to renew the book till the due date, then the book will be overdue and the user pays fine.
6. User can fill the feedback form available if they want to.
7. Librarian has a key role in this system. Librarian adds the records in the library database about each student or user every time issuing the book or returning the book, or paying fine.
8. Librarian also deletes the record of a particular student if the student leaves the college or passed out from the college. If the book no longer exists in the library, then the record of the particular book is also deleted.
9. Updating database is the important role of Librarian (GeeksforGeeks, 2024).

Requirement Prioritization for Library Management System

MoSCoW technique:

The table below presents a MoSCoW prioritization plan for a Library Management System (LMS), structured across four iterations. Each use story is categorized by priority, assigned a point value, and includes the source of the requirement. This format also suggests one or more 'Won't have' stories to reflect features out of scope for the current release.(Marthasari, n.d.)

Iterations	Use Stories	MoSCow Priority	Point	Sources
Iteration 1	Registering the members	Must have	1	Librarian request
	Registering the books	Must have	1	Librarian request
	Inputting the book borrowed	Must have	1	System requirement

	Automated reminder messages	Must have	1	User feedback
	Out-of-scope: Integration with external libraries	Won’t have	0	Stakeholder decision
Velocity			4	
Iteration 2	Finding the books based on the title	Must have	1	User feedback
	Counting the fine automatically	Must have	1	Library policy compliance
	Accepting the notification of the new books	Must have	1	Librarian request
	Observing the due date of borrowing by the admin	Must have	1	Admin requirement
	Out-of-scope: Real-time book tracking via RFID	Won’t have	0	Budget constraint
Velocity			4	
Iteration 3	Registering the new admin	Must have	1	System requirement
	Special access for a user	Must have	1	Admin requirement
	Returning the books	Must have	1	Librarian request
	Changing the website information data	Must have	1	UX improvement
Velocity			4	
Iteration 4	Suggesting the new books	Should have	1	User suggestion
	Uploading the book file	Should have	1	Admin request
	Observing the new books	Could have	1	System feature
	Observing the due date of borrowing	Should have	1	Admin suggestion
	Out-of-scope: Support for multilingual metadata	Won't have	0	Project scope limit
Velocity			4	

Traceability Metrix

Req ID	Requirement Description	Module / Feature	Test Case / Verification	Status
FR-01	Store all librarian and patron data, including access keys and priority	User Management Module	TC01	Covered
FR-02	Store item and patron data in separate databases	Data Management Module	TC02	Covered
FR-03	Allow item search by author, title, or keywords	Search Module	TC03	In Progress
FR-04	Add, delete, modify, and check item availability	Book Management Module	TC04	Not Covered
FR-05	Generate daily request reports for acquisition decisions	Reporting Module	TC05	Covered
NFR-01	Search results must be displayed within 3 seconds	Performance Requirement	TC06	Pending
NFR-02	Support for 500 concurrent users	Scalability/Technical Design	TC07	Pending
NFR-03	Daily backups must be stored securely	Security/Backup Module	TC08	Pending
CR-01	System must support up to 500 concurrent users	Infrastructure Requirement	TC09	Pending
CR-02	RFID and external integration are out of scope due to budget	Project Scope Management	N/A	Confirmed
CR-03	Must comply with data protection and accessibility standards	Legal Compliance Requirement	TC10	Pending

Tool Usage Explanation

I have used Trello and GitHub tools for this project.

Trello link: https://trello.com/invite/b/6839757ccdba6ad5c93476c9/ATTIe3fe032f82b002f9bc7a3bdd03045dad0FDD08FD/re-assignment

