University of Central Punjab

(Incorporated by Ordinance No. XXIV of 2002 promulgated by Government of the Punjab)

Faculty of Information Technology

PROJECT OFFICE | **FORM FOR PROJECT / THESIS AND GROUP ALLOCATION**

	Day		Month		Year		
DATE	0	1 —	1	0 —	2	0	2 4

Thesis / Project Title: AssetIn: Asset Management Tool

Tick the appropriate box

☒ **BS**   ☐ **MSCS**

Brief Description:

AssetIn is an advanced asset management tool designed to address the inefficiencies of current asset tracking systems. It integrates real-time data tracking, vendor management, and predictive analytics, offering a user-friendly and scalable platform. By leveraging modern technologies such as Angular, .NET Core, and MySQL, AssetIn aims to streamline asset workflows, optimize asset utilization, and enhance decision-making processes for organizations. Key features include real-time asset tracking, seamless vendor management, secure media storage, and predictive analytics for maintenance and asset performance optimization.

Tools to be used:
Front-End: Angular
Back-End: .NET
Database: MySQL
Project Management: JIRA

Particulars of the students:

(MS students are not allowed to work in groups)

Sr. #	Registration#	Name in Full	Email	Contact #	CGPA	Signatures
1	L1F21BSCS1059	MUHAMMAD BURHAN	l1f21bscs1059@ucp.edu.pk	03004653232	3.58	
2	L1F21BSCS0485	AREEBA KHAN	l1f21bscs0485@ucp.edu.pk	03224386028	2.97	
3	L1F21BSCS0484	NOOR-UL-AAIN MAQBOOL	l1f21bscs0484@ucp.edu.pk	03081333354	3.49	

Advisor's Consent

I Mr. Asif Farooq am willing to guide these students in all phases of above-mentioned project / thesis as advisor. I have carefully seen the Title and description of the project / thesis and believe that it is of an appropriate difficulty level for the number of students named above.

E-Mail Address (IN CAPITAL LETTERS): ASIF.FAROOQ@UCP.EDU.PK

Note:
Advisor can't be changed without prior permission of the Manager Projects and the duration for completion of Research Project / Thesis is 1 Year (approx.) from the date of Registration of Research Project/Thesis.

Signatures and Date

Advisor

For Project Office use only

Remarks:

Signatures and Date

Group No   F24BS042

Manager Projects

BSCS FINAL PROJECT PROPOSAL

AssetIn: Asset Management Tool

Term of Registration: Fall 2024

Presented by:

Registration No:	Name:
L1F21BSCS1059	MUHAMMAD BURHAN
L1F21BSCS0485	AREEBA KHAN
L1F21BSCS0484	NOOR-UL-AAIN MAQBOOL

Faculty of Information Technology
University of Central Punjab

Project Title

AssetIn: Asset Management Tool.

Project Advisor

Asif Farooq

Particulars of the students:

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Advisor's Consent

I Prof. / Dr. / Mr. / Ms. <u>Asif Farooq</u> am willing to guide these students in all phases of above-mentioned project as advisor. I have carefully seen the Title and description of the project and believe that it is of an appropriate difficulty level for the number of students named above.

Note:

Advisor can't be changed without prior permission of the Manager Projects and the duration for completion of the Project is 2 regular semesters (approx.) from the date of Registration of Research Project.

Signatures and Date

Advisor

EVALUATOR/REFEREE 1

I have carefully read the project proposal and feel that the proposed project is a useful one and of a sufficient difficulty level to justify 2 regular semesters workload for above mentioned students. I have made recommendations in the evaluation form to improve the scope and quality of the project.

Signatures and Date

EVALUATOR/REFEREE 2

I have carefully read the project proposal and feel that the proposed project is a useful one and of a sufficient difficulty level to justify 2 regular semesters workload for above mentioned students. I have made recommendations in the evaluation form to improve the scope and quality of the project.

Signatures and Date

Abstract / Executive Summary

Asset management is crucial for organizations to maintain operational efficiency, yet many existing tools suffer from fragmented systems, poor usability, and limited scalability. These inefficiencies lead to increased costs, underutilization of assets, and difficulties in decision-making processes. Our project, **AssetIn**, aims to address these challenges by providing an intuitive, cloud-based asset management tool that integrates real-time data, vendor management, and predictive analytics.

