Department of Information and Communication Technology
Faculty of Technology
University of Ruhuna

Tools Management System

Final Project Report

Group project (ICT3183) - 2024

Group ID: GP-2024-02

Submitted by:

1. TG/2020/688 – J.M.N.A. Senevirathne
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3. TG/2020/737 – I.A.N.M. Anusari
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Submitted to:

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Ms. Malsha Prabudhdhi

Date of submission
07.08.2024

Abstract

Dilum BMK Engineers (Pvt) Ltd, a prominent cranes company in Sri Lanka, encountered significant challenges in managing their tool stores distributing tools to various projects, and ensuring the return of tools without losses. Addressing these issues, Group 02, 3rd year ICT students at University of Ruhuna's Faculty of Technology, under the supervision of Ms. Malsha Prabudhdhi, developed a comprehensive web-based Tools Management System.

The Tools Management System is designed to streamline the entire process of tool inventory management and distribution. In this system controls the four main roles Admin, Manager, Stock Supervisor and Site Supervisor. Each role achieved different functions. Stock Supervisors can efficiently add new equipment to the inventory, update existing equipment information, and manage damaged equipment records. They also have the capability to view requests from Site Supervisors, create and update toolboxes for projects, and monitor overall inventory levels. Site Supervisors, on the other hand, can request specific tools from the Equipment Store, track the location of tools, provide status updates on equipment usage, and report any maintenance needs. This ensures that tools are effectively managed and utilized at project sites. Company Managers play a crucial role in overseeing project details and resource allocation. They manage project information, assign Site Supervisors to specific projects, and access detailed reports on tool usage, inventory levels, and project-wise tool allocations. This enables them to make informed decisions and optimize project management processes. Additionally, the Admin role is responsible for managing user accounts within the system, ensuring appropriate access control, and updating or deleting user account details as needed. Key achievements of the project include enhanced inventory management, streamlined tool distribution processes, accurate real-time tracking of tool locations, comprehensive reporting for informed decision-making, and robust user account management. This system effectively addresses the specific needs of Dilum BMK Engineers (Pvt) Ltd, offering a reliable solution for managing their tool stores, optimizing project workflows, and ensuring efficient resource management. Through this project, the company can achieve greater operational efficiency and significantly reduce the risk of tool loss.

Acknowledgement

We would like to extend our heartfelt gratitude to everyone who has contributed to the successful completion of this project.

Firstly, we give our biggest effort to the success for this project, and we should give our deepest gratitude for our subject coordinator sir Mr. P.H.P. Nuwan Laksiri. We would like to extend our sincere thanks to our supervisor madam Ms. Malsha Prabudhdhi for their biggest effect and guidelines. Team especially thankful for the department of ICT in our technology faculty for giving this chance to improve our abilities and knowledge.

Our sincere thanks go to Dilum BMK Engineers (Pvt) Ltd for their cooperation and for providing us with real-world insights and requirements that shaped the practical aspects of our system. Their support ensured that our project addressed genuine industry needs and enhanced its applicability.

We would also like to acknowledge the contributions of the site supervisors, stock supervisors, and company managers who shared their experiences and feedback, helping us to refine our system to better serve its intended users.

Team has to be thankful to the Team Leader who gathered every member in any kind of difficult situation and all team members for their attention and intervention for this project. We also thank our colleagues who willingly helped us with their abilities.

Declaration

We hereby declare that the project titled " Tools Management System "is an original work carried out by our team under the guidance of our supervisor. This project has been developed to fulfill the client requirements of "an inventory system for distributing the tools to projects sites".
All information, data, and results presented in this project are genuine and have been compiled through rigorous research, development, and testing.
We confirm that the contents of this project report are a true representation of the work we have performed. Any external references and sources used have been duly acknowledged. We have adhered to all academic and professional standards throughout the development of this project.
This project was carried out as part of our academic coursework and represents our commitment to delivering a high-quality, functional solution to meet the client's needs. We take full responsibility for the integrity and authenticity of the project and its outcomes.

Project Details

Project Title	**Tools Management System**
Project ID	**GP-2024-02**

Group Members

Reg. No	Name	Signature
TG/2020/688	J.M.N.A. Senevirathne	
TG/2020/717	W.A.I. Ganga	
TG/2020/737	I.A.N.M. Anusari	
TG/2020/738	N.G.N. Sansala	

Client Consent

DILUM B M K ENGINEERS (PVT) LTD

Engineers & Contractors

No.474/B, Erawwala, Pannipitiya., Sri Lanka.

Tel: +94 112 896 024 /+94 113 151 619 Fax: +94 112 84 08 72 E-mail: bmkdilum@sltnet.lk

19th July, 2024.

Mr. P.H.P. Nuwan Laksiri,
Lecturer (Probationary)
Department of ICT
Faculty of Technology, University of Ruhuna,

Dear Sir,

HANDOVER TO DEVELOPED SOFTWARE – TOOL MANAGEMENT SYSTEM

We are writing as the manager of Dilum BMK Engineers (Pvt) Ltd, a company specializing in providing superior and suitable engineering services to the nation. We are pleased to inform you that the software developed for our company, named Tool Management System, and has been successfully handed over. This software was developed by a group of four students from the University of Ruhuna, Department of ICT.

1. J.M.N.A. Senevirathne TG/2020/688
2. W.A.I. Ganga TG/2020/717
3. I.A.N.M. Anusari TG/2020/737
4. N.G.N. Sansala TG/2020/738

The software has been developed successfully according to our requirements, and we are highly satisfied with the outcome. We express our gratitude to the University of Ruhuna and the Department of ICT for their invaluable support and collaboration in this project. The students have demonstrated exceptional skill and professionalism throughout the development process, and we are confident that this software will significantly enhance our operational efficiency.

We look forward to further collaborations with the University of Ruhuna and hope to continue benefiting from the innovative solutions provided by its talented students.

Thank you once again for your support and cooperation.

Yours truly,

DILUM BMK ENGINEERS (PVT) LTD. PV 80685

Eng. DILUM SAMARANAYAKE
MANAGING DIRECTOR
DILUM BMK ENGINEERS(PVT) LTD
Tel: +94 71 422 0278
Email: dilum@dilumbmkengineers.com

Figure 1 - Client Consent Letter

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List of Acronyms and Abbreviations

- **CRUD**: Create, Read, Update, Delete
- **ERD**: Entity-Relationship Diagram
- **JSON**: JavaScript Object Notation
- **UI/UX**: User Interface/User Experience

1. Introduction

1.1. Introduction to the Client

Dilum BMK Engineers, based in Horana, is a leading firm in engineering projects, specializing in construction and infrastructure development. Known for delivering high-quality projects on time and within budget, the company has built strong client relationships across sectors. The Main Equipment Store in Horana is essential for managing and distributing equipment to project sites, but current manual processes have led to inefficiencies. To address these challenges, Dilum BMK Engineers plans to implement a web-based Equipment Management and Tracking System. This digital system will automate equipment management, reduce errors, improve efficiency, and provide real-time data for better decision-making, enhancing overall project support and maintaining the firm's industry reputation.

1.2. Problem Statement

The current method of managing equipment at Dilum BMK Engineers relies heavily on manual processes. The Main Equipment Store in Horana is responsible for the distribution of equipment to various project sites, and this process involves a significant amount of paperwork and manual documentation. The existing system has several drawbacks:

Inefficiency: Manual processes are time-consuming and often result in delays, especially when managing large inventories and multiple project sites.

Error-Prone: Human error is a significant risk in manual systems, leading to inaccurate records, misplaced equipment, and difficulty in tracking inventory levels.

Lack of Real-Time Data: Manual tracking does not provide real-time visibility into inventory levels or the status of equipment, making it challenging to make informed decisions quickly.

Poor Communication: The manual system makes it difficult to communicate effectively between the Main Equipment Store, project sites, and management, leading to misunderstandings and delays.

To address these issues, Dilum BMK Engineers plans to implement a web-based Equipment Management and Tracking System. This new system will automate and streamline the equipment management process, reducing errors, improving efficiency, and providing real-time data and better communication channels.

1.3. Project Scope

The proposed Equipment Management Web Application System will serve as a comprehensive solution to automate the equipment management process at Dilum BMK Engineers. The system will be designed to meet the needs of various stakeholders, including Admins, Company Managers, Stock Supervisors, and Site Supervisors. The key features and functionalities of the system include:

User Account Management (Admin):

Create user accounts for individuals involved in the system.
View details of user accounts.
Update user account information.
Delete user accounts as necessary.

Project Management (Company Manager):

Manage and oversee project details.
Assign site supervisors to specific projects.
View detailed reports on tool usage, inventory status, and tool allocation by project.

Inventory Management (Stock Supervisor):

Add new equipment to the inventory.
View detailed equipment information.
Update existing equipment information.
Delete records of damaged or obsolete equipment.
View and respond to equipment requests from project sites.
Select and pack toolboxes with the required equipment for site projects.
Generate and view reports on inventory status and levels.

Site Operations (Site Supervisor):

Submit requests for equipment needed at project sites.
updates on equipment delivery and status.
Manage on-site equipment and ensure proper usage and maintenance.

The system will provide a user-friendly interface and robust backend support to ensure smooth and efficient operations. It will be accessible via web browsers, ensuring that users can access the system from any location with an internet connection.

1.4. Project Report Structure

The report documenting the development and implementation of the Equipment Management and Tracking Web Application System will be structured as follows:

1. **Introduction**
    - Introduction to the Client
    - Problem Statement
    - Project Scope
    - Project Report Structure
2. **System Requirements**
    - Functional Requirements: Detailed description of the functionalities and features the system must possess.
    - Non-Functional Requirements: Performance, security, usability, and other quality attributes that the system must meet.
    - User Roles and Permissions: Definition of user roles and their respective permissions within the system.
3. **System Design**
    - Architecture Design: Overview of the system's architecture, including hardware and software components.
    - Database Design: Detailed schema of the database, including tables, relationships, and data flow.
    - User Interface Design: Wireframes and descriptions of the user interface for different system users.
4. **Implementation Plan**
    - Development Methodology: The approach and methodology used for the system's development.
    - Timeline: A detailed timeline with key milestones and deliverables.
    - Milestones: Specific milestones and goals set for the project.
5. **Testing and Validation**
    - Test Plan: Comprehensive test plan outlining the testing strategy and process.
    - Test Cases: Detailed test cases for each functionality and feature.
    - Validation Criteria: Criteria for validating the system's performance and correctness.

6. **Conclusion and Recommendations**
    - Summary of Findings: Summary of the project outcomes and findings.
    - Recommendations for Future Work: Suggestions and recommendations for future improvements and developments.

This structured approach will ensure that all aspects of the project are thoroughly documented, providing a clear understanding of the system and its implementation process. It will serve as a valuable resource for stakeholders and future reference.

2. Methodology

2.1. Requirements and Analysis

In this chapter, we will discuss and analyze the Tools Management System for Dilum BMK Engineers, including the Software Requirement Specification (SRS). Before the implementation process, a thorough definition and overview of the system specifications must be provided. In the SRS section, both functional and non-functional requirements are listed. After gathering client specifications, we identified and examined the system requirements to ensure comprehensive understanding and accuracy.

Functional Requirements

Functional requirements describe the key technical specifications and behaviors the system must perform. They are categorized by user roles to provide clarity on each stakeholder's responsibilities and interactions with the system.

Admin

ID	Description
1	Create new user accounts with appropriate roles.
2	View existing user account details.
3	Update user account information.
4	Delete user accounts when necessary.

Company Manager

ID	Description
1	Create, view, update, and delete project details.
2	Assign site supervisors to specific projects.
3	View reports on tool usage, inventory levels, and project-wise tool allocation.

Stock Supervisor

ID	Description
1	Add new equipment to the inventory database.
2	View detailed information on each piece of equipment.
3	Update information on existing equipment
4	Remove records of damaged or obsolete equipment.
5	View and respond to equipment requests from project sites.
6	Select and pack toolboxes with the required equipment for site projects.
7	View detailed reports on inventory status and levels.

Site Supervisor

ID	Description
1	Submit requests for equipment needed at project sites.
2	Updates on equipment delivery status.
3	Generate required equipment and tool status reports.
4	Manage on-site equipment, ensuring proper usage and maintenance.

Non-Functional Requirements

The non-functional requirements define the system's quality attributes, performance standards, and constraints, ensuring the system's overall usability, reliability, and maintainability.

Performance:

Performance requirements consist of criteria that define the expected performance or standards under specific conditions.

Name	Description
Page loading time	The loading time should be within 5-8 seconds
Searching time	The searching time should be 5-10 seconds
UI responsiveness	All UIs should be responsive across devices

Security:

Authentication and Authorization:

Ensure secure login mechanisms, with role-based access control to restrict functionalities based on user roles.

Data Encryption:

Implement data encryption for sensitive information both in transit and at rest.

Usability:

User Interface:

Provide a user-friendly, intuitive, and responsive interface accessible on various devices (desktop, tablet, mobile).

Documentation:

Offered comprehensive user guides and documentation to assist users in efficiently navigating and using the system.

Accessibility:

Ensure the system adheres to accessibility standards to accommodate users with disabilities.

Reliability:

Availability:

The system should have an uptime of 99.9%, ensuring it is always available for use, with minimal downtime.

Error Handling:

Implement robust error-handling mechanisms to gracefully manage unexpected errors and provide meaningful error messages to users.

Maintainability:

Modularity:

Design the system with a modular architecture to facilitate easy maintenance, updates, and feature enhancements.

Documentation:

Maintain comprehensive technical documentation to support developers and IT staff in maintaining and updating the system.

2.2. Tools and Technologies

Frontend Development: React.js for building a responsive and interactive user interface.

Backend Development: Spring boot for server-side development and API creation.

Database : MySQL Database.

Version Control : Git and GitHub for version control and collaborative development.

Project Management : Click up for task management, tracking progress and collaboration.

Testing Tools: Selenium for end-to-end testing

2.3. Design

The design phase involves creating a detailed plan for the system's architecture, database schema, and user interface.

System Architecture Design:

Defining the overall architecture of the system, including client-server interactions, API endpoints, and data flow.

Database Design:

Designing the database schema with tables, relationships, and data models to ensure efficient data storage and retrieval.

User Interface Design:

Creating wireframes and prototypes for the user interface to ensure a user-friendly experience.

Design Review:

Conducting design reviews with stakeholders to gather feedback and make necessary adjustments.

2.4. Implementation

The implementation phase involves developing the system based on the design specifications.

Software Requirement

Server Side:

- OS: Windows 10
- Database: MYSQL
- Application: phpMyAdmin

Client-Side:

- OS: Windows 10
- Web browser: Google Chrome / Mozilla Firefox / Opera

Hardware Requirement

Server Side:

- Processor: Dual Intel(R) Xeon(R) CPU E5-2660 v4 @ 2.00GHz / Dual Intel Xeon Gold 6140 2.3G
- RAM: Minimum 20GB disk space
- RAM: Minimum 8GB

Client- Side

- Processor: Intel® Core™ i3- 10105 3.7GHZ
- RAM: Minimum 4GB

2.5. Testing

The testing phase is critical to ensure the system is functional, reliable, and meets the specified requirements.

Unit Testing:

Writing and executing unit tests for individual components and functions to ensure they work as intended.

Integration Testing:

Testing the interaction between different modules and components to ensure they work together seamlessly.

System Testing:

Conducting end-to-end testing to validate the entire system's functionality from a user's perspective.

Performance Testing:

Evaluating the system's performance under various conditions to ensure it meets the required performance standards.

User Acceptance Testing (UAT):

Involving stakeholders to test the system in a real-world scenario and gather feedback.

Bug Fixing and Refinement:

Identifying and fixing any issues or bugs discovered during testing, and refining the system based on user feedback.