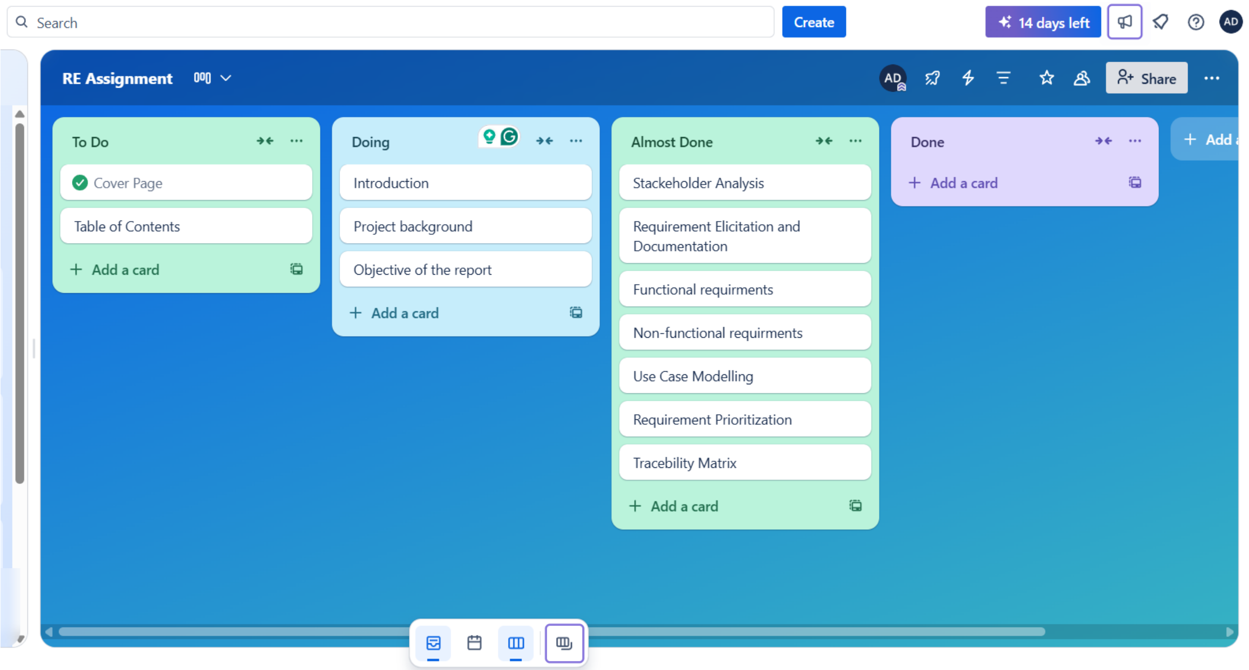
GitHub link:

https://github.com/alisenadanishwer/Requirement-Engineering-Assignment.git

Justification for Selection:

Trello and GitHub are highly effective tools for project management. They facilitate efficient collaboration among employees or students by providing clear visibility of tasks and project progress. These tools enable users to manage their responsibilities promptly and systematically, ensuring improved productivity and organization.

Screenshot of Trello:



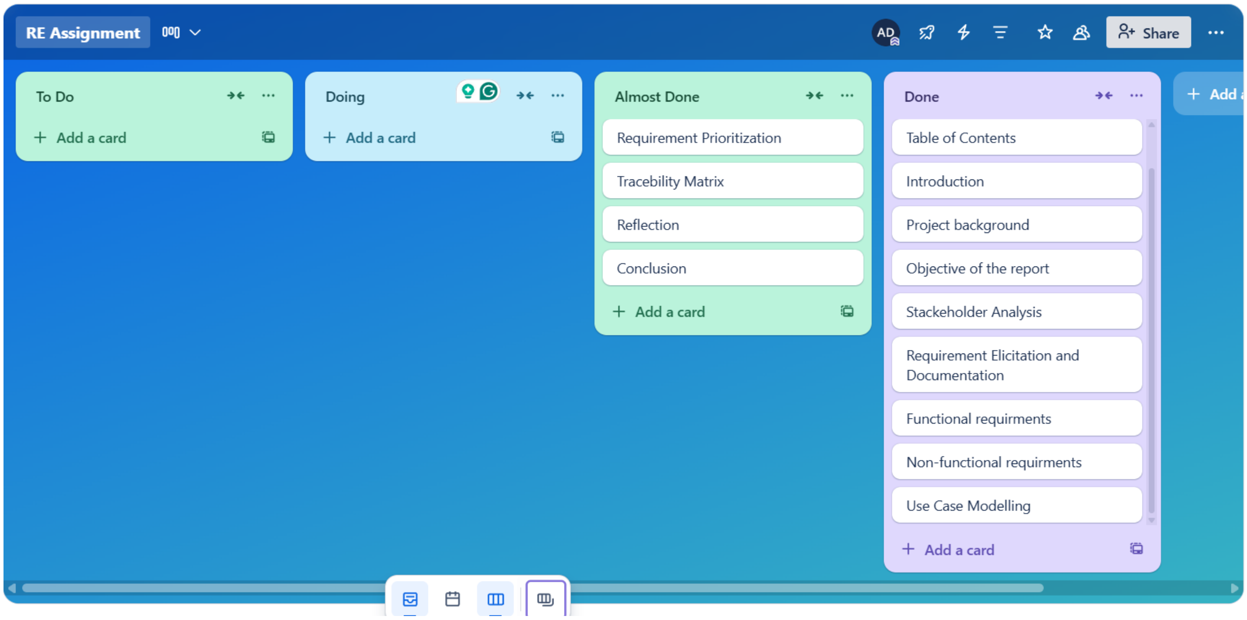
RE Assignment

To Do
- Cover Page
- Table of Contents

Doing
- Introduction
- Project background
- Objective of the report

Almost Done
- Stackeholder Analysis
- Requirement Elicitation and Documentation
- Functional requirments
- Non-functional requirments
- Use Case Modelling
- Requirement Prioritization
- Tracebility Matrix

