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**MINISTER OF HIGHER EDUCATION**

**FACULTY OF ENGINEERING**

**AND TECHNOLOGY**

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**FACULTY OF ENGINEERING AND TECHNOLOGY**

**Department : Computer Engineering**

**CEF 440: Internet Programming and Mobile programming**

**TASK 3**

**REQUIREMENT ANALYSIS**

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**1. INTRODUCTION**

**1.1 Project Overview**

The Biometric Student Attendance Mobile Application is a cutting-edge solution designed to revolutionize the way educational institutions manage and track student attendance. At its core, the application aims to leverage biometric technology, specifically fingerprint recognition, to streamline the attendance-taking process while enhancing security and accuracy.

**1.2 Project Scope**

The objective of our biometric student attendance mobile application is to streamline the process of tracking student attendance in educational institutional using fingerprint recognition technology.

The application aims lies in its potential to address several challenges faced by educational institutions in attendance management: like time saving, reduced administrative burden, enhanced accountability by ensuring that attendance records are accurate and cannot be manipulated, fostering a culture of responsibility among students and improved decision-making.

**1.3 Requirement Analysis**

Requirements analysis or requirements engineering is a process used to determine the needs and expectations of a new product. It involves frequent communication with the [stakeholders](https://www.simplilearn.com/stakeholders-impact-on-the-projects-article) and end-users of the product to define expectations, resolve conflicts, and document all the key requirements.

Requirements analysis is a common and essential concept in [software development](https://www.techtarget.com/whatis/definition/software-development) and software [project management](https://www.techtarget.com/searchcio/definition/project-management). At the start of every software project, the project team must understand, finalize and document the features and functionalities required of the end product. These required features and functionalities are often called [functional specifications](https://www.techtarget.com/searchsoftwarequality/definition/functional-specification), and the process of determining and understanding them is called requirements gathering and analysis.

Requirements must be quantifiable, as detailed as possible and relevant to the end product. In addition, they should be clearly documented so the development team has clear expectations and understands required specifications from the beginning.

Requirements analysis in software engineering does the following:

* Clarifies the required features and overall vision of a new product.
* Clarifies [stakeholder](https://www.techtarget.com/searchcio/definition/stakeholder) expectations for that product.
* Prevents conflict and communication gaps during development and testing.
* Ensures that the final product conforms to requirements, i.e., prevents [scope](https://www.techtarget.com/searchcio/definition/project-scope) creep.

**2. STAKEHOLDER IDENTIFICATION**

**2.1 Definition**

Stakeholders are individuals, groups or entities who have an interest or “stake” in a particular project, organization, or system. They can include employees, customers, investors, suppliers, communities and government entities among others.

**2.2. Key Stakeholders**

Stakeholder involvement is crucial in the success of this biometric student attendance mobile application project. Let’s analyze the key stakeholders involved, their roles and responsibilities, and the importance of involving them in the requirement gathering process.

* **Faculty Administrators (Faculty Deans, Departments Heads, or Other Administrative staffs):** Responsible for overseeing the implementation within their respective departments, ensuring alignment with departmental policies, and managing administrative aspect.
* **Instructors:** Responsible for taking attendance, monitoring student participation to track and manage attendance records
* **Students:** End-users of the application who rely on the system for marking their attendance, viewing their records, and receiving notifications.

**3. Functional Requirement**

Functional requirements describe the specific behavior or functions a software system must perform to satisfy the needs of its users or stakeholders. These requirements define what the system should do in terms of its inputs, outputs, processes, and interactions with users and other systems. Functional requirements are typically detailed, precise, and measurable, allowing for objective verification of whether the system meets its intended functionality.

**3.1. Client – server Application:**

The system should be a client Server Application. When the lecturer wants to record students’ attendance through the platform, the lecturer will just initiate the attendance taking, the student will login from their client application installed on their device and they will double authenticate themselves with their fingerprint data to ensure that they are one login in, after doing that, they will connect to the server of the lecturer machine/device using the lecturer hotspot and they will probe to mark their attendance using their fingerprint on their client application. And the data will be sent to the server application, which processes it, marks attendance, and stores information in a database.

**3.2. Registration and Account Creation:**

* Students need to download and install the biometric student attendance client application on their smartphone
* They will be required to create an account within the application by providing necessary personal information such as their name, matriculation number, institutional email, alternative email, phone number, department, level.

**3.3. Fingerprint Enrollment Initiation:**

* Once the student has created an account, they can initiate the fingerprint enrollment process within the client application.
* The client application will guide the student through the necessary steps to enroll their biometric data

**3.4. Double Authentication and Login**

* They system or the platform will enabling students to double authenticate themselves after login with their credential to verify their identities using fingerprint.
* The system or platform will enable Instructor’s to login using a secure mechanism with appropriate access control.

**3.5. Attendance Tracking and Reporting**

* The system should maintain a record of student attendance including dates, timestamps and any attendance exception
* Instructors and Administrators should be able to generate attendance reports of individual courses

**3.6. Attendance Summary**

* The system should be able to generate the summary of the percentage of lectures that an individual student has attended and also for the course as well the percentage of students that have attended that particular course

**3.7**. **Notification:**

* Students should be able to get attendance percentage notifications on their various mobile telephones. So as to comply with the University of Buea student’s guide which says that a student with a overall percentage attendance less than 70% is not eligible to write exams.

**3.8. Attendance History:**

* The system should give the possibility to students to be able track their individual attendance record of each courses they are offering on their client application.