3. System Design

3.1. Architecture

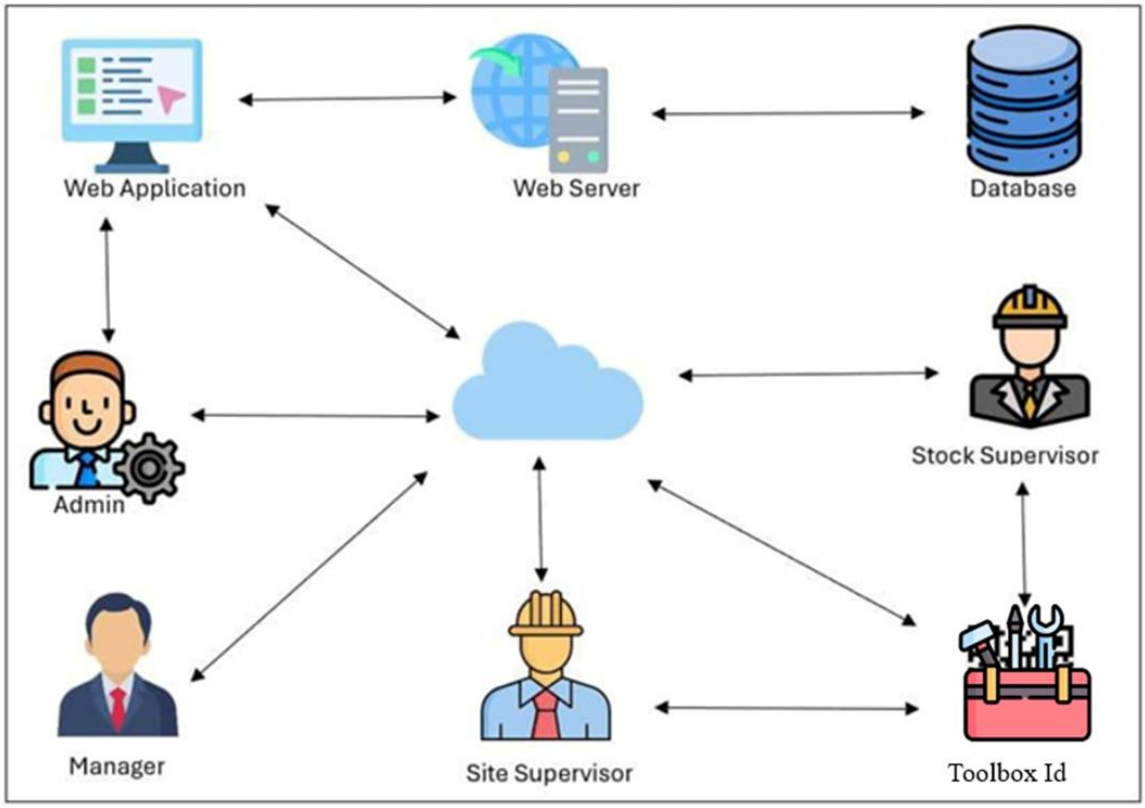

Figure 2 - Architecture Design

3.2. Database Design

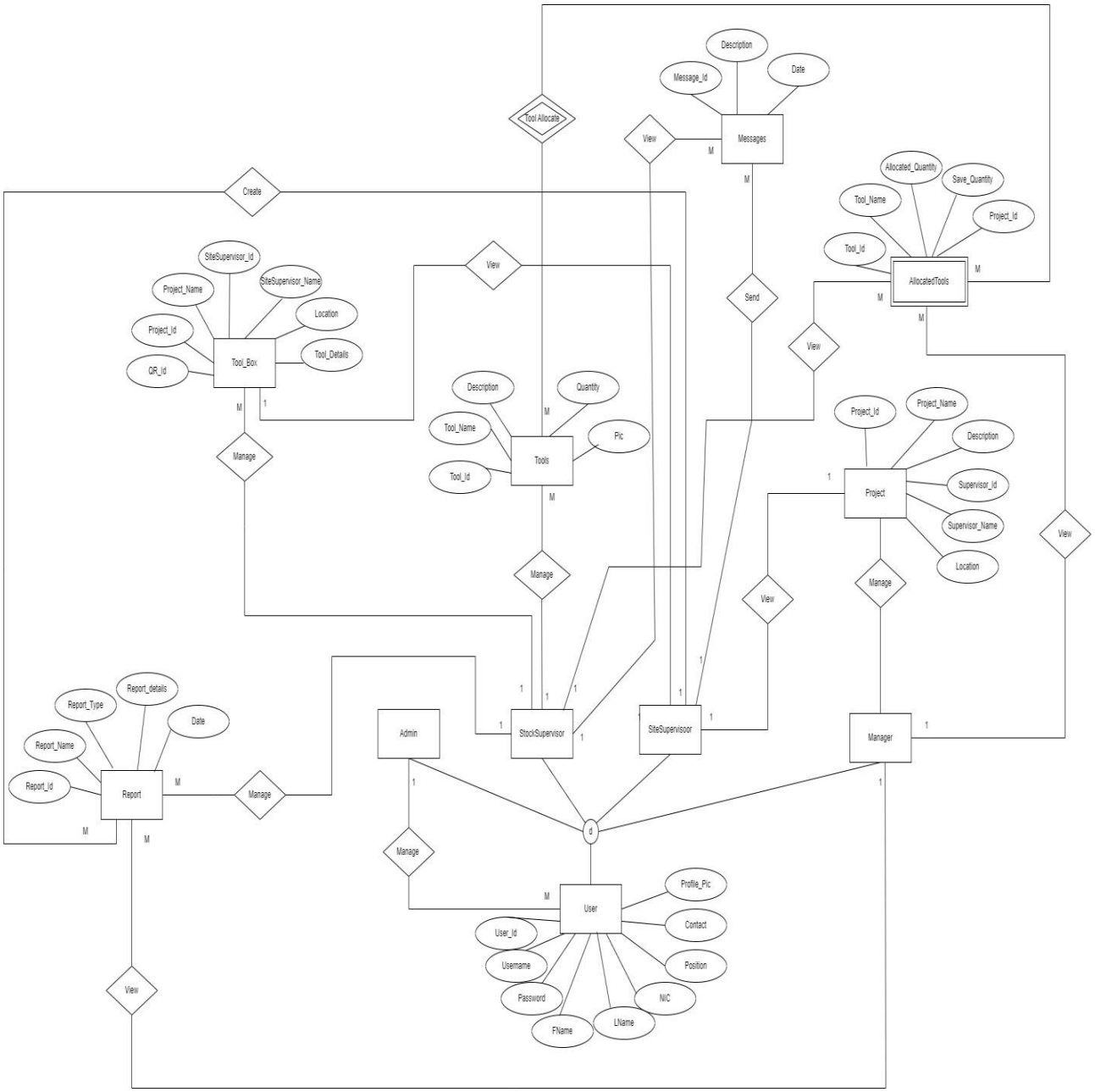

Figure 3 – ER Diagram

3.3. UI/UX Design

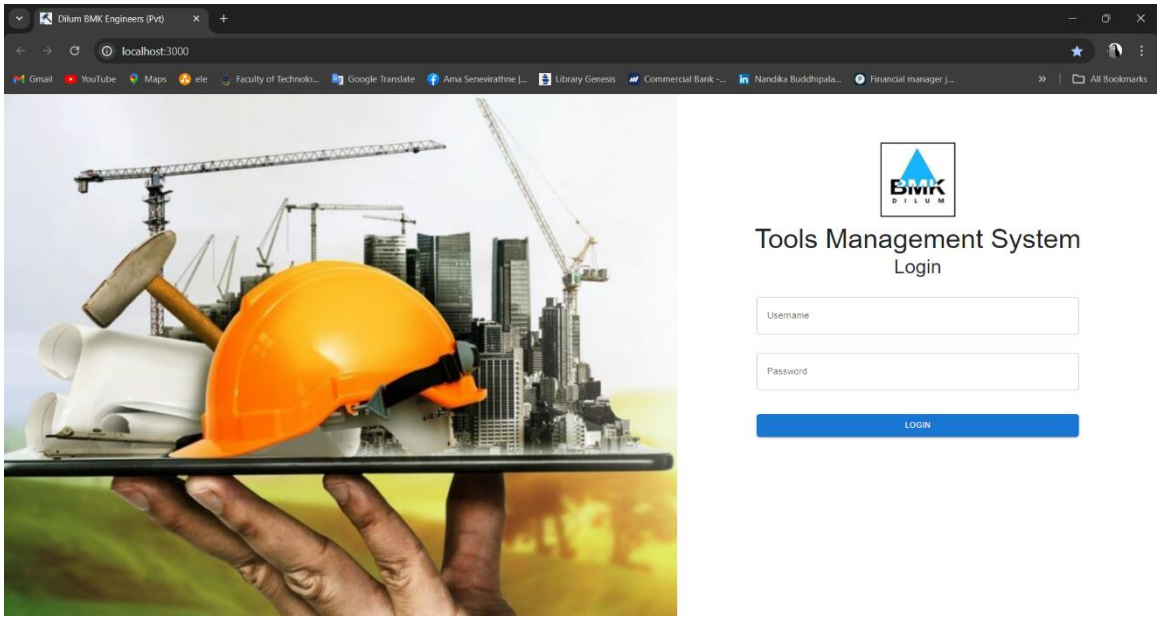

Figure 4- Login page of the Web application

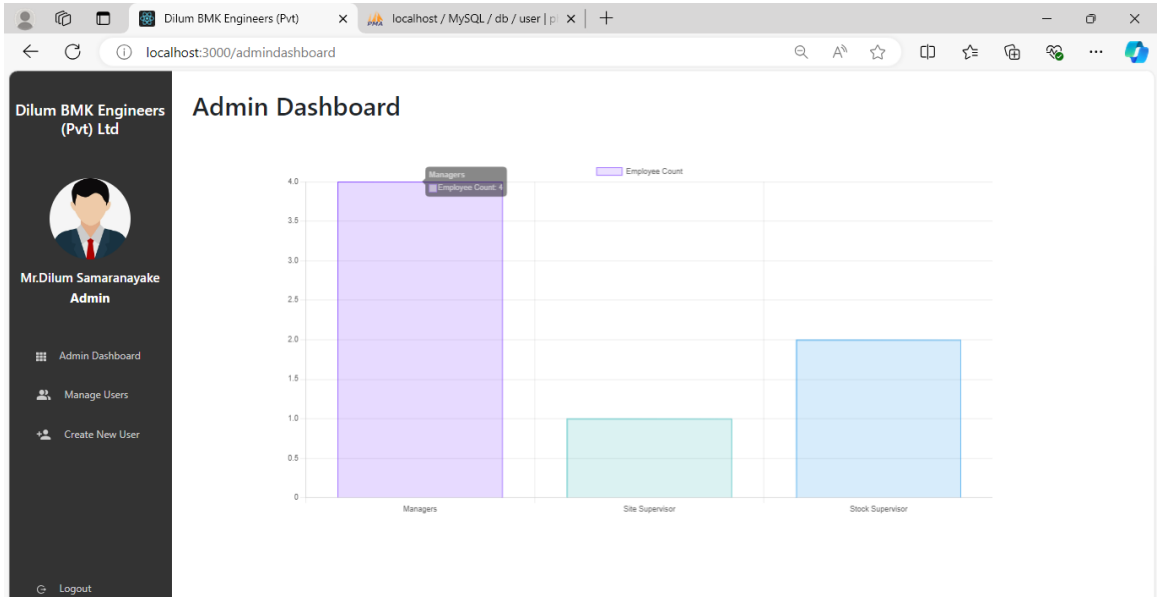

Figure 5 - Admin Dashboard

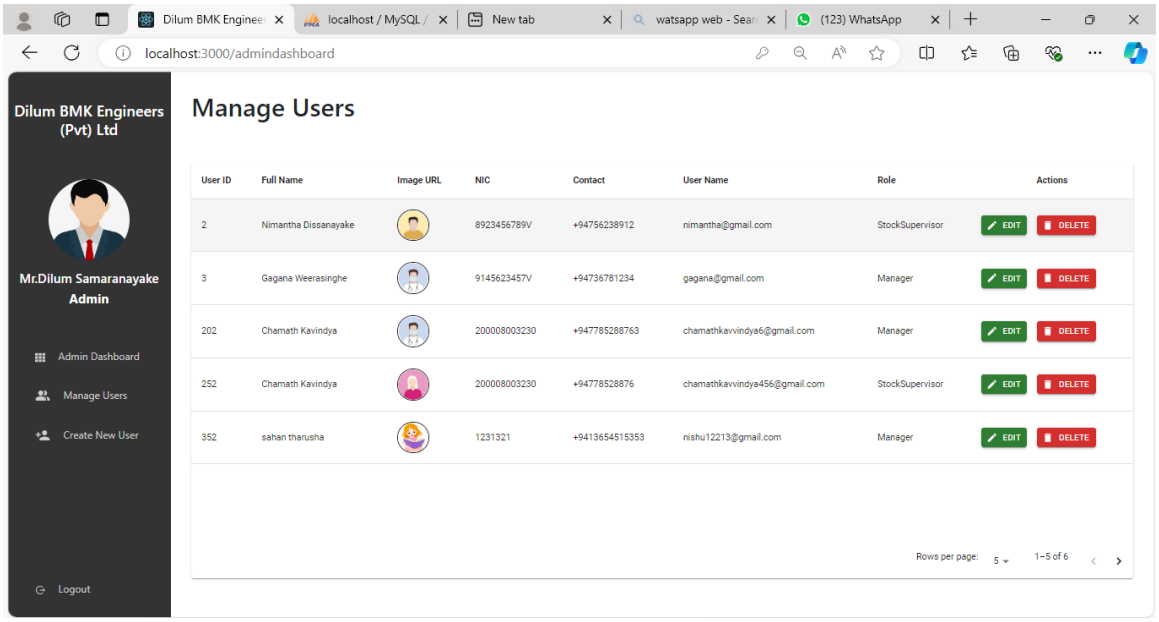

Figure 6 - Manage Users Page

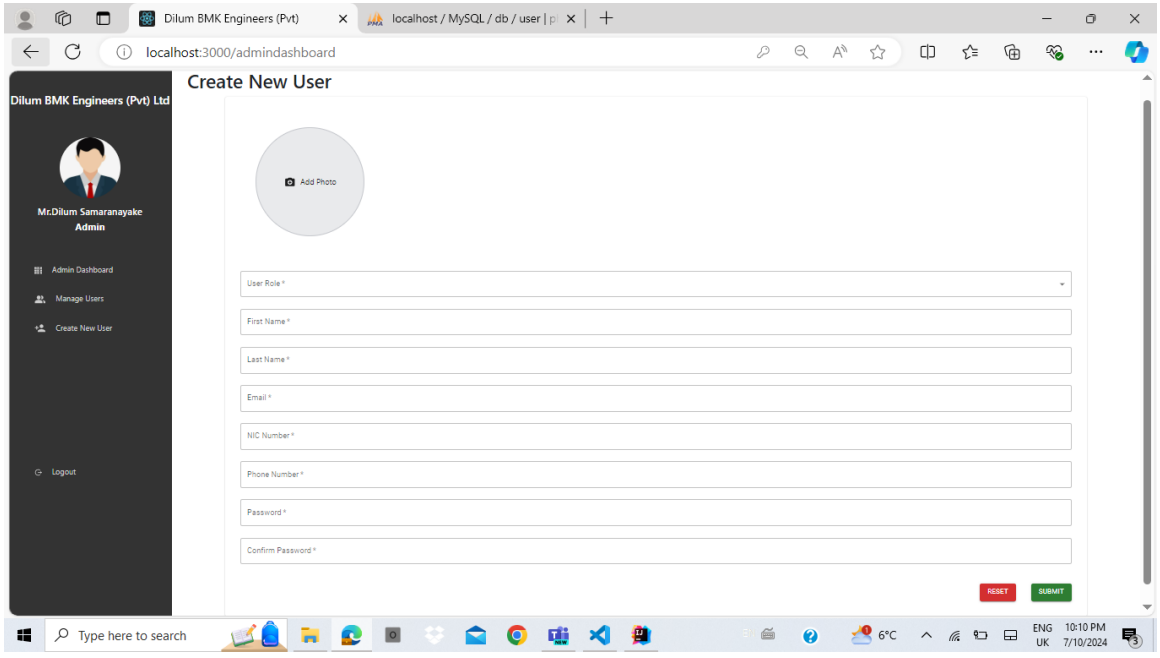

Figure 7 - Create New user Form

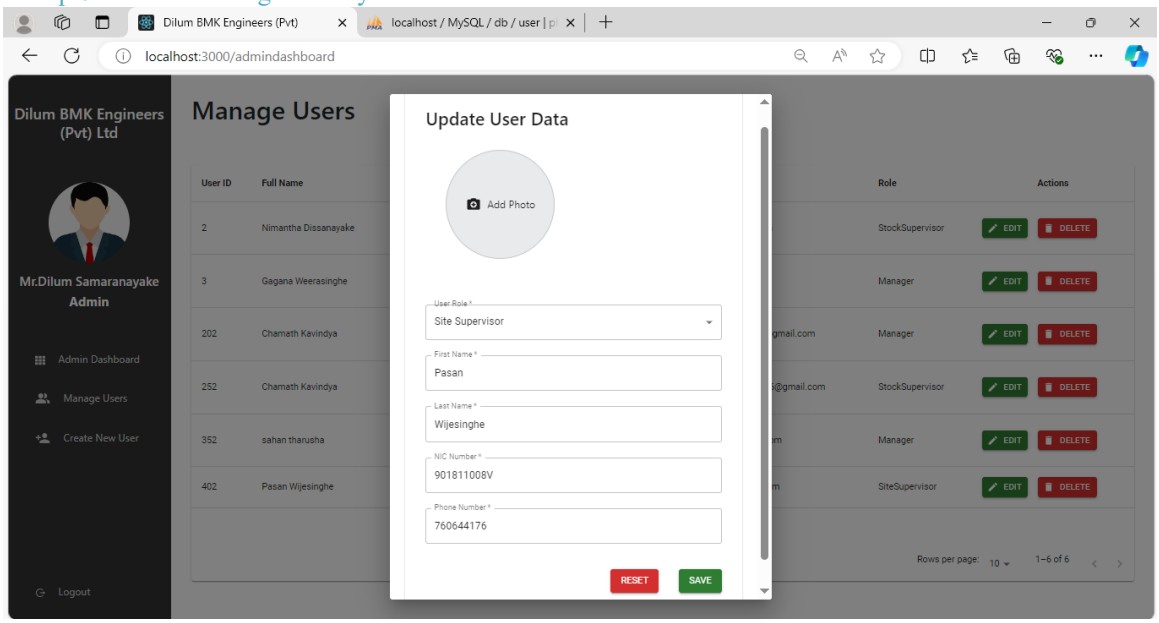

Figure 8 - Update User Form

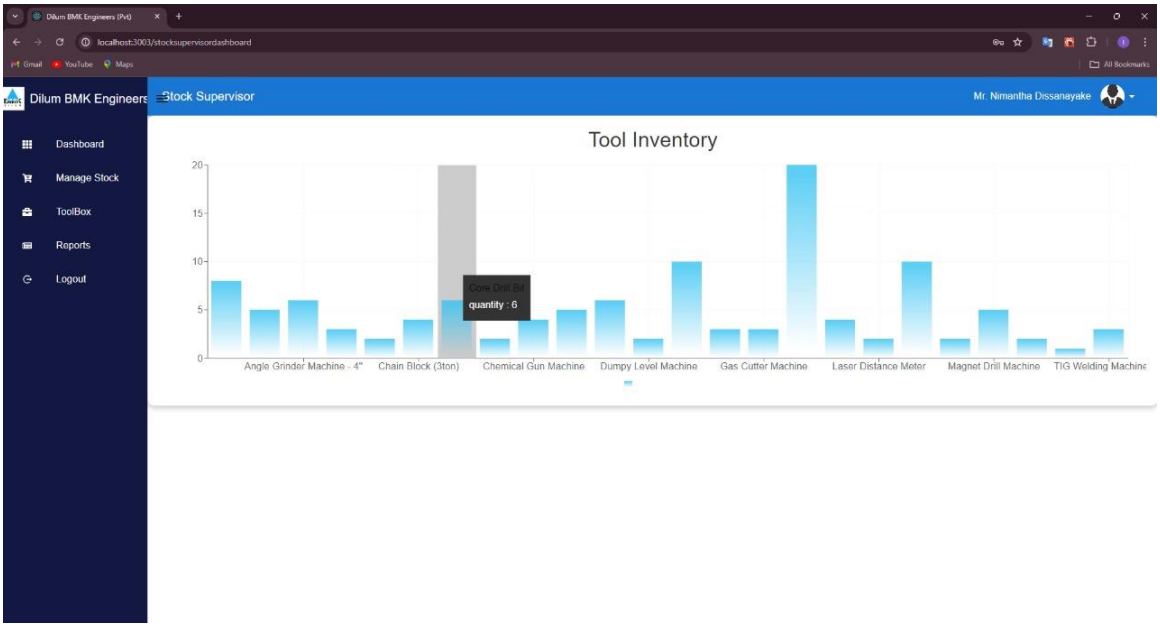

Figure 29 - Stock Supervisor Dashboard

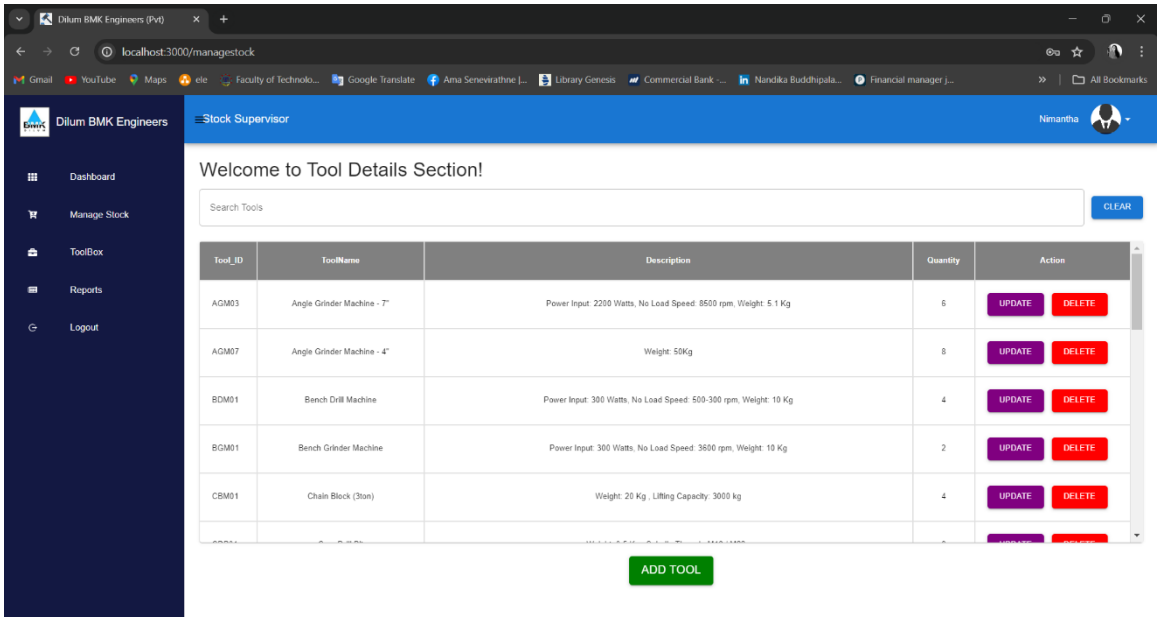

Figure 10 - Stock Supervisor View Tool Inventory

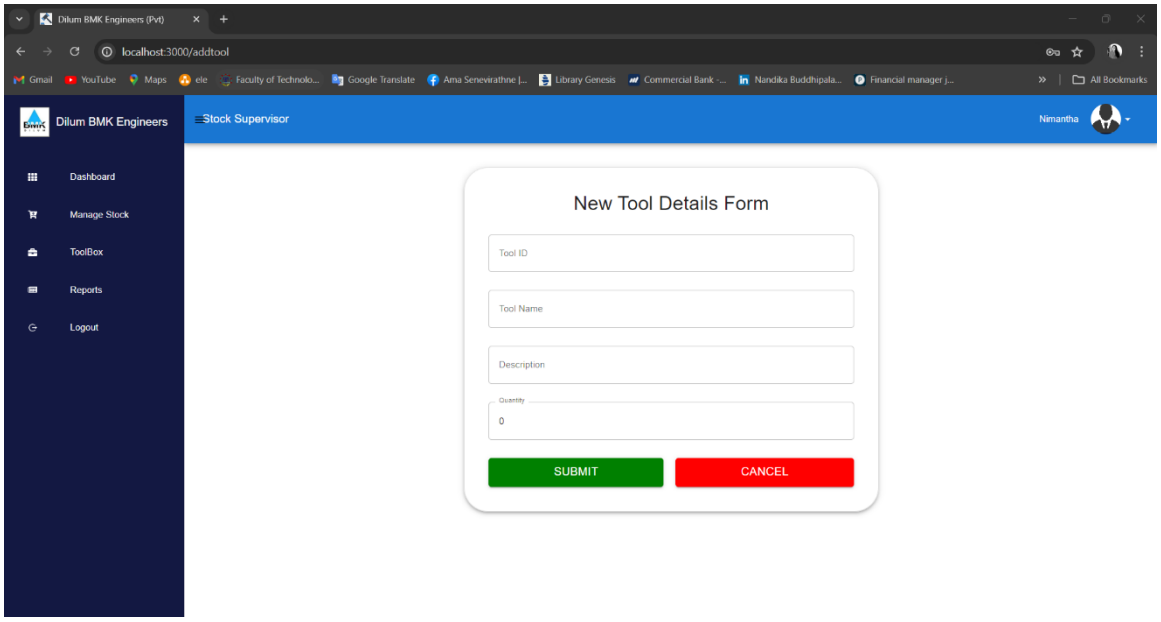

Figure 11 - Stock Supervisor Add New Tool Details Form

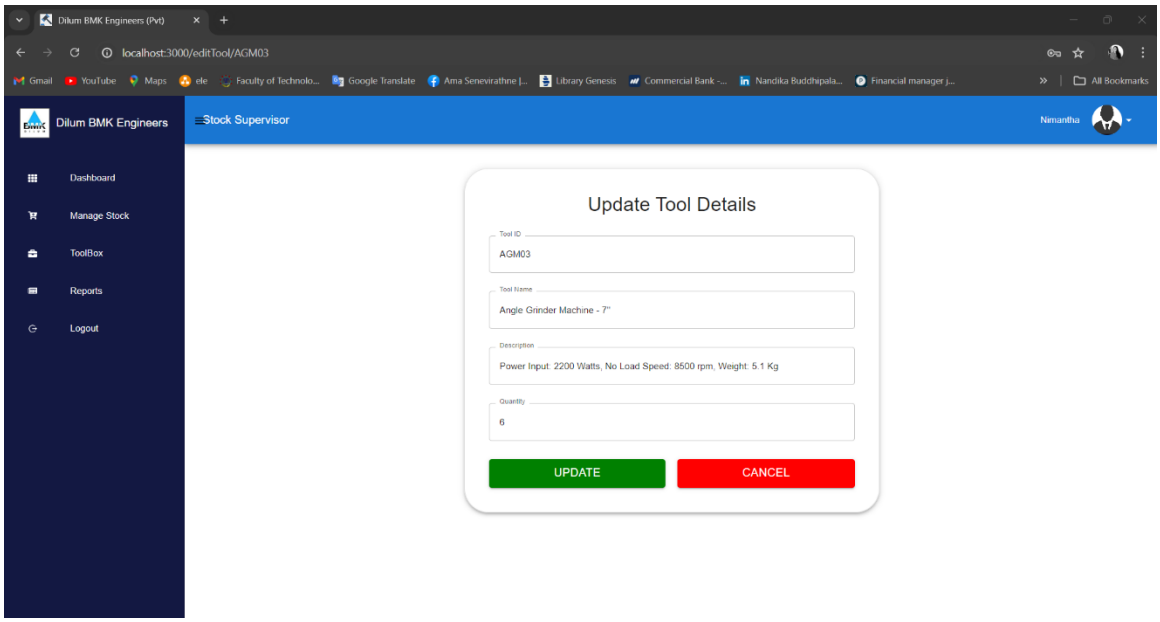

Figure 12 - Stock Supervisor Update Tool Details Form

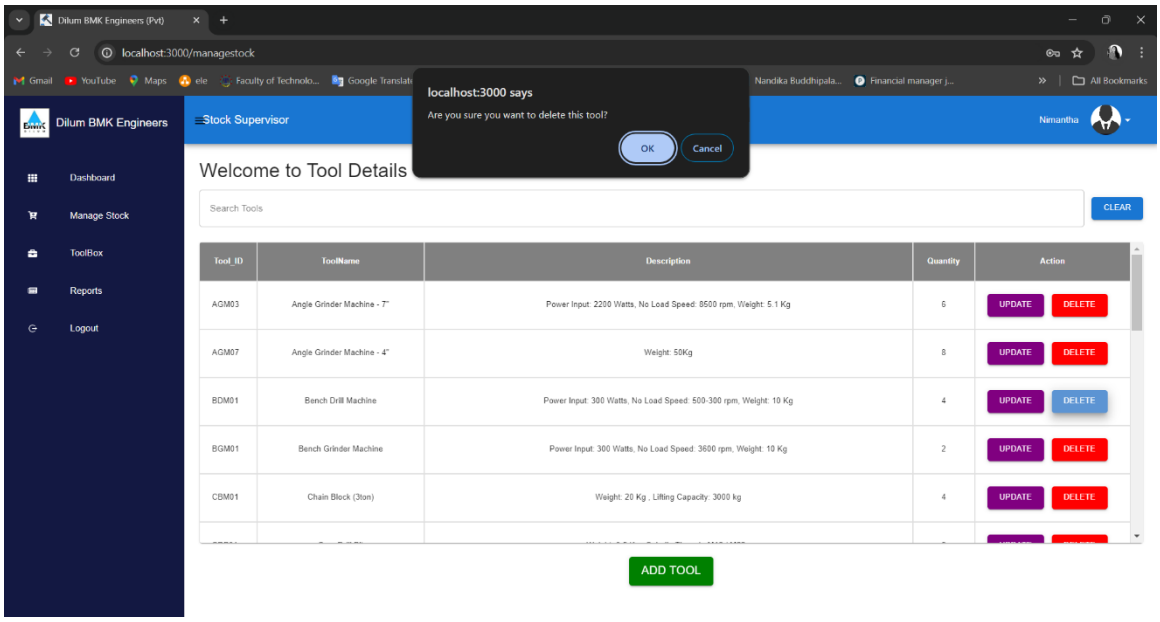

Figure 13 - Stock Supervisor Tools Delete

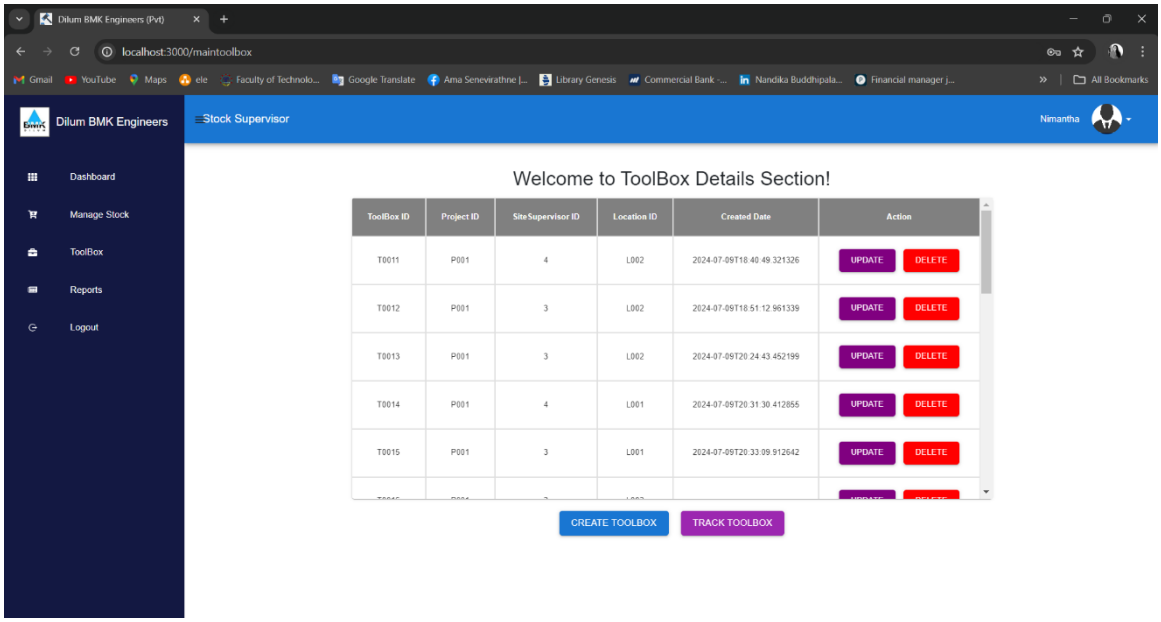

Figure 14 - Stock Supervisor Toolbox Details Page

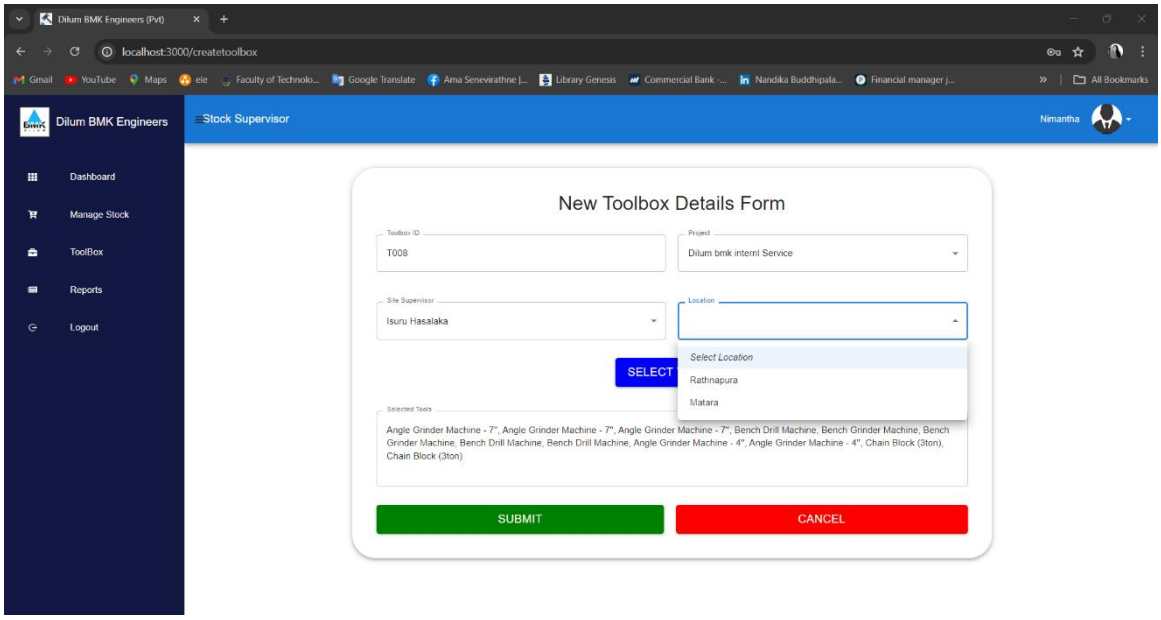

Figure 15- Stock Supervisor Create New Toolbox Details Form

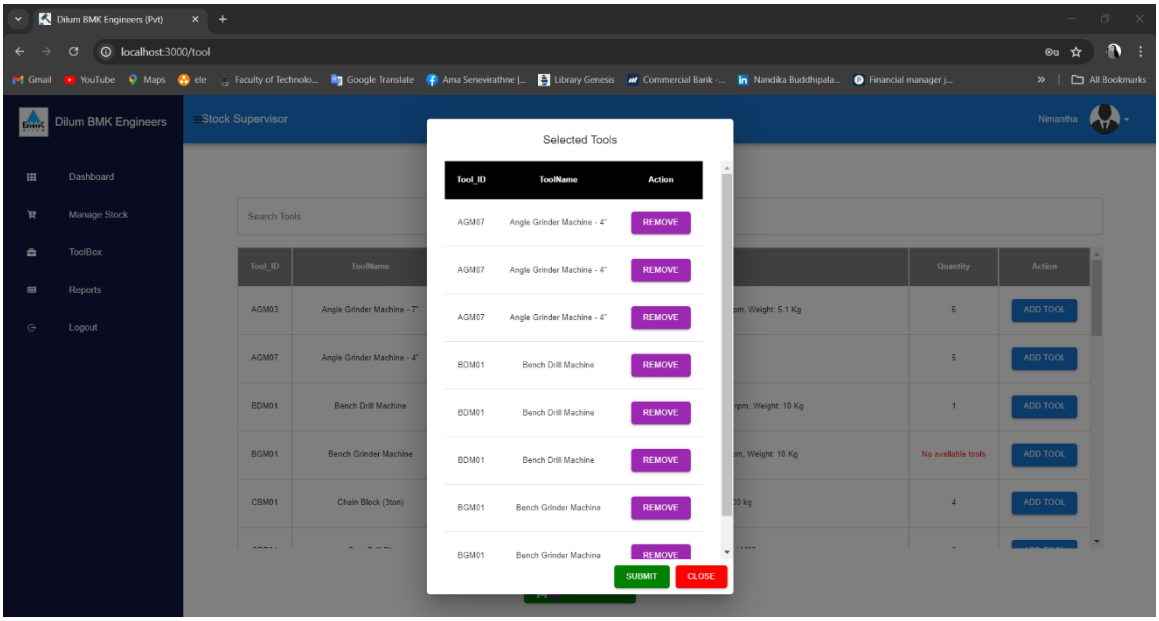

Figure 16 - Stock Supervisor Selected Tools Section

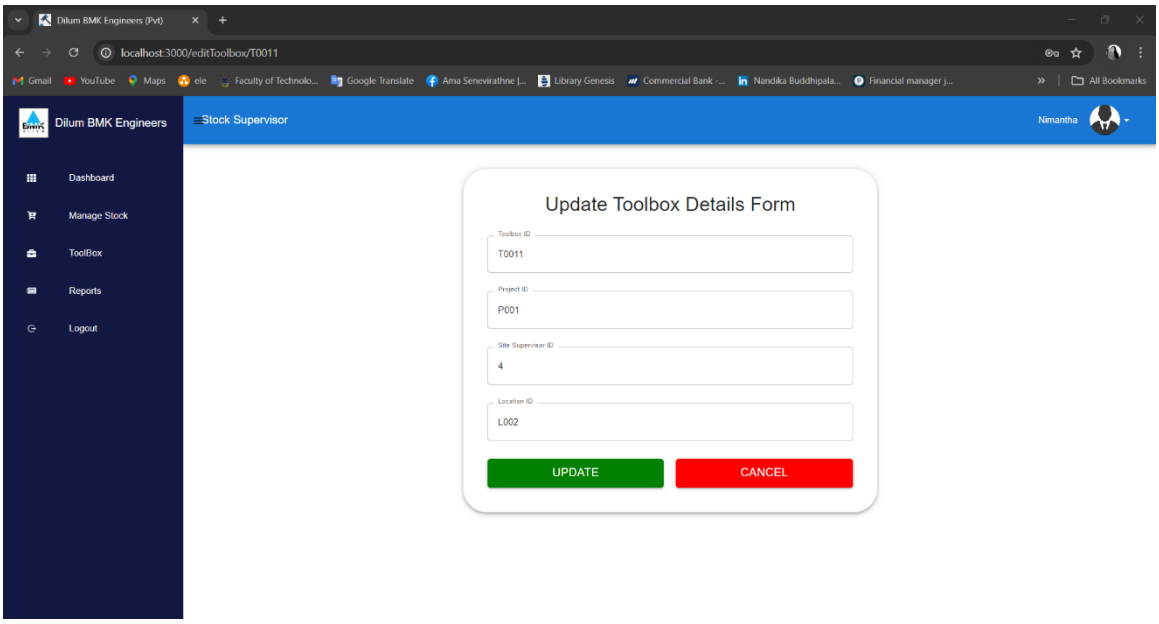

Figure 17 - Stock Supervisor Update Toolbox Details Form

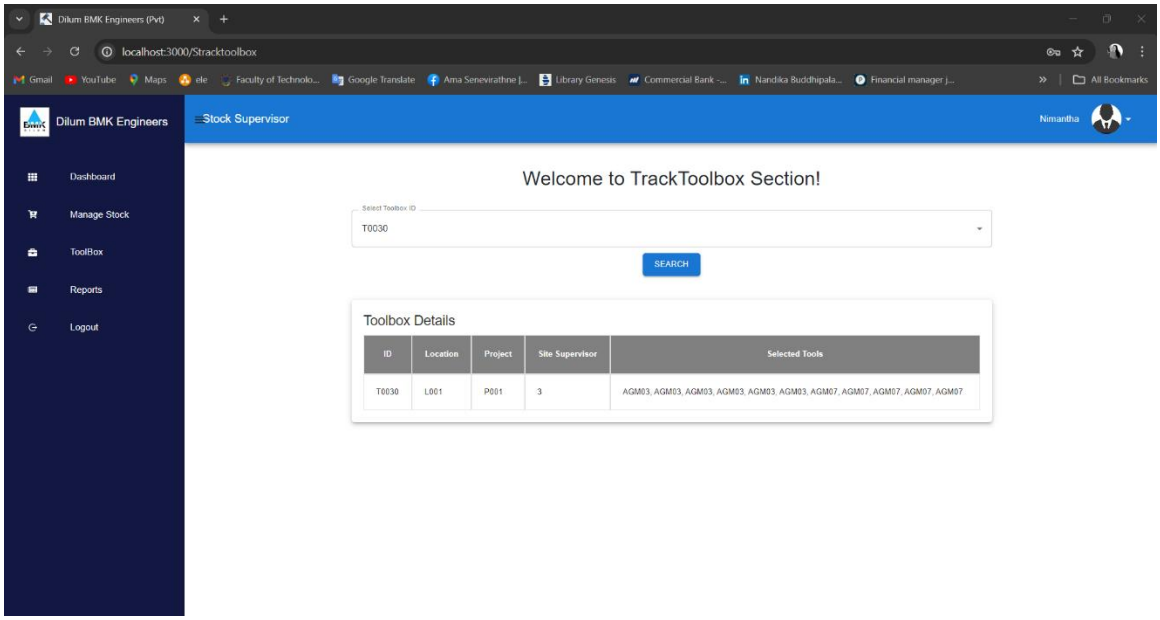

Figure 18 - Stock Supervisor Track Toolbox Details view Page

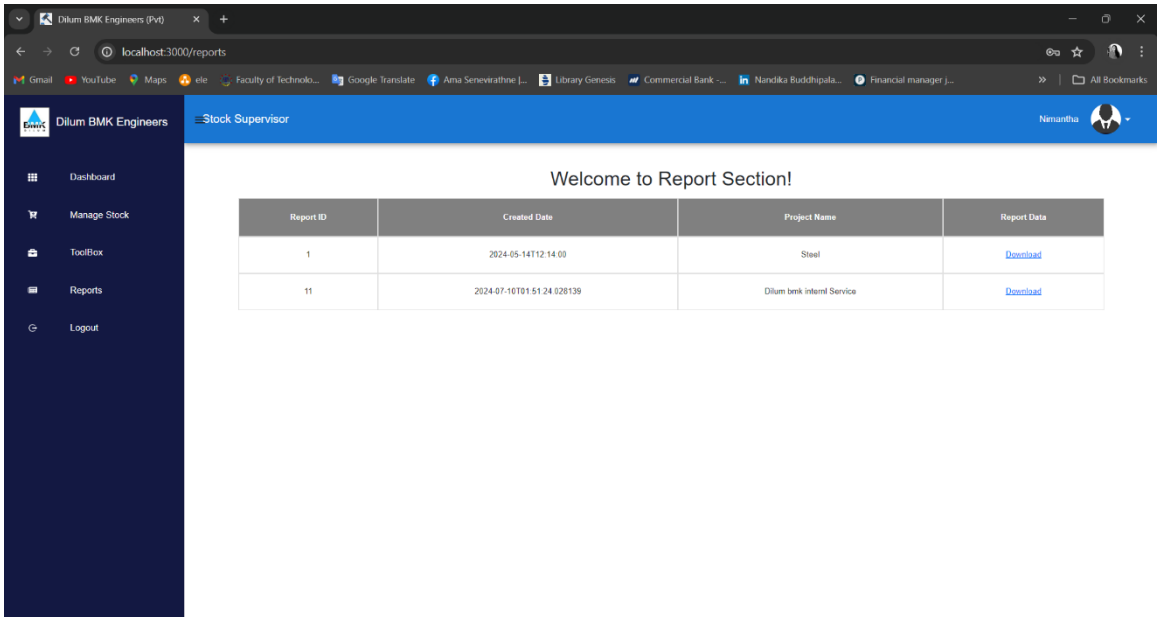

Figure 19 - Stock Supervisor View Report Page

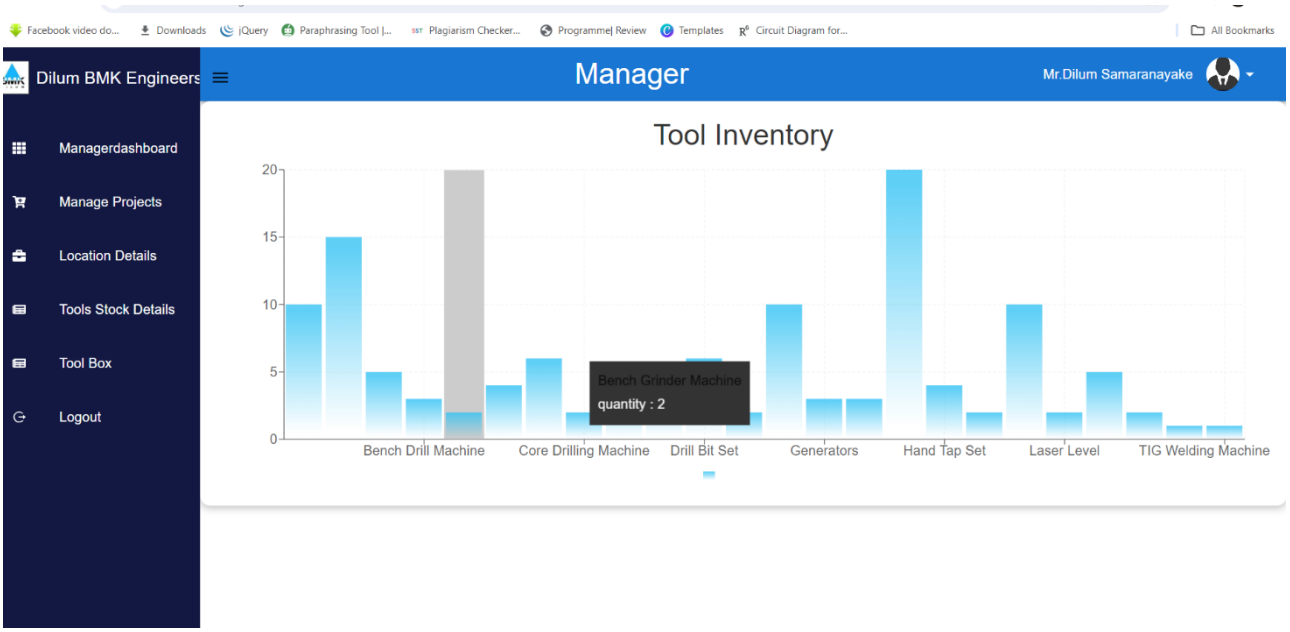

Figure 20 - Manager Dashboard

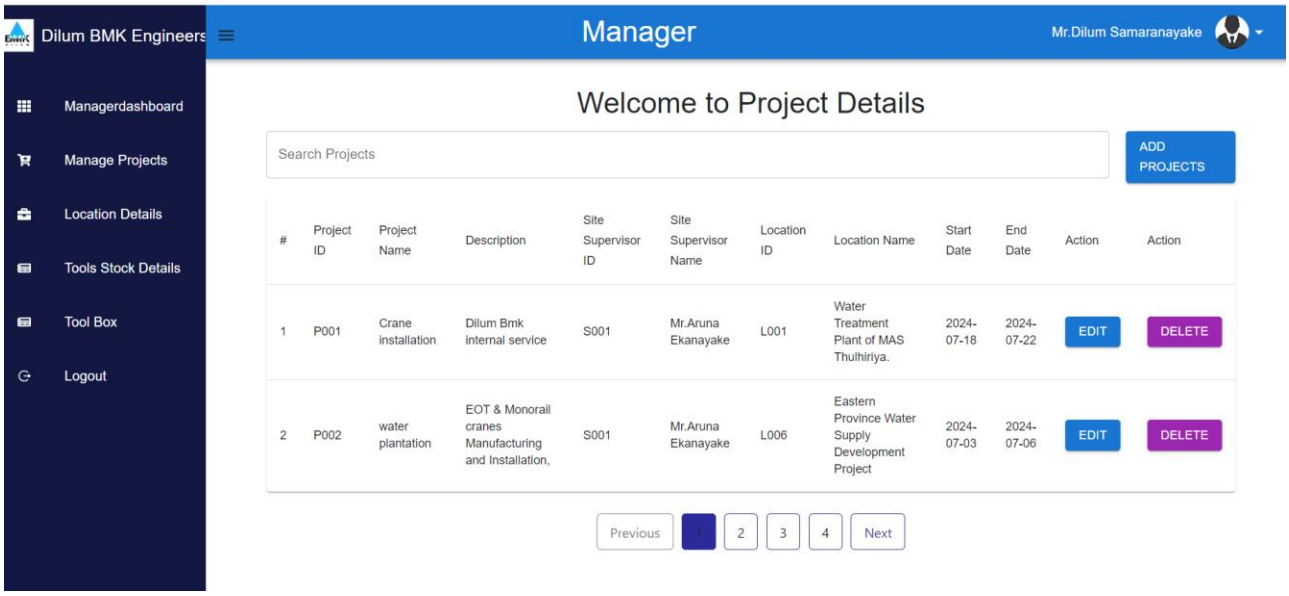

Figure 21 - Manager Manage Project details Page

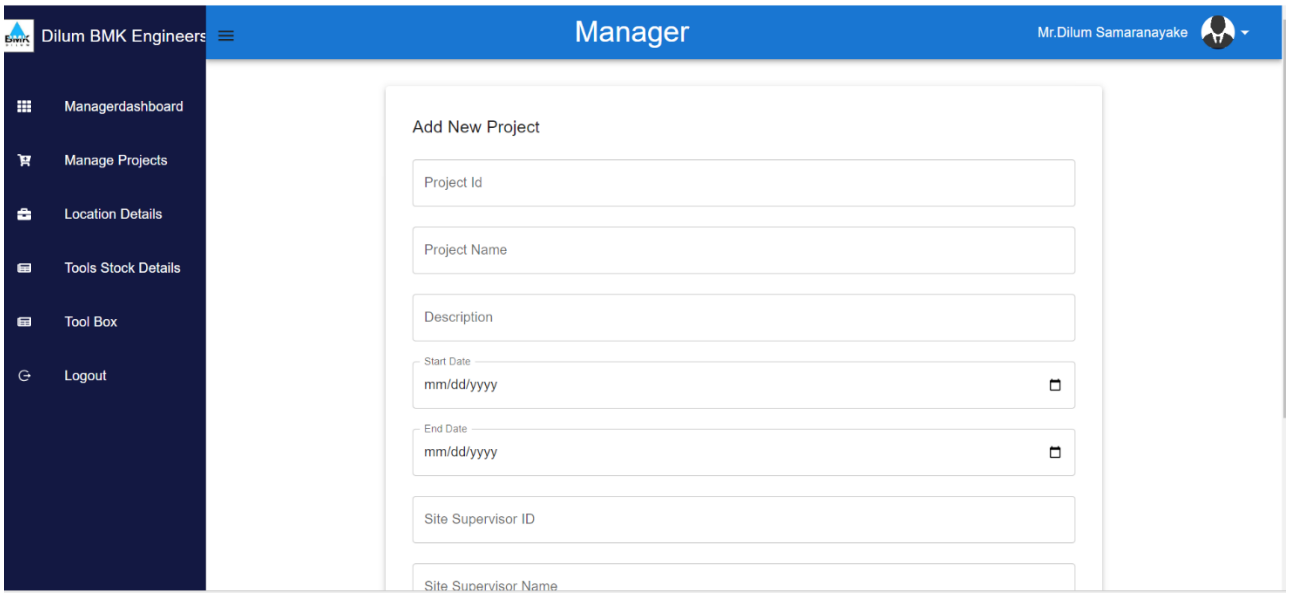

Figure 22 - Manager Add New Project details Form

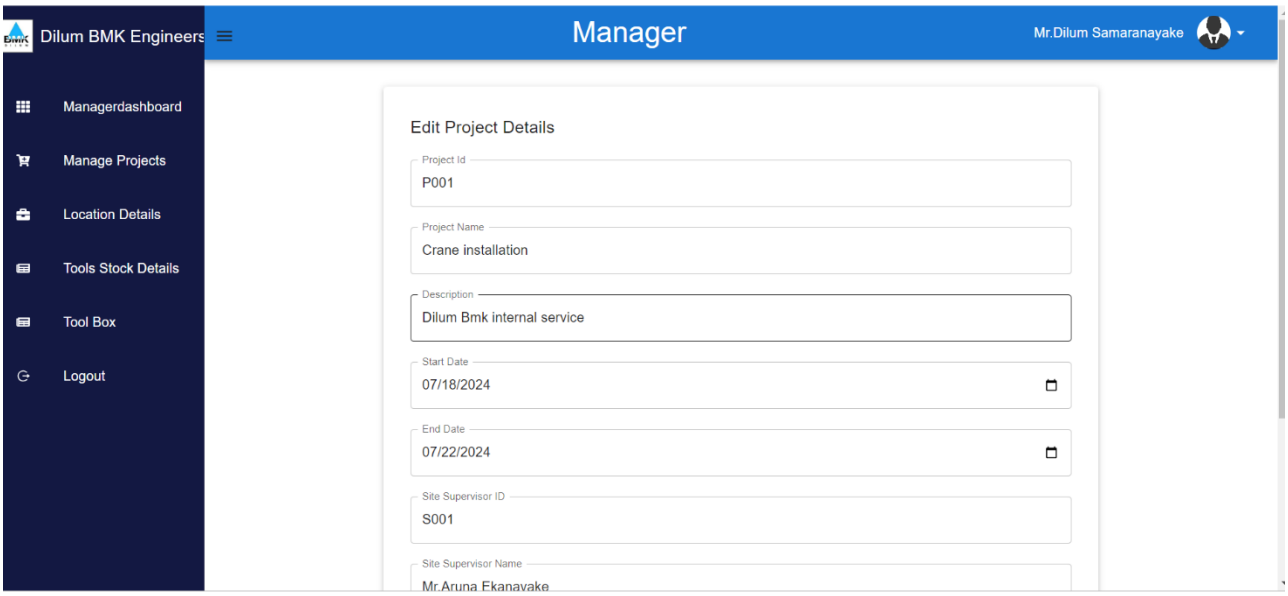

Figure 23 - Manager Update Project Details Form

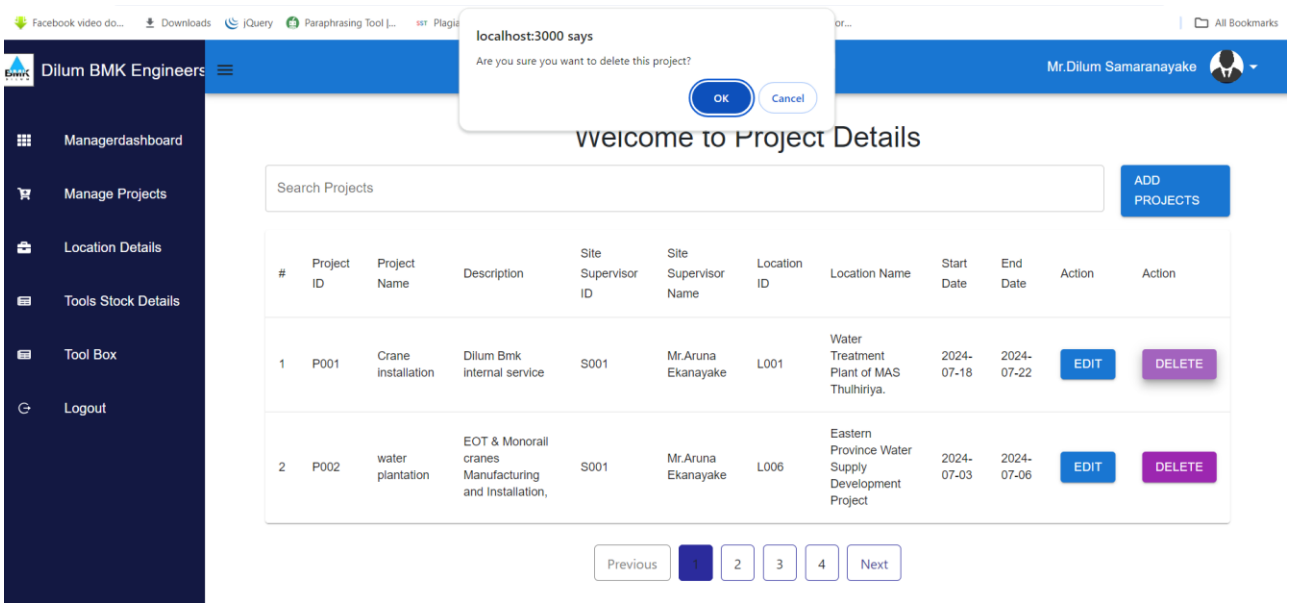

Figure 24 - Manger Delete Project Details

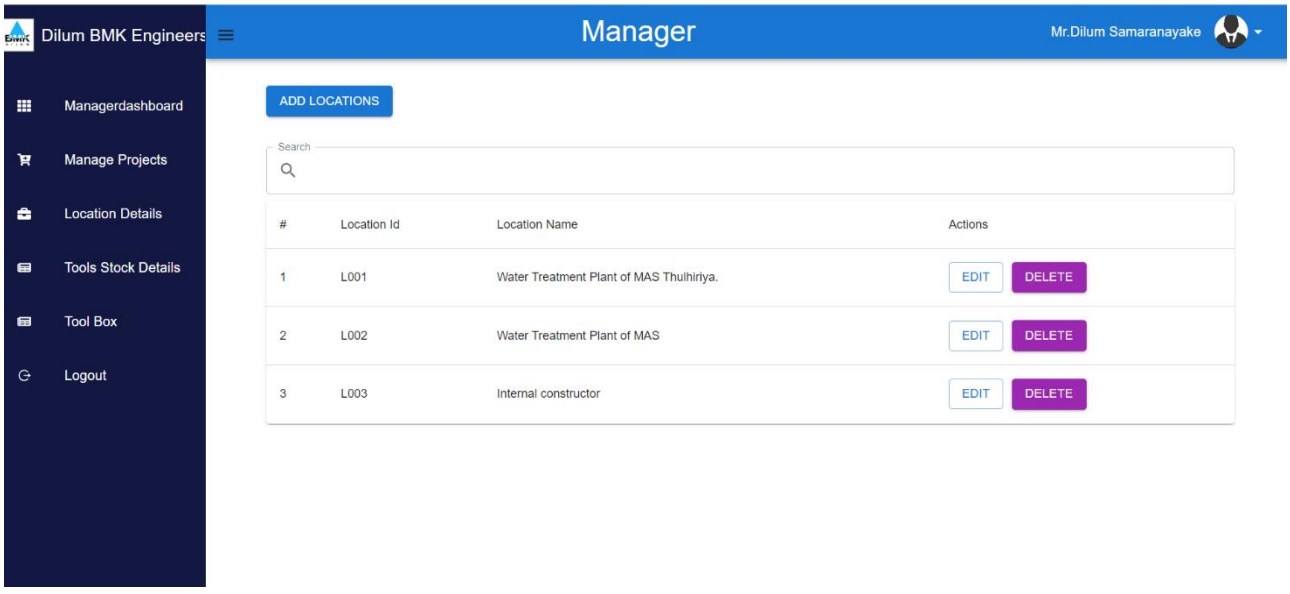

Figure 25 - Manager Add Location Details Form

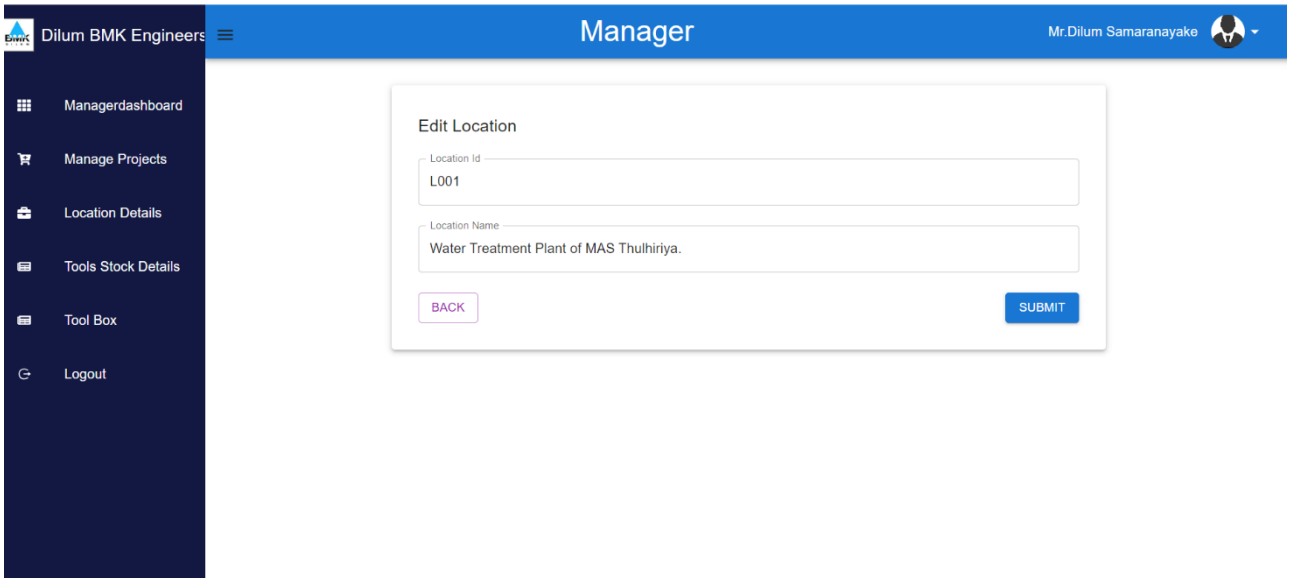

Figure 26 - Manager Edit Location Details Form