Done



RE Assignment

To Do

Doing

Almost Done
- Requirement Prioritization
- Tracebility Matrix
- Reflection
- Conclusion

Done
- Table of Contents
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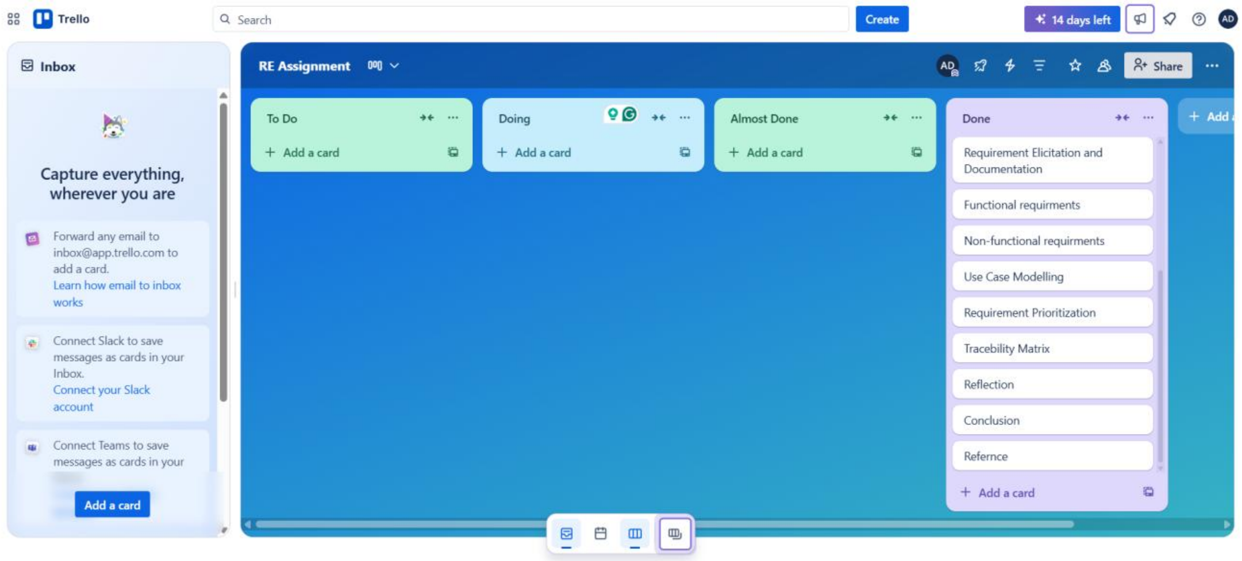

Inbox

Capture everything, wherever you are

Forward any email to inbox@app.trello.com to add a card. Learn how email to inbox works

Connect Slack to save messages as cards in your Inbox. Connect your Slack account