Leveraging modern technologies such as **Angular**, **.NET**, and **MySQL**, the tool offers a comprehensive solution for tracking both fixed and variable assets, managing vendor relationships, and streamlining maintenance schedules. The tool also incorporates **cloud storage** for secure and scalable media handling, allowing organizations to store asset-related images, documents, and videos efficiently.

By addressing the shortcomings of existing tools such as Ralph3, SnipeIT, and Asset Tiger, **AssetIn** is expected to significantly improve asset management workflows. This solution will enhance user experience, optimize asset utilization, and reduce operational costs for organizations. Collaboration with **Nextonix** ensures industry-standard practices, and the final product will be tested in real-world scenarios to deliver a robust and practical asset management tool.

Introduction and Background

Effective asset management is a critical function for organizations aiming to optimize resources, reduce operational costs, and maintain long-term efficiency. Assets, including software licenses, development tools, intellectual property, and employee expertise, play a pivotal role in the functioning of any organization, particularly in the software industry. Despite the availability of several asset management tools, many organizations continue to face inefficiencies in tracking, maintaining, and utilizing their assets. These inefficiencies stem from overly complex systems, fragmented workflows, lack of real-time data integration, and limited customization options. The consequences include higher operational costs, underutilization of assets, and difficulties in making informed decisions.

Existing asset management solutions, such as **Ralph3**, **SnipeIT**, and **Asset Tiger**, provide specific functionalities but fail to deliver a comprehensive solution that balances usability, scalability, and efficiency. **Ralph3**, for example, is known for its robust features but is highly complex to install and configure, often requiring advanced technical knowledge. **SnipeIT**, while simplifying IT service management, lacks broader applicability for other types of assets and does not include vendor management features. Similarly, **Asset Tiger** offers ease of use but is not scalable for larger organizations. The fragmented nature of these systems hinders their effectiveness when applied across diverse organizational contexts.

AssetIn, our proposed solution, addresses these gaps by offering an intuitive, scalable, and cloud-based asset management tool that integrates multiple asset management functions into a single platform. Built using **Angular**, **.NET**, and **MySQL**, and leveraging **cloud storage**, AssetIn aims to provide a seamless experience for managing both fixed and variable assets. The tool will also incorporate predictive analytics, vendor management, and media handling features, ensuring organizations can optimize their asset utilization, streamline workflows, and make data-driven decisions.

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The significance of this project lies in its potential to reduce the operational complexities faced by organizations in managing assets. By providing a user-centered, easy-to-use platform, AssetIn is set to enhance productivity, lower costs, and simplify asset management processes. The collaboration with **Nextonix** further ensures that the system adheres to industry standards, making it a practical and impactful solution for real-world applications.

Statement of the Problem

Many organizations, particularly in the software industry, struggle with inefficiencies in managing assets such as software licenses, development tools, intellectual property, and physical assets. Existing asset management tools are often overly complex, fragmented, or lack essential features like real-time data integration, predictive analytics, and vendor management. These limitations lead to challenges such as difficulty in tracking assets in real time, fragmented workflows requiring multiple tools, low user adoption due to complex interfaces, and scalability issues where smaller organizations find solutions too advanced while larger ones find them insufficient. **AssetIn** aims to address these problems by offering a comprehensive, cloud-based solution that integrates all aspects of asset management, including real-time tracking, vendor management, and predictive analytics, in a user-friendly and scalable platform designed to reduce operational complexities and enhance decision-making. **The project aims to provide organizations with a unified platform to efficiently manage and optimize their assets while improving decision-making and reducing operational complexities.**

Objective(s) / Aim(s) / Target(s)

The primary objective of the **AssetIn** project is to develop a comprehensive and user-friendly asset management tool that addresses the inefficiencies of existing solutions by integrating key features such as real-time tracking, vendor management, and predictive analytics. The system will be scalable, secure, and accessible to organizations of varying sizes and industries. The specific objectives of the project are as follows:

1. **Develop an Intuitive and Accessible Interface**: Create a user-friendly platform that simplifies asset management tasks, allowing organization owners and asset managers to efficiently track, maintain, and manage both fixed and variable assets without extensive technical knowledge.
2. **Implement Real-Time Asset Tracking and Monitoring**: Enable organizations to track the location, condition, and usage of assets in real time, ensuring optimal utilization and timely maintenance.
3. **Integrate Vendor Management and Procurement**: Incorporate functionalities for managing vendor relationships, including asset purchases, repairs, and sales, within the same platform, streamlining workflows.
4. **Provide Predictive Analytics for Asset Optimization**: Utilize data-driven insights to help organizations forecast maintenance needs, optimize asset performance, and make informed decisions on asset lifecycle management.
5. **Ensure Cloud-Based Storage for Asset-Related Media**: Incorporate secure cloud storage solutions for storing and retrieving asset-related documents, images, and videos, making the system scalable and easy to manage.
6. **Maintain Scalability and Security**: Build a scalable and secure system that can handle growing numbers of assets and users, with robust authentication mechanisms such as **JWT** for secure user access and data protection.