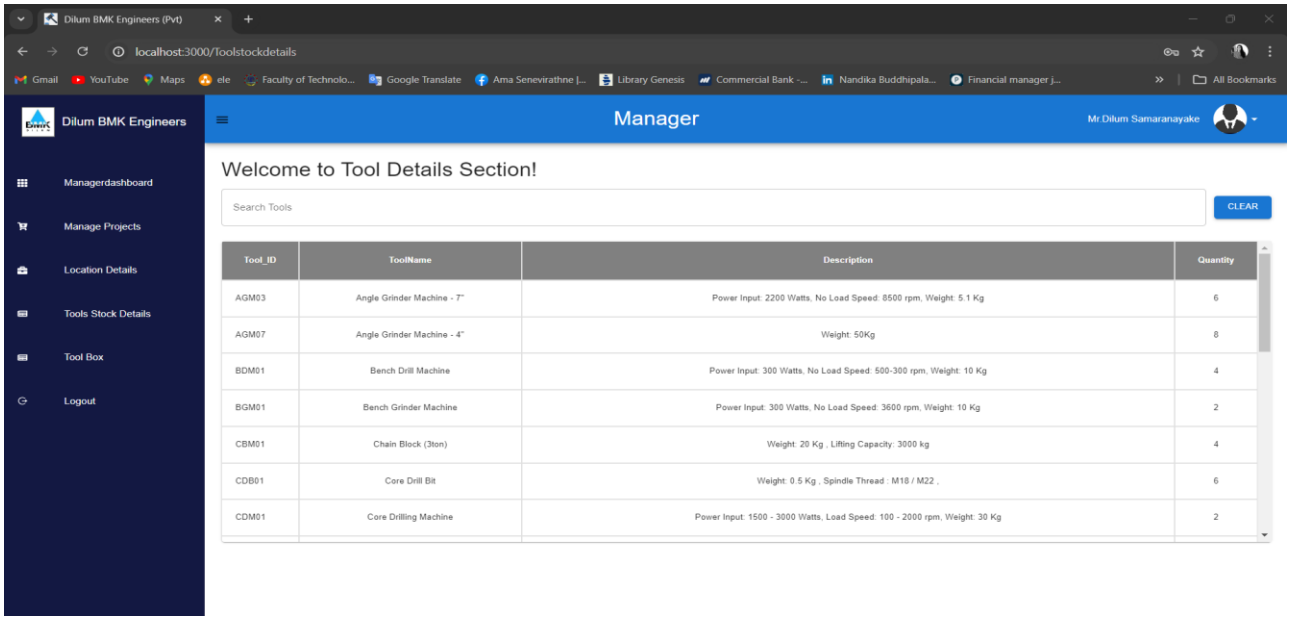

Figure 27 - Manager View Tools Details Page

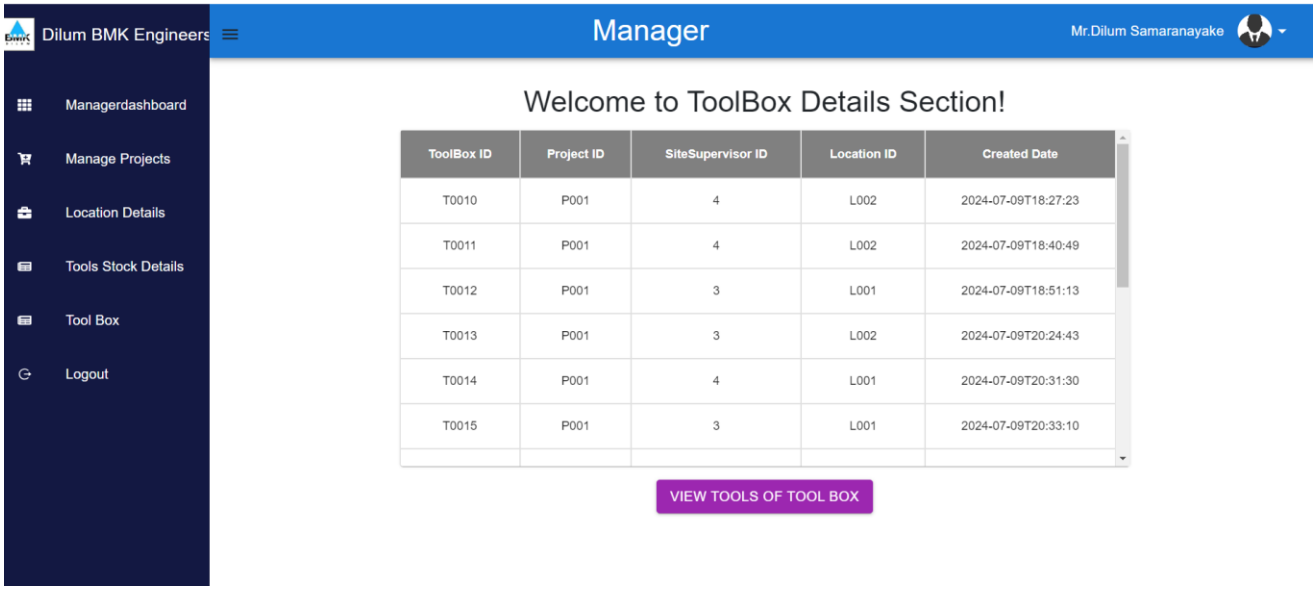

Figure 28 - Manager View Toolbox Details Page

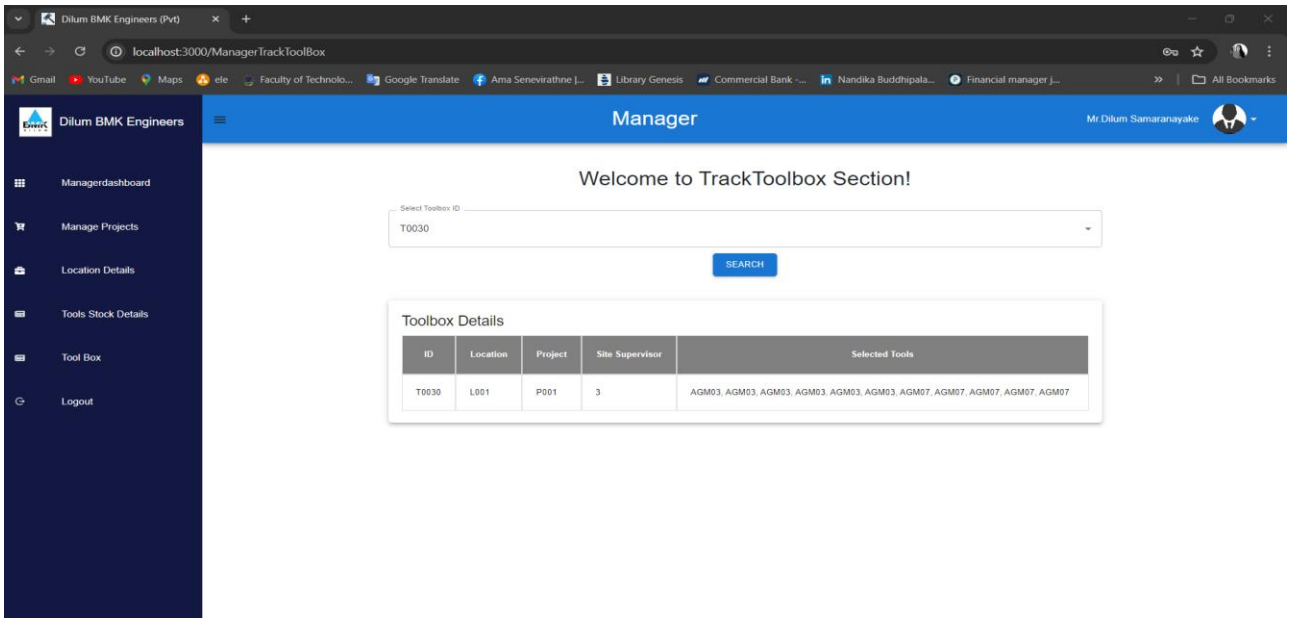

Figure 29 - Manager View Selected Tools Details in the Toolbox Page

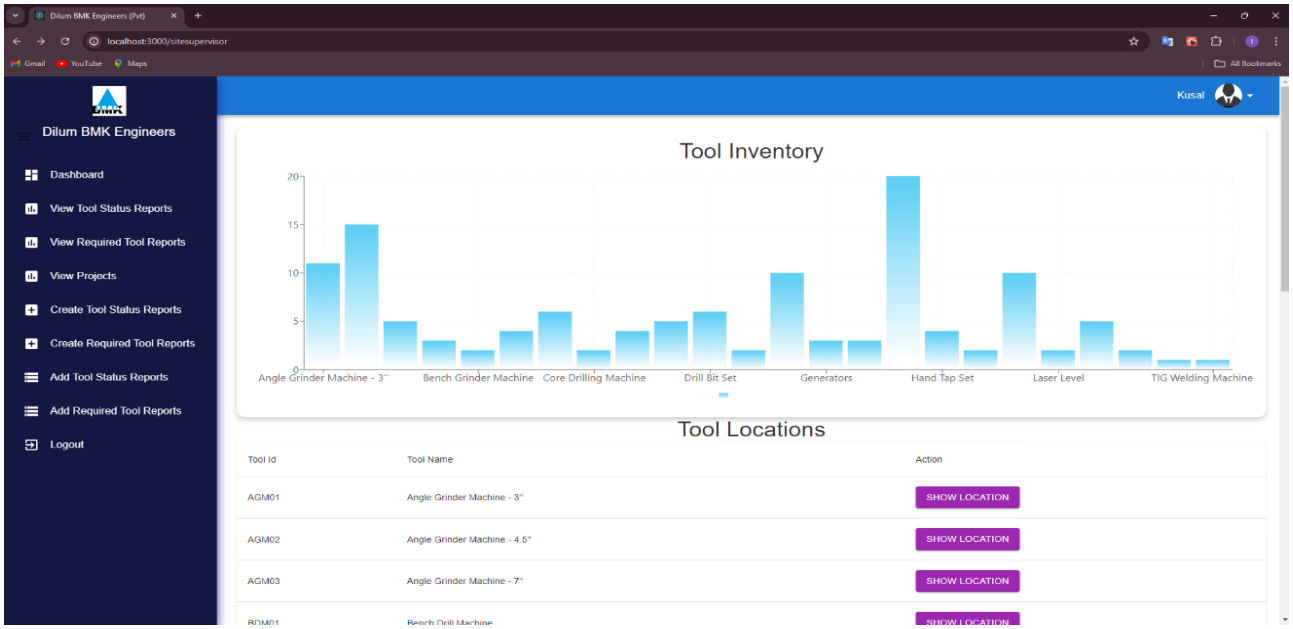

Figure 30 - Site Supervisor Dashboard

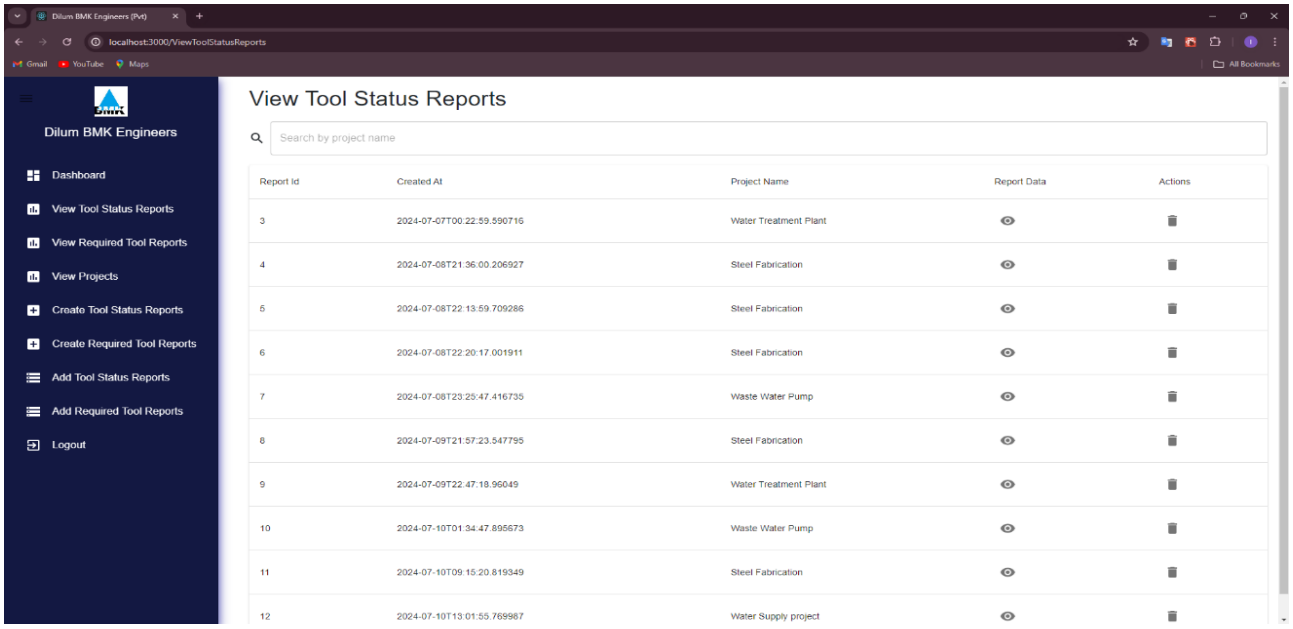

Figure 31 - Site Supervisor View Tool status Reports page

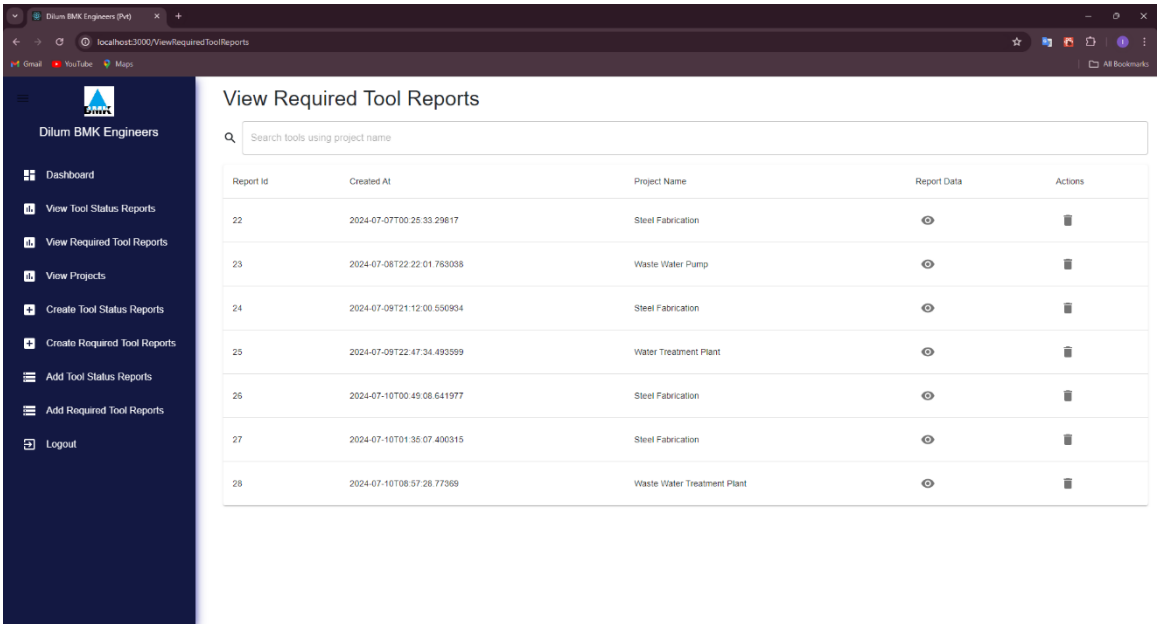

Figure 32 - Site Supervisor View Required Tool Reports page

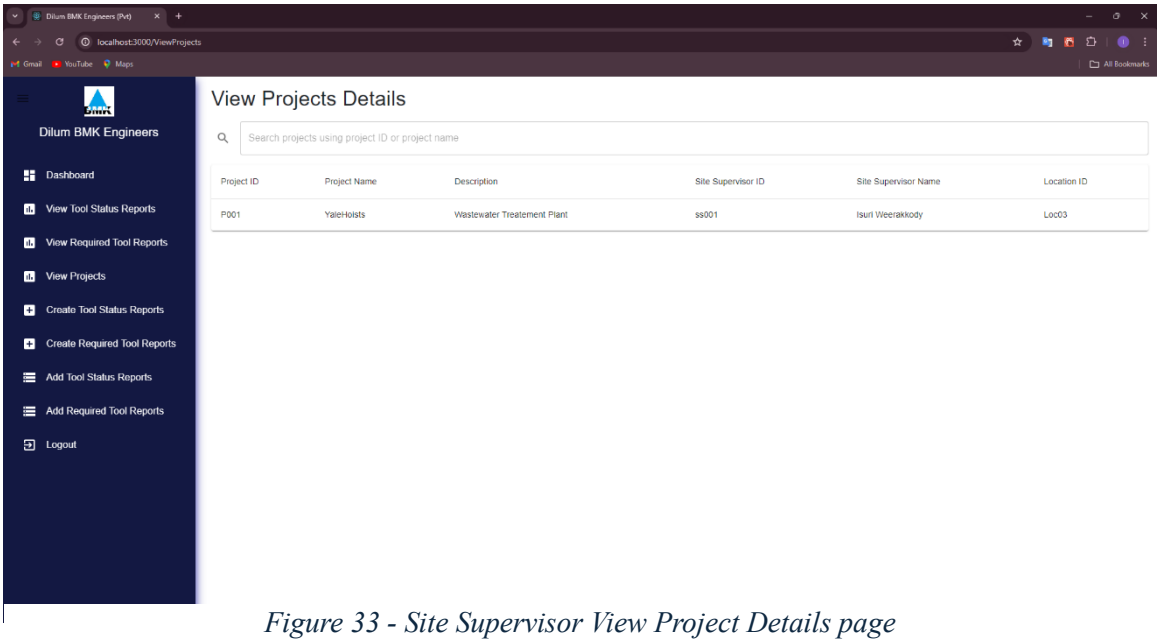

Figure 33 - Site Supervisor View Project Details page

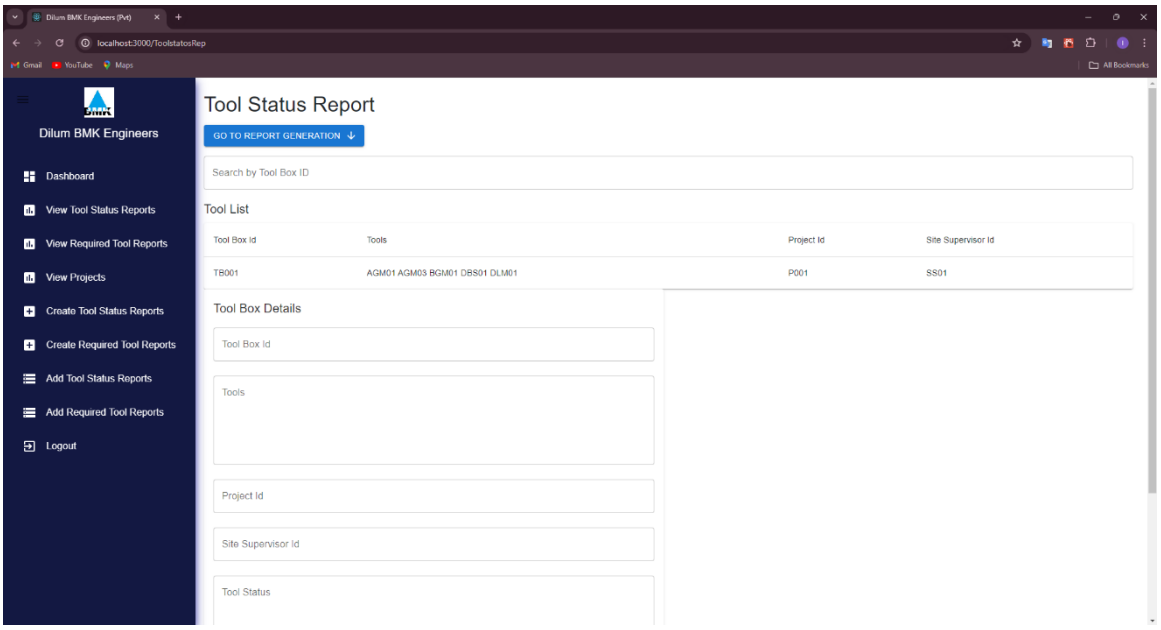

Figure 34 - Site Supervisor Create Tool Status Report page

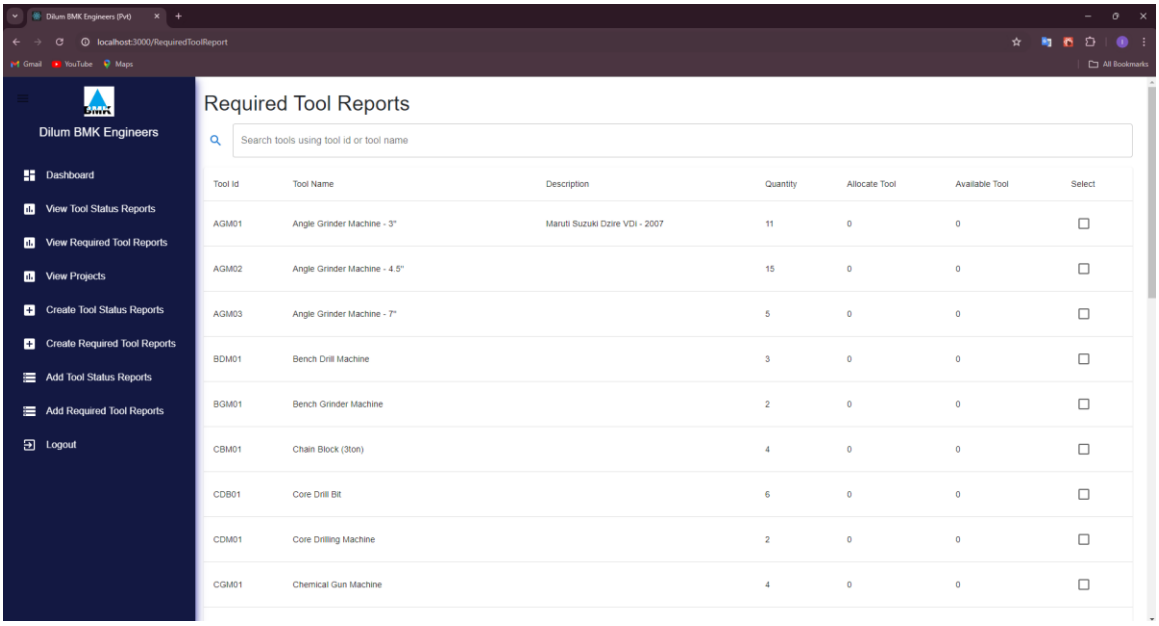

Figure 35 - Site Supervisor view Required Tool Report page

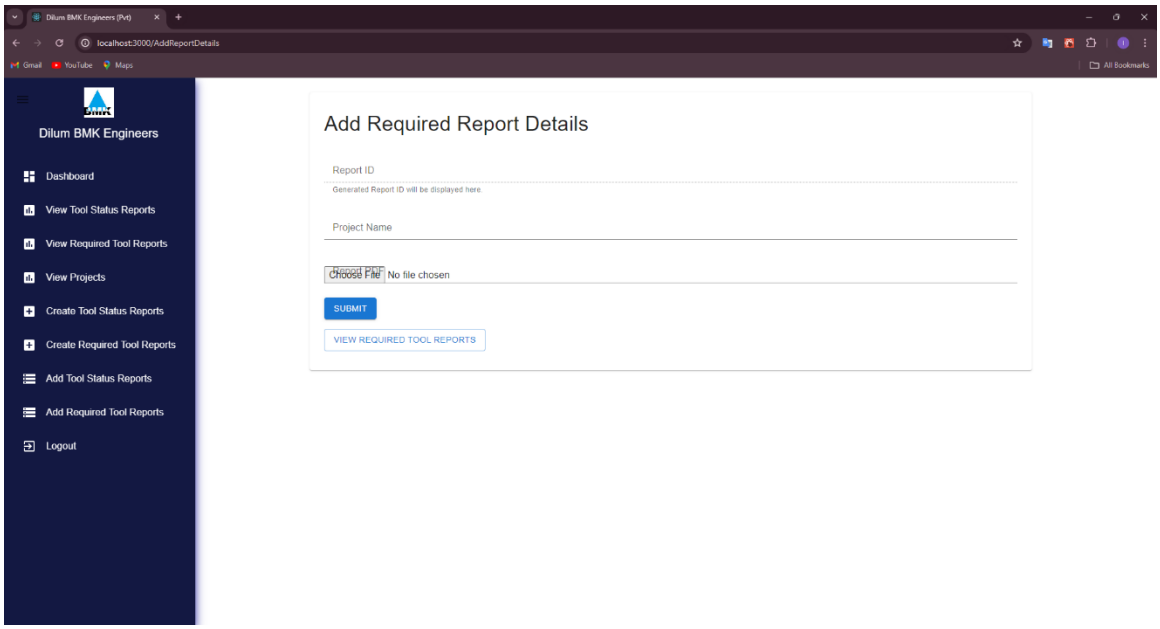

Figure 36 - Site Supervisor Add Required Tool Report Form page

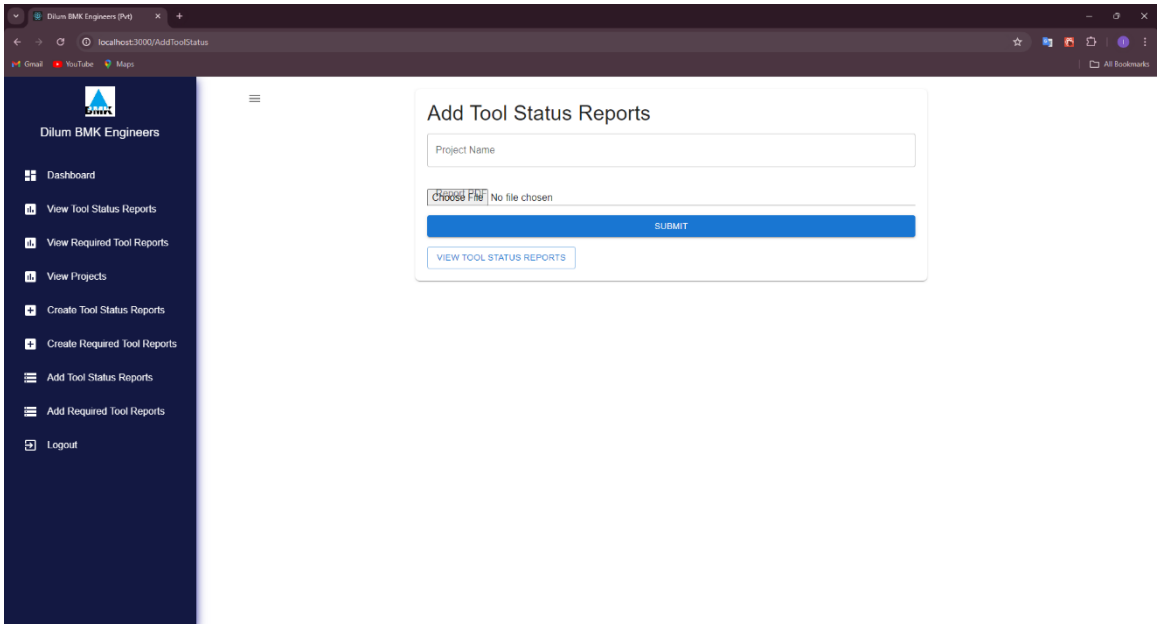

Figure 37 - Site Supervisor Add Tool Status Report Form page

4. Implementation

4.1. Development Process

1. Requirement Gathering and Analysis- The first step is to gather and analyze the requirements from stakeholders, including admins, managers, stock supervisors, and site supervisors. This involves understanding the specific needs and functionalities required by each user role.

2. System Design- Once the requirements are clear, the system design phase begins. This includes designing the architecture of the system, creating wireframes for the user interface, and defining the database schema. The architecture typically involves a frontend built with React.js, a backend using Spring Boot, and a MySQL database for data storage.

3. Frontend Development- The frontend is developed using React.js, with an emphasis on creating a responsive design to ensure compatibility across different devices. This involves implementing user interfaces for various roles, such as admin, manager, stock supervisor, and site supervisor.

4. Backend Development- The backend is developed using Java with the Spring Boot framework. This includes implementing RESTful APIs to handle communication between the frontend and backend, managing business logic, and integrating with the database.

