2023-2024 Spring Term SE 216 Software Project Management

ECOLIB:

Enhancing Library Efficiency Through Reservation System

Project Final Report

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1) Introduction

The school library, a crucial resource for students, needs to meet the demands of its users. The primary issue lies in the insufficient number of tables available relative to the student population, exacerbated by students` inefficient use of these tables. Often, tables are occupied by students' belongings rather than the students themselves, leading to a scarcity of available study spaces. Additionally, the noise generated by students searching for free seats disrupts those already engaged in their studies, further diminishing the library's effectiveness as a study environment. This problem is particularly acute during exam periods when the demand for quiet study spaces peaks.

To address these issues, we propose implementing a library reservation system. This system aims to enhance the management of library resources and ensure a more equitable distribution of study spaces. The system will incorporate several key features, including turnstiles at the library entrance to monitor entry and exit, and an image processing system to track table occupancy and identify misuse. Through the integration of cameras and real-time data processing, students can access up-to-date information on table availability via a mobile application, thereby reducing the time spent searching for seats and minimizing noise disturbances.

Furthermore, the reservation system will include mechanisms to enforce the appropriate use of library spaces, such as penalizing those who reserve tables but do not use them effectively, or who damage library property. During peak periods like exam weeks, the system will ensure fair usage by allowing all students to reserve study time in advance, promoting equal access to library facilities. By implementing this reservation system, we anticipate significantly improving the library's functionality, allowing it to serve our student body better and support their academic success.

2) Functional and Non-Functional Requirements

2.1) Functional Requirements

1. **Access Control and Verification:** The images taken from the cameras and the photos in the database of users who try to enter the turnstile by scanning a card or QR code should be compared, rejected, or approved.
2. **User Registration and Login:** Users should be able to register and log in to the application with their Oasis user information.
3. **Table Occupancy Monitoring:** If an empty table is detected via cameras during the reservation time, the time the table is empty should be calculated. If this period is over 20 minutes, the table should be shown as empty in the system, and the library staff should be directed to the detected table.
4. **Real-time Occupancy Data:** The occupancy rate of the library must be calculated accurately with the library's entry and exit data and updated on the system.
5. **Reservation Management:** Once the reservation is received, the reserved table should be colored in the application and closed for reservations. In the application interface, available tables should be colored green, occupied tables should be colored red, and tables not available for reservation should be colored gray. In the event of a canceled reservation, users must be notified that the reserved table is available.
6. **User Notifications:** When users create a reservation, the application should send a confirmation message and offer the option to add the reservation information to the calendar.
7. The application should send a reservation reminder message to users 30 minutes before the reservation time.
8. **Rule Enforcement:** The application must detect users who exceed the reservation time by 15 minutes and restrict these users for the specified period. Access to the application should be restricted for users who do not comply with the rules and are restricted.
9. **User-Friendly Interface:** Users should be offered language options in the application settings. On the interface, desks with computers should be specified separately from other desks. If users logging into the application enter the wrong information 3 times, the user should be asked for verification via SMS or e-mail.
10. **User Guidance:** It should be an informative guide for users to understand and use the reservation system effectively.

2.2) Non-Functional Requirements

1. **System Availability:** The system should be able to work uninterruptedly 24/7.
2. **System Recovery:** The system should be able to restart itself within 3 minutes at the latest when it encounters a situation such as a crash.
3. **System Integration and Performance:** The turnstiles at the entrance of the library and the image processing system should work in an integrated and fast manner.
4. **User Experience:** The application should be user-friendly, offering a simple interface so that students can easily make reservations.
5. **Security Measures:** The access control system must have security measures against unauthorized entry. Student information and reservation data must be stored securely.
6. **Administrative Access:** Only administrators should have access to system data except in exceptional circumstances.
7. **Scalability:** The application should be easily adaptable to the growing number of users and library spaces in the future.
8. **Device Compatibility:** It should be ensured that it can work on devices with different hardware.
9. **Maintenance and Support:** Regular maintenance and support must be provided to keep the application running smoothly.

3) Stakeholders

There are several key stakeholders in this project, each with specific roles and impacts on the project's success or failure:

Product Owner

Contribution to the Project: To guarantee compliance with organizational goals, the Product Owner establishes project goals and ranks features. They supervise the development process, help clients and the development team communicate, make sure deliverables fulfill requirements, and authorize modifications.

- **Impact of Project Success:** A successful project enhances the Product Owner's reputation inside the company and fosters stakeholder trust by showcasing their capacity to provide worthwhile solutions that address organizational needs.

- **Impact of Project Failure:** If the system is not implemented, inefficiencies can persist, which would be detrimental to the Product Owner's credibility and ability to provide practical solutions.

Scrum Master

Contribution to the Project: The Scrum Master helps the team follow Scrum practices and principles by removing roadblocks and facilitating the Scrum process. They support the group in being as productive as possible.

- **Impact of Project Success:** Confirms the Scrum Master's abilities to lead the development team through the Scrum process, communicate clearly, and resolve issues.
- **Impact of Project Failure:** A project's failure can cast doubt on a scrum master's competence in scrum project management by adversely affecting their capacity to oversee the development process, respond quickly to problems, and keep the team motivated.

Development Team

Contribution to the Project: The reservation system is designed, developed, and tested by the development team according to project specifications. During each sprint, they work together to provide high-quality increments.

- **Impact of Project Success:** Shows that they can work together, think creatively, and produce high-quality increments inside the sprint and project schedule, which boosts team spirit and inspires confidence for further endeavors.
- **Impact of Project Failure:** A project's failure could indicate a lack of expertise or teamwork among the development team, casting doubt on their capacity to produce high-caliber software solutions and affecting team morale and confidence in subsequent endeavors.

Users (Students)

Contribution to the Project: User input on the efficiency and usefulness of the reservation system is a contribution to the project.

- **Impact of Project Success:** If the project is implemented successfully, it will greatly enhance students' library experiences by allowing for improved resource utilization, noise reduction, and study environment enhancement. These improvements will ultimately boost student happiness and academic achievement.
- **Impact of Project Failure:** If the system is not implemented, current issues will persist, causing inefficiency, noise disruption, and workspace difficulties that will have a detrimental influence on students' academic lives.

Customers (Universities)

Contribution to the Project: To ensure that the project is in line with the objectives and standards of the university, customers supply resources, support, and requirements.

- **Impact of Project Success:** shows the university's dedication to expanding academic support services and student amenities, which will improve the university's reputation and increase overall student happiness.
- **Impact of Project Failure:** If the system is not implemented, it may have a detrimental effect on the university's capacity to serve students' requirements and offer effective library services.

Library Staff

Contribution to the Project: The library staff provides details on the internal layout, locations of the cameras that are currently in place, and how the library operates. When issues arise at the library, they step in to help.

- **Impact of Project Success:** A successful outcome would boost staff satisfaction and free them up to concentrate on other facets of their jobs by streamlining library

operations, lowering staff workloads associated with overseeing study areas, and improving overall library service efficiency.

- **Impact of Project Failure:** If a project fails, it could exacerbate already-existing issues that library employees deal with, like controlling workspaces and noise problems, adding to staff workloads, and causing stress.

IT Team of University

Contribution to the Project: After the reservation system is delivered, the IT Team makes sure it is integrated with the university's databases and infrastructure and offers technical support.

- **Impact of Project Success:** Demonstrates the IT team's capacity to implement and maintain cutting-edge technologies to improve services on campus.
- **Impact of Project Failure:** A project failure may have a detrimental effect on the IT team's capacity to provide and maintain vital systems, which may result in reputational damage, limit prospects for future employment, and limit chances for professional development.

4) Process Model

Software Process Name: SCRUM

Software Process Description:

Scrum is an agile project management framework emphasizing flexibility, teamwork, and iterative progress. It involves three key roles: the Product Owner, who prioritizes work and manages the backlog; the Scrum Master, who ensures the team adheres to Scrum practices and facilitates problem resolution; and the Development Team, which delivers increments of the product. Scrum employs artifacts like the Product Backlog and Sprint Backlog to track work and uses events such as Sprint Planning, Daily Scrum, Sprint Review, and Sprint Retrospective to facilitate communication and continuous improvement. The primary goal of Scrum is to deliver value to customers efficiently while promoting transparency and continuous development.

Software Process Model:

Sprint 1: Project Initiation and Planning (2 weeks)

- Form a project team and define roles.
- Conduct stakeholder meetings to establish objectives and requirements.
- Develop initial product backlog.
- Set up a development environment and version control system.

Sprint 2: Basic Reservation System (3 weeks)

- Implement user authentication and registration.
- Develop basic reservation system functionality without image processing.
- Create a simple booking management interface.
- Perform internal testing and address issues.

Sprint 3: Image Processing Integration (4 weeks)

- Integrate image processing for occupancy detection.
- Develop features to identify empty tables and calculate empty time.
- Integrate turnstile system for access control.
- Conduct extensive testing of image processing features.

Sprint 4: Reservation System Enhancements (3 weeks)

- Improve the booking system interface.
- Implement reservation changes and cancellations.
- Provide notifications for empty tables and reminders.
- Conduct usability testing and gather user feedback.

Sprint 5: Sanctioning System and Image Processing Improvement (3 weeks)

- Implement a sanction system for violators.
- Enhance image processing to identify abuse and damage.
- Update documentation according to system changes.

Sprint 6: Language Options and Access Controls (2 weeks)

- Define language options in the application.
- Set access controls and restrictions.
- Test effectiveness of access controls.

Sprint 7: System Stability and User Guidance (2 weeks)

- Focus on system stability and performance improvements.
- Develop a comprehensive user manual.
- Perform final tests for the entire system.
- Prepare for deployment.

Sprint 8: Deployment and Post Deployment (1 week)

- Deploy the system to production.
- Track issues and address feedback.
- Complete final documentation.

5) Project Risks

Project risks are going to be analyzed with a combined risk list.

5.1) Likelihood Risk List

LIKELIHOOD RANK	RISK DESCRIPTION
1	**Testing:** Risks in the testing process such as inadequate test coverage, inappropriate test environment, test data management issues and regression testing can affect software quality, delay on-time delivery and reduce customer satisfaction.
2	**Schedule Delays:** The project schedule might be unrealistic or unexpected delays might occur due to technical challenges or resource limitations.
3	**System Integration**: Integrating multiple systems can lead to compatibility issues, especially when dealing with hardware components like turnstiles and cameras.
4	**Unclear Requirements:** Incomplete or unclear requirements can lead to features that don't meet user needs or a system that is difficult to develop and maintain.
5	**Stakeholder Communication:** Poor communication with stakeholders (students, library staff, administrators) can lead to misunderstandings and resistance to the new system.
6	**Complexity of Image Processing**: Developing and implementing accurate image processing algorithms to identify occupancy and user behavior can be challenging.
7	**Resource Constraints:** Interruption or disruption of the flow of information and resources provided for the project disrupts the continuity of the project.
8	**Security Concerns:** The system will store student information and data on library usage. Measures need to be implemented to ensure data security and privacy.

5.2) Impact Risk List

IMPACT RANK	RISK DESCRIPTION
1	**Security Concerns:** The system will store student information and data on library usage. Measures need to be implemented to ensure data security and privacy.
2	**System Integration**: Integrating multiple systems can lead to compatibility issues, especially when dealing with hardware components like turnstiles and cameras.
3	**Complexity of Image Processing**: Developing and implementing accurate image processing algorithms to identify occupancy and user behavior can be challenging.
4	**Testing:** Risks in the testing process such as inadequate test coverage, inappropriate test environment, test data management issues and regression testing can affect software quality, delay on-time delivery and reduce customer satisfaction.
5	**Resource Constraints:** Interruption or disruption of the flow of information and resources provided for the project disrupts the continuity of the project.
6	**Stakeholder Communication:** Poor communication with stakeholders (students, library staff, administrators) can lead to misunderstandings and resistance to the new system.
7	**Unclear Requirements:** Incomplete or unclear requirements can lead to features that don't meet user needs or a system that is difficult to develop and maintain.
8	**Schedule Delays:** The project schedule might be unrealistic or unexpected delays might occur due to technical challenges or resource limitations.

5.3) Combined Risk List

LIKELIHOOD RANK	IMPACT RANK	COMBINED RANK	RISK DESCRIPTION
1	4	5	**Testing:** Risks in the testing process such as inadequate test coverage, inappropriate test environment, test data management issues and regression testing can affect software quality, delay on-time delivery and reduce customer satisfaction.
3	2	5	**System Integration**: Integrating multiple systems can lead to compatibility issues, especially when dealing with hardware components like turnstiles and cameras.
6	3	9	**Complexity of Image Processing**: Developing and implementing accurate image processing algorithms to identify occupancy and user behavior can be challenging.
8	1	9	**Security Concerns:** The system will store student information and data on library usage. Measures need to be implemented to ensure data security and privacy.
2	8	10	**Schedule Delays:** The project schedule might be unrealistic or unexpected delays might occur due to technical challenges or resource limitations.
4	7	11	**Unclear Requirements:** Incomplete or unclear requirements can lead to features that don't meet user needs or a system that is difficult to develop and maintain.
5	6	11	**Stakeholder Communication:** Poor communication with stakeholders (students, library staff, administrators) can lead to misunderstandings and resistance to the new system.
7	5	12	**Resource Constraints:** Interruption or disruption of the flow of information and resources provided for the project disrupts the continuity of the project.

6) Project Needs

The process of identifying the needs has an association with the assignment regarding project requirements and other tied aspects. In a high level perspective the Needs are evaluated in three major sections.

6.1) Software Needs

1. **Database Management System (PostgreSQL):**
   The Database Management System will serve as the backbone of the reservation application, storing critical data such as user information, reservation details, table statuses, and library occupancy rates.
2. **Mobile App Development (React Native):**
   The mobile application development framework will enable the development of an application interface. This interface will allow students to easily reserve library tables, get information about table status, receive and manage notifications and manage reservations. The mobile application will interact seamlessly with backend systems, providing real-time updates on table status.
3. **Image Processing Library (OpenCV):**
   The Image Processing Library analyzes camera images to verify people entering the library and determine table occupancy. It identifies empty tables, calculates the number of people and classifies table types. It works integrated with the reservation system.
4. **Implementing Image Processing (Python):**
   Implementing Image Processing involves integrating the image processing library into the reservation system to provide dynamic updates on library occupancy and table availability. This component will involve setting up and configuring cameras strategically within the library space, processing camera feeds in real-time, and utilizing machine learning models to analyze images and extract relevant data. The goal is to provide users with live feedback on table availability and optimize the library's space utilization.

5. **Testing Softwares (Jest, Pytest):**
   Testing Softwares will be used to ensure the reliability, performance, and security of the reservation application throughout its development lifecycle. This includes automated testing tools for functional testing, load testing, and integration testing to validate the application's behavior under different scenarios.

6.2) Hardware Needs

In the specific needs of Hardware it outlines the physical computing resources required to support the proposed system. This includes the necessary hardware components such as surveillance components, servers, auxiliary power supply systems along with their specifications and quantities.

1. **Cameras:**
   Cameras are key hardware components used for surveillance and image capture in the library space. They will be placed at strategic points to monitor table occupancy, detect misuse and integrate with the image processing system. High resolution cameras can have wide angle lenses and low light capacities, which is essential to provide accurate and real-time data for the booking application.
2. **Turnstiles:**
   Ensures the management of the occupation beforehand with the help of id/QR validation and helps the establishment of a static separation border. Turnstiles help to accurately monitor occupancy by ensuring that only students with reservations can enter the library.
3. **Server:**
   Hosts DBMS and provides a hub for all the software utilities with computing power. The server acts as the hub for storing and processing the data collected by the reservation system. It hosts the database management system, image processing algorithms and other software components necessary for the functionality of the application. The server must have sufficient processing power, memory and storage capacity to perform real-time data processing functions and ensure system reliability.

4. **Display Screen:**
   The screens at the library desk will reflect the images from the database of the users entering the library and the images taken from the cameras during the entrance. These screens will also enable library staff to support manual authentication.
5. **Power Backup:**
   Power backup solutions such as uninterruptible power supplies (UPS) or generators are critical to ensure system continuity during power outages. Since the reservation system operates 24/7, uninterrupted power supply is essential to prevent data loss and maintain system availability. The power backup system should be capable of supporting all critical hardware components, including servers and cameras, for extended durations if necessary.

7) Measurements

1. **Average Occupancy Rate:** It shows what is the percentage of the occupied areas during the peak hours of the library.

2. **Sprint Duration:** The length of time allocated for each sprint in the Scrum development process.

3. **Stakeholders Satisfaction Level :** The level of contentment or happiness expressed by stakeholders with the reservation system.

4. **Number of Issues Encountered:** The total count of bugs, defects, or errors identified during testing phases.

5. **Accuracy and Efficiency Rate of Data:** The percentage of correct outputs generated by our software and their computational efficiency.

6. **Project Duration:** The total time elapsed from project initiation to the delivery of the final product.

7. **Software Performance:** The effectiveness of softwares in terms of both accuracy and computational efficiency during development.

8) Programming Languages

Python: Python is chosen for its simplicity and readability, which facilitates rapid development and easy maintenance of the code. It is well-supported by numerous libraries and frameworks that make it suitable for complex tasks like image processing. Python's flexibility allows for the seamless integration of various components of the project, ensuring a cohesive and functional application.

React Native: React Native is selected for mobile application development due to its ability to deliver high-quality mobile apps for both Android and iOS platforms from a single codebase. It provides a responsive and smooth user interface, which is essential for a user-friendly reservation system. React Native's component-based architecture and extensive library support enable rapid development and iteration of the application's features.

9) Software Tools

Image Processing Tool

OpenCV: OpenCV (Open Source Computer Vision Library) is a highly optimized library for computer vision tasks. Its comprehensive set of tools for image and video processing makes it an ideal choice for tasks such as occupancy detection and behavior analysis in the library. It supports multiple programming languages, but its integration with Python offers the advantage of simplicity and ease of use.

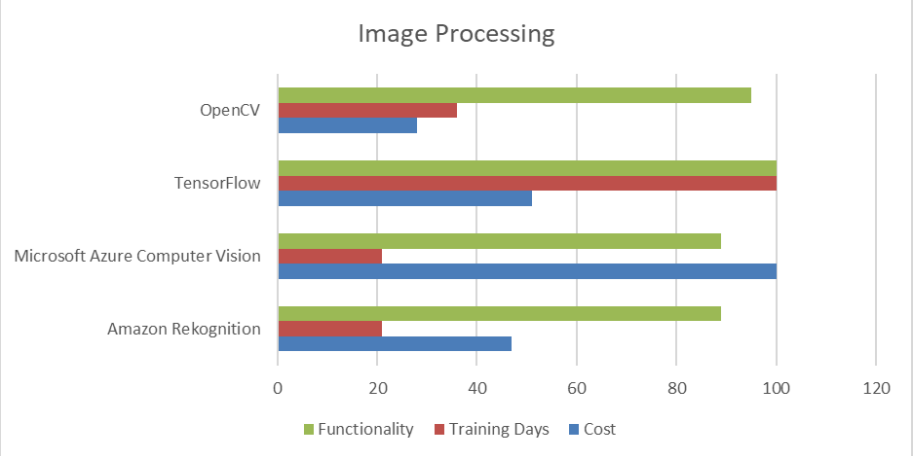
- **Versatility:** Offers a wide range of image and video analysis functions.
- **Cost-Effectiveness:** Open-source library with extensive community support and documentation.
- **Capabilities:** Ideal for object detection, facial recognition, and image segmentation, meeting the project's image processing needs.

Tool Cost/Training/Functionality Data

Tool	Amazon Rekognition	Microsoft Azure Computer Vision	TensorFlow	OpenCV
Cost	$2592/y	$5430/y	$2860/y	$1548/y
Training Days	3	3	14	5
Functionality	85	85	95	90

Normalized Cost/Training/Functionality Data

Tool	Amazon Rekognition	Microsoft Azure Computer Vision	TensorFlow	OpenCV
Cost	47	100	51	28
Training Days	21	21	100	36
Functionality	89	89	100	95



Database Management System

PostgreSQL: PostgreSQL is a powerful, open-source object-relational database system. It is highly versatile and capable of handling complex queries and a large volume of data efficiently. Its support for binary data storage and advanced SQL capabilities make it suitable for managing the library's reservation data, including processed images. Its robustness, security features, and active community support ensure reliable performance and easy maintenance.

- **Robust Features:** Efficiently handles various data types, including binary data for images.
- **Integration:** Seamless integration with Python through libraries like psycopg2.

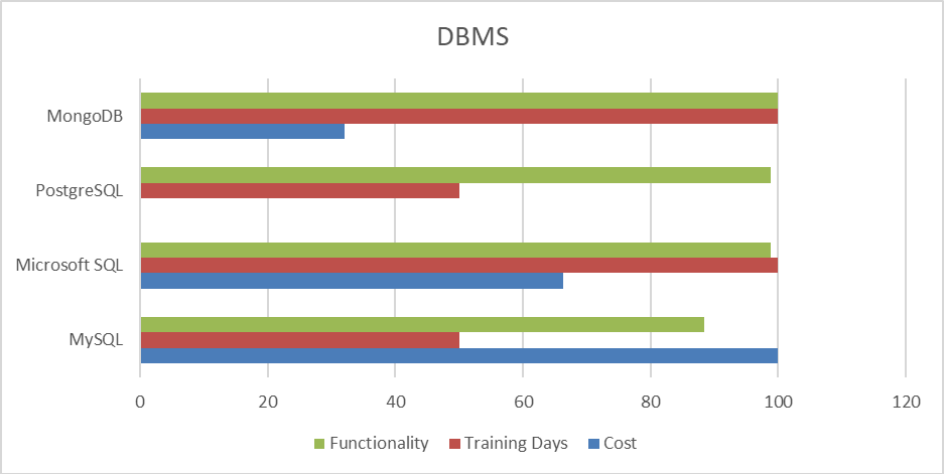
- **Security:** Advanced security features and strong community support ensure safe and reliable data management.

Tool Cost/Training/Functionality Data

Tool	MySQL Standard Edition	Microsoft SQL Server	PostgreSQL	MongoDB
Cost	$2,140/y	$1,418/y	$0	$684/y
Training Days	5	10	5	10
Functionality	76	85	85	86

Normalized Cost/Training/Functionality Data

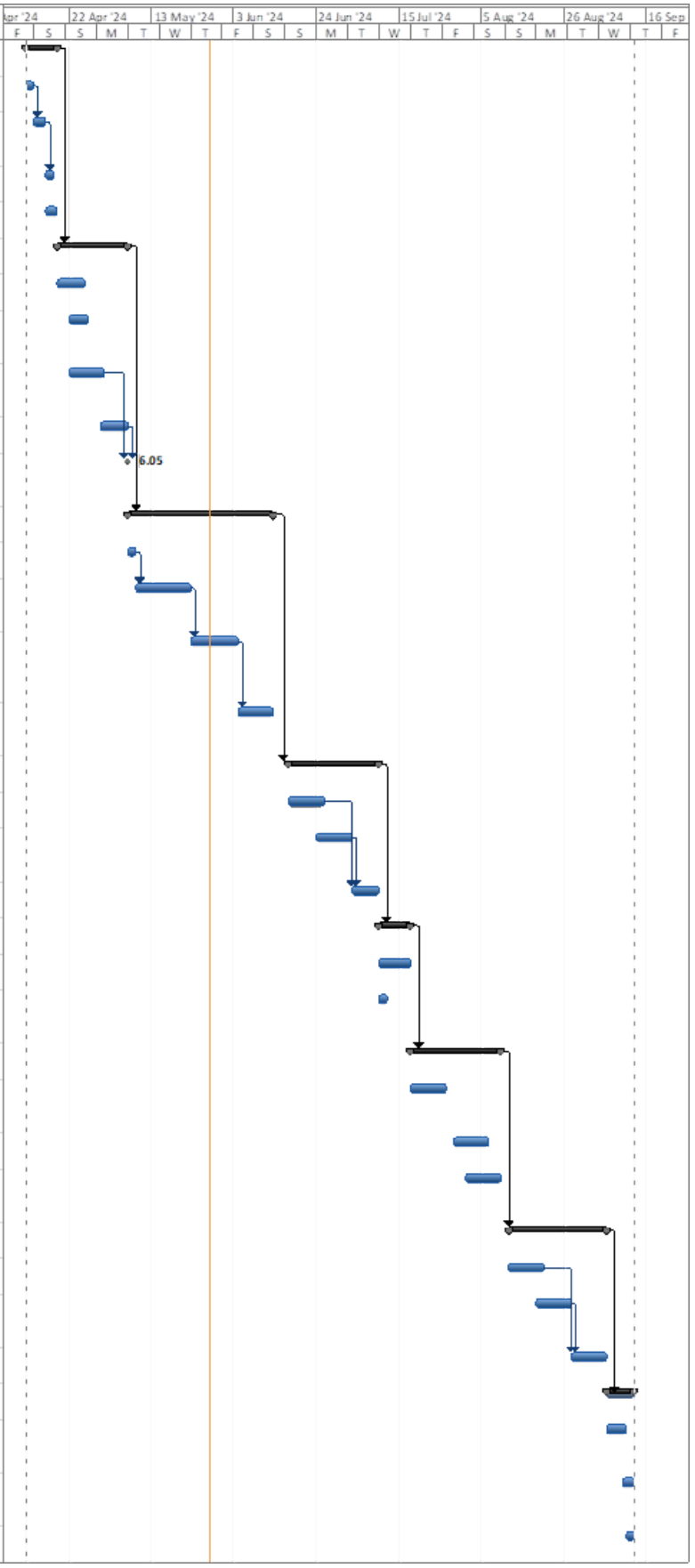
Tool	MySQL	Microsoft SQL Server	PostgreSQL	MongoDB
Cost	100	66,3	0	32
Training Days	50	100	50	100
Functionality	88,4	98,8	98,8	100



10) Project Schedule and Gantt Chart

The project is planned to consist of 8 sprints. This project, which is planned to start in April and be completed in September, includes creating a database, developing a backend and frontend reservation system, creating an image processing algorithm, creating a mobile app, integrating each of them, and testing these. There are also hardware stages such as rearranging the camera and library layout and placing turnstiles and screens in the library.

ID	Task Mode	Task Name	Duration	Start	Finish	Predecessors	Resource Names
1		**Project Initiation and Planning**	**8 days**	**Thu 11.04.24**	**Thu 18.04.24**		
2		Forming Project Team and Defining Roles	2 days	Thu 11.04.24	Fri 12.04.24		
3		Conducting Stakeholder Meetings and Defining Objectives	3 days	Sat 13.04.24	Mon 15.04.24	2	
4		Developing Initial Product Backlog	2 days	Tue 16.04.24	Wed 17.04.24	3	
5		Setting Up Development	3 days	Tue 16.04.24	Thu 18.04.24		
6		**Database Setup and Basic System**	**12 days**	**Fri 19.04.24**	**Mon 6.05.24**	1	
7		Creating PostgreSQL Database Schema	5 days	Fri 19.04.24	Thu 25.04.24		
8		Implementing User Authentication and Registration	5 days	Mon 22.04.24	Fri 26.04.24		
9		Developing Basic Reservation System Backend	7 days	Mon 22.04.24	Tue 30.04.24		
10		Development of The Frontend	5 days	Tue 30.04.24	Mon 6.05.24		
11		Integrating The Backend and Frontend of The Reservation	0 days	Mon 6.05.24	Mon 6.05.24	9;10	
12		**Image Processing Integration**	**27 days**	**Tue 7.05.24**	**Wed 12.06.24**	6	
13		Installing Cameras at Strategic Locations	2 days	Tue 7.05.24	Wed 8.05.24		
14		Developing Image Processing Algorithms using OpenCV	10 days	Thu 9.05.24	Wed 22.05.24	13	
15		Integrating Image Processing System with Reservation System Backend	8 days	Thu 23.05.24	Mon 3.06.24	14	
16		Testing Image Processing Integration and Optimizing	7 days	Tue 4.06.24	Wed 12.06.24	15	
17		**Mobile App UI Development and Testing**	**17 days**	**Mon 17.06.24**	**Tue 9.07.24**	12	
18		Designing Mobile App Interface	7 days	Mon 17.06.24	Tue 25.06.24		
19		Implementing Real-time Table Status Updates in Mobile App	7 days	Mon 24.06.24	Tue 2.07.24		
20		Conducting UI/UX Testing and Gathering	5 days	Wed 3.07.24	Tue 9.07.24	18;19	
21		**Hardware Setup and Integration**	**6 days**	**Wed 10.07.24**	**Wed 17.07.24**	17	
22		Integrating Turnstiles with Reservation	6 days	Wed 10.07.24	Wed 17.07.24		
23		Installation of Screens at The Library Information Desk	2 days	Wed 10.07.24	Thu 11.07.24		
24		**Testing and Quality Assurance**	**17 days**	**Thu 18.07.24**	**Fri 9.08.24**	21	
25		Developing Automated Testing Scripts (Jest, Pytest)	7 days	Thu 18.07.24	Fri 26.07.24		
26		Performing Functional Testing	7 days	Mon 29.07.24	Tue 6.08.24		
27		Conducting Load Testing and Performance Analysis	7 days	Thu 1.08.24	Fri 9.08.24		
28		**Documentation and Final Adjustments**	**19 days**	**Mon 12.08.24**	**Thu 5.09.24**	24	
29		Preparing User Guides and Documentation	7 days	Mon 12.08.24	Tue 20.08.24		
30		Finalizing System Adjustments and Feature Enhancements	7 days	Mon 19.08.24	Tue 27.08.24		
31		Performing Final System Testing and Bug	7 days	Wed 28.08.24	Thu 5.09.24	29;30	
32		**Deployment and Post-Deployment**	**5 days**	**Fri 6.09.24**	**Thu 12.09.24**	28	
33		Deploying Reservation System to Production Environment	3 days	Fri 6.09.24	Tue 10.09.24		
34		Monitoring Post-Deployment System Performance	3 days	Tue 10.09.24	Thu 12.09.24		
35		Organizing Training Sessions for Library	2 days	Wed 11.09.24	Thu 12.09.24		



11) Project Payoffs

1. **Developer team:** Developers gain valuable experience and improve their technical skills. Successfully completing a project enhances their professional portfolio, opening up new career opportunities. Seeing their work make a real impact can boost morale and job satisfaction.

2. **Students (users):** Now students are using the library easier and more efficiently. They can do their reservations on the application and by doing that they are saving more time to study in the library.

3. **Customers (universities):** Universities are using their library resources more efficiently. They are also solving the problem of capacity for each student in the library .

4. **Library staff:** By using our product, library staff have time for focusing on their more important duties and they can see what is happening in the library easily.

5. **IT team of university:** IT team of university has more time for focusing their more important duties and they can check whenever they want to check the system.

12) Graphical User Interface (GUI)

13) Conclusion

As a result, this project will be a solution to the density of the library, unnecessary use of tables, and noise problems by processing the data received from the cameras with image processing and controlling the time spent in the library and the time spent in the library with the reservation application and turnstiles. In addition, this project will be implemented not only in the Izmir University of Economics library but also in other libraries and will be a solution to general problems in libraries. The general aim of the project is to spend time more effectively and efficiently in libraries and thanks to this project, it is hoped that the time spent in the library will be productive for people.