By achieving these objectives, **AssetIn** will contribute to improving operational efficiency, reducing costs, and enhancing decision-making in asset management processes across various industries.

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Completeness Criteria

Here is a proposed completeness criteria table for **AssetIn**, based on the key components of your project. Each subpart is defined, with assigned weightage to reflect the importance of each feature in evaluating the project's success:

S.No.	Criteria	Weightage %
1	**User Interface Design (Web GUI):** Develop an intuitive, user-friendly interface for organization owners, asset managers, and vendors to easily manage and track assets. This will include real-time dashboards and essential navigation for core functionalities.	15
2	**Real-Time Asset Tracking and Monitoring:** Implementation of real-time tracking to monitor asset locations, status (assigned, in stock, damaged), and maintenance schedules, with advanced search and filter options.	15
3	**Vendor and Procurement Management:** Integration of vendor-related functionalities, allowing users to manage procurement, repairs, sales, and vendor registrations in a seamless manner.	10
4	**Cloud Storage Integration:** Securely manage asset-related media (documents, images, videos) through cloud storage solutions, ensuring scalability and accessibility of data.	10
5	**Predictive Analytics and Reporting:** Develop and implement predictive analytics for maintenance scheduling and asset performance optimization, as well as generating comprehensive reports for decision-making.	15
6	**Database Design and Iterative Development:** Ongoing design and adjustments of the database schema (using MySQL) to accommodate new requirements during the development process. The database design will be flexible and scalable, ensuring normalization, security, and efficiency throughout all phases of development.	20
7	**Security and Authentication:** Ensure robust security features such as **JWT-based authentication and authorization** to protect user data and asset information, especially in cloud storage environments.	5
8	**Testing:** Comprehensive functional and non-functional testing to ensure the system works effectively in real-world environments.	10

Total: 100%

This breakdown provides a clear structure for the evaluation of your project, with appropriate weightage for each critical component.

Challenges

The development of **AssetIn** involves several complex tasks that require deep understanding of technologies, problem-solving skills, and adaptability. Key challenges include:

1. **Scalability of Database Design**: Ensuring the **MySQL database** remains scalable and optimized as requirements evolve, while maintaining performance and flexibility.
2. **Implementation of Predictive Analytics**: Developing predictive models for asset optimization and integrating them with user-friendly reporting mechanisms.

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3. **Ensuring Security and Data Protection**: Implementing robust security measures, including **JWT** for authentication, to protect sensitive data in a cloud environment.
4. **Performance Optimization**: Optimizing the system's performance as it scales, ensuring efficient handling of increasing assets, users, and media files.
5. **User Experience (UX) Design**: Creating an intuitive interface that supports multiple user roles without compromising usability in complex asset management workflows.

These challenges will require significant technical expertise and iterative problem-solving to ensure that the **AssetIn** system is robust, scalable, and user-friendly.

Knowledge Areas Required

The development of **AssetIn** will leverage a wide range of knowledge areas from the **BSCS** degree program. These areas include:

- **Software Engineering**: System design, requirement analysis, and testing to ensure functionality and performance.
- **Database Management Systems (DBMS)**: Database design, data security, and cloud integration for efficient storage and management.
- **Web Development**: Frontend development with **Angular**, backend with **.NET Core**, and full-stack integration for seamless communication.
- **Predictive Analytics**: Data analysis and forecasting for asset optimization and maintenance prediction.
- **Human-Computer Interaction (HCI)**: Designing a user-friendly interface for ease of navigation and usability for both technical and non-technical users.

These knowledge areas will be crucial in successfully developing and delivering **AssetIn** as a comprehensive and user-friendly asset management solution.

Learning Outcomes

Upon successful completion of the **AssetIn** project, students will gain valuable skills and knowledge across several key areas of computer science and software development. The specific learning outcomes include:
1. **Proficiency in Full-Stack Development:**
   - Students will develop skills in **frontend (Angular)** and **backend (.NET Core)**, building a scalable, real-time web application with integrated **MySQL** databases and **cloud storage**.
   - They will implement **APIs**, apply predictive analytics, and ensure **data security** using **JWT**.
   - Experience in **UI/UX design** for user-friendly interfaces and using **JIRA** for **Agile project management**.
2. **Deployment:**
   Students will learn the deployment process, optimizing performance and ensuring smooth operation in real-world environments.