5. Database Design and Integration- A MySQL database is set up to store and manage data, including user accounts, project information, inventory details, and reports. The backend is integrated with the database to facilitate data access and manipulation.

6. Testing and Quality Assurance- The system undergoes thorough testing to ensure it functions as expected. This includes unit testing, integration testing, and user acceptance testing. Testing ensures that the system is free of bugs and meets the specified requirements.

4.2. Challenges

- Requirement Changes - One of the primary challenges is managing changes in requirements. As stakeholders gain a better understanding of the system, they may request changes or new features. This can affect the project timeline and require adjustments to the development process.

- Data Security and Privacy - Given that the system handles sensitive company and personal information, ensuring data security and privacy is a major challenge.

- System Integration - Integrating the frontend, backend, and database components could be complex. Ensuring smooth communication and data exchange between these components requires careful design and thorough testing.

- Scalability - As the company grows, the system must be able to handle an increasing amount of data about tools and users. Designing the system to be scalable and performant under varying loads is a significant challenge.

- User Experience and Usability - Creating a user-friendly interface that meets the needs of different user roles is crucial. This involves designing intuitive navigation, providing clear instructions, and ensuring the system is accessible to all users.

- Testing and Quality Assurance - Thoroughly testing the system to identify and fix bugs is challenging, especially as the system becomes more complex. Ensuring that all features work as intended and that the system is reliable under various conditions requires extensive testing.

- Technology Stack and Compatibility - Choosing the right technology stack and ensuring compatibility with various operating systems, browsers, and devices can be challenging. For instance, ensuring that the web application works seamlessly on both Google Chrome and Mozilla Firefox, and that it performs well on different screen sizes, requires careful planning and testing.

5. Testing

5.1. Testing Approach

Unit Testing -

- We employed this to verify the functionality of individual components or modules in isolation.
- Includes testing of individual functions, methods, and classes, ensuring that each unit performs as expected.
- Tools - JUnit for Java-based backend testing and Jest for React.js frontend testing.

Integration Testing -

- We employed this to test the interaction between different modules and ensure they work together correctly.
- Focuses on the communication between the frontend and backend, particularly the RESTful APIs and database interactions.
- Tools - Postman for API testing and Selenium for end-to-end integration testing.

System Testing -

- We employed this to evaluate the complete and integrated software system to ensure it meets the specified requirements.
- Includes testing the entire application, covering all functional requirements and user roles (Admin, Manager, Stock Supervisor, and Site Supervisor).
- Tools - Manual testing and automated test scripts.

5.2. Results

Test Case Description

Test case ID	TC_01	Test Case description		Test the login functionality in Tool Management System	
Created by	Ama	Date Created	March 30, 2024		
Tester's Name	Ama	Date Tested	March 30, 2024	Test case	Pass
S#	Prerequisites	S#	Test Data		
1	Access to chrome browser	1	Username = isuru@gmail.com		
2	The user must be registered user in the system.	2	Password = isu0ru@123		
Test Scenario	Verify on entering valid username and password, the user can login to the system and redirected to their dashboard.				

Step #	Step Details	Expected Results	Actual Results	Pass/Fail/Not executed/ Suspended
1	Navigate to Tool Management System	Site should open	As Expected,	Pass
2	Enter Username & Password	Credential can be	As Expected,	Pass
3	Click Login button	Successfully login and Redirect user dashboard	As Expected,	Pass

Table 1 - User Login (Verify on entering valid username and password)

Test case ID	TC_05	Test Case description		Test the insert Tools into the inventory in the Tool Management System	