Connect Teams to save messages as cards in your

RE Assignment

To Do

Doing

Almost Done

Done
- Requirement Elicitation and Documentation
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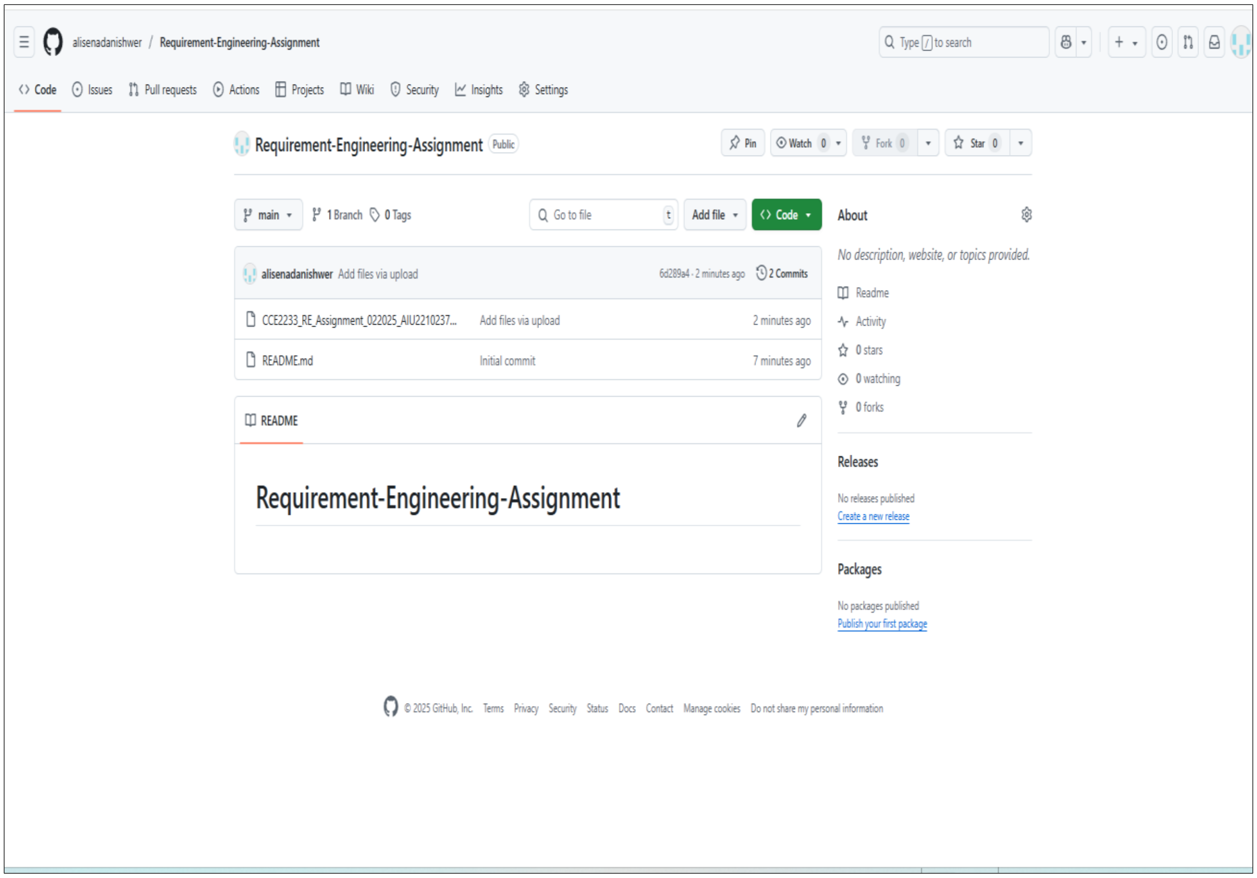
- Tracebility Matrix
- Reflection
- Conclusion
- Refernce

Screenshot of GitHub:



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CCE2233_RE_Assignment_022025_AIU2210237...	Add files via upload	2 minutes ago
README.md	Initial commit	7 minutes ago

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About

No description, website, or topics provided.

Readme
Activity
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Releases

No releases published

Packages

No packages published

Reflection

This project gave us some great takeaways about how to use requirements engineering in designing a system that actually works in the real world. While we were working on the Library Management System (LMS), we noticed a few important things:

- Engaging with Stakeholders is Key
  Talking directly to different stakeholders helped us really understand what they needed and expected. This way, we made sure the requirements were relevant and focused on their real-life challenges.

- Benefits of a Structured Approach
  By following a clear process for requirements engineering—from gathering to validating—we kept everything organized and clear. This helped avoid confusion during the design and development stages.

- Using Tools and Techniques
  Incorporating tools like Trello and methods like MoSCoW prioritization and use case modeling made a big difference in managing tasks, improving communication, and keeping the requirements sorted throughout the project.

Conclusion

In conclusion, this paper provides a systematic and successful way of designing a LMS based on fundamental principles of the requirements engineering. By involving stakeholders in the elicitation of system requirement the project was able to organize and structure and agenda and issues, the project was able to define both functional and non-functional system requirements properly in its requirement specification. Tools like Microsoft Word, Trello and GitHub worked well in establishing and monitoring tasks, and methods including MoSCoW prioritization and use case modelling provided clarity and focus to meet users’ needs. Constraints and system limitations were acknowledged with a sense of pragmatism, providing it contributed to a practical and achievable design. The report demonstrates a solid understanding of requirements engineering practices and lays the groundwork for an LMS that is efficient, scalable, and tailored to the needs of modern library environments.

Reference

Ali, S. (2017). Library Management System Mini Project Report on LIBRARY MANAGEMENT SYSTEM. *www.academia.edu*. https://www.academia.edu/download/54051452/library_management_system.pdf

Pressman, R. S., & Maxim, B. R. (2014). *Software Engineering: A Practitioner's Approach* (8th ed.). McGraw-Hill Education.

Sommerville, I. (2011). *Software Engineering* (9th ed.). Addison-Wesley.

GeeksforGeeks. (2024, September 20). *Use case diagram for library management system*. GeeksforGeeks. https://www.geeksforgeeks.org/use-case-diagram-for-library-management-system/

Marthasari, G. I. (n.d.). *XXX-X-XXXX-XXXX-X/XX/$XX.00 ©20XX IEEE Personal Extreme Programming with MoSCoW Prioritization for Developing Library Information System 1 st*.