Nature of the End Product / Research Outcomes

The end product of the **AssetIn** project will be a **comprehensive asset management software tool** designed to address inefficiencies in existing asset management solutions. The product will offer a unified platform for tracking, managing, and optimizing both fixed and variable assets,

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while integrating features like real-time a monitoring, vendor management, and predictive analytics. Key characteristics of the end product include:

1. **Real-Time Data Tracking and Monitoring**:
   The system will allow organizations to track the location, condition, and status of assets in real time, providing up-to-date information for improved decision-making and operational efficiency.
2. **Predictive Analytics for Asset Optimization**:
   Incorporation of predictive analytics to forecast asset maintenance needs and optimize performance, ensuring that organizations can reduce downtime and underutilization of assets.
3. **Vendor Management and Procurement**:
   A fully integrated vendor management module that allows users to handle procurement processes, repairs, and asset sales, all within the same system.
4. **Cloud Storage for Media Handling**:
   The system will include secure cloud-based storage for managing media (images, documents, videos) related to assets, ensuring easy access and scalability.
5. **Scalability and Adaptability**:
   The product will be designed to scale with organizational needs, capable of handling a growing number of assets, users, and media files without compromising performance.
6. **Security and Authentication**:
   The software will include robust security features, such as **JWT (JSON Web Token)** for secure user authentication and authorization, ensuring that sensitive asset-related data is protected.

Related Work / Literature Survey / Literature Review

Asset management tools have been widely studied and developed, with a focus on improving usability, scalability, and performance. Several solutions already exist in the market, each addressing specific organizational needs. However, most existing tools suffer from complexity, limited scalability, or fragmented functionalities. This literature review explores popular asset management tools like:

1. **Ralph3**
2. **Snipe-IT**
3. **Asset Tiger**

Conclusion:

While existing asset management tools like Ralph3, Snipe-IT, and Asset Tiger address certain aspects of asset tracking, they often fall short in providing a comprehensive, scalable, and user-friendly solution. **AssetIn** aims to fill this gap by offering a holistic asset management system that integrates **real-time tracking**, **vendor management**, **predictive analytics**, and **cloud storage** into one powerful and easy-to-use platform. Through this, AssetIn will streamline asset management workflows and improve decision-making processes for organizations across various industries.

Deliverables / Work Breakdown Structure

Decompose The **AssetIn** project can be decomposed into key deliverables, ensuring clear, trackable milestones throughout the development cycle. Each deliverable represents a major functional or technical achievement, enabling progress monitoring and ensuring timely completion of the project. The work will primarily be original, with a focus on designing, developing, and integrating unique features of the asset management tool.

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Key Deliverables:
1. **Requirement Analysis and Documentation**:
   - **Deliverable**: Detailed documentation outlining the functional and non-functional requirements of the system, including system architecture and user roles (organization owners, asset managers, vendors).
   - **Work Reuse**: Minimal reuse; entirely based on custom system requirements.
2. **Database Schema Design**:
   - **Deliverable**: Development of the **MySQL** database schema to support asset tracking, vendor management, user authentication, and asset-related media storage.
   - **Work Reuse**: Some standard database structures (e.g., user roles, authentication tables) can be reused, but asset-specific tables will be original.
3. **Frontend Development (Angular)**:
   - **Deliverable**: Development of the frontend using **Angular** to implement user interfaces, including asset tracking, reporting, and asset request panels.
   - **Work Reuse**: Angular components may reuse existing libraries for forms, navigation, and authentication, but the overall functionality will be built from scratch.
4. **Backend Development (ASP.NET Core)**:
   - **Deliverable**: Implementation of backend services using **ASP.NET Core** to manage business logic, data processing, asset tracking, and vendor management.
   - **Work Reuse**: Standard libraries for handling HTTP requests and database connections might be reused, but business logic and data models will be custom-developed.
5. **Cloud Storage Integration**:
   - **Deliverable**: Integration of cloud storage for asset-related media (documents, images, videos), ensuring secure and scalable storage.
   - **Work Reuse**: Cloud storage solutions (e.g., Cloudinary) will be leveraged, but the integration and media management logic will be original.
6. **Real-Time Asset Tracking**:
   - **Deliverable**: Implementation of real-time asset tracking and status updates using asynchronous communication between the frontend and backend.
   - **Work Reuse**: Some real-time communication protocols (e.g., Web Sockets) may be reused, but the tracking logic will be developed specifically for AssetIn.
7. **Vendor Management Module**:
   - **Deliverable**: Integration of vendor management features to handle asset purchases, repairs, and vendor registrations within the same platform.
   - **Work Reuse**: Vendor management systems will be custom-built, with minimal reuse from existing frameworks.
8. **Predictive Analytics and Reporting**:
   - **Deliverable**: Development of predictive analytics for asset optimization and performance, with reporting functionalities to visualize maintenance schedules and asset usage.
   - **Work Reuse**: Libraries for data visualization (e.g., Chart.js) may be reused, but the predictive models and reporting logic will be custom-developed.
9. **Security and Authentication**:
   - **Deliverable**: Implementation of **JWT-based** security features for secure authentication and authorization.
   - **Work Reuse**: Standard authentication and **JWT l**ibraries may be reused, but integration with AssetIn's custom user roles and permissions will be original.

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10. **Testing and Quality Assurance**:
    - **Deliverable**: Comprehensive functional, unit, and integration testing to ensure system reliability and performance.
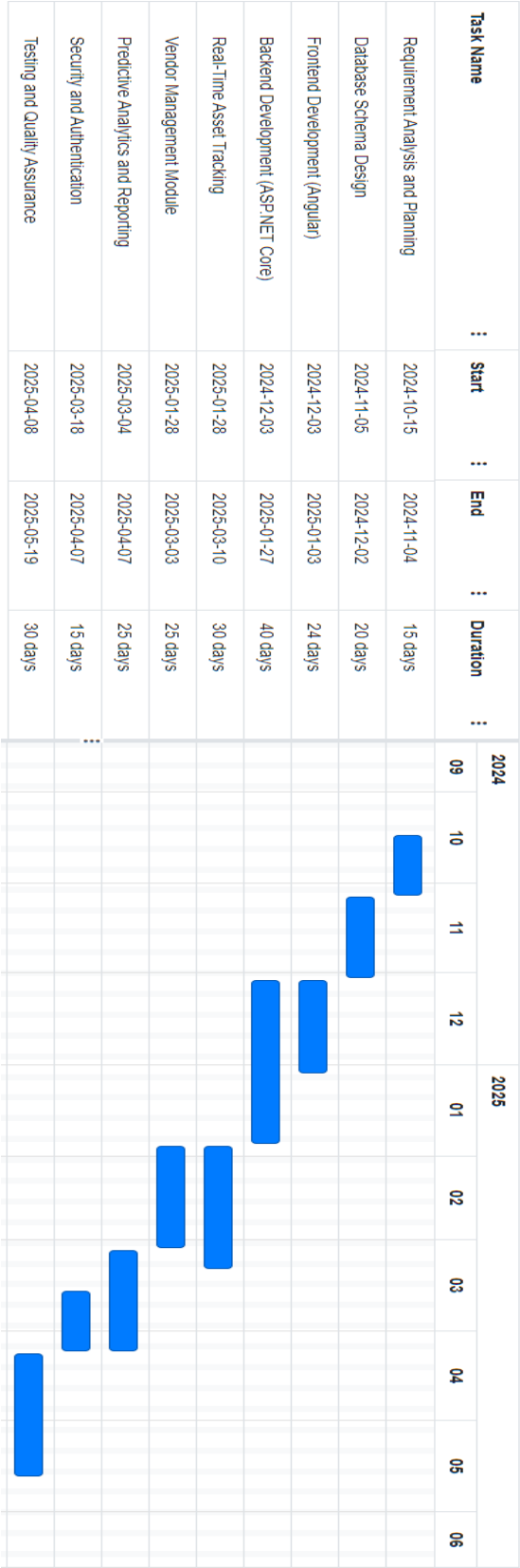
Work Breakdown Structure (WBS):

S.No.	Task	Sub-Tasks	Duration(Weeks)
1	Requirement Analysis and Planning	• Gather requirements • Define system architecture • Document user stories and workflows	3
2	Database Schema Design	• Design database schema • Implement tables, relationships, and constraints • Perform iterative schema updates based on evolving requirements	4
3	Frontend Development (Angular)	• Develop main user interface • Implement asset tracking dashboard • Create forms for asset requests, vendor management, and real-time status updates	8
4	Backend Development (ASP.NET Core)	• Implement business logic and data models • Develop API endpoints • Handle data processing and validation	8
5	Real-Time Asset Tracking	• Implement Web Socket communication • Integrate real-time asset tracking and status updates	6
6	Vendor Management Module	• Develop vendor registration and asset purchase features • Implement procurement management logic	5
7	Predictive Analytics and Reporting	• Develop predictive models for maintenance • Implement reporting dashboards	5
8	Security and Authentication	• Implement JWT-based authentication • Integrate user roles and permissions	3
9	Testing and Quality Assurance	• Perform unit and integration testing • Conduct user testing and bug fixes	6

Reused Work:

Some reusable libraries and frameworks **(e.g., Angular components, JWT for security, MySQL connections, testing frameworks)** will be leveraged, but **60-70% of the project** will be the students' original work, focusing on custom features such as real-time tracking, vendor management, predictive analytics, and cloud storage integration.

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Project Plan / Project Schedule / Project Timetable / Project Calendar

Task Name ...	Start ...	End ...	Duration ...
Requirement Analysis and Planning	2024-10-15	2024-11-04	15 days
Database Schema Design	2024-11-05	2024-12-02	20 days
Frontend Development (Angular)	2024-12-03	2025-01-03	24 days
Backend Development (ASP.NET Core)	2024-12-03	2025-01-27	40 days
Real-Time Asset Tracking	2025-01-28	2025-03-10	30 days
Vendor Management Module	2025-01-28	2025-03-03	25 days
Predictive Analytics and Reporting	2025-03-04	2025-04-07	25 days
Security and Authentication	2025-03-18	2025-04-07	15 days
Testing and Quality Assurance	2025-04-08	2025-05-19	30 days

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Task	Resources
Requirement Analysis and Planning	All team members, Advisor for feedback
Database Schema Design	Backend Lead, periodic input from the team for schema modifications
Frontend Development (Angular)	Frontend Team (2 members) using Angular, Backend Lead for API integration
Backend Development (ASP.NET Core)	Backend Lead using .NET Core, collaboration with Frontend Team for integration
Real-Time Asset Tracking	Backend Lead for Web Socket and real-time logic, Frontend Team for UI display of real-time data
Vendor Management Module	Backend Lead, input from Frontend Team for UI integration
Predictive Analytics and Reporting	Backend Lead, Frontend Team for presenting data on dashboards
Security and Authentication	Backend Lead for authentication logic, Frontend Team for ensuring secure user flows
Testing and Quality Assurance	All team members, involvement of Advisor for feedback and validation

Monitoring Progress on a Periodic Basis:
1. **Weekly Team Meetings**:
   - **Internal meetings** will occur weekly to discuss completed tasks, current progress, and challenges. Each member will report on their specific area of responsibility.
2. **Milestone Reviews**:
   - **End of Phase Review**: At the end of each major phase, such as **Requirement Analysis**, **Frontend/Backend Development**, and **Testing**, the advisor will evaluate progress based on predefined milestones.
   - **Mid-Development Review (around Week 15)**: Both the frontend and backend should have core functionality in place, allowing for a more thorough integration review by the advisor.
3. **Testing Phases**:
   - During the **Testing and Quality Assurance phase**, progress will be monitored through **test case reports**, **bug tracking**, and periodic **user testing feedback**. The advisor will help validate the correctness and usability of the system during this stage.
4. **Task Completion Reports**:
   - After each subtask (e.g., Database Schema Design, Frontend Development), the team will prepare a **progress report** to document what has been achieved. These reports will be shared with the advisor to maintain visibility on progress and ensure alignment with project goals.
5. **Project Management Tools**:
   - **JIRA or Trello** will be used to track tasks, assign deadlines, and monitor task completion. The advisor will have access to this tool to view real-time updates on progress and intervene when necessary.

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Resources Required

1. **Software Development Tools**
   - Angular Framework (Frontend)
   - ASP.NET Core (Backend)
   - MySQL (Database)
   - Cloud Storage Integration (Cloudinary)
2. **Project Management and Collaboration Tools**
   - JIRA/Trello (Project Management)
3. **Testing and Debugging Tools**
   - Postman (API Testing)
4. **Hardware**
   - Barcode Scanner (If using for asset tracking)
5. **Books and Reference Materials**
   - Documentation / Online Articles (Angular, ASP.NET Core)
   - Documentation / Online Articles (Cloudinary)

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