Created by	Ama	Date Created	March 30, 2024		
Tester's Name	Ama	Date Tested	March 30, 2024	Test case	Pass

S#	Prerequisites	S#	Test Data
1	Access to chrome browser	1	ToolID = 1
2	Login to the Tools Management System	2	Tool name = Angle Grinder Machine
3	Access to the Stock Supervisor Dashboard	3	description
4	Access to Manage Stock interface	4	Quantity = 10

Test Scenario	Verify on entering invalid toolID details, Stock Supervisor cannot add new Tool details

Step #	Step Details	Expected Results	Actual Results	Pass/Fail/Not executed/ Suspended
1	Navigate to Tool Management System	Site should open	As Expected,	Pass
2	Insert invalid ToolID , Tool name, Description, and Quantity	Display an Alert of error "Enter String type ToolID "	As Expected,	Pass
3	Click Add button	Display an error message "New Tool details are not added successfully"	As Expected,	Pass

Table 2 - Test the Insert of New Tools to the Inventory System (Verify on entering invalid toolID details, Stock Supervisor cannot add new Tool details)

Test case ID	TC_12	Test Case description		Test the Create New Toolbox in the Tool Management System	
Created by	Ama	Date Created	April 04, 2024		
Tester's Name	Ama	Date Tested	April 08, 2024	Test case	Pass

S#	Prerequisites	S#	Test Data
1	Access to chrome browser	1	Toolbox ID = T0031
2	Login to the Tools Management System	2	Project
3	Access to the Stock Supervisor Dashboard	3	Site Supervisor =
4	Access to Manage Stock interface	4	Location = Rathnapura
		5	Selected Tools = "Angle Grinder Machine-7, Bench Drill Machine"

Test Scenario	Verify on entering invalid toolbox details as not fill the data values, Stock Supervisor cannot add new Tool details

Step #	Step Details	Expected Results	Actual Results	Pass/Fail/Not executed/ Suspended
1	Navigate to Tool Management System	Site should open	As Expected,	Pass
2	Not enter the values to field in the toolbox create form	Display an Alert of error" Fill all data values in the field "	As Expected,	Pass
3	Click Add button	Display an error message "New Toolbox details are not added successfully"	As Expected,	Pass

Table 3 - Test the Create New Toolbox (Verify on entering invalid toolbox details as not fill the data values)

Test case ID	TC_13	Test Case description		Verification of tool assignment	
Created by	Ganga	Date Created	March 30, 2024,		
Tester's Name	Ganga	Date Tested	March 30, 2024,	Test case	Pass

S#	Prerequisites	S#	Test Data
1	Access to chrome browser	1	Project_Id= 001
2	Login to the Tools Management System	2	Project_name = Water Treatment Plant Expansion
3	Access to the Site Supervisor Dashboard	3	Tool_Id = T001
			Quantity = 10

Test Scenario	Verify that the site supervisor can assign tools to their specific projects successfully

Step #	Step Details	Expected Results	Actual Results	Pass/Fail/Not executed/ Suspended
1	select specific project	System displays a list of available projects and choose desired project	As expected,	Pass
2	Navigates to the project details	System redirects site supervisor to the project details page for the selected project on the project details page	As Expected,	Pass
3	Verifies the list of assigned the list of assigned tools.	System displays the list of tools assigned to the project details page	As Expected,	Pass
4	Cross references the assigned tools	Compares the list of assigned tools displayed on the project details page with the inventory records.	As Expected,	Pass

Table 4 - Verification of tool assignment

Test case ID	TC15	Test Case description		Test Status report creating	
Created by	Ganga	Date Created	March 30, 2024		
Tester's Name	Ganga	Date Tested	March 30, 2024	Test case	Pass

S#	Prerequisites	S#	Test Data
1	Access to chrome browser	1	Report_Id= Rep001
2	Login to the Tools Management System	2	Report_Type = Tool status report
3	Access to the Site Supervisor Dashboard	3	
			Quantity = 5

Test Scenario	Test Status report creating

Step #	Step Details	Expected Results	Actual Results	Pass/Fail/Not executed/ Suspended
1	Navigates to the reporting section	System provides an option for site supervisor to generate a report about tool status.	As Expected	Pass
2	Selects the option to create a report	System presents a form where the site supervisor can input parameters for the report generation.	As Expected ,	Pass
3	Fill the required information	Inputs necessary details such as project name, tools Id, data range etc for the report.	As Expected	Pass

Table 5 - Test Status report creating

Test case ID	TC16	Test Case description		Test generated report contains accurate information	
Created by	Ganga	Date Created	March 30, 2024		
Tester's Name	Ganga	Date Tested	March 30, 2024	Test case	Pass

S#	Prerequisites	S#	Test Data
1	Access to chrome browser	1	Report_Id= 001
2	Login to the Tools Management System	2	Report_type=Tool status report
3	Access to the Site Supervisor Dashboard	3	
			Quantity = 5

Test Scenario	Test generated report contains accurate information

Step #	Step Details	Expected Results	Actual Results	Pass/Fail/Not executed/ Suspended
1	Receives the generated report.	System delivers the generated report to the site supervisor in readable and accessible format	As Expected	Pass
2	Reviews the report contents.	Generated report contains accurate	As Expected	Pass

Table 6 - Test generated report contains accurate information

Test case ID	TC23	Test Case description		Test the User Registration	
Created by	Nishadi	Date Created	March 30, 2024		
Tester's Name	Nishadi	Date Tested	March 30, 2024	Test case	Pass

S#	Prerequisites	S#	Test Data
1	Access to chrome browser	1	User_ID=02
2	Login to the Tools Management System	2	First name= Nishadi
3	Access to the Site Admin Dashboard	3	Last name=Sansala
		4	NIC=200053303135
		5	Password=N@123
		6	Contact=+94760644176
		7	User name=nishu12213@gmail.com
		8	Position =Admin

Test Scenario	Verify on entering User details, Admin can add new User

Step#	Step Details	Expected Results	Actual Results	Pass/Fail/Not executed/ Suspended
1	Navigate to Tool Management System	Site should open	As Expected	Pass
2	Enter User_ID, First name, Last name, NIC, Password, Contact, Username, position	Credential can be	As Expected	Pass
3	Click Add button	Admin can add new User Details	As Expected	Pass

Table 7 - Test the User Registration

Test Case Id	TC_26	Test Case Description	Verify unsuccessful user registration with a duplicate phone number.
Created By	Nishadi	Date Created	2024/05/06

Tester's Name	Nishadi	Date Tested	2024/05/06	Test Case	Pass

S#	Prerequisites
1	Navigate to https://www.dilumbmkengineers.com
2	Access to the register User form
3	Required fields are clearly defined as red in color star mark

S#	Test Data
	Phone number 0784490388
	Phone number 0784490388

Step #	Step Details	Expected Results	Actual Results	Pass/Fail/Not executed/Suspended
1	Navigate to https://www.dilumbmkengineers.com	Show the website home page to the user	As Expected	Pass
2	Click the "Login" button.	Popup login form	As Expected	Pass
3	Click the "New user registration" button.	Popup User Registration form	As Expected	Pass
4	Fill in all required fields with valid data.	Fill in all required fields	As Expected	Pass
5	Enter a phone number that already exists in the database in the Phone Number field	System should reject the phone number as it duplicates	As Expected	Pass
6	Proceed with the registration process.	Registration should be unsuccessful	As Expected	Pass
7	Attempt to register with a new duplicate phone number.	System should reject the duplicate phone number with an error	As Expected	Pass

Table 8 - Verify unsuccessful user registration with a duplicate phone number.

Test Case Id	TC_27	Test Case Description	Valid user deletion.
Created By	Nishadi	Date Created	

Tester's Name	Nishadi	Date Tested	2024/04/14	Test Case	Pass

S#	Prerequisites
1	Log in to the system as Admin.
2	Access to the user table.

S#	Test Data
1	UserId=001

Test Scenario	To verify an existing user is successfully deleted.

Step #	Step Details	Expected Results	Actual Results	Pass/Fail/Not executed/Suspended
1	Login into the system as Admin	Show the admin dashboard.	As Expected.	Pass
2	Click the "Users" button in the sidebar.	Show the "Users" button in the sidebar.	As Expected.	Pass
3	Navigate the user table	Show the user table.	As Expected.	Pass
4	Click the "Delete" button in the user table.	Click the "Delete" button.	As Expected.	Pass
5	Display confirmation message box.	Expect a confirmation message box to appear.	As Expected.	Pass
6	Delete the user by clicking "OK".	User deleted; alert message: "User delete successful"	As Expected.	Pass
7	Click the "Cancel" button.	User deletion canceled, table refreshed	As Expected.	Pass

Table 9 – verify an existing user is successfully deleted

Test case ID	PM1	Test case Description	Testing the Insert of all project details		
Created By	Manuji	Date Created	29-March-2024		
Tester's Name	Manuji	Date Tested	29-Mrach-2024	Test Case	pass

S#	Prerequisites	S #	Test Data
1	Access to chrome Browser	1	Project id =P001
2	Login to the Tools management system	2	Project name = EOT & Monorail cranes Manufacturing and installation
3	Access to the Manager Dashboard	3	Description = Client: CCB Envico Pty Ltd-Australia.
		4	Site Supervisor id = SiteS001
		5	Site Supervisor name =Saman Kumara
		6	Location id =L001
		7	Location Name = Wastewater pump stations in Dehiwala, Mount Lavinia and Kolonnawa.
		8	Date =24th April 2024
Test Scenario	Verify on system response entering valid project details(positive)		

Step #	Step Details	Expected Results	Actual Results	Pass/Fail/Not Executed/ Suspended
1	Navigate to Tools management system.	Site should open	As Expected	Pass
2	Enter Project id, Project id, Project Name, Description, Site Supervisor, Site Supervisor name, Location id & Location name	Credential can be	As Expected	Pass
3	Click Submit button	Credential can be	As Expected	Pass

Table 10 - Testing the Insert of all project details

Test case ID	PM2	Test case Description	Testing the One filed is not added		
Created By	Manuji	Date Created	29-Mrach-2024		
Tester's Name	Manuji	Date Tested	29- March- 2024	Test Case	pass

S#	Prerequisites	Test Data
1	Access to chrome Browser	Project id =P002
2	Login to the Tools management system	Project name = Manufacturing and installation,2 over Head travelling crane
3	Access to the Manager Dashboard	Description = Client: Squire Mech Engineers Pvt Ltd.
4	Access to the Project managing section	Site Supervisor id = SI002
		Site Supervisor name =Hemal Perera
		Location id =L002
		Location Name = Wastewater pump stations in Dehiwala, Mount Lavinia and Kolonnawa.
		Date = [empty]
Test Scenario	Verify system response when entering invalid project details(Negative)	

Step #	Step Details	Expected Results	Actual Results	Pass/Fail/Not Executed/ Suspended
1	Navigate to Toolsmanagement system.	Site should open	As Expected	Pass
2	Enter Project id, Project id, Project Name, Description, Site Supervisor, Site Supervisor name, Location id & Location name	Credential can be.	As Expected	Pass
3	Click Submit button	Display an error message "Please fill in all fields.".".	As Expected	Pass

Table 11 - Verify system response when entering invalid project details (Negative)

Test case ID	PM3	Test case Description	Testing the insert of Project Id in invalid format.		
Created By	Manuji	Date Created	29-Mrach-2024		
Tester's Name	Manuji	Date Tested	29-March-2024	Test Case	pass

S#	Prerequisites	S#	Test Data
1	Access to chrome Browser	1	Project id =kl67
2	Login to the Tools management system	2	Project name = All Mechanical Installation of Water treatment plant & Intake.
3	Access to the Manager Dashboard	3	Description = Client: Abeima
		4	Site Supervisor id = SI003
		5	Site Supervisor name =prasad adikari
		6	Location id = L002
		7	Location Name = Wastewater pump stations in Dehiwala, Mount Lavinia and Kolonnawa.
		8	Date = 6th of July 2024
Test Scenario	Verify on system response when update by empty project details,		

Step #	Step Details	Expected Results	Actual Results	Pass/Fail/Not Executed/ Suspended
1	Navigate to Tools management system.	Site should open	As Expected	Pass
2	Enter Project id, Project id, Project Name, Description, Site Supervisor, Site Supervisor name, Location id & Location name	Credential can be.	As Expected	Pass
3	Click Submit button	Project ID must be in the format P001	As Expected	Pass

Table 12 - Verify on system response when update by empty project details,

6. Deployment

6.1. Deployment Strategy

- Environment Preparation - Setting up the necessary infrastructure, including servers, databases, and networks, to host the application. This step ensures the environment is ready to support the application and handle expected user loads.

- Staging and Testing - Before going live, the application is deployed in a staging environment that mirrors the production setup. This allows for thorough testing of the entire system, including the integration between the frontend (React.js) and backend (Spring Boot) components. The staging phase helps identify and fix any issues, ensuring that the system operates smoothly.

- Data Migration - If applicable, existing data from legacy systems or other sources needs to be migrated into the new system's database. This process should be carefully planned and executed to ensure data integrity and consistency.

- Deployment Rollout - The actual deployment of the system to the live production environment. This can be done in phases (phased deployment) or all at once (big bang deployment). The choice of strategy depends on factors like the system's complexity, the number of users, and the potential impact on business operations.

- Monitoring and Support - Post-deployment, the system should be closely monitored for any issues or bugs. A support plan should be in place to address any problems quickly. This includes having a support team ready to assist users and resolve technical issues.

6.2. User Training

- Training Materials – We created comprehensive documentation, including user manuals, quick reference guides, and video tutorials, covering all aspects of the system's functionality. This material should be role-specific, focusing on the features and tasks relevant to each user group.

- Training Sessions- We organized hands-on training sessions or workshops where users can learn to navigate the system and perform their specific tasks. These sessions can be conducted in person or online, depending on the users' geographical locations and availability.

- Practice Environment- We provided a practice environment where users can try out the system without affecting real data. This allows them to become comfortable with the system's interface and features before using it in a live setting.

- Ongoing Training and Updates: As the system evolves and new features are added, ongoing training sessions should be provided to keep users updated. Regularly update training materials to reflect any changes in the system.

7. Maintenance and Support

7.1. Project documentation

Overview:
Comprehensive project documentation is crucial for ensuring smooth project implementation, maintenance, and future development. This documentation provides a detailed record of all aspects of the Tool Management System, including system architecture, user manuals, technical specifications, and operational guidelines.

Components:

1. System Architecture Documentation:
This document outlines the overall structure of the system, detailing the components, their interactions, and the technologies used. It includes diagrams and descriptions of the system's modules, databases, and interfaces.

2. User Manuals:
User manuals are provided for different user roles, including administrators, company managers, stock supervisors, and site supervisors. These manuals guide users through the functionalities they have access to, including step-by-step instructions for tasks such as logging in, managing accounts, tracking tools, and generating reports.

- User Manual Documentation

User Manual Report - Tool Management System

3. Technical Specifications:
This document provides detailed technical information about the system, including hardware and software requirements, database schemas, API specifications, and security protocols. It serves as a reference for developers and IT staff involved in maintaining or upgrading the system.

4. Operational Guidelines:
These guidelines include procedures for system setup, user account management, data backup, and recovery processes. They ensure that the system operates efficiently and securely under various scenarios.

5. Change Log:
A detailed log of changes made during the development and maintenance phases, including bug fixes, updates, and new features. This log helps track the system's evolution and assists in troubleshooting issues.

6. Training Materials:
Training materials, including presentations, videos, and practice exercises, are provided to help users and administrators understand and effectively use the system.

7.2. Maintenance Plan

Overview:
The maintenance plan outlines the processes and procedures for ensuring the ongoing functionality, security, and efficiency of the Tool Management System. It includes preventive, corrective, and adaptive maintenance activities.

Types of Maintenance:

1. Preventive Maintenance:
Regular system checks and updates to prevent potential issues. This includes updating software components, performing security audits, and optimizing database performance. Scheduled maintenance windows will be communicated to users in advance to minimize disruption.

2. Corrective Maintenance:
Procedures for addressing system issues, bugs, or failures. Users can report problems through a dedicated support portal. The development team will prioritize and resolve issues based on severity, ensuring minimal impact on business operations.

3. Adaptive Maintenance:
Adjustments made to the system in response to changes in the operating environment, such as new regulations, business processes, or technology upgrades. This includes updating security protocols, integrating new tools, or modifying system features.

Support Services:

1. User Support:
A helpdesk will be available to assist users with system-related issues. Support can be reached via email, phone, or an online ticketing system. Support staff will provide troubleshooting assistance, guidance on system usage, and escalate issues to the technical team when necessary.

2. System Monitoring:
Continuous monitoring of system performance and security. Automated alerts will notify the support team of any unusual activity or system anomalies, allowing for prompt response to potential issues.

3. Backup and Recovery:
Regular backups of the system data will be performed to prevent data loss. In the event of a system failure, recovery procedures will be in place to restore the system to the last known good state, minimizing downtime and data loss.

4. Documentation Updates:
Project documentation, including user manuals and technical specifications, will be regularly updated to reflect any changes or enhancements made to the system. Users will be notified of significant updates and provided with access to the latest documentation.

Review and Improvement:
The maintenance plan will be reviewed annually to ensure it meets the evolving needs of the company and its stakeholders. Feedback from users and support staff will be considered in planning system enhancements and updates.

8. Conclusion

The project successfully delivered a high-quality and functional solution that meets the client's needs. The system includes robust functionalities for managing user accounts, projects, inventory, and site operations. The team adhered to all academic and professional standards, ensuring the integrity and authenticity of the project outcomes. The maintenance plan outlines preventive, corrective, and adaptive maintenance activities to ensure the system's ongoing functionality, security, and efficiency. Regular updates and reviews will keep the system aligned with the evolving needs of the company and its stakeholders.

9. Individual Contribution

Admin: TG/2028/738 - N.G.N. Sansala

- User Registration:

Responsible for creating new user accounts within the system, ensuring accurate data collection, verification of credentials, and assignment of appropriate roles and access levels.

- User Account Deleting:

Managed the process of securely removing user accounts, ensuring that only current employees or authorized users-maintained access to the system.

- User Account Updating:

Handled updates to user accounts, including changes in roles, permissions, or personal information, maintaining the accuracy and relevance of user data.

- User List Viewing:

Oversaw the list of active user accounts, regularly auditing for unauthorized access and ensuring compliance with security protocols.

Company Manager: TG/2020/737 – I.A.N.M. Anusari

- Manage Project Details:

Oversaw all project details, including setup, scope definition, documentation of requirements, and timelines for new and ongoing projects.

- Assign Site Supervisors:

Assigned site supervisors to specific projects, aligning expertise and project needs to ensure effective management and oversight.

- Inventory Management:

Collaborated in managing inventory levels, ensuring tools and equipment were available for projects, and coordinating with the stock supervisor.

- Project-wise Tool Allocation:

Allocated tools and resources to various projects, optimizing distribution based on project priorities and requirements to minimize downtime.

Stock Supervisor: TG/2020/688 – J.M.N.A. Senevirathne

- Add, View, Update, and Delete Equipment Information:

Managed the equipment database, ensuring the addition of new tools, updating of existing records, and removal of outdated or damaged equipment.

- Create Toolboxes for Projects:

Assembled and prepared toolboxes tailored to project requirements, selecting appropriate tools and ensuring readiness for project deployment.

- Create Reports:

Generated comprehensive reports on inventory status, tool usage, and equipment conditions, providing essential data for decision-making and planning.

- View Current Location of Toolboxes:

Monitored the tracking system for toolboxes, ensuring accurate location data for efficient management and retrieval of equipment.

- View Equipment Required Tools Reports:

Reviewed and responded to equipment request reports from site supervisors, coordinating the preparation and dispatch of necessary tools.

Site Supervisor: TG/2020/717 – W.A.I. Ganga

- Assign Equipment to Projects:

Assigned tools and equipment to projects, coordinating with the stock supervisor to fulfill project requirements effectively.

- Create Reports on Equipment States:

Assessed and reported the condition of equipment on-site, documenting status updates and identifying maintenance or replacement needs.

- Send Required Equipment Reports to Stock Supervisor:

Communicated project-specific equipment needs to the stock supervisor, ensuring that all required tools were procured and delivered.

- Upload Reports on Equipment Status:

Regularly uploaded detailed reports on the status and usage of tools at project sites, providing critical information for operational planning and resource management.

10. References

[1] "Dilum BMK Engineers," [Online]. Available: https://www.dilumbmkengineers.com/services.

[2] https://www.dilumbmkengineers.com/download

[3] https://ieeexplore.ieee.org/document/9537086

[4] https://app.diagrams.net/

11. Appendices

11.1. Git hub link

Tool Management System Frontend

https://github.com/NilmiSenevirathne/ToolManagementSystem-Group02--FrontEnd

Tool Management System Backend

https://github.com/NilmiSenevirathne/ToolManagementSystem-Group02--BackEnd