**3.9. Attendance Session Taking:**

* The system should provide lecturers with the flexibility to open the attendance session taking to record students’ attendance at any time of his period and able to closed any time during lecturer period.

**3.10.** **Real-time Attendance tracking:**

* The system should support real-time attendance tracking, allowing instructors to view attendance record, instantly as student check in using biometric credentials.

1. **Non- Functional Requirement**

Non-functional requirements specify criteria that can be used to judge the operation of a system, rather than specific behaviors. They often relate to qualities like performance, security, usability, reliability, and scalability. These requirements are crucial for ensuring the overall success and effectiveness of a system but may not directly affect its functionality**.**

# 4.1 Security

* Secure storage of student biometric data (fingerprint templates). Implement industry-standard encryption for data transmission. User authentication mechanisms to prevent unauthorized access. Audit logs to track user activity and maintain accountability

# Performance

* Fingerprint recognition should be fast and reliable (less than 5 seconds per student).
* The application should function smoothly on various mobile devices with different specifications. Efficient data synchronization between the mobile app and central server.
  1. **Usability:**
* The platform should be Intuitive and user-friendly interface for both students, instructors and administrators. Design that caters to different screen sizes and resolutions. Accessibility features for users with disabilities.
  1. **Scalability:**
* The application should be scalable to accommodate a growing number of users and classes and also allowing education institution to adapt the application to their specific requirements.
  1. **Offline Functionality:**
* The system or platform will support offline functionality allowing students to check-in attendance on their client application with no or little connection (data will be synced later).
  1. **Compatibility:**
* The application should be compatible to run on multiple versions of iOS and Android devices, also it should ensure consistent functionality and user experience across different devices and screen sizes. It should also be able to be integrated to other applications and can integrate some services from other applications.

**5. User Roles and Permissions**

User roles and permissions refer to the system of defining and regulating what actions different users are allowed to perform within a software application or platform.

User roles categorize users based on their responsibilities, tasks, or functions within the system while Permissions are rules or setting that specify what actions users with a particular role are allows or not allowed to do within the system

**5.1. Administrator:**

* **Permissions:**
* **Administrative Dashboard:**
* The administrator should have access to a centralized dashboard to monitor or track the attendance across multiple courses or departments level.
* **Manages Classes:**
* The Administration creates the class, edit existing class and can delete class and put additional information like the data of a class, the lecturer.
* Also manages the class specification information such as course title, course code, , class hall, dates and time and the instructor taking that course.

# User Management:

* Authorized administrators shall have access to a separate interface for managing user accounts and system settings.
* Admin users shall be able to create, update, or delete user accounts as needed, with appropriate validation checks and confirmation prompts.
* Administrators shall have the ability to view detailed logs of user activities, including account authentication attempts, and modifications.
* **Role-Based Access**
* The system should support role-based access control allowing the administration to define different levels of access and permission for instructors, students and other staff members.
* **Data Analysis and Reporting:**
* Administrators have a centralized system enables efficient data analysis and reporting. It allows the administrators to generate and view attendance report at the department or faculty level, providing valuable insight into attendance patterns, trends and compliance.

**5.2. Instructor:**

* **Permissions:**
* **Dashboard**
* Overview of current and upcoming classes with attendance summaries
* Real-time attendance updates for ongoing classes.
* Quick access to students’ attendance records for individual courses
* Option to export or share attendance report
* **Attendance list management:**
* The ability to view and management the attendance list of students for various classes and the option to add, remove or edit students from the attendance list including manually entering student information.
* **Attendance Exception:**
* Instructor should be able to mark attendance for a student who was not in class and has a valid reason for not coming or a student could not mark their attendance because their fingerprint data is no longer recognized into the system database.
* **Attendance Session taking:**
* Record student attendance using their fingerprint data.

**5.3. Students:**

* **Permission:**

* Mark their own attendance
* View their own attendance records
* View their personal information
* Receive notifications related to attendance

**6. SYSTEM CONSTRAINT AND DEPENDENCIES**

**6.1. System Constraints:**

* **Budget:** The project should adhere to a specific budget allocated for developing the attendance recording system, considering the costs associated with hardware, software, and implementation.
* **Time frame:** There may be a predefined timeline or deadline for implementing the system, and the project should be completed within that time frame.
* **Battery Consumption:** The application must minimize battery consumption to ensure prolonged usage without draining the user’s devices quickly, potentially limiting the use of power-intensive features.
* **Integration with Existing Systems:** The application may need to integrate with existing student management systems or databases, imposing data formats, APIs, and compatibility.

**6.2. Dependencies:**

* **APIs and SDKs:** The Application will rely on third-party APIs or Software Development Kits (SDKs) provided by biometric technology vendors to access and process biometric data.
* **Backend Infrastructure:** The application relies on backend infrastructure including servers, databases, and APIs to store and manage attendance data securely.
* **User Authentication Services:** The application depends on user authentication services to verify the identity of students, teachers, and administrators accessing the system. Integration with authentication services such as OAuth, or LDAP is necessary to ensure secure access control.
* **Mobile Platform Dependencies:** The application development and deployment are dependent on specific requirement and capabilities of Mobile platform such as Android and iOS. This include adherences to platform guidelines, compatibility, testing, and leveraging.
* **Data Security and Compliance:** The application’s compliance with data security and privacy regulations depends on the implementation of encryption, access controls and audit trails.

**7. CONCLUSION**

Overall, requirement analysis is the most essential step of project development and involving the stakeholders in the requirement process promotes collaboration, reduces risks, enhances understanding and increases the chances of